INTERNATIONAL REAL ESTATE REVIEW

2015 Vol. 18 No. 1: pp. 177 – 215

Calendar Anomalies: Do REITs Behave Like Stocks?

Mehmet Akbulut
Department of Finance, Mihaylo College of Business and Economics, California State University-Fullerton. Email: makbulut@fullerton.edu

Su Han Chan
Carey Business School, Johns Hopkins University. Email: Schan@jhu.edu

Mariya Letdin
Department of Risk Management, Insurance, Real Estate & Business Law, Florida State University. Email: mletdin@business.fsu.edu

This study addresses the unsettled question of whether REITs behave similarly to stocks with respect to calendar anomalies. We determine the magnitudes of several types of calendar anomalies for both the REIT and stock market index returns in 22 countries between 1990 and 2012. In general, our evidence shows that the calendar effects are not universal across countries and that REITs behave differently from their stock counterparts in a number of countries. The difference in behavior is especially evident around the turn of the month where REITs exhibit significantly higher returns than general stocks in the global sample as well as in 7 of the 22 countries examined. This result may be possibly linked to the higher level of institutional ownership in REITs than stocks in their corresponding market during the period examined.

Keywords

Real Estate Investment Trusts, Seasonality, Calendar Anomalies

1. Introduction

Do REITs, which are a pool of properties that trade in the stock market, behave like stocks in the general market? This is an age-old question that researchers, to date, are still trying to answer. Prior studies, so far, have sought to address this question from several angles. One strand of the literature focuses on the correlation, co-integration or integration of REITs with stocks, bonds or real estate (e.g., Li and Wang, 1995; Ling and Naranjo, 1999; Glascock and Lu, 2000; Clayton and MacKinnon, 2001; Case et al., 2012), while another strand examines if REITs behave similarly to other stocks in corporate events such as initial public offerings (IPOs; e.g., Wang et al., 1992; Chan et al., 2013), mergers (e.g., Allen and Sirmans, 1987) and post-earnings announcements (Price et al., 2012).

While evidence from corporate events shows that REITs behave somewhat differently from other stocks, the evidence on the correlation, co-integration or integration of REITs with general stocks is mixed depending on the research methodology used, sample analyzed, and time period under consideration. Of note is an observed shift in U.S. REIT-stock market relations between the pre-early 1990 and the post 1990 periods, which coincided with a change in REIT characteristics (from fund-like to more operational like) and an increase in institutional investor participation that led to improved information efficiency in the REIT marketplace. [1]

To shed additional light on the unsettled question of whether REITs behave like stocks in the general market, this study uses post 1990 returns data on REITs from 22 countries around the globe to test whether equity REITs behave similarly to general stocks with respect to the manifestation of calendar anomalies. These calendar anomalies (effects related to day-of-the-week, turn of the month (TOM), turn of the year (TOY), seasons of the year and holidays) have been observed in general stocks around the globe (e.g., Agrawal and Tandon, 1994) and also in U.S. REITs (e.g., Redman et al., 1997; Connors et al., 2002; Chan et al., 2005; Wiley and Zumpano, 2009) and international property shares (Lenkkeri et al., 2006; Brounen and Ben-Hamo, 2009; Almudhaf and Hansz, 2011; Khaled and Keef, 2012; Hui et al., 2013). However, due to differing samples, countries and time periods analyzed in the various studies, it is not possible to directly compare their results in order to draw conclusions about the similarity in behavior with respect to calendar anomalies between REITs and general stocks. This is especially true given that REIT structures, regulatory requirements and institutional arrangements (such as trading methods, clearing mechanism, settlement procedures, bid-ask spreads) may differ across countries and evolve over time. As such, the

[1] See Wang et al. (1995) for details on the characteristics of the REIT market in the pre-1992 era and Chan et al. (1998 and 2003) for evidence on the growth in institutional ownership in REITs.

evidence from existing calendar anomaly studies does not fully address whether REITs behave similarly to other stocks.

This study differentiates itself from, and contributes to, the existing literature in several ways. First, we examine the presence of several types of calendar effects in both the REIT and general stock market indices in 22 different countries (with a REIT regime) that span five continents during the 1990-2012 period. (It is noteworthy that prior international studies have included countries that do not yet have a REIT regime.) Not only does this study update earlier works by covering a longer time period and including more recent REIT regimes, it also covers more countries (both developed and emerging) than all of the prior studies that have examined calendar effects in REITs.

Second, we employ similar empirical methodologies to examine the calendar anomalies exhibited by REITs and stocks in each of the 22 countries, thus enabling us to make meaningful comparisons. Furthermore, our study is one of the very few (or may be the only one) in the literature to conduct a systematic test of the difference in the magnitude of calendar effects between REITs and general stocks in the same market (to control for institutional peculiarities of a market) and over the same time period (to control for the influence of macroeconomic events).

Finally, our comparison of the calendar effects in REITs and stocks across 22 countries that differ with respect to the maturity of the REIT industry, level of stock market development, and percentage of institutional ownership in REITs relative to general stocks may offer us insights into whether the calendar anomalies exhibited by REITs and stocks are universal among countries, or if not, whether those differences coincide with one or more of these market characteristics.

We find that the calendar effects are not universal across countries and that REITs behave differently from stocks in a number of the countries that we examined. The difference in behavior is most evident in the TOM effect where REITs exhibit significantly higher returns on the last day of the month than general stocks in 7 of the 22 countries examined and also at the global level. Interestingly, the percentage of institutional ownership is also higher in REITs than in general stocks in 6 of the above 7 countries, thus suggesting that the difference in the magnitude of the TOM effect may be linked to the level of institutional ownership.

Section 2 is a review of the relevant studies on calendar anomalies. In Section 3, we describe our data while in Section 4, we discuss our empirical methods and findings. The last section concludes.

2. Related Literature on Calendar Anomalies

This section briefly reviews the evidence on the types of calendar anomalies that we examine in this study. The anomalies are: the day-of-the-week, TOM, TOY, May-to-October and holiday effects.[2]

The day-of-the-week effect typically manifests itself as negative and lower Monday returns and higher than average Friday returns (see Pettengill (2003) for a comprehensive survey of this literature). From the late 1980s onwards, researchers find that the day-of-the-week effect (especially on Monday) has dissipated both in the U.S. and in the major international stock markets (e.g., Lakonishok and Smidt, 1988 and Agrawal and Tandon, 1994), which could possibly be attributed to improved market efficiency in the overall stock market (Kohers et al., 2004). More specifically, Chan et al. (2004, 2005) show that the Monday anomaly in the U.S. general stock market disappeared after 1990 as institutional ownership of stocks increased over time, and the REIT Monday return behavior moved closer to that of regular stocks after 1992 following structural changes and growth in institutional participation in the U.S. REIT market.[3] More recently, Lenkkeri et al. (2006) find no Monday effect but a positive Friday effect in European real estate indices from 1990 to 2003, and Brounen and Ben-Hamo (2009) also find the same result for property companies in 9 out of 11 countries from 1987 to 2007. For U.S. REITs, the latter study finds the effect to be more pronounced in small and young firms with low proportions of closely held shares. Hui et al. (2013), however, find little evidence of a day-of-the-week effect in the property indices of the U.S., Asia, Europe, and Australia from 2000 to 2011.

The TOM effect is marked by high returns in the last several days of the month and the first few days of the following month. Agrawal and Tandon (1994) observed this effect in the international stock markets while Redman et al. (1997) and Wiley and Zumpano (2009) also find this anomaly in the U.S. REIT market. The latter study attributes the anomaly partially to institutional investment whereby large institutional shareholders manipulate returns by buying high performing and selling underperforming stocks. While some studies attribute the TOM effect in stock prices to increased market liquidity and hence buying pressure by small and large traders at month-end (e.g., Ogden, 1990), McConnell and Xu (2008) cannot provide evidence to rule out or support the month-end buying pressure hypothesis through the use of U.S. stock data. The authors also find that neither firm size nor stock price can explain for the anomaly and hence conclude that the TOM effect is still in search of an explanation.

---

[2] Other anomalies examined in the literature include the daylight saving time effect (Kamstra et al., 2000), weather (Hirshleifer and Shumway, 2003) and Ramadan (Białkowski et al., 2012).

[3] The two major structural changes are the switch from external to internal advisor use and a fund-like structure to one more similar to operating firms in the stock market.

The January, or turn-of the-year effect is the phenomenon in which stocks (especially small stocks) exhibit abnormally high returns in early January. It is traditionally attributed to tax-loss selling whereby individual investors sell in December those stocks on which they have experienced a loss that they would like to recognize on their taxes (e.g., Griffiths and White, 1993; Agrawal and Tandon, 1994; Starks et al., 2006) or to window-dressing whereby institutional investors sell underperforming or loser stocks prior to year-end reports (e.g., Ng and Wang, 2004). Several studies on U.S. REITs confirm the January effect, especially in smaller REITs (e.g., Colwell and Park, 1990; Friday and Peterson, 1997; Redman et al., 1997; Hardin et al., 2005), whereas other studies find a December (instead of a January) effect in U.S. REITs (e.g., Connors et al., 2002) and a number of European property indices (e.g., Almudhaf and Hansz, 2011 and Hui et al., 2013).

The seasonal effect (also called the sell-in-May effect) refers to the phenomenon of higher average returns during the November-April period than the May-October period. Bouman and Jacobsen (2002) examine 37 stock markets across the globe from 1970 to 1998 and find this effect to be present in many developed (particularly those in the Northern Hemisphere) as well as emerging stock markets. However, they are unable to attribute the effect to the January effect or other factors such as risk, trading volume and sector specific differences. Jacobsen and Visaltanachoti (2009) provide more recent evidence (from 1998 to 2007) that shows the continued existence of this seasonal effect in 19 developed markets and a significant difference in the effect across U.S. sectors and industries. In examining mean stock return and trading activity during the summer months (defined locally and quarterly instead of from May-October) for 51 stock markets, Hong and Yu (2009) find a link between decreased trading activity among retail and institutional investors and lower returns in the summer months. Brounen and Ben-Hamo (2009) also detect a seasonal effect in the returns of property shares in five out of ten countries examined. In sum, the seasonal anomaly appears to be a market-wide phenomenon that is still in search of an explanation.

Finally, the holiday effect describes the occurrence of high returns in the days that lead up to a holiday. This effect is reported for the U.S. stock market (e.g., Lakonishok and Smidt, 1988; Ariel, 1990), some international stock markets (e.g., Cadsby and Ratner, 1992) and U.S. REITs (Redman et al., 1997; Connors et al., 2002). More recently, Chong et al. (2005) report a disappearance of the pre-holiday effect for the U.S. stock market in the 1997-2003 period. The pre-holiday effect does not seem to be driven by other calendar anomalies, the small firm effect or a difference in institutional arrangements (e.g., Ariel, 1990; Kim and Park, 1994). There is some limited evidence, however, that the effect may be linked to the trading behavior of small versus informed investors, with the likelihood of higher informed trading on pre-holidays (see Meneu and Pardo, 2004).

In summary, prior research shows that several types of calendar anomalies occur in the general stock markets as well as in some real estate markets around the world. Furthermore, some studies find that one or more of these anomalies (i.e., day-of-the-week and January effects) have dissipated from the 1990s onwards. However, the evidence for both the general stock market and the real estate market varies depending on the methodology, sample used and the time period examined. A direct comparison of the calendar effects between REITs and the general stocks in the same market over the same time period seems warranted.

3. Data and Sample Description

Our data comprise daily total returns on REIT and stock market indices retrieved from DataStream for 22 countries (which span North America, Australia, Asia, Europe, and Africa) and the global market for the period that starts in 1990 and ends at the end of the first quarter of 2012. We deem 1990 as an appropriate start year given that the available daily return series for the selected REIT indices of all the 22 countries (except the Netherlands) begin after 1990.[4] In addition, the examining of only the post-1990 period allows us to focus our analysis on modern U.S. REITs that have undergone structural changes (in management style and institutional participation level) in the early 1990s, thus making them more similar to other operating firms in the stock market.

In situations where DataStream provides a choice of REIT indices for the same country, we select the index with a start date closest to the start date of the country's REIT regime (taken from *EPRA Global REIT Survey 2011*). As a result, the indices that we selected are derived from various data providers in the DataStream database, including Global Property Research (GPR), DataStream, FTSE, Dow Jones, and Standard and Poor's. In some instances where we discovered that a local currency index (such as for Belgium, Malaysia, Taiwan, and the U.S.) has monthly return data in the early periods, but daily data that commence at a later date, we use the daily data availability as the start date of the series. The common ending date that we impose for all of the index series is 3/30/2012. However, the REIT index series for South Korea and Germany have data available only up to 12/17/2010 and 3/19/2010, respectively. Tables 1a and 1b present the descriptive statistics of the 23 (22 country and 1 global) stock market and REIT indices that we use in this study. The indices that we gathered are measured in local currency and value-weighted indices. (The value-weighted index discriminates for size and large firms carry more weight in the index.)[5]

[4] The daily return series for the REIT and the market indices of the Netherlands started in 1973 and 1983, respectively.

[5] Hardin et al. (2005) find that the detection of calendar anomalies in U.S. REITs may be sensitive to the index used.

Table 1a Description of REIT and Stock Market Indices by Country

Continent	Country	Code	Market Index Used	REIT Index Used	REIT Start Year	Data Start Date	Data End Date
Americas	United States	US	DJ US TOTAL STOCK MARKET	GPR 250 REIT, Datastream REIT	1961	12/30/1999	3/30/2012
	Canada	CAN	S&P/TSX COMPOSITE	S&P Canada REIT	1993	6/28/1996	3/30/2012
	Mexico	MEX	MSCI Mexico	Mexico Datastream REITs	2004	3/21/2011	3/30/2012
Australia	Australia	AUS	Australia Datastream	DataStream REITs	1971	6/1/1992	3/30/2012
Asia	Japan	JPN	TOPIX	GPR 250 REIT Japan	2001	9/28/2001	3/30/2012
	Hong Kong	HK	Hang Seng	GPR 250 REIT Jong Kong	2005	10/1/2004	3/30/2012
	South Korea	SK	MSCI Korea	DJTM South Korea	2002	6/20/2008	12/17/2010
	Taiwan	TWN	TAIWAN SE WEIGHTED	S&P Taiwan REIT	2005	3/15/2006	3/30/2012
	Singapore	SNG	STRAITS TIMES	GPR 250 REIT SINGAPORE	2002	9/30/2003	3/30/2012
	Malaysia	MAL	FTSE Malaysia	S&P Malaysia REIT	2005	9/20/2010	3/30/2012
	Thailand	THA	Bangkok S.E.T.	TR Thailand REIT	2003	4/1/2011	3/30/2012
Europe/ME	United Kingdom	UK	FTSE 100	GPR 250 REIT UK	2007	12/29/2006	3/30/2012
	France	FR	France CAC 40	S&P France REIT	2003	9/30/2003	3/30/2012
	Germany	GER	DAX 30	GPR 250 REIT Germany	2007	9/22/2008	3/19/2010
	Netherlands	NED	AEX	Netherlands Datastream REIT	1969	1/1/1990	3/30/2012
	Italy	ITL	FTSE MIB	GPR 250 REIT Italy	2007	5/1/2008	3/30/2012
	Belgium	BEL	MSCI BELGIUM	GPR 250 REIT BELGIUM	1995	12/30/1999	3/30/2012
	Turkey	TUR	MSCI Turkey	GPR 250 REIT Turkey	1997	12/30/2005	3/30/2012
	Israel	ISR	FTSE Israel	FTSE EPRA/NAREIT ISRAEL	2006	6/10/2010	3/30/2012
	Greece	GR	ATHEX Composite	Greece Datastream REITs	1999	4/11/2006	3/30/2012
	Bulgaria	BUL	Bulgaria Datastream	Bulgaria DataStream REIT	2004	8/1/2006	3/30/2012
Africa	South Africa	SAF	FTSE/JSE ALL SHARE	S&P South Africa REIT	2003	5/9/2005	3/30/2012
All	Global	GLB	MSCI World US Dollar	GPR 250 REITS Global US$		12/30/1999	3/30/2012

Notes: All indices are value weighted indices. The REIT start year is the start date of the REIT regime in each country as reported in the 2011 EPRA Global REIT Survey. The date range of each index series varies by country and is based on the availability of daily returns data for the REIT index in each country.

Table 1b Descriptive Statistics of The Returns for The REIT and The Stock Market Indices by Country

Continent	Country	Index Series Starting Date	REIT index			Market index			REIT vs. Market	
				Daily Return			Daily Return		Difference in	Return
			Nobs	Mean (%)	Std. dev.	Nobs	Mean (%)	Std. dev.	Mean Returns (%)	Correlation
Americas	US	12/30/1999	3,195	0.060	1.752	3,197	0.018	1.297	0.042*	0.70
	CAN	6/28/1996	4,110	0.052	1.006	4,111	0.039	1.117	0.013	0.47
	MEX	3/21/2011	269	0.089	0.888	270	0.060	1.177	0.030	0.12
Australia	AUS	6/1/1992	5,175	0.042	1.145	5,175	0.039	0.933	0.003	0.60
Asia	JPN	9/28/2001	2,740	0.033	1.382	2,741	0.013	1.316	0.020	0.46
	HK	10/1/2004	1,955	0.075	1.313	1,955	0.038	1.547	0.037	0.38
	SK	6/20/2008	650	0.004	1.677	651	0.053	1.651	-0.049	0.35
	TWN	3/15/2006	1,577	0.041	0.621	1,578	0.036	1.394	0.006	0.32
	SNG	9/30/2003	2,218	0.057	1.465	2,219	0.047	1.209	0.010	0.64
	MAL	9/20/2010	400	0.090	1.056	400	0.037	0.622	0.053	0.35
	THA	4/1/2011	260	0.069	0.606	261	0.074	1.286	-0.005	0.52
Europe/ME	UK	12/29/2006	1,370	-0.033	2.088	1,371	0.014	1.403	-0.047	0.70
	FR	9/30/2003	2,218	0.065	1.527	2,219	0.018	1.357	0.047*	0.69
	GER	9/22/2008	390	-0.003	3.815	390	-0.023	1.915	0.020	0.34
	NED	1/1/1990	5,805	0.025	1.025	5,805	0.033	1.299	-0.008	0.45
	ITL	5/1/2008	1,021	-0.060	2.652	1,022	-0.050	1.836	-0.009	0.53
	BEL	12/30/1999	2,936	0.029	1.070	2,936	0.007	1.355	0.021	0.40
	TUR	12/30/2005	1,630	0.020	2.270	1,631	0.045	1.856	-0.025	0.69
	ISR	6/10/2010	471	0.026	1.440	472	-0.014	1.173	0.040	0.44
	GR	4/11/2006	1,558	-0.033	1.970	1,559	-0.090	1.845	0.057	0.38
	BUL	8/1/2006	1,479	0.045	1.625	1,479	-0.018	1.559	0.062	0.09
Africa	SAF	5/9/2005	1,799	0.066	0.991	1,800	0.072	1.368	-0.006	0.30
All	GLB	12/30/1999	2,936	0.049	1.322	2,936	0.018	1.096	0.031*	0.74

Notes: The starting date of the index series is based on the availability of daily returns data for the REIT index used in each country (see Table 1a). The ending date for all series is 3/30/2012, except for South Korea (SK) and Germany (GER) which have ending dates of 17/12/2010 and 3/19/2010, respectively. *Indicates statistical significance at the 10% level, with the use of a two-tailed test.

Table 1a lists the countries within each continent, names of the REIT and stock market indices that we use, start date of the REIT regime, and date ranges of the data series in each country.[6] The average sample time period is slightly over 8 years, with the longest time period available for the Netherlands at 22 years (5805 daily observations) and the shortest for Thailand at 1 year (260 daily observations).

Appendix 1 lists the rules and the number of constituent stocks for the general stock market and the REIT indices that we use in this study. While we are able to gather information from various data sources on the constituent stocks for all the general stock market indices, we are only able to find this information for eight of the REIT indices. It is noteworthy that a stock can only become the constituent of an index if it meets the criteria of the index calculation. Also, the price of an index can be calculated with only one qualifying stock but no prices will be calculated when there are no qualifying constituents for the index. This explains the earlier end dates of the REIT series for South Korea and Germany as opposed to the common end date (3/30/2012) that we set for all the other 20 countries and the global index. Furthermore, a closer examination of the constituent stocks in each market index (by using available 2013 information) reveals that REITs are included (at least in 2013) in 14 of the 23 stock market indices. (The 14 countries are identified with an asterisk in Appendix 1a.) For earlier years, it is possible that REITs might be included in some of those country indices as well if they met the listing requirements in that year. However, even if REITs were included in the market index, they are few in number and constitute little weight in the index, thus making the market index a reasonable proxy for non-REIT stocks.

Table 1b presents descriptive statistics on the risk and return of the REIT index and those of the market index for each country and for the global market. The number of daily return observations available for each country ranges between 260 for Thailand and 5,805 for the Netherlands. Across the sample periods studied, the daily mean returns are higher for the REIT index than the market index in 17 of the 22 countries and this also holds true at the global level. However, the difference between the REIT and the market index returns is statistically significant in only two countries (the U.S. and France) and at the global level during the periods examined. The low standard deviations of daily returns reported for the Taiwan and Thailand REIT indices are consistent with the fund-like nature of the REITs in these two countries. The table also shows that the return correlations between the two indices are relatively high (around 0.70) in the more established stock markets (the U.S., Australia, the UK, France, and Turkey) and in the global sample.

[6] For the U.S., we also ran our analyses by using an alternative index, the FTSE/NAREIT index, which has daily returns that start on 1/1/1999 and obtained qualitatively similar results to those by using the GPR250 REIT US Index.

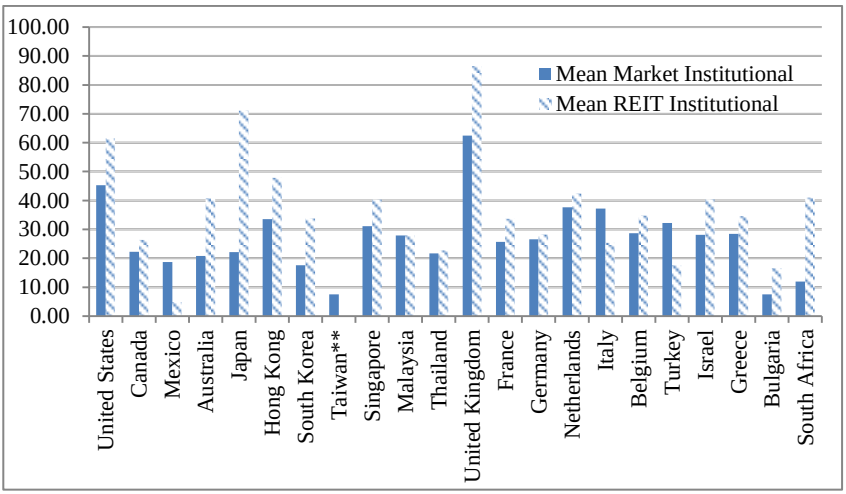
Table 2 Market Capitalization (in Millions of Dollars as of March 31, 2012): REIT versus Overall Stock Market

Continent	Country	REIT market			Overall Stock Market			REIT/Stock Market	
		Nobs	Market Cap		Nobs	Market Cap		Market Cap	
			Mean	Total		Mean	Total	Mean	Total
Americas	United States	181	3,044	551,017	8,125	2,181	17,721,329	1.40	0.03
	Canada	35	1,328	46,477	3,290	548	1,804,482	2.42	0.03
	Mexico	1	1,724	1,724	122	4,200	512,422	0.41	0.00
Australia	Australia	43	1,900	81,698	1,824	727	1,326,686	2.61	0.06
Asia	Japan	34	1,227	41,725	3,715	926	3,440,683	1.33	0.01
	Hong Kong	7	1,911	13,379	1,206	1,104	1,331,579	1.73	0.01
	South Korea	9	82	738	1,897	547	1,037,042	0.15	0.00
	Taiwan	5	419	2,095	1,693	447	756,926	0.94	0.00
	Singapore	23	1,587	36,505	615	720	442,507	2.21	0.08
	Malaysia	15	387	5,812	948	460	435,728	0.84	0.01
	Thailand	5	249	1,246	559	560	313,035	0.44	0.00
Europe/ME	United Kingdom	20	1,972	39,437	1,566	1,885	2,952,030	1.05	0.01
	France	36	1,557	56,050	1,114	1,379	1,536,279	1.13	0.04
	Germany	5	289	1,446	1,055	1,314	1,385,804	0.22	0.00
	Netherlands	5	1,713	8,567	167	4,390	733,124	0.39	0.01
	Italy	2	568	1,136	284	2,142	608,275	0.27	0.00
	Belgium	15	491	7,367	170	1,534	260,750	0.32	0.03
	Turkey	21	321	6,751	381	659	250,897	0.49	0.03
	Israel	1	182	182	888	236	209,848	0.77	0.00
	Greece	3	109	328	296	137	40,562	0.80	0.01
	Bulgaria	10	30	302	126	40	4,978	0.76	0.06
Africa	South Africa	5	1,124	5,621	351	1,539	540,261	0.73	0.01
All		481			30,392				

Notes: Market capitalization figures (as of 3/31/2012) at the firm level in each country are obtained from Bloomberg. The figures, which are provided in local currency, are converted into U.S. dollars by using the exchange rates provided by Bloomberg as of 3/31/2012. The figures that we report exclude firms with market capitalizations below one million USD.

While the REIT regime start dates in Table 1a may serve as an indicator of the maturity of the respective REIT markets, we also provide in Table 2 and Figure 1 statistics on the level of stock market development in each country by using, as a proxy, the stock market capitalization of each country (see Table 2) as well as the percentage of institutional ownership in REIT and general stocks in each market (see Figure 1). The statistics on the size of the two markets are computed by using data at the firm level of all publicly traded stocks and all publicly traded REITs collected from Bloomberg as of 3/31/2012. The figures, which are provided in local currency, are converted into U.S. dollars by using the exchange rates provided by Bloomberg on the same date. The figures that we report exclude firms with market capitalizations below one million USD.

Figure 1 Mean Percent Institutional Ownership: REITs versus All Stocks (3/31/2012)



Notes: The mean percent institutional ownership in REITs and in all stocks are computed from firm level institutional holdings data obtained from Bloomberg (as of 3/31/2012). The percent institutional ownership is the fraction of the market value of stocks owned by institutions. The computation excludes firms with institutional holding figures in excess of 100% and also firms with missing institutional holding data. Therefore, for some countries, the resultant number of firms used in the computation may be smaller than the total number of firms reported in Table 2. In addition, the plot does not show the mean institutional holdings percentage for Taiwan REITs because of large discrepancies between the institutional holding figures reported in Bloomberg and other news sources.

As Table 2 shows, the average size of a REIT is larger than its corresponding stock in the general market in eight countries (the U.S., Canada, Australia, Japan, Hong Kong, Singapore, the UK and France). With the exception of

Singapore, the above stock markets rank higher than stock markets in the rest of the countries in terms of total market capitalization. Figure 1 is a comparison of the mean percentage institutional ownership in REITs with that in the corresponding general stock market. With the exception of Mexico, Italy and Turkey, the mean percentage institutional ownership in REITs is higher than that in the corresponding stock market. (This result also holds when we compare the two markets by using the median percentage institutional ownership figure and when we exclude REITs from the overall stock market mean and median figures.)

4. Methodologies and Empirical Results

We run various sets of regressions to first test for the possible existence of the six types of calendar anomalies (day-of-the-week, Monday, TOM, TOY, seasonal and holiday effects). To see if the daily return behaviors of the REIT indices in each country resemble those of the corresponding general stock market indices, we run separate regressions (over the same time period by using the same empirical model) for the REIT index and the corresponding stock market index of each country and then test if the coefficients of the calendar dummies between the REITs and their corresponding stock market indices are significantly different.[7] It is noteworthy that benchmarking the mean returns of REITs against those of the market within the same country helps to remove country-specific institutional factors (such as trading methods, clearing mechanism, settlement procedures, bid-ask spreads) as potential explanations of differences in anomalous behavior, if any, between REITs and their stock counterparts. In other words, if we find that REITs exhibit anomalous price returns that are not significantly different from the price returns in the market, then we cannot conclude that REITs behave differently from stocks in the general market.

We examine the day-of-the-week effect by using the following regression (as in, for example, Brounen and Ben-Hamo (2009)):

$$R_t = \sum_{i=1}^{5} \beta_i D_{it} + \beta_6 R_{t-1} + \varepsilon_{i,t} \ , \qquad (1)$$

where R_t is the percentage daily REIT (market) index return on day t for a given country. D_{it} is a dummy variable that takes on a value of 1 if day t is the i^{th} day-of-the-week and zero otherwise. R_{t-1} is the return on the REIT (market) index on the previous trading day introduced into the model to correct for first-order autocorrelation and ε_t is the error term. We estimate this (as well as

[7] We use the seemingly unrelated estimation in Stata to combine the parameter estimates and associated covariance matrices from the REIT and market return regressions, and then test the equality of coefficients across the models by using a chi-square test.

all subsequent regressions) by using ordinary least squares (OLS) and report t-statistics based on the robust standard errors in White (1980). Since we include all five weekdays as dummy variables, the coefficients of the dummy variables can be interpreted as the average return for that particular weekday. We also conduct a test of the hypothesis that all coefficients of the weekday dummies are equal to zero simultaneously.

To further verify the Monday effect specifically, we run three different sets of regressions with the following variations on how we define the Monday dummy variable. The three sets of regressions for examining the Monday effect are specified as follows:

$$R_t = \alpha + \beta_1 MONALL + \beta_2 R_{t-1} + \varepsilon_{i,t} , \quad (2a)$$

where *MONALL* is a dummy variable that takes a value of 1 if the trading day is a Monday and zero otherwise.

$$R_t = \alpha + \sum_{i=1}^{5} \beta_i MON_i + \beta_6 R_{t-1} + \varepsilon_{i,t} , \quad (2b)$$

where MON_i is a dummy variable that takes a value of 1 if the Monday is the ith Monday of the month and zero otherwise.

$$R_t = \alpha + \beta_1 MON123 + \beta_2 MON45 + \beta_3 R_{t-1} + \varepsilon_{i,t} , \quad (2c)$$

where *MON123 and MON45* are dummy variables that take a value of 1 if the Monday falls on the first three Mondays of the month and the last two Mondays of the month, respectively. This segregation allows us to examine whether the Monday effect, if any, primarily occurs in the last two weeks of the month (as in Wang et al., 1997). The intercept term in this and Regressions (2a) and (2b) measure the average daily return on non-Mondays. Other symbols in the equations are as previously defined.

We next analyze the turn-of-the-month (year) effect by dividing the trading days into the last four trading days of the previous month (year) and the first four trading days of the current month and the non-TOM trading days (as in, for example, Lakonishok and Smidt, 1988 and Wiley and Zumpano, 2009). The regression equation to test the turn-of-the month (year) effect is specified as follows:

$$R_t = \alpha + \sum_{i=-4}^{4} \beta_i D_{it} + \beta_5 R_{t-1} + \varepsilon_t, \quad (3)$$

where D_{it} is a dummy variable that takes a value of 1 if day t is the i^{th} trading day (i = -4, -3, -2, -1, +1, +2, +3, +4) relative to the first trading day of the month (year) and zero otherwise. In this case, days -1 and 1 are the last and the first trading days of a month (year). The intercept term in this regression measures the average daily return on days that fall outside the eight day window around the turn of the month (year). All other variables are as previously defined.

Note that in testing for the TOY effect, the dummy variables are defined relative to the first trading day in January. The application of this specification (as used in Keim, 1983) allows us to examine if the January effect is concentrated within a narrow window that extends from four days (in December) before the first trading day in January to four days after. In addition**,** as in prior studies, we also examine the January effect by regressing the daily returns on dummy variables that represent the months (February through December) of the year. The intercept term in this alternative specification is the average return in January.

We examine the existence of a seasonal effect by using the following regression (as in Bouman and Jacobsen, 2002):

$$R_t = \alpha + \beta Nov\text{-}to\text{-}Apr_t + \varepsilon_{i,t}, \quad (4)$$

where R_t is the percentage daily REIT (market) index return on day t for a given country, *Nov-to-Apr* is a dummy variable that takes a value of 1 if the months fall in the November through April period and zero otherwise. A significant and positive coefficient of the *Nov-to-Apr* dummy would suggest the presence of a seasonal or a sell-in-May effect.

Finally, we examine whether pre-holiday (post-holiday) returns are significantly different from non-pre(post)-holiday returns by using the following specification:

$$R_t = \alpha + \beta PREHOL_t + \varepsilon_{i,t}\ , \quad (5)$$

where *PREHOL* (or *POSTHOL*) is a dummy variable that takes a value of 1 if the trading day immediately precedes (or follows) a holiday. A holiday is defined as a trading day during which the market is closed (or in other words, a day when trading would normally have occurred but did not). The intercept measures the returns on non-pre(post)-holiday trading days. A significant coefficient of *PREHOL (or POSTHOL)* would suggest the presence of a holiday effect. To identify holidays (non-trading days excluding weekends) in our daily data series, we match the dates of the stock market index series from DataStream with those collected from the Bloomberg database. Given that the DataStream data series includes holidays while the Bloomberg series does not, a match of the two series enables us to identify the days that are the holidays (non-trading days) in each country.

4.1 Day-of-the-Week (Monday) Effect

Table 3 presents the day-of-the-week regression results for the REIT index (Panel A) and the general stock market index (Panel B) by country and for the global index. The last column of each panel presents the F-statistics from the Wald test of the null hypothesis that there is no day-of-the-week effect (i.e., coefficients for all weekday dummies are jointly equal to zero).

Table 3 Day-of-the-Week Effect for Daily Returns of REIT and All Stock Indices

Panel A: REIT Index

		Monday	Tuesday	Wednesday	Thursday	Friday	R_{t-1}	F-Stat
Americas	US	-0.007	0.135*	0.077	0.041	0.097	-0.162***	1.487
	CAN	0.010	0.042	0.067*	0.047	0.068**	0.109***	2.285**
	MEX	0.059	-0.007	0.010	0.066	0.370***	-0.071	2.166*
Australia	AUS	-0.015	0.090**	0.078**	0.077**	-0.023	0.020	3.088***
Asia	JPN	-0.003	0.053	0.060	-0.018	0.052	0.079**	0.523
	HK	0.085	0.121*	0.009	0.102	0.068	-0.024	1.690
	SK	-0.090	0.063	-0.048	0.110	-0.020	0.109	0.227
	TWN	0.053	0.013	0.015	0.069*	0.028	0.138***	1.137
	SNG	-0.003	0.039	0.122*	0.053	0.068	0.029	1.026
	MAL	-0.061	0.161	0.309***	-0.017	0.158	-0.263***	2.317**
	THA	-0.033	0.059	0.098	0.105	0.132*	-0.026	1.574
Europe/ME	UK	-0.277**	0.086	0.207	-0.160	-0.019	0.026	1.917*
	FR	-0.075	0.117	0.163**	0.019	0.088	0.041	2.109*
	GER	-0.323	0.159	-0.276	0.051	0.372	-0.107**	0.385
	NED	-0.049	0.044	0.070**	0.010	0.041	0.081***	2.503**
	ITL	-0.060	-0.266	0.057	-0.007	-0.011	0.085**	0.439
	BEL	-0.018	0.106**	0.054	-0.020	0.024	-0.021	1.522
	TUR	0.083	0.055	0.005	-0.051	0.009	0.052*	0.155
	ISR	0.255	-0.020	0.137	-0.201	-0.024	-0.110**	1.148
	GR	0.109	-0.271**	0.001	-0.018	-0.029	-0.136***	1.532
	BUL	0.037	-0.053	0.253**	-0.061	0.100	-0.248***	1.669
S. Africa	SAF	0.029	0.095*	0.084*	0.063	0.010	0.137***	1.572
Global	GLB	-0.034	0.115**	0.061	0.024	0.070	0.030	1.597

(Continued…)

(Table 3 Continued)

Panel B: Market Index

		Monday	Tuesday	Wednesday	Thursday	Friday	R_{t-1}	F-Stat
Americas	US	-0.020	0.042	0.023	0.064	-0.014	-0.062**	0.501
	CAN	0.021	0.013	0.032	0.032	0.095***	0.016	1.769*
	MEX	-0.024	0.113	0.195	0.041	-0.020	-0.023	0.450
Australia	AUS	0.050	0.009	0.058**	0.059**	0.017	0.015	2.209**
Asia	JPN	-0.010	-0.047	0.025	0.103*	-0.008	0.015	0.856
	HK	0.094	-0.083	0.094	0.051	0.033	-0.015	0.895
	SK	0.163	-0.153	0.302**	-0.068	0.021	-0.018	1.447
	TWN	0.014	-0.068	0.190***	0.008	0.027	0.043	1.698
	SNG	-0.008	0.009	0.130**	-0.006	0.101**	0.024	1.815*
	MAL	-0.088	0.026	0.223***	0.010	-0.004	0.094	3.635***
	THA	-0.094	0.230	0.263*	0.035	-0.065	0.012	0.992
Europe/ME	UK	0.002	0.094	0.030	-0.057	0.004	-0.033	0.368
	FR	-0.018	0.035	0.073	-0.012	0.013	-0.028	0.352
	GER	0.176	0.150	0.019	-0.325	-0.136	-0.006	0.788
	NED	0.054	0.044	0.014	0.008	0.042	0.009	0.903
	ITL	-0.093	-0.041	0.116	-0.073	-0.150	0.050	0.641
	BEL	0.005	-0.031	0.052	0.008	-0.004	0.071**	0.257
	TUR	0.028	0.064	0.063	0.087	-0.029	0.034	0.321
	ISR	0.091	-0.202*	0.072	-0.029	-0.000	-0.014	0.898
	GR	-0.227**	-0.179	0.008	-0.085	0.050	0.049	1.614
	BUL	-0.237**	-0.061	-0.001	0.150*	0.063	0.086**	2.015*
S. Africa	SAF	0.154**	-0.005	0.122*	0.091	-0.011	0.025	1.686
Global	GLB	-0.015	0.025	0.044	0.047	-0.024	0.119***	0.570

Notes: The table presents the results of the OLS regression: $R_t = \sum_{i=1}^{5} \beta_i D_{it} + \beta_6 R_{t-1} + \varepsilon_{i,t}$, where R_t is the percentage daily REIT (market) index return on day t for a given country. D_{it} is a dummy variable that takes a value of 1 if day t is the i^{th} day-of-the-week and zero otherwise. R_{t-1} is the return on the REIT (market) index on the previous trading day introduced into the model to correct for serial autocorrelation and ε_t is the error term. The F-statistic tests the hypothesis that coefficients of Monday through Friday dummy variables are zero simultaneously. T-statistics (unreported) are based on robust standard errors per White (1980). ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, with the use of a two-tailed test.

The F-statistics column in Panel A shows that 7 out of 22 REIT markets exhibit a significant weekly seasonal. Five of these REIT markets are in developed countries (Canada, Australia, the UK, France and Netherlands) and two are in emerging countries (Mexico and Malaysia). The UK is the only REIT market that exhibits a significant negative Monday return while the other six countries show significant positive returns mostly on Wednesdays. The glaring absence of a Monday anomaly across the REIT markets seems to be consistent with Chan et al. (2005) who show a gradual disappearance of the Monday anomaly in the U.S. REIT market starting from the early 1990s. Only 2 of these 7 REIT markets (Canada and Mexico) show significant positive Friday returns. While Connors et al. (2002) and Lenkkeri et al. (2006) find significant Friday returns for U.S. REITs during the 1994-1999 period and European securitized real estate indices between 1990 and 2003, respectively, we show that this Friday effect has disappeared in the these REIT markets during the 1999 to early 2012 sample period. Our results, in general, are somewhat in line with Hui et al. (2013) who find little evidence of a Friday effect in the Europe and global REIT indices during the 2000 to 2007 period.

Looking at the F-statistics in Panel B, only five stock markets (three developed and two emerging) exhibit a significant weekly seasonal with the effect showing up on different days but mostly on Wednesdays (like in the REIT markets). Three of those countries (Canada, Australia, and Malaysia) also exhibit significant weekly seasonal in their respective REIT indices. Bulgaria (an emerging market) is the only stock market that exhibits a significant weekly seasonal and a significant negative Monday effect.

Finally, in comparing the magnitudes of the coefficients on specific weekdays between the REIT indices and their corresponding market indices (for the countries that show significant F-statistics in either the REIT or the stock market), we find that in only three countries (Mexico, Australia, and the UK) do REITs differ significantly from their stock market counterparts. (For example, the difference in the Friday coefficients, 0.37% and -0.20%, respectively, for the REIT and stock market indices in Mexico is statistically significant.)

All in all, our finding of a significant general (rather than a fixed) weekday effect in a mix of developed and emerging countries is in line with Doyle and Chen (2009) who find significant general weekday effects but no Monday effects in their sample of 13 stock market indices during the 1993 to 2007 period.

Table 4 (Panels A-C) shows the regression results for the Monday effect. (We also ran similar regressions for the market indices, but do not report them in the table.) As Panel A shows, the Monday returns tend to be lower than other days; the coefficient for MONALL is negative for 17 out of 22 countries but

only significant for five countries (namely, Australia, Malaysia, the UK, France and the Netherlands).

In the unreported results, we repeat Panel A by using market returns and compare MONALL coefficients across models for REITs and their corresponding market indices. We find that the Monday effect is absent in the market returns of all but two emerging countries, Malaysia and Bulgaria. In comparing the Monday effect in REITs with that in the stock market, only three REIT markets (Australia, the UK and France) exhibit significantly lower (i.e., more negative) Monday returns than their stock market counterparts. Also, consistent with Wang et al. (1997), Panels B and C show that the lower Monday returns seem to be coming from the fourth and fifth Mondays of the month.

To sum up, a significant negative Monday effect is detected in five (four developed, one emerging) non-U.S. REIT markets and two emerging stock markets. The effect is significantly stronger (more negative) in REITs than stocks in only 3 of the 22 countries examined. The absence of a Monday effect in most of our sample countries in the post 1990 period is possibly linked to an increase in institutional participation in both the REIT and general stock markets around the globe in the post 1990 era.

Table 4 Monday Effect for REITs

Panel A: All Mondays

		MONALL	R_{t-1}	Intercept	F-value
Americas	US	-0.094	-0.163***	0.088**	12.11***
	CAN	-0.046	0.109***	0.056***	7.791***
	MEX	-0.052	-0.067	0.110*	0.798
Australia	AUS	-0.070*	0.020	0.056***	1.952*
Asia	JPN	-0.040	0.079**	0.037	2.157*
	HK	0.011	-0.025	0.075**	0.188
	SK	-0.116	0.107	0.027	1.048
	TWN	0.022	0.137***	0.031*	3.425***
	SNG	-0.073	0.029	0.070**	0.681
	MAL	-0.213*	-0.266***	0.153***	15.03***
	THA	-0.132	-0.023	0.099**	0.661
Europe/ME	UK	-0.306**	0.024	0.029	2.757**
	FR	-0.171**	0.040	0.097***	2.672**
	GER	-0.399	-0.108**	0.076	2.419
	NED	-0.091***	0.081***	0.041***	7.245***
	ITL	-0.004	0.085**	-0.057	2.027*
	BEL	-0.059	-0.021	0.041*	1.009
	TUR	0.078	0.052*	0.004	1.485
	ISR	0.282	-0.113**	-0.027	3.602***
	GR	0.188	-0.138***	-0.079	9.819***
	BUL	-0.023	-0.251***	0.060	15.92***
S. Africa	SAF	-0.034	0.136***	0.063**	6.668
Global	GLB	-0.101	0.029	0.068**	1.505

(Continued…)

(Table 4 Continued)

Panel B: Mondays by Week of the Month

		MON1	MON2	MON3	MON4	MON5	R_{t-1}	Intercept	F-value
Americas	US	0.069	0.011	-0.248	-0.047	-0.168	-0.162***	0.088**	4.521***
	CAN	-0.062	-0.072	-0.091	0.064	-0.079	0.109***	0.056***	3.196***
	MEX	0.090	-0.335	-0.137	-0.006	0.238	-0.062	0.110*	0.771
Australia	AUS	-0.087	0.001	-0.211***	-0.022	-0.039	0.020	0.056***	1.414
Asia	JPN	-0.076	-0.127	-0.145	-0.041	0.183	0.077*	0.037	1.540
	HK	-0.129	0.045	-0.037	0.108	-0.020	-0.024	0.075**	0.219
	SK	-0.712	0.108	0.133	0.181	-0.704*	0.108	0.027	1.329
	TWN	0.162	-0.052	-0.022	-0.000	0.113	0.134**	0.031*	1.796*
	SNG	-0.048	0.012	-0.252	-0.102	0.046	0.028	0.070**	0.547
	MAL	0.634**	-0.364	-0.051	-0.115	-0.579***	-0.285***	0.154***	7.259***
	THA	-0.444	-0.028	0.066	-0.020	-0.470	-0.019	0.098**	0.637
Europe/ME	UK	-0.729	-0.289	-0.164	-0.331	-0.268	0.025	0.029	1.041
	FR	-0.017	-0.118	-0.119	-0.263*	-0.255	0.041	0.097***	1.146
	GER	-1.803	0.199	-1.652*	1.195	-0.594	-0.100*	0.077	1.896
	NED	-0.135	-0.022	-0.026	-0.117*	-0.186**	0.082***	0.041***	3.074***
	ITL	0.259	0.637	-0.510	0.082	-0.352	0.088**	-0.056	1.556
	BEL	-0.068	0.003	-0.116	-0.021	-0.103	-0.022	0.041*	0.658
	TUR	0.227	0.001	-0.106	0.109	0.261	0.053*	0.004	0.670
	ISR	-0.744	0.214	0.217	0.061	0.994**	-0.113**	-0.027	2.003*
	GR	0.467	0.379*	0.053	0.113	0.084	-0.139***	-0.079	3.692***
	BUL	-0.030	-0.375**	0.021	0.272	-0.004	-0.251***	0.060	6.409***
S. Africa	SAF	-0.287*	0.011	0.011	-0.041	-0.014	0.138***	0.063**	2.691
Global	GLB	-0.048	-0.052	-0.250**	-0.040	-0.084	0.029	0.068**	0.918

(Continued…)

(Table 4 Continued)

Panel C: First Three and Last Two Mondays of the Month

		MON123	MON45	R_{t-1}	Intercept	F-value
Americas	US	-0.086	-0.105	-0.163***	0.088**	8.072***
	CAN	-0.078	-0.004	0.109***	0.056***	5.810***
	MEX	-0.194	0.117	-0.065	0.110*	1.278
Australia	AUS	-0.102**	-0.030	0.020	0.056***	1.539
Asia	JPN	-0.126	0.066	0.078**	0.037	2.395**
	HK	-0.018	0.046	-0.024	0.075**	0.194
	SK	-0.026	-0.237	0.108	0.027	0.870
	TWN	-0.003	0.054	0.137***	0.031*	2.702**
	SNG	-0.108	-0.030	0.029	0.070**	0.525
	MAL	-0.091	-0.352**	-0.270***	0.153***	10.83***
	THA	-0.046	-0.235	-0.026	0.099**	0.551
Europe/ME	UK	-0.310*	-0.300	0.024	0.029	1.841*
	FR	-0.101	-0.259**	0.041	0.097***	2.250*
	GER	-0.941	0.356	-0.101*	0.077	2.206
	NED	-0.044	-0.150***	0.081***	0.041***	5.726***
	ITL	0.096	-0.127	0.087**	-0.057	1.445
	BEL	-0.059	-0.061	-0.021	0.041*	0.679
	TUR	-0.006	0.182	0.052*	0.004	1.131
	ISR	0.084	0.516*	-0.113**	-0.027	2.958***
	GR	0.258	0.099	-0.138***	-0.079	6.824***
	BUL	-0.153	0.138	-0.253***	0.060	11.22***
S. Africa	SAF	-0.039	-0.028	0.136***	0.063**	4.53
Global	GLB	-0.133	-0.061	0.029	0.068**	1.087

Notes: The table presents the results of three sets of regressions: $R_t = \alpha + \beta_1 MONALL + + \beta_2 R_{t-1} + \varepsilon_{i,t}$ (see Panel A), $R_t = \alpha + \sum_{i=1}^{5} \beta_i MON_i + \beta_6 R_{t-1} + \varepsilon_{i,t}$ (see Panel B), and $R_t = \alpha + \beta_1 MON123 + \beta_2 MON45 + \beta_3 R_{t-1} + \varepsilon_{i,t}$ (see Panel C), where R_t is the percentage daily REIT index return on day t for a given country, MON_i is a dummy variable that takes a value of 1 if the Monday is the ith Monday of the month and zero otherwise, *MONALL* is a dummy variable that takes a value of 1 if the trading day is a Monday and zero otherwise, and *MON123 and MON45* are dummy variables that take a value of 1 if the Monday falls on the first three Mondays of the month and the last two Mondays of the month, respectively. R_{t-1} is the return on the REIT index on the previous trading day introduced into the model to correct for serial autocorrelation and ε_t is the error term.. The intercept term in the regressions measures the average daily return on non-Mondays. R_{t-1} is the return on the REIT index on the previous trading day introduced into the model to correct for autocorrelation and ε_t is the error term. The F-value measures the joint significance of all the coefficients in the regression. T-statistics (unreported) are based on the robust standard errors in White (1980). Coefficients that appear in a box (in Panel A) are statistically significant as well as significantly different between the REIT and market indices. Difference in the coefficients between the REIT and market indices in Panels B and C are not tested, and therefore, not reported. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, with the use of a two-tailed test.

4.2 Turn-of-the-Month (Year) Effect

Table 5 reports our findings for the TOM effect for REITs and all stocks. Significant coefficients for any of the trading day dummies in the 8-day window (days -4 to +4) will point to the existence of the TOM effect. The results in Panel A show that the TOM effect is present in the 8-day window for 21 out of 23 REIT markets (including the global REIT market), and mostly manifests itself as a significant positive coefficient for D_{-1}, the last trading day of the month, for 13 markets plus the global market. Panel B shows that the TOM effect is observed in a large majority of the international stock market indices (18 out of 22) as well. However, if we examine the TOM effect by using a single dummy to represent the 8-day window (results not reported in a table), five countries (Mexico, South Korea, Thailand, Germany, and South Africa) do not exhibit a significant TOM effect in both their REIT and stock market returns.

Finally, we test for a significant difference in the TOM effect between REITs and their stock market counterparts. We specifically focus on the D_{-1} coefficients since we find this to be the day in which the effect is strongest in most of the REIT markets (14 out of 22). Our results (see coefficients that appear in a box in Panel A of Table 5) show that the TOM effect is significantly stronger (more positive) in REITs than general stocks for 7 countries (the U.S., Mexico, Japan, Singapore, Malaysia, the UK, and France) as well as for the global index. For Belgium, however, the TOM effect is significantly stronger in the stock market than the REIT market (see Panel B of Table 5).

What could possibly be the underlying reason(s) for a significantly different TOM effect between REITs and general stocks in the eight countries? The mean REIT-to-stock market cap information provided in Table 2 does not seem to support a size differential argument (that smaller firms exhibit a stronger TOM effect) as only two (Mexico and Belgium) of the eight countries that exhibit significant differences in the TOM effect between REITs and general stocks show a mean REIT-to-stock market cap ratio of below 0.5. Note that in the case of Belgium, the size prediction seems to work in an opposite direction. It is possible, however, that institutional involvement may have an influence on the TOM effect - in all the above 7 countries (excluding Mexico, which has only one REIT), the average percentage institutional ownership in those REIT markets are higher than that in their respective stock markets (based on Bloomberg data as of 3/31/2012).

Table 5 Turn-of-the-Month Effect for REITs and All Stocks

Panel A: REIT Index

		D_{-4}	D_{-3}	D_{-2}	D_{-1}	D_{+1}	D_{+2}	D_{+3}	D_{+4}	R_{t-1}	Intercept
Americas	US	0.275**	0.303**	0.142	0.300**	0.135	0.092	0.003	-0.023	-0.166***	0.012
	CAN	0.161**	0.261***	0.068	0.259***	-0.024	-0.061	0.057	-0.005	0.106***	0.014
	MEX	-0.181	-0.335	0.085	0.967**	0.046	-0.066	-0.338	-0.144	-0.081	0.099
Australia	AUS	0.013	0.061	0.141*	0.220***	-0.036	0.198**	-0.084	-0.018	0.020	0.019
Asia	JPN	0.270**	0.206	0.330***	0.521***	0.119	-0.021	-0.201*	-0.150	0.070*	-0.020
	HK	0.274*	0.084	0.038	0.277*	0.104	0.203	0.057	0.109	-0.025	0.024
	SK	0.362	0.258	0.435	0.307	-0.197	0.165	0.208	-0.069	0.107	-0.067
	TWN	0.085	0.086	0.252*	0.231***	0.078	-0.018	-0.033	0.100**	0.128**	-0.000
	SNG	0.095	0.234	0.052	0.638***	0.074	0.312**	0.035	-0.091	0.027	-0.006
	MAL	-0.138	0.281	0.121	1.018**	0.442**	0.050	-0.007	-0.274	-0.286***	0.042
	THA	0.341*	0.075	-0.071	0.107	0.080	-0.173	0.203*	0.217	-0.009	0.036
Europe/ME	UK	0.175	0.468	0.290	0.768***	0.026	0.476*	0.493*	0.149	0.020	-0.163**
	FR	-0.002	0.102	0.237	0.554***	0.203	0.354**	0.099	-0.125	0.035	-0.002
	GER	-0.080	-0.503	0.370	1.014	-0.282	1.459	1.036	-0.829	-0.110**	-0.104
	NED	0.063	0.022	0.023	0.251***	0.003	0.161**	0.102*	-0.084	0.081***	-0.002
	ITL	-0.028	-0.151	0.830**	-0.274	0.414	0.563	-0.234	-0.175	0.087**	-0.100
	BEL	0.050	0.089	0.042	0.106	0.135	0.203*	0.104	-0.157*	-0.023	0.003
	TUR	0.184	0.059	0.004	-0.080	0.335	0.540**	0.255	0.081	0.049	-0.043
	ISR	0.344	0.241	-0.070	0.058	-0.536	0.363*	-0.053	-0.344	-0.110**	0.028
	GR	0.123	0.201	-0.053	0.881***	0.393	0.381	0.258	-0.237	-0.141***	-0.131**
	BUL	0.202	0.306	0.182	0.040	0.021	-0.322**	0.152	-0.111	-0.253***	0.034
S. Africa	SAF	0.143	0.088	0.002	0.117	-0.255**	-0.042	-0.011	-0.064	0.137***	0.057*
Global	GLB	0.240**	0.227**	0.127	0.382***	0.063	0.178	-0.047	-0.073	0.025	-0.003

(Continued…)

(Table 5 Continued)

Panel B: Market Index

		D_{-4}	D_{-3}	D_{-2}	D_{-1}	D_{+1}	D_{+2}	D_{+3}	D_{+4}	R_{t-1}	Intercept
Americas	US	0.203**	0.167	0.057	0.091	0.209*	0.037	0.145	-0.088	-0.063**	-0.019
	CAN	0.036	-0.009	0.099	0.204**	0.174**	0.115	0.107	-0.004	0.014	0.005
	MEX	0.124	0.580	0.525***	0.382	-0.069	-0.244	-0.221	-0.476	-0.047	0.033
Australia	AUS	0.051	0.103*	0.051	0.138**	0.073	0.177***	-0.051	-0.002	0.014	0.014
Asia	JPN	0.217*	0.171	0.350***	0.081	0.151	0.226*	0.033	0.041	0.012	-0.046
	HK	0.142	0.128	0.312*	0.236*	0.163	0.292	-0.049	0.096	-0.019	-0.023
	SK	-0.030	-0.308	0.103	0.102	-0.143	0.269	0.528**	-0.359	-0.024	0.045
	TWN	-0.026	0.109	0.265	0.325**	0.189	0.184	-0.082	0.190	0.038	-0.019
	SNG	0.173	0.189	0.203*	0.180	0.193	0.377***	0.115	0.047	0.017	-0.022
	MAL	0.238	0.176	0.197*	0.427***	0.156	0.284	0.101	0.260*	0.076	-0.051
	THA	0.499	0.460	0.305	0.393	-0.193	0.195	-0.073	0.293	0.016	-0.013
Europe/ME	UK	0.072	0.235	0.009	0.202	0.096	0.270	0.187	-0.171	-0.034	-0.027
	FR	0.154	0.320**	0.057	0.148	0.296*	0.206	0.121	-0.219	-0.032	-0.031
	GER	0.401	-0.066	0.130	-0.090	0.101	0.918	0.448	-0.587	-0.007	-0.081
	NED	0.090	0.132	0.033	0.110	0.188**	0.176*	0.113	0.026	0.007	-0.008
	ITL	0.261	0.219	-0.022	0.171	0.143	0.218	0.311	-0.679**	0.051	-0.077
	BEL	0.123	0.105	0.167	0.336***	0.242*	0.141	0.041	0.041	0.067**	-0.049
	TUR	0.350	0.057	0.223	0.337	0.220	0.661***	-0.267	0.068	0.033	-0.033
	ISR	-0.077	0.365	-0.452*	0.196	0.073	-0.128	0.123	-0.112	-0.009	-0.013
	GR	0.152	0.142	-0.069	0.733***	0.227	0.177	0.076	-0.144	0.047	-0.146**
	BUL	0.242	0.129	0.393**	0.193	-0.103	-0.163	-0.158	0.088	0.083**	-0.046
S. Africa	SAF	0.123	0.041	0.175	0.089	0.123	0.043	-0.211	-0.059	0.022	0.055
Global	GLB	0.181**	0.170*	0.069	0.113	0.160	0.124	0.057	-0.110	0.116***	-0.020

Notes: The table presents the results of the OLS regression: $R_t = \alpha + \sum_{i=-4}^{4} \beta_i D_{it} + \beta_5 R_{t-1} + \varepsilon_t$, where Rt is the percentage daily REIT (market) index return on day t for a given country, Dit is a dummy variable that takes a value of 1 if day t is the ith trading day (i = -4, -3, -2, -1, +1, +2, +3, +4) relative to the first trading day of the month and zero otherwise. In this case, days -1 and 1 are the last and the first trading days of a month. Rt-1 is the return on the REIT (market) index on the previous trading day introduced into the model to correct for serial autocorrelation and εt is the error term. The intercept term in this regression measures the average daily return on days that fall outside the eight-day window around the turn of the month. Due to space limitations, F-values of the regressions are not reported. T-statistics (unreported) are based on the robust standard errors in White (1980). Coefficients appearing in a box are statistically significant as well as significantly different between the REIT and market indices. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, with the use of a two-tailed test.

In summary, our finding that the TOM effect in REITs is a global phenomenon extends prior studies that report a significant TOM effect for U.S. REITs (e.g., Redman et al., 1997; Connors et al., 2002; Wiley and Zumpano, 2009). Our finding of a TOM effect in general stocks conforms to prior studies that report the effect in many stock markets around the globe (e.g., Agrawal and Tandon, 1994; Kunkel et al., 2003; McConnell and Xu, 2008). More importantly, we find that REITs in eight countries behave differently (in terms of the TOM effect) from their stock counterparts, which could possibly be attributable to the higher institutional ownership in REITs than in stocks. The result that the TOM effect is different between REITs and stocks in some countries has not been previously reported in the literature. Our findings differ from Khaled and Keef (2012) whose study differs from ours in both methodology and data. The authors use a panel data (as opposed to country-by-country) approach to show that the TOM effects in REITs are not different from those in stocks in 14 countries between 1993 and 2011. For data, they use the FTSE EPRA/NAREIT Global Real Estate Index and a common start date (January 1993) for the data series for all 14 countries in their sample while our study uses different REIT indices for each country and start dates that begin after the establishment date of REITs in each country.

Table 6 repeats the analysis in Table 5 for the month of January, to see if there is a TOY effect. In addition, by comparing the TOM results in Table 5 with the TOY results in Table 6, we can see whether the TOM effect is primarily driven by the December to January turn. In Table 6, days D_{-4} to D_{-1} represent the last four trading days in December and days D_{+1} to D_{+4} represent the first four trading days in January.

Compared to the TOM effect, the TOY effect is somewhat more muted in the REIT market and spread across various trading days (Panel A). The D_{-1} coefficients in the REIT regressions are positive and significant for five countries (Mexico, Hong Kong, Taiwan, Germany and Greece) and negative and significant for two countries (Thailand and Turkey). In the market regressions (Panel B), the TOY effect is muted on D_{-1} (significant only in Thailand and Turkey) and spreads across days D_{-4} to D_{-4}. The TOY effect at D_{-1} is significantly different between REITs and general stocks in only two countries (Mexico and Thailand). In the unreported results, we also examine the average TOY effect over the 8-day window (days -4 to +4) and find that the effect is more pervasive in the stock market than the REIT market (eight versus three countries). However, in only one country, the Netherlands, do we find a significant difference in the average TOY effect between REITs and general stocks. Given that the TOY effect is much more muted compared to the TOM effect (in Table 5), it may be safe to say that the December to January turn (which prior studies have shown to be primarily generated by investors who are trading in small stocks) does not seem to be a primary driver of the TOM effect (which most plausibly is linked to institutional participants).

Table 6 Turn-of-the-Year Effect for REITs and All Stocks

Panel A: REIT Index

		D_{-4}	D_{-3}	D_{-2}	D_{-1}	D_{+1}	D_{+2}	D_{+3}	D_{+4}	R_{t-1}	Intercept
Americas	US	0.555*	0.843	-0.708	0.025	0.030	-0.489	-0.591	0.398	-0.164	-0.015
	CAN	0.189	0.210	-0.443**	0.219	-0.108	0.011	-0.074	0.244	0.236***	0.052
	MEX	0.169	-0.622**	0.489*	3.414***	0.675	-0.321	-0.234	-0.439**	-0.035	0.229
Australia	AUS	0.020	0.097	0.384	0.161	0.059	0.174	0.144	0.090	0.043	-0.042
Asia	JPN	-0.207	0.299	0.344*	0.397	0.041	0.392	0.257	-0.136	0.089	-0.052
	HK	-0.285	-0.475	0.894	1.070**	-0.045	-0.165	-0.188	0.442	-0.069	0.171
	SK	0.186	1.073	0.102	0.177	0.207	-1.494	-0.146	0.040	0.084	-0.207
	TWN	-0.086	-0.035	-0.015	0.144*	0.257	-0.286	-0.221	0.007	-0.121	-0.042
	SNG	-0.906	0.970	0.254	0.572	-0.154	0.267	0.635	0.129	0.172*	0.021
	MAL	0.314	0.656	-0.096	1.048	-0.029	-1.174	0.333	-0.698**	-0.036	0.114
	THA	-0.099	0.036	-0.165	-0.329*	0.140	-0.071	0.274	0.376**	-0.379	0.071
Europe/ME	UK	0.235	0.989	-1.496***	1.168	0.325	1.453	-0.134	0.303	0.008	-0.333
	FR	0.059	0.967	0.055	0.323	0.153	0.863	0.258	-0.095	0.059	-0.033
	GER	-1.063	1.529	2.548***	4.438**	0.484	6.961***	2.020	-1.618*	-0.104	-0.484
	NED	-0.108	0.317	-0.275	0.086	0.072	0.629**	0.386	-0.300	0.093	0.090
	ITL	-0.286	0.322	-1.253	2.098	0.702	2.625*	0.286	0.459	0.308*	-0.023
	BEL	0.285	0.318	-0.191	-0.332	0.334	1.376**	0.226	-0.181	0.106	-0.013
	TUR	0.020	0.629	-1.150	-1.581**	0.658	0.925	-0.421	0.776	-0.018	0.175
	ISR	0.354	1.066***	1.954*	-1.923	1.245***	2.097***	0.747	0.978***	-0.249	-0.240
	GR	0.299	0.569	0.663	2.362***	1.655**	1.539	0.116	0.220	-0.274***	-0.331
	BUL	1.663**	0.400	-0.213	-1.415	-0.097	-0.048	0.947	1.499	-0.384***	0.012
S. Africa	SAF	-0.361	0.106	0.201	-0.239	0.186	0.358**	0.199	0.093	-0.004	0.000
Global	GLB	0.415**	0.661	-0.672*	0.301	0.040	0.104	-0.226	0.221	0.038	-0.056

(Continued…)

(Table 6 Continued)

Panel B: Market Index

		D_{-4}	D_{-3}	D_{-2}	D_{-1}	D_{+1}	D_{+2}	D_{+3}	D_{+4}	R_{t-1}	Intercept
Americas	US	0.387*	0.387	-0.606*	0.312	0.032	0.169	0.686*	0.261	-0.167**	-0.112
	CAN	0.526***	0.335*	-0.263	0.330	0.068	0.299	0.510	0.233	-0.088	-0.045
	MEX	0.306	-0.166	0.127	0.298	0.581	0.142	0.013	-0.950**	-0.202	-0.013
Australia	AUS	-0.024	0.275	0.112	0.175	0.034	0.316**	0.015	0.237	0.058	-0.045
Asia	JPN	0.133	0.208	0.017	-0.178	0.143	0.384**	0.733**	0.491	-0.065	-0.142
	HK	-0.517	0.502*	0.582	0.044	0.500*	1.230*	0.646	0.448	-0.016	-0.268*
	SK	-0.694	2.333	1.851***	-0.865	0.401	2.609**	1.359	1.888***	-0.053	-0.401
	TWN	-1.021	0.265	0.882*	0.194	0.016	0.284	0.105	0.837***	0.005	-0.204
	SNG	-0.349	0.554	0.013	-0.104	0.282	0.940**	1.021*	0.369	0.072	-0.111
	MAL	0.098	0.307	-0.212**	0.282	0.462	0.211	0.300	0.455	0.148	-0.078
	THA	0.791	0.919***	-0.108	0.628*	-0.151	-0.196	0.866**	0.294	-0.324	0.196
Europe/ME	UK	0.374	0.654	-0.801**	0.054	0.297*	1.904***	0.936***	-0.005	-0.198*	-0.313**
	FR	0.639**	0.930*	-0.905***	0.212	0.849**	1.233**	0.121	-0.123	-0.077	-0.162
	GER	1.035*	2.798	-1.195**	0.430	0.774**	3.229***	0.682	1.220**	0.027	-0.774**
	NED	0.378***	0.331	0.047	0.164	0.449***	0.658	0.429**	0.256	-0.009	-0.120*
	ITL	0.533	0.493	-1.403***	0.635	0.972*	1.320**	-0.269	-0.044	0.189*	-0.099
	BEL	0.608**	0.732	-0.242	0.474	0.612***	1.199**	-0.128	0.184	-0.035	-0.149
	TUR	-0.067	0.392	-0.478	-0.993*	0.437	0.873	0.459	0.236	0.023	-0.059
	ISR	0.592	0.671	-1.061	-1.185	1.839	0.172	0.710	0.480	-0.125	0.113
	GR	0.505	-0.401	0.109	1.507	-0.085	0.104	0.649	-0.278	0.038	-0.017
	BUL	0.564	0.804	0.633	0.051	0.491	-0.441	-0.761	-0.047	0.041	-0.323
S. Africa	SAF	0.036	1.072**	-0.382	0.301	0.215	1.287***	-0.113	0.023	0.124	-0.099
Global	GLB	0.482***	0.309	-0.445*	0.350	0.164	0.854**	0.466*	0.128	0.092	-0.145**

Notes: The table presents the results of the OLS regression: $R_t = \alpha + \sum_{i=-4}^{4} \beta_i D_{it} + \beta_5 R_{t-1} + \varepsilon_t$, where Rt is the percentage daily REIT (market) index return on day t for a given country, Dit is a dummy variable that takes a value of 1 if day t is the ith trading day (i = -4, -3, -2, -1, +1, +2, +3, +4) relative to the first trading day of the year and zero otherwise. In this case, days -1 and 1 are the last and the first trading days of a year. Rt-1 is the return on the REIT (market) index on the previous trading day introduced into the model to correct for serial autocorrelation and εt is the error term. The intercept term in this regression measures the average daily return on days that fall outside the eight-day window around the turn of the year. Due to space limitations, F-values of the regressions are not reported. T-statistics (unreported) are based on the robust standard errors in White (1980). Coefficients that appear in a box are statistically significant as well as significantly different between the REIT and market indices. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, with the use of a two-tailed test.

4.3 Seasonal (May-to-October) and Holiday Effects

Table 7 shows that the prevalence of the seasonal effect (manifesting as higher returns from November to April than May to October) in both the REIT and market indices across the globe. The effect is significant in 13 REIT markets and 9 stock markets, of which 6 REIT markets and 4 stock markets are in Asia. It is interesting that a significant seasonal effect is also detected in both the REIT and stock markets of Australia and South Africa (even though they both have a different winter/summer season from countries in the northern hemisphere). This result differs from Boumen and Jacobsen (2002) who do not find a significant seasonal effect in the stock indices of these two countries in the earlier years. The magnitudes of the seasonal effect for REIT and market indices are generally similar, with five countries (Canada, Mexico, Hong Kong, South Korea, and the Netherlands) that exhibit a significant difference in the effect between the two indices.

The holiday effects are examined in Table 8. As Panel A shows, REIT indices earn significantly higher returns on pre-holiday trading days in six countries. Although the holiday effects seem to be absent from the U.S. REIT market, the results for the other countries are consistent with earlier U.S.-based REIT studies (e.g., Redman et al., 1997 and Connors et al., 2002). For post-holiday trading days (Panel B), returns are higher for 7 countries, 6 of which are European countries.

Table 7 Seasonal (or Sell-in-May) Effect for REITs and All Stocks
Panel A: REIT Index

		Nov-to-Apr	Intercept	Nobs	F-value
Americas	US	1.467*	0.034	148	2.096*
	CAN	0.837**	0.248***	189	9.402***
	MEX	0.784	-0.021	13	0.107
Australia	AUS	0.801**	0.123	237	5.325***
Asia	JPN	1.362*	0.207**	125	5.313***
	HK	2.474***	0.075	90	5.030***
	SK	-0.922	0.173	30	0.300
	TWN	2.146***	0.020	72	7.560***
	SNG	1.817**	0.161	101	4.223***
	MAL	2.093*	0.127	18	4.895***
	THA	3.131**	-0.079	12	8.879***
Europe/ME	UK	-0.342	0.135	63	0.641
	FR	1.249*	0.230**	102	5.714***
	GER	0.541	0.198	18	0.387
	NED	0.691**	0.195**	351	8.663***
	ITL	0.628	0.132	47	0.338
	BEL	0.885**	-0.095	136	2.079*
	TUR	1.772	0.041	75	0.840
	ISR	0.945	-0.305**	22	4.731***
	GR	-0.393	-0.139	72	0.678
	BUL	1.091	0.173	69	1.733
S. Africa	SAF	1.686**	0.046	82	3.115***
Global	GLB	1.101	0.181	136	3.377***

(Continued…)

(Table 7 Continued)

Panel B: Market Index

		Nov-to-Apr	Intercept	Nobs	F-value
Americas	US	0.683	0.155	148	2.682**
	CAN	1.103**	0.187**	190	7.834***
	MEX	2.841*	-0.629	13	2.389**
Australia	AUS	1.136***	0.055	237	7.258***
Asia	JPN	0.799	0.271***	126	5.609***
	HK	0.809	0.147	90	0.932
	SK	3.182*	0.159	30	2.006*
	TWN	1.587	0.143	72	1.621
	SNG	1.237*	0.238*	102	4.129***
	MAL	1.685*	-0.283	18	2.507**
	THA	4.845**	-0.255	12	4.694***
Europe/ME	UK	0.749	0.111	64	0.898
	FR	0.724	0.199*	103	2.782**
	GER	1.774	0.311	18	0.924
	NED	1.656***	0.096	351	11.13***
	ITL	-0.047	0.234*	47	1.661
	BEL	0.910	0.284***	136	5.092***
	TUR	1.101	-0.045	76	0.452
	ISR	-0.039	-0.086	22	0.0570
	GR	-1.151	0.205*	72	2.739**
	BUL	0.219	0.191*	68	1.463
S. Africa	SAF	1.793**	0.003	82	3.447***
Global	GLB	0.809	0.212*	136	3.983***

Notes: The table presents the results of the OLS regression: $Rt = \alpha + \beta Nov\text{-}to\text{-}Aprt + \varepsilon_{i,t}$,where Rt is the percentage daily REIT (market) index return on day t for a given country, Nov-to-Apr is a dummy variable that takes a value of 1 if the months fall in the November through April period and zero otherwise. The F-value measures the joint significance of all the coefficients in the regression. T-statistics (unreported) are based on the robust standard errors in White (1980). Coefficients that appear in a box are statistically significant as well as significantly different between the REIT and market indices. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, with the use of a two-tailed test.

Panels C and D show that the holiday effects seem to be more common for the market indices, where ten countries exhibit positive and significant pre-holiday effects and ten countries exhibit positive and significant post-holiday effects. It is also interesting to note that almost all European market indices exhibit both pre-holiday and post-holiday effects. This result is in contrast to that obtained by Cadsby and Ratner (1992) who do not detect a pre-holiday effect in the five European markets that they study. Furthermore, our finding of an insignificant pre-holiday effect in the U.S. stock market is in contrast to early studies that find significant pre-holiday returns for the U.S. market (e.g., Lakonishok and Smidt, 1988), but conforms to more recent studies that report a disappearance of the pre-holiday effect for the U.S. stock market (see Chong et al., 2005).

Table 8 Holiday Effect for REITs and All Stocks

		REIT Index							
		Panel A				Panel B			
		PREHOL	R_{t-1}	Intercept	F-value	POSTHOL	R_{t-1}	Intercept	F-value
Americas	US	0.147	-0.163***	0.064**	12.04***	0.074	-0.163***	0.066**	11.69***
	CAN	0.127	0.109***	0.043***	8.049***	0.164	0.109***	0.042***	8.076***
	MEX	0.577**	-0.064	0.085	2.866***	-0.339*	-0.071	0.109*	2.489**
Australia	AUS	0.146*	0.020	0.038**	1.583	0.151	0.020	0.038**	1.127
Asia	JPN	0.227*	0.078**	0.018	4.130***	0.123	0.079**	0.023	2.227**
	HK	-0.045	-0.025	0.079***	0.250	-0.020	-0.025	0.078***	0.191
	SK	0.412	0.109	-0.008	1.724*	-0.420	0.108	0.014	1.471
	TWN	0.003	0.137***	0.036**	3.422***	0.022	0.137***	0.035**	3.418***
	SNG	0.298*	0.029	0.046	2.036*	0.363*	0.029	0.044	2.182**
	MAL	0.609**	-0.272***	0.079	15.05***	0.266	-0.268***	0.097*	13.48***
	THA	0.066	-0.027	0.070	0.233	-0.016	-0.027	0.074	0.0164
Europe/ME	UK	1.010***	0.022	-0.054	4.797***	0.484	0.024	-0.043	0.997
	FR	0.400	0.039	0.058*	2.063*	0.721**	0.040	0.055*	3.295***
	GER	1.607	-0.118**	-0.027	2.543**	4.148***	-0.110**	-0.067	6.469***
	NED	0.020	0.081***	0.023*	4.469***	0.292**	0.081***	0.018	6.532***
	ITL	0.478	0.085**	-0.064	2.285**	0.718	0.085**	-0.067	2.335**
	BEL	-0.048	-0.021	0.030	0.299	0.555**	-0.021	0.022	3.000***
	TUR	-0.033	0.052*	0.021	1.371	1.017*	0.052*	-0.001	3.249***
	ISR	-0.289*	-0.110**	0.089	4.073***	0.241	-0.113**	-0.020	3.374***
	GR	0.211	-0.138***	-0.049	9.438***	0.313	-0.138***	-0.052	9.471***
	BUL	-0.029	-0.252***	0.056	15.94***	0.192	-0.251***	0.052	16.12***
S. Africa	SAF	0.068	0.137***	0.054**	6.630***	0.278***	0.137***	0.047*	10.02***

(Continued…)

(Table 8 Continued)

		Panel C: PREHOL	R_{t-1}	Intercept	F-value	Panel D: POSTHOL	R_{t-1}	Intercept	F-value
Americas	US	0.080	-0.062**	0.016	3.096***	-0.035	-0.062**	0.020	2.797**
	CAN	0.072	0.016	0.036**	0.523	0.278**	0.016	0.030*	2.485**
	MEX	0.609*	-0.018	0.045	1.822*	-0.073	-0.022	0.063	0.0734
Australia	AUS	0.109	0.014	0.036***	1.291	0.165**	0.015	0.035***	2.521**
Asia	JPN	0.070	0.015	0.009	0.338	0.467***	0.015	-0.009	4.049***
	HK	-0.002	-0.016	0.038	0.140	0.376	-0.016	0.023	1.335
	SK	0.014	-0.025	0.053	0.117	0.006	-0.026	0.053	0.115
	TWN	0.489**	0.040	0.021	4.098***	0.364	0.041	0.025	1.878*
	SNG	0.123	0.023	0.041	0.638	0.668***	0.023	0.023	6.202***
	MAL	0.222*	0.094	0.022	2.192*	0.266	0.095	0.020	1.731*
	THA	0.171	0.015	0.064	0.524	0.686	0.017	0.039	0.883
Europe/ME	UK	0.316*	-0.034	0.007	2.127*	0.562**	-0.033	0.002	2.799**
	FR	0.321**	-0.029	0.015	3.016***	0.979***	-0.028	0.008	9.335***
	GER	1.003*	-0.006	-0.039	1.493	1.980***	-0.003	-0.054	13.98***
	NED	0.186**	0.008	0.029*	3.281***	0.494***	0.009	0.024	5.498***
	ITL	0.913**	0.048	-0.060	3.737***	0.895**	0.050	-0.061	4.082***
	BEL	0.275**	0.071**	0.002	5.323***	0.760***	0.071**	-0.004	9.760***
	TUR	0.154	0.033	0.040	0.858	0.548	0.034	0.032	1.351
	ISR	-0.077	-0.017	0.002	0.262	0.085	-0.019	-0.031	0.230
	GR	0.484*	0.048	-0.102**	3.069***	0.104	0.048	-0.090*	1.292
	BUL	0.316	0.084**	-0.023	3.759***	-0.157	0.086**	-0.014	3.119***
S. Africa	SAF	-0.066	0.023	0.072**	0.336	0.276	0.023	0.061*	1.325

Notes: The table presents the results of the following OLS regressions: $R_t = \alpha + \beta PREHOL_t + \varepsilon_{i,t}$ (see Panels A and C) and $R_t = \alpha + \beta POSTHOL_t + \varepsilon_{i,t}$ (see Panels B and D), where R_t is the percentage daily REIT (market) index return on day t for a given country, and *PREHOL* (or *POSTHOL*) is a dummy variable that takes a value of 1 if the trading day immediately precedes (or follows) a holiday. A holiday is defined as a trading day during which the market is closed (or, in other words, a day when trading would normally have occurred but did not). R_{t-1} is the return on the REIT (market) index on the previous trading day introduced into the model to correct for serial autocorrelation and ε_t is the error term. The intercept measures the returns on non-pre (post)-holiday trading days. The F-value measures the joint significance of all the coefficients in the regression. T-statistics (unreported) are based on the robust standard errors in White (1980). Coefficients that appear in a box are statistically significant as well as significantly different between the REIT and market indices. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively, with the use of a two-tailed test.

Finally, in comparing Panels A and C, we find a significant difference in the pre-holiday effect between REITs and general stocks in only three countries (Taiwan, the UK, and Belgium). For the post-holiday effect, only two countries (Japan and Singapore) show a significant difference between the REIT and stock market returns (see Panels B and D). Given that the difference is detected in only a handful of countries, we can conclude that REITs and stocks generally exhibit similar holiday effects.

5. Conclusion

Prior studies have documented calendar anomalies in the general stock market as well as in the real estate market in different countries over different time periods but none, to our knowledge, have directly compared the two markets and in a systematic manner over the same time period. In general, the existing findings on the presence of calendar anomalies are mixed, country specific and time period dependent. This study fills the gap and provides recent, systematic and comprehensive evidence from around the globe to address the unanswered question of whether REITs behave like other stocks with respect to the manifestation of calendar anomalies.

Our evidence, based on REIT and stock market data from 1990-2012 for 22 countries, shows that the calendar effects are not universal across countries and that REITs behave differently from stocks in a number of countries. The difference in behavior is especially prevalent around the TOM where the effect is significantly stronger on the last day of the month in REITs than in general stocks in the global index as well as in 7 of the 22 countries examined. This result may be possibly linked to the higher level of institutional ownership in REITs than in stocks in their corresponding stock market during the period examined. This link may deserve further exploration and testing in future studies.

Acknowledgements

The authors would like to thank Jim Shilling, Robert Edelstein, Jeff Fisher, Rose Lai, and participants at the DePaul University 2012 Symposium in Macau, the AsRES 2013 meeting in Kyoto, and the GCREC 2013 meeting in Beijing, for their helpful comments and suggestions on earlier versions of this paper.

References

Agrawal, A. and Tandon, K. (1994). Anomalies or illusions? Evidence from stock markets in eighteen countries. *Journal of International Money and Finance* 13 (1) (2): 83-106.

Allen, P.R. and Sirmans, C.F. (1987). An analysis of gains to acquiring firm's shareholders – the special case of REITs. Journal of Financial Economics 18: 175-184.

Almudhaf, F. and Hansz, A. (2011). Systematic equity return patterns in listed European property companies. *International Real Estate Review* 14 (1): 61.

Ariel, R.A. (1990). High stock returns before holidays: Existence and evidence on possible causes. *Journal of Finance* 45 (5) (12): 1611-26.

Białkowski, J., Etebari, A. and Wisniewski, T.P. (2012). Fast profits: Investor sentiment and stock returns during ramadan. *Journal of Banking & Finance* 36 (3) (3): 835-45.

Bouman, S. and Jacobsen, B. (2002). The Halloween indicator, 'Sell in May and Go Away': Another puzzle. *American Economic Review, 92*(5): 1618-1635.

Brounen, D. and Ben-Hamo, Y. (2009). Calendar anomalies: The case of international property shares. *Journal of Real Estate Finance and Economics* 38 (2) (02): 115-36.

Cadsby, C.B. and Ratner, M. (1992). Turn-of-month and pre-holiday effects on stock returns: some international evidence. Journal of Banking and Finance 16(3): 497-509.

Case, B., Yang, Y. and Yildirim, Y. (2012). Dynamic correlations among asset classes: REIT and stock returns. *Journal of Real Estate Finance & Economics* 44 (3) (04): 298-318.

Chan, S.H., Chen, J. and Wang, K. (2013). Are REIT IPOs unique?: The global evidence. Forthcoming, *Journal of Real Estate Finance & Economics*.

Chan, S.H., Erickson, J. and Wang, K. (2003). Real estate investment trusts: structure, performance, and investment opportunities. *Oxford University Press.*

Chan, S.H., Leung, W.K. and Wang, K. (1998). Institutional investment in REITs: Evidence and implications. Journal of Real Estate Research 16: 357-374.

Chan, S.H., Leung, W.K. and Wang, K. (2004). The impact of institutional investors on the monday seasonal. *Journal of Business* 77 (4) (10): 967-86.

Chan, S.H., Leung, W.K. and Wang, K. (2005). Changes in REIT structure and stock performance: Evidence from the Monday stock anomaly. *Real Estate Economics* 33 (1) (Spring): 89-120.

Chong, R., Hudson, R., Keasey, K. and Littler, K. (2005). Pre-holiday effects: International evidence on the decline and reversal of a stock market anomaly. Journal of International Money and Finance 24: 1226-1236.

Clayton, J. and MacKinnon, G. (2001). The time-varying nature of the link between REIT, real estate and financial asset returns. *Journal of Real Estate Portfolio Management* 7(1): 43-54.

Colwell, P.F. and Park, H.Y. (1990). Seasonality and size effects: The case of real-estate-related investment. Journal of Real Estate Finance and Economics 3 (3) (09): 251-9.

Connors, D.N., Jackman, M.L., Lamb, R.P. and Rosenberg, S.B. (2002). Calendar anomalies in the stock returns of real estate investment trusts. *Briefings in Real Estate Finance* 2 (1) (06): 61.

Doyle, J.R. and Chen, C.H. (2009). The wandering weekday effect in major stock markets. *Journal of Banking & Finance* 33: 1388–1399.

Friday, H.S. and Peterson, D.R. (1997). January return seasonality in real estate investment trusts: Information vs. tax-loss selling effects. *Journal of Financial Research* 20 (1) (Spring): 33-51.

Glascock, J.L. and Lu, C. (2000). Further evidence on the integration of REIT, bond, and stock returns. *Journal of Real Estate Finance & Economics* 20 (2) (03): 177-94.

Griffiths, M.D., and White, R.W. (1993). Tax-induced trading and the turn-of-the-year anomaly: An intraday study. *The Journal of Finance* 48 (2) (Jun.): pp. 575-598.

Hardin, W., Liano, K. and Huang. G. (2005). Real estate investment trusts and calendar anomalies: Revisited. *International Real Estate Review* 8 (1): 83.

Hirshleifer, D. and Shumway, T. (2003). Good day sunshine: Stock returns and the weather. *Journal of Finance* 58 (3) (06): 1009-32.

Hong,H. and Yu, J.(2009). Gone fishin': Seasonality in trading activity and asset prices. *Journal of Financial Markets*, 12 (4): 672-702.

Hui, E.C.M., Wright, J.A., and Yam, S.C.P. (2013). Calendar effects and real estate securities. *Journal of Real Estate Finance and Economics.* Advance online publication. doi: 10.1007/s11146-012-9398-4.

Jacobsen, B. and Visaltanachoti, N. (2009). The Halloween effect in U.S. sectors. *Financial Review* 44(3): 437-459.

Kamstra, M.J., Kramer, L.A. and Levi, M.D. (2000). Losing sleep at the market: The daylight saving anomaly. *American Economic Review* 90 (4) (09): 1005-11.

Keim, D.B. (1983). Size related anomalies and stock return seasonality: Further empirical evidence. Journal of Financial Economics 12(1): 13-32.

Khaled, M.S. and Keef, S.P. (2012). Calendar anomalies in REITs: international evidence. Journal of Property Investment and Finance 30 (4): 375-388.

Kim, C. and Park, J. (1994). Holiday effects and stock returns: Further evidence. *Journal of Financial & Quantitative Analysis* 29 (1) (03): 145-57.

Kohers, G., Kohers, N, Pandey, V., and Kohers, T. (2004). The disappearing day-of-the-week effect in the world's largest equity markets. *Applied Economics Letters* 11, 167–171.

Kunkel, R.A., Compton, W.S. and Beyer, S. (2003). The turn-of-the-month effect still lives: The international evidence. *International Review of Financial Analysis* 12 (2) (0/2nd): 207-21.

Lakonishok, J. and Smidt, S. (1988). Are seasonal anomalies real? A ninety-year perspective. *Review of Financial Studies* 1: 403-425.

Lenkkeri, V., Marquering, W. and Strunkmann-Meister, B. (2006). The Friday effect in European securitized real estate index returns. *Journal of Real Estate Finance and Economics* 33 (1) (08): 31-50.

Li, Y. and Wang, K. (1995). The predictability of REIT returns and market segmentation. *Journal of Real Estate Research* 10 (4): 471-82.

Ling, D.C. and Naranjo, A. (1999). The integration of commercial real estate markets and stock markets. *Real Estate Economics* 27 (3) (Fall): 483-515.

McConnell, J. and Xu, W. (2008). Equity Returns at the Turn of the Month. *Financial Analysts Journal,* 64 (2):49-64.

Meneu, V. and Pardo, A. (2004). Pre-holiday effect, large trades and small investor behavior. *Journal of Empirical Finance* 11: 231-246.

Ng, L. and Wang, Q. (2004). Institutional trading and the turn-of-the-year effect. *Journal of Financial Economics,* 74(2): 343-366.

Ogden, J.P. (1990). Turn-of-month evaluations of liquid profits and stock returns: a common explanation for the monthly and January effects. *Journal of Finance* 45: 1259-1272.

Pettengill, G.N. (2003). A survey of the Monday effect literature. *Quarterly Journal of Business and Economics* 42 (3–4): 121–137.

Price, S.M, Gatzlaff, D.H. and Sirmans, C.F. (2012). Information uncertainty and the post-earnings announcement drift anomaly: Insights from REITs. *Journal of Real Estate Finance and Economics* 44 (1/2): 250-274.

Redman, A.L., Manakyan, H. and Liano, K. (1997). Real estate investment trusts and calendar anomalies. *Journal of Real Estate Research* 14 (1-2): 19-28.

Starks, L.T., Yong L. and Zheng, L. (2006). Tax-Loss Selling and the January Effect: Evidence from Municipal Bond Closed-End Funds. Journal of Finance 61 (6): 3049-3067.

Wang, K., Chan, S.H. and Gau, G. (1992). Initial public offerings of equity securities: Anomalous evidence using REITs. Journal of Financial Economics 31: 381-410.

Wang, K., Erickson, J. and Chan, S.H. (1995). Does the REIT stock market resemble the general stock market? *Journal of Real Estate Research* 10 (4): 445-60.

Wang, K., Li, Y. and Erickson, J. (1997). A new look at the Monday effect. *The Journal of Finance* 52 (5): 2171-2186.

White, Halbert (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica* 48 (4): 817–838.

Wiley, J. and Zumpano, L. (2009). Institutional investment and the turn-of-the-month effect: Evidence from REITs. *Journal of Real Estate Finance and Economics* 39 (2): 180-201.

Appendix 1 Eligibility Rules and Number of Constituent Stocks in The General Stock and REIT Market Indices, by Country (June 2013)

Country	General Stock Market				REIT Market			
	Index	Rules	#	Source	Index	Rules	#	Source
US	DJ US Tot. Stock Mkt*	To be included in the index, a security must be the primary equity issue of a U.S. company. Excluded are bulletin-board issues.	3622	Dow Jones Indexes	GPR 250 REIT United States	See Note 1	NA	GPR
Canada	S&P/TSX COMPOSITE*	The S&P/TSX Composite is the headline index for the Canadian equity market. It is the basis for multiple sub-indices including but not limited to equity, income trust, capped, GICS and market cap based indices.	236	S&P Dow Jones	S&P Canada REIT	See Note 2	N/A	S&P
Mexico	MSCI Mexico*	The MSCI Mexico Investable Market Index (IMI) is designed to measure the performance of the large, mid and small cap segments of the Mexican market. With 47 constituents, the index covers approximately 99% of the free float-adjusted market capitalization in Mexico.	47	MSCI, iShares	Mexico Datastream REITs	N/A	1	Datastream
Australia	Australia Datastream*	The S&P/ASX All Ordinaries Index is a capitalization - weighted index of the 500 most highly capitalized companies traded on the Australian Stock Exchange.	500	Datastream	Australia Data Stream REITs	N/A	15	Datastream
Japan	TOPIX	All domestic common stocks listed on the TSE First Section. The first section is for the largest, most successful companies - often referred to as 'blue chips'.	1760	TSE	GPR 250 REIT Japan	See Note 1	N/A	GPR
Hong Kong	Hang Seng	A company must be in the top 90% of the total market capitalization of all eligible shares listed on the SEHK; must constitute the top 90% of the total turnover of all primary listed shares on the SEHK; and should normally have a listing history of 24 months on the SEHK or meet the market cap requirements.	80	Hang Seng	GPR 250 REIT Hong Kong	See Note 1	N/A	GPR

(Continued…)

(Appendix 1 Continued)

Country	General Stock Market				REIT Market			
	Index	Rules	#	Source	Index	Rules	#	Source
South Korea	MSCI Korea*	The MSCI Korea Index is designed to measure the performance of the large and mid cap segments of the South Korean market. With 104 constituents, the index covers about 85% of the Korean equity universe	104	MSCI, iShares	DJTM South Korea	Same as S&P, see note 2	N/A	S&P
Taiwan	TAIWAN SE WEIGHTED	The FTSE TWSE Taiwan Index Series consists of: FTSE TWSE Taiwan 50 Index, FTSE TWSE Taiwan Mid-Cap 100 Index, FTSE TWSE Taiwan Eight Industries Index, FTSE TWSE Taiwan Technology Index	786	TWSE, FT	S&P Taiwan REIT	See Note 2	N/A	S&P
Singapore	STRAITS TIMES	Comprises the top 30 SGX Mainboard listed companies on the Singapore Exchange selected by full market capitalization	30	Reuters	GPR 250 REIT SINGAPORE	See Note 1	N/A	GPR
Malaysia	FTSE Malaysia	FTSE Bursa Malaysia Index Series methodology ranks companies according to their full market capitalization. The companies are tested for minimum free float and liquidity requirements.	30	FTSE	S&P Malaysia REIT	See Note 2	N/A	S&P
Thailand	Bangkok S.E.T.*	The SET Index is a composite index which represents the price movement for all common stocks that are trading on the SET.	617	SET	TR Thailand REIT	N/A	8	Datastream
UK	FTSE 100*	The FTSE 100 consists of the largest 100 UK companies, by full market value, which are eligible for inclusion in the index.	100	FTSE, LSE	GPR 250 REIT UK	See Note 1	N/A	GPR
France	France CAC 40*	The CAC 40 Index, which contains 40 equities selected among the top 100 market capitalization and the most active listed equities, is the main benchmark for NYSE Euronext Paris. Tracking a sample of blue-chip equities, CAC 40 performance is closely correlated to that of the market as a whole.	40	LSE, Euronext Paris	S&P France REIT	See Note 2	N/A	S&P

(Continued…)

(Appendix 1 Continued)

Country	General Stock Market				REIT Market			
	Index	Rules	#	Source	Index	Rules	#	Source
Germany	DAX 30	The DEX reflects the segment of blue chips admitted to the Prime Standard Segment and comprises the 30 largest and most actively traded companies listed.	30	LSE	GPR 250 REIT Germany	See Note 1	N/A	GPR
Netherlands	AEX*	The AEX-Index is made up of shares issued by the 25 most traded companies listed on Euronext Amsterdam in such a way that it is suitable to serve as the underlying value for index-linked products such as derivatives.	25	LSE	Netherland Datastream REIT	N/A	5	Datastream
Italy	FTSE MIB	The FTSE MIB Index is the primary benchmark index for the Italian equity market and represents the large cap component of the FTSE Italia All-Share Index. Capturing approximately 80% of the domestic market capitalization, the FTSE MIB Index measures the performance of the 40 most liquid and capitalized Italian shares and seeks to replicate the broad sector weights of the Italian stock market.	40	FTSE, LSE	GPR 250 REIT Italy	See Note 1	N/A	GPR
Belgium	MSCI BELGIUM*	The MSCI Belgium Investable Market Index (IMI) is designed to measure the performance of the large, mid and small cap segments of the Belgian market. With 42 constituents, the index covers approximately 99% of the free float-adjusted market capitalization in Belgium.	42	MSCI	GPR 250 REIT BELGIUM	See Note 1	N/A	GPR
Turkey	MSCI Turkey*	The MSCI Turkey Index is designed to measure the performance of the large and mid cap segments of the Turkish market. With 24 constituents, the index covers about 85% of the equity universe in Turkey.	24	MSCI	GPR 250 REIT Turkey	See Note 1	N/A	GPR
Israel	FTSE Israel	The FTSE Israel Index is part of the FTSE RAFI Country Index Series. The index comprises the 40 stocks with the largest RAFI fundamental scores selected from those listed on the Tel Aviv Stock Exchange subject to size, free-float and liquidity criteria.	40	FTSE	FTSE EPRA/NAR EIT ISRAEL	See Note 3	N/A	FTSE

(Continued…)

(Appendix 1 Continued)

Country	General Stock Market				REIT Market			
	Index	Rules	#	Source	Index	Rules	#	Source
Greece	ATHEX Composite*	The 60 shares from the Main Market of the Athens Exchange, with the highest rank according to average market cap and clean trade value.	60	LSE FESE	Greece Data stream REITs	N/A	1	Datastream
Bulgaria	Bulgaria Datastream*	Datastream Bulgarian total market index plus sector indices reflects 16 securities which includes all the quoted securities for the BSE A and B 'Official Markets'.	16	Datastream	Bulgaria Data Stream REIT	N/A	7	Datastream
South Africa	FTSE/JSE ALL SHARE *	The FTSE/JSE Africa Index Series is designed to represent the performance of South African companies. The FTSE/JSE All-Share Index represents 99% of the full market capital value of all ordinary securities listed on the main board of the JSE.	167	FTSE, Bloomberg	S&P South Africa REIT	See Note 2	N/A	S&P
Global	MSCI World US Dollar	The MSCI World Index captures large and mid cap representation across 23 Developed Markets countries. With 1,604 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in each country.	1604	MSCI				

Note: # = number of constituent stocks in the index. *Index includes REITs in its constituents as of 6/30/2013.

1. GPR 250 REIT rules for company inclusion: size >50 US$ million free float market cap, investability >15% free float, property activity >75% operational turnover, rental Income >25% operational turnover, sector allocation >60% operational turnover from one specific sector, else diversified, country allocation >75% operational turnover from one country, else country of listing. Company structure: Real Estate Investment Trust.
2. S&P Dow Jones rules for company inclusion: All REIT companies must have at least US$ 100 million in float-adjusted market capitalization. Liquidity: All index constituents must have a minimum value traded of US$ 50 million for the preceding 12 months as of the annual index reconstitution reference date. BMI Buffer rule: At the annual rebalancing, an index constituent that falls below US$ 100 million in float-adjusted market capitalization remains in the index if its capitalization remains above US$ 75 million. A stock that does not fall below the US$ 75 million capitalization floor but trades less than US$ 35 million during the preceding 12 months is dropped from the index.
3. FTSE EPRA/NAREIT Global Real Estate Index Series rules for company inclusion. Size: a relative measure that is expressed as a percentage of the regional index market capitalization (after the application of investability weightings). Liquidity: Non-constituent securities which do not turnover at least 0.05% of their shares in issue (after the application of any investability weightings) based on their median daily trade per month in ten of the twelve months prior to a full market review, will not be eligible for inclusion in the Index Series. An existing constituent failing to trade at least 0.04% of its shares in issue (after the application of any investability weightings) based on its median daily trade per month for more than four of the twelve months prior to a full market review will be removed.