不動產投資信託基金反向效應與其獲利來源

Contrarian Effect of REITs and the Sources of their Profitability

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摘 要
本文分析不動產投資信託基金之反向效應與其獲利來源。本文貢獻在於探討除了投資人過度反應外，是否還有其他因素造成了不動產投資信託基金反向效應。分析結果如下：首先，不動產投資信託基金反向投資組合確可以產生正的異常報酬率。其次，除了投資人過度反應之外，另有兩個因素對反向效應有顯著影響：跨自我相關效應與橫斷面報酬變異效應。此外，如果跨自我相關效應不存在，則反向投資組合報酬率將會比實證上所觀察之報酬率來得更大。另外，橫斷面報酬變異降低了反向投資組合之報酬率。綜合而言，過度反應並不是造成不動產投資信託基金反向效應的唯一因素，跨自我相關效應與橫斷面報酬變異效應都會減少不動產投資信託基金反向投資組合之獲利。關鍵詞：不動產投資信託基金、反向效應、過度反應、跨自我相關、橫斷面變異

ABSTRACT

The current literature documents that the contrarian effect in the REIT markets can be attributed to investor overreaction. The objective of this article is to explore whether factors other than investor overreaction may also cause the REIT’s contrarian effect. We find that, first, the contrarian portfolios in the REIT markets are still profitable even after we control for the risk of these portfolios. Second, by decomposing the contrarian returns of REITs, we show that three factors account for this contrarian phenomenon: investor overreaction, the cross-autocorrelation effect, and the cross-sectional return-variation effect. Our analysis suggests that the observed REITs’ contrarian returns would have been even larger if the cross-autocorrelation effect were absent. The cross-sectional return-variation effect significantly decreases the contrarian profitability of REITs. Overall, our research indicates that investor overreaction is not the only factor explaining the REITs’ contrarian effect. Both the cross-autocorrelation effect and the cross-sectional variation effect contribute to the contrarian profitability of REITs.

Key words: REITs, contrarian effect, overreaction, cross-autocorrelation, cross-sectional variations

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1. Introduction

Extant literature documents that contrarian strategies in the stock markets generate positive excess returns. DeBondt & Thaler (1985, 1987) find that a contrarian strategy, which buys stocks with lower returns (i.e., losers) and sells stocks with higher returns (i.e., winners), is profitable. They argue that the contrarian effect exists in the stock markets because investors overreact to the news about the intrinsic values of common stocks. In contrast, Jegadeesh & Titman (1993, 2001) find that the momentum strategy, which buys winners and sells losers, earns a positive excess return. To explore why contrarian effect or momentum effect may exist, Daniel et al. (1998) develop a model in which investors who are subject to overconfidence and self-attribution biases will cause security prices to exhibit a short-term momentum effect and a long-term contrarian effect. In general, prior literature finds that a momentum strategy in the stock markets is usually profitable at the medium horizons, while a contrarian strategy generates significant profits at relatively longer horizons (for example, Conrad & Kaul, 1998). This contrarian effect, however, may exist in one asset, but not in another because the degrees of investors’ overreaction to the news may vary across different assets. Johnson & Fowler (2009) develop a theory that shows that investors’ overconfidence increases with the magnitude of uncertainty of security returns. Daniel & Titman (1999) confirm this theory by reporting that investors’ overconfidence is more profound in stocks that are more difficult to evaluate.

The objective of this study is to analyze the sources of contrarian effect of REITs. Our major contribution is two-fold. Firstly, we examine the factors other than investor overreaction that may explain the contrarian effect of REITs. By employing Lo & Mackinlay’s (1990) model to decompose the contrarian profit of REITs, we find that not only investor overreaction, but also other two factors (i.e., cross-autocorrelation effect and cross-sectional return-variation effect) can explain the contrarian effect in the REIT markets. Specifically, our results indicate that, first, contrarian strategies in the REIT markets generate significantly positive returns. This finding is consistent with Cooper et al. (1999) finding that a contrarian strategy using the REITs is many times more profitable than the associated transaction costs. Our finding is also related to Lin et al. (2006), who find that the contrarian effect also exists in the associated stock markets. Second, the profitability of contrarian strategies is not due to the risk of contrarian portfolios in the REIT markets. This evidence is inconsistent with the efficient-market hypothesis (Fama, 1991). Third, investment returns of contrarian strategies in the REIT markets can be explained by three effects: over-reaction effect, cross-autocorrelation effect, and cross-sectional return-variation effect. Of these three effects, the cross-sectional return-variation effect has the least impact on the contrarian profitability. Our results show that investor overreaction is not the only factor that can drive the contrarian phenomena in the REIT markets.

Secondly, our analysis sheds light on how time-series and cross-sectional return dynamics can affect the contrarian profitability of REITs. Extant studies on the REIT contrarian effect argue that investor overreaction causes the REIT contrarian effect. These studies, however, mostly ignore the importance of time-series and cross-sectional return patterns of the REIT contrarian portfolios.
Our analysis indicates that, in addition to time-series autocorrelation of REITs, both cross-sectional return-variation and cross-autocorrelation of REITs lead to the REITs’ contrarian profitability. This knowledge may help investors to enhance their REIT portfolio return-and-risk performance. For example, an investor may increase his or her investment in REITs following a period of time over which REIT prices continue to hit 52-week low levels, which indicates that REIT markets may overreact to the bad news and is likely to rebound. Another example is that an investor may decrease his or her holdings in REITs following a period of time over which a large number of investors rush to buy REITs, which would cause other REITs’ prices to subsequently reverse because the cross-autocorrelation effect is negative.

This article is organized as follows. Section 1 provides an introduction of this paper. In Section 2, we review related articles and develop empirical hypotheses. Section 3 contains a description of the sample. In Section 4, we discuss how to decompose the REITs’ contrarian returns into three components. We then present the empirical results and discuss how our results are related to extant literature in Section 5. Section 6 concludes this paper.

2. Literature review and hypothesis development

2.1 Literature review

Extant literature finds that contrarian strategies, which buy past losers and sell past winners, in the stock markets generate positive returns. These positive returns are not a compensation for the risk of the contrarian portfolios. This finding is inconsistent with the efficient-market hypothesis proposed by Fama(1991).

One of the causes of contrarian effect in the stock markets is related to investor behavior. Hirshleifer(2001) argues that investors in the stock markets are subject to psychological biases that cause the patterns of stock returns to behave as if they are not perfectly efficient. Empirically, DeBondt & Thaler(1985, 1987) find that contrarian portfolios in the stock markets generate positive excess returns because investors overreact to the news about the intrinsic value of stocks.

Investor overreaction is not the only source of contrarian profit in the stock markets. By decomposing the contrarian returns in the stock markets, Lo & Mackinlay(1990) find that, in addition to investor overreaction, non-synchronous trading phenomenon can cause the observed contrarian effect in the stock markets. The non-synchronous trading phenomenon occurs when the returns of liquid stocks “lead” those of less-liquid stocks. Lo & Mackinlay(1990) argue that if the returns of past winners lead those of past losers, we will observe the contrarian effect even if investors are rational (i.e., investors do not overreact to the news). Empirically, Lo & Mackinlay(1990) find that this lead-lag effect is a significant component of the contrarian profit in the stock returns, as evidenced by positive cross-correlation coefficients of stock returns.

The impact of cross-sectional return-variation on the stocks’ contrarian effect has been analyzed by Conrad & Kaul(1998). In contrast to Lo & Mackinlay(1990), Conrad & Kaul(1998) emphasize the importance of factors other than investor overreaction and cross autocorrelation that may cause the profitability of the return-based trading strategies in the stock markets. Specifically,
Conrad & Kaul(1998) employ a single unifying framework to analyze the sources of profits to a wide spectrum of return-based trading strategies documented in the literature. They show that cross-sectional variation in the mean returns of individual stocks included in these return-based trading strategies play an important role in the profitability of these strategies. The cross-sectional return-variation can account for the profitability of short-term momentum strategies and it is also responsible for attenuating the profits from price reversals to long-horizon contrarian strategies.

Extant literature finds that asset types and investor structure are also related to contrarian effect in the stock markets. For example, Johnson & Fowler(2009) develop a theory in which investor overconfidence increases with the degree of uncertainty of security returns. Empirically, Daniel & Titman(1999) find that investor overconfidence is more profound in the assets that are more difficult to evaluate (for example, growth stocks as opposed to value stocks). Another line of argument suggests that investor types are closely related to contrarian and momentum effects. Chiu et al.(2010) find that the degree of investor individualism (which refers to that people tend to view themselves as “autonomous and independent” individuals and, thus, tend to be overconfident) is significantly related to the returns of momentum portfolios in the countries other than East Asian countries. Chiu et al.(2003, 2010) argue that momentum effect is insignificant in East Asian countries because individualism is relatively weak in these countries. In addition, Grinblatt & Keloharju(2000) analyze a detailed dataset in Finland and find that domestic household investors tend to be contrarian investors and foreign investors tend to be momentum investors. Domestic household investors appear to significantly underperform foreign investors after controlling for their respective contrarian portfolios’ returns and momentum portfolios’ returns. It is worth mentioning that the finding of domestic household investors being contrarians does not necessarily imply that contrarian effect is more likely to occur in a stock market which is dominated by domestic household investors.

The contrarian effect is not limited to the stock markets. For example, Cooper et al.(1999) find that a contrarian portfolio using REITs generates a positive abnormal return after controlling for transaction costs. Furthermore, they demonstrate that the REIT market has been sufficiently liquid to execute the contrarian trading strategy. This finding is related to the filter strategy that filters out the return noise since only REITs with large price movements satisfy the hypothetical investor’s selection criteria. In another study on investor overconfidence in the REIT markets, Lin et al.(2010) find that REIT returns “lead” trading volume of REITs, a result consistent with Odean’s (1998) model in which investor overconfidence increases trading volume. In addition, the contrarian effect also exists in the foreign exchange markets. Wan & Kao(2009) utilize a non-linear behavior model where the chartists and fundamentalists coexist and find that contrarian effect exists in the British Pound, Japanese Yen and German Mark markets. Furthermore, they find that the contrarian trading can only partially offset the price impact of trend-followers. The fundamentalists’ confidence in trade fades during large misalignments, which make the mean reversion function of the fundamentalists relatively weak. Why does the contrarian effect exist in these markets? Extant literature (for example, Cooper et al., 1999) attributes the contrarian effect to investor overreaction
based on the empirical observation of a price reversal of contrarian portfolios. Whether or not the factors other than investor overreaction may cause the contrarian effect in the REIT markets has not been analyzed in prior literature. We aim to fill this void.

It is generally believed that REITs are an asset class different from common stocks. Ghosh et al. (1996) argue that REITs are more like real estate assets than common stocks because REIT holdings are legally limited to real estate assets. Ghosh et al. (1996) point out that the correlation between REITs and common stocks is low. A low correlation between REITs and stocks may offer a further diversification benefit for investors who hold diversified portfolios. In addition, Glascock (1991) and Ghosh et al. (1996) find that REITs are defensive (i.e., safer) assets because REITs are less risky than the general stock markets and exhibit less negative returns than the general stock markets during the bear markets.

Extant literature on asset types and investor structure offers implications on whether REIT markets are more likely to be subject to contrarian effect than stock markets. Under the theory that investor overconfidence leads to contrarian effect (Daniel et al., 1998), contrarian effect will be low or non-existent in the REIT markets if the REITs are relatively easy for investors to evaluate (see Johnson & Fowler, 2009, for such a theory and Daniel & Titman, 1999, for supportive empirical evidence) because REITs are required by law to distribute most of the cash flows to shareholders. On the other hand, if investors are unfamiliar with the REITs (for example, investors in Taiwan may be unfamiliar with the REITs because these assets were first listed for trading in March 2005), contrarian effect may exist in the REIT markets. Empirically, both Cooper et al. (1999) and Lin et al. (2010) find that contrarian effect exists in the REIT markets even in the USA.

In summary, although REITs are traded in the major exchanges in which common stocks are also traded, REITs are assets distinct from common stocks. Given the distinct characteristics of REITs [as opposed to stocks], does the contrarian effect exist in the REIT markets? If the contrarian effect exists in the REIT markets, can we attribute this contrarian effect to investor overreaction? Are there any factors other than investor overreaction that may contribute to the contrarian effect in the REIT markets? Do these factors contribute to the contrarian effect in the REIT markets in the same way as they do in the stock markets? Although extant literature has already addressed the first two questions (see Cooper et al., 1999), the last two questions have not yet been analyzed. We aim to fill this void.

2.2 Hypothesis development

Although REITs are traded on the major exchanges like common stocks, REITs and common stocks are not the same. Ghosh et al. (1996) argue that REITs are an asset class that is distinct from stocks because REIT holdings are legally limited to real estate assets and the correlation between real estate returns and stock returns is low. It is generally concluded that REITs look more like real estate than stocks (Ghosh et al., 1996). Furthermore, REITs may be relatively easy for investors to evaluate and, thus, the degree of investor overconfidence in REITs should be small or non-existent (Johnson & Fowler, 2009; Daniel & Titman, 1999). In contrast, Lin et al. (2010) find that REIT returns “lead” trading volume, indicating that investor overconfidence is evident. Accordingly, we
develop the following empirical hypotheses to explore whether and why the contrarian effect exists in the REIT markets.

_Hypothesis One: Contrarian effect exists in the REIT market._

REITs are traded in the exchanges where common stocks are also traded. Therefore, if the patterns of stock returns are not as efficient as Fama(1991) suggested, it is likely that the patterns of REIT returns are not efficient either. DeBondt & Thaler(1985, 1987) find that the contrarian effect exists in the stock markets. Accordingly, we hypothesize that contrarian effect may exist in the REIT markets.

_Hypothesis Two: Investor overreaction contributes to the contrarian effect of REITs._

We develop Hypothesis Two based on the following arguments. First, Lin et al.(2010) report that REIT returns “lead” trading volume in REITs. This finding is consistent with Odean’s(1998) model in which investor overconfidence increases trading volume. Second, Cooper et al.(1999) finds that price reversals in REITs are evident. This suggests that investors in REITs may overreact to news, causing REIT prices to eventually reverse. This inference is similar to DeBond & Thaler’s(1985, 1987) argument that a significant contrarian effect of stocks is consistent with the behavior hypothesis of investor overconfidence. Third, investors have the same access to both trading stocks and trading REITs in the exchanges. Therefore, if investor behavior affects the patterns of stock returns, it is likely that this behavior will affect the patterns of REIT returns. DeBondt & Thaler(1985, 1987) argue that contrarian effect exists in the stock markets because investors over-react to the news related to the values of common stocks. Accordingly, we hypothesize that investor overreaction contributes to the contrarian effect in the REIT markets.

_Hypothesis Three: The cross-autocorrelation effect affects the contrarian returns of REITs._

Theoretical models developed by Lo & Mackinlay(1990) and Conrad & Kaul(1998) demonstrate that not only investor overreaction, but also cross-autocorrelation of returns [as well as cross-sectional return-variation] causes the contrarian profitability of stocks. Empirically, this cross-autocorrelation effect may be positive, negative, or non-existent. First, Lo & Mackinlay(1990) report that the cross-autocorrelation effect in stock contrarian profitability is positive for the data of up to 3 weeks. They argue that a positive cross-autocorrelation effect is consistent with the notion that if liquid stocks “lead” less-liquid stocks because not all the stocks are traded simultaneously, The contrarian effect will occur even if investors do not overreact to the news. Second, Vijh(1994) finds that returns are negatively cross-autocorrelated for stocks that are subject to excessive buying pressure over a period of time. Excessive buying pressure will induce negative auto-correlations among these stocks over the subsequent time period(Vijh, 1994). Third, although Lo & Mackinlay(1990) and Vijh(1994) find that cross-autocorrelation effect of stock returns is significantly different from zero, this cross-autocorrelation effect may be small or non-existent in our study because we analyze monthly REIT returns. If the lead-lag effect(Lo & Mackinlay, 1990) or excessive buying pressure(Vijh, 1994) does not last longer than one month, the cross-autocorrelation component in our sample may be small or insignificant. Whether or not this cross-autocorrelation effect is positive, negative, or zero in the REIT markets remains to be empirically explored.
Hypothesis Four: The cross-sectional return-variation of REITs lowers the contrarian profitability in the REIT markets.

In Lo & Mackinlay’s (1990) exposition of the decomposition of contrarian effect in the stock markets, cross-sectional variation of stock returns can explain the contrarian effect because of the mathematical derivation of contrarian returns. The intuition of this theoretical result can be explained as follows. Assume that all the REITs can be divided into two groups: high-mean-return REITs and low-mean-return REITs. In the absence of investor overreaction and cross-autocorrelation effects, contrarian trading strategies will buy low-mean-return REITs and sell high-mean-return REITs. Accordingly, as long as not all the REITs have identical mean returns, contrarian profitability of REITs will decrease by the amount of any cross-sectional dispersion of mean returns of REITs. Conrad & Kaul (1998) provide a similar argument to explain how the momentum portfolios are profitable due to the cross-sectional return-variation of stocks.

3. Data

We identify REITs that have returns available in the Taiwan Economic Journal Database from 2005 to 2010 as the first REIT in Taiwan, Fu-bon REIT Number 1, was listed for trading in March, 2005. Monthly returns of REITs and market index returns over the sample period are then obtained from the Taiwan Economic Journal Database. The sample period is from June 2007 to June 2010 in order to include all the eight REITs that are currently traded in Taiwan, as of June 2010. These eight REITs are Fu-bon REIT Number 1, Fu-bon REIT Number 2, Cathay REIT Number 1, Cathy REIT Number 2, Shin-kon REIT, Shan-ding REIT, Gie-tai REIT, and Gen-Ma REIT.

4. Research methods

The objective of this paper is to explore the sources of contrarian effect in the REIT markets. First, the contrarian effect in the REIT markets may be due to the risk of the contrarian trading strategy. To address this possibility, we employ Capital Asset Pricing Model. Second, to analyze whether factors other than investor overreaction can explain the contrarian effect in the REIT markets, we use Lo & Mackinlay’s (1990) model to decompose the contrarian returns into three components: investor overreaction, cross-autocorrelation effect (or lead-lag effect) and cross-sectional return-variation effect. We discuss these research methods below.

4.1 Risk-adjusted returns

Contrarian portfolios consist of buying losers and selling winners. Losers and winners are determined based on their respective returns over the ranking periods. Returns of contrarian portfolios are then analyzed over the test periods, which are subsequent to the ranking periods. If contrarian returns over the test periods are positive, it is possible that the contrarian profits may be due to the risk of the contrarian portfolios. To analyze whether contrarian returns are simply a compensation for the risk, we follow DeBondt & Thaler (1987) to employ Capital Asset Pricing Model to examine whether contrarian portfolios generate positive risk-adjusted returns: $R - R_f = \alpha + \beta \cdot (R_m - R_f)$ where $R$ is the test-period return of a contrarian portfolio. $R_m$ is the stock market returns.
index return. $R_f$ is the risk-free rate of return. If contrarian portfolios generate positive excess returns, $\alpha$ estimate should be significantly positive. Conversely, if contrarian returns are simply a compensation for the risk of contrarian portfolios, $\alpha$ estimate should be zero.

4.2 Decomposition of contrarian returns of REITs

To decompose the returns of contrarian portfolios of RIETs, we follow Lo & Mackinlay’s(1990) model, which is useful in decomposing stocks’ contrarian profitability. First, the contrarian portfolio consists of buying REITs and sell REITs at time $t-1$ based on their return performance from time $t-2$ to $t-1$, where the ranking period $\{t-2, t-1\}$ can span one month through 12 months. Second, we follow Lo & Mackinlay(1990) to assign $w_{it-1}$ (investment weight) as the fraction of wealth devoted to REIT $i$, where $w_{it-1}$ is determined by the ranking-period return performance of REIT $i$ relative to the equally-weighted average return of all REITs that are included in the contrarian portfolios. Specifically,

$$w_{it-1}(k) = -\frac{1}{N} [R_{it-1}(k) - R_{mt-1}(k)]$$

where $R_{it-1}(k)$ is the return on REIT $i$ at time $t-1$, $R_{mt-1}(k)$ is the return on equally-weighted portfolio of all REITs, and $k$ is the length of the time interval $\{t-1, t\}$. A negative sign is present at the right-hand side of Equation (1) because a contrarian trading strategy sells winners (whose ranking-period returns are relatively higher) and buys losers (whose ranking-period returns are relatively lower). Formation of contrarian portfolios using equation (1) ensures that all REITs are included into the contrarian portfolios (with investment weights in proportional to the ranking-period returns of individual REITs) and, therefore, allows us to decompose contrarian portfolio returns into time-series and cross-sectional components. In contrast, the formation of contrarian portfolios using Jegadeesh & Titman’s(1993) selection criteria to pick winners and losers does not permit such a return decomposition because Jegadeesh and Titman select the top decile portfolio only (determined by ranking-period returns) as the winner and the bottom decile portfolio as the loser. In this process, 80 percent of securities are excluded from portfolios of winners and losers, making it difficult to decompose contrarian returns.

The realized return at the test period $t$, $\pi_t(k)$, to a contrarian portfolio using the investment weights in Equation (1) is given by

$$\pi_t(k) = \sum_{i=1}^{N} w_{it-1}(k)R_{it}(k)$$

The test-period return of a contrarian portfolio can then be decomposed as follows.

$$E[\pi_t(k)] = Cov[R_{mt}(k), R_{mt-1}(k)] - \frac{1}{N} \sum_{i=1}^{N} Cov[R_{it}(k), R_{it-1}(k)]$$

$$- \frac{1}{N} \sum_{i=1}^{N} [\mu_{it-1}(k) - \mu_{mt-1}(k)]^2$$
where $E(\pi(k))$ is the expected test-period return of the contrarian portfolio, $C(k)$ is the cross-autocorrelation component, $O(k)$ is the autocorrelation component, and $\sigma^2[\mu(k)]$ is the cross-sectional return-variation component. Lo & Mackinlay (1990) argue that if investors overreact to the news about the security prices, security returns will eventually reverse. This implies that the autocorrelation component, $O(k)$, in Equation (3) is positive [because $O_t$ in Equation 4 below comes with a negative sign]. Therefore, if the estimate of $O(k)$ in Equation (3) is significantly positive, we can interpret this result as supportive of the view that investors in the REIT markets overreact to the news about REIT prices. In addition, the cross-autocorrelation component, $C(k)$, can contribute to the contrarian returns in the REITs even if there is no investor overreaction (and, therefore, no price reversal) in the REITs. One possible source of such cross-autocorrelation effect is known as nonsynchronous trading problem, in which the prices of highly-liquid securities “lead” those of distinct securities (Fisher, 1966; Scholes & Williams, 1977; Cohen et al., 1986). Finally, the cross-sectional return-variation component, $\sigma^2[\mu(k)]$, can decrease the profitability of contrarian trading strategies because this component per se is always positive and is attached with a negative sign in Equation (3). This cross-sectional variation component is not related to the first two components, both of which are time-series aspects of return characteristics in nature.

Lo & Mackinlay (1990) demonstrate that three components of contrarian returns can be estimated as follows.

$$\hat{O} = \frac{1}{T-K} \sum_{t=k+1}^{T} O_t \quad \cdots \quad (4)$$  

$$\hat{C} = \frac{1}{T-K} \sum_{t=k+1}^{T} C_t \quad \cdots \quad (5)$$  

$$\sigma^2(\hat{\mu}) = \frac{1}{N} \sum_{i=1}^{N} (\hat{\mu}_i - \hat{\mu}_m)^2 \quad \cdots \quad (6)$$  

where

$$O_t = -\frac{N-1}{N^2} \sum_{i=1}^{N} (r_{i,t-k}r_{i,t} - \hat{\mu}_i^2)$$  

$$C_t = r_{m,t}r_{m,t-k} - \hat{\mu}_m^2 - \frac{1}{N^2} \sum_{i=1}^{N} (r_{i,t}r_{i,t-k} - \hat{\mu}_i^2)$$  

$\hat{\mu}_i$ and $\hat{\mu}_m$ are the sample means of the returns of REIT $i$ and the equal-weighted index $m$, respectively.

By employing the above methodology, we are able to decompose the profitability of the contrarian trading strategy of REITs into three components: investor overreaction component, cross-autocorrelation component and cross-sectional return-variation component. Our methodology has
the advantage that prior literature on REIT’s contrarian effect does not have. Our methodology allows us to differentiate price reversals from trading-related phenomenon, while methodologies of prior literature on REITs (for example, Cooper et al., 1999) do not.

5. Empirical results and interpretations

Table 1 provides summary statistics for the monthly returns of REITS over the period from June 2007 to June 2010. The mean value of the monthly return of the REITs in the sample is positive at 0.0747%, while the median value is 0.00%. The maximum value of the monthly returns of REITs is 25.870%, while the minimum value is -22.880%. The standard deviation is 5.877%. Compared to the sample of Cooper et al.(1999), our sample has the same median value (0.00%). The returns in our sample are less volatile than those of Cooper et al.(1999), who report that the mean value of weekly returns is 0.27% and the standard deviation of weekly returns is 3.91% for REITs in the USA over the time period from 1973 to 1995.

<table>
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<th>Sample size</th>
<th>Mean return(%)</th>
<th>Median return(%)</th>
<th>Maximum return(%)</th>
<th>Minimum return(%)</th>
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<td>0.000</td>
<td>25.870</td>
<td>-22.880</td>
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</table>

Table 2 reports that the contrarian trading strategy, which buys past losers and sells past winners, in the REIT markets is profitable. Following Jagadeesh & Titman(1993), we identify losers and winners based on the return performance over the ranking period, denoted by $J$ in Table 2. We then form contrarian portfolios by buying losers and selling winners and observe the return performance of contrarian portfolios over the subsequent test periods, denoted by $K$ in Table 2. Empirical results indicate that contrarian portfolios yield significantly positive returns over the test periods of 3 and 5 through 12 months. For example, the contrarian portfolio of ranking period ($J$) of 12 months yields a significantly positive return of 21.334% over the 12-month test period ($K$). It is noted that the returns reported in Table 1 are raw returns, which are not adjusted by the risk of investment. Nevertheless, Table 2 provides a preliminary indication that the contrarian effect may exist in the REIT markets. To some extents, this finding is similar to Conrad & Kaul(1998), who find that a contrarian strategy in the stock markets provides significant profits at relatively longer horizons.
Table 2: Test-period returns of contrarian portfolios

The contrarian portfolio is composed of buying past loser and selling past winner. The selection of loser and winner is based on the return performance over the ranking period (Jegadeesh & Titman, 1993). \( J \) is the number of months of the ranking period. \( K \) is the number of months of the test period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

<table>
<thead>
<tr>
<th>( J )</th>
<th>( K )</th>
<th>Test-period return</th>
<th>( t )-value</th>
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<td>1.54717</td>
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<tr>
<td>6</td>
<td>6</td>
<td>0.04985**</td>
<td>2.13219</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>0.09482***</td>
<td>3.10417</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>0.13036***</td>
<td>3.63876</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>0.15089***</td>
<td>3.37161</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>0.15695***</td>
<td>3.18478</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>0.19450***</td>
<td>3.98735</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>0.21334***</td>
<td>4.50765</td>
</tr>
</tbody>
</table>

Table 3 confirms that the contrarian portfolios in the REIT markets are still profitable even after we control for the risk of contrarian trading strategy. Following DeBondt & Thaler (1987), we employ Capital Asset Pricing Model to analyze whether the positive returns of contrarian portfolios are simply a compensation for the risk of these portfolios. If the risk can explain the returns of contrarian portfolios, the excess returns of contrarian portfolios should be zero. In Table 3, \( \alpha \) estimates (i.e., the excess returns of contrarian portfolios) are significantly positive over the test periods of 3 through 12 months. For example, the contrarian portfolio of ranking period of 12 months offers a significantly positive risk-adjusted return of 1.017% per month over the 12-month test period. It is not surprising to find that the beta estimates in Table 3 are smaller than one because the contrarian portfolios are composed of short positions and long positions and, therefore, the beta estimates tend to smaller than the general market. Overall, Table 3 implies that the REIT markets may not be as efficient as Efficient-Market Hypothesis (Fama, 1991) would suggest.
Table 3: Risk-adjusted returns of contrarian portfolios over the test periods

The contrarian portfolio consists of buying past loser and selling past winner. Following DeBondt & Thaler(1987), estimates of $\alpha$ and $\beta$ are based on the following asset-pricing model:

$$R - R_f = \alpha + \beta (R_m - R_f)$$

where $R$ is the test-period return of the contrarian portfolio, $R_m$ is the stock market index return, $R_f$ is the risk-free rate of return. The selection of loser and winner is based on the return performance over the ranking period (Jegadeesh & Titman, 1993). Returns reported below are monthly returns. $J$ is the number of months of the ranking period. $K$ is the number of months of the test period. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

<table>
<thead>
<tr>
<th>$J$</th>
<th>$K$</th>
<th>$\alpha$</th>
<th>$t$-value</th>
<th>$\beta$</th>
<th>$t$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0.01144</td>
<td>-0.51</td>
<td>0.21432**</td>
<td>2.39</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0.00506</td>
<td>0.88</td>
<td>-0.18500**</td>
<td>-2.31</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>0.01070***</td>
<td>2.14</td>
<td>0.18123***</td>
<td>2.36</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>0.00804*</td>
<td>1.82</td>
<td>0.18920**</td>
<td>2.56</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>0.01026***</td>
<td>3.00</td>
<td>0.21860***</td>
<td>3.56</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>0.00914***</td>
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<td>0.17724**</td>
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<td>7</td>
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<td>0.15052*</td>
<td>1.83</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
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<td>4.11</td>
<td>0.19864**</td>
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</tr>
<tr>
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<td>9</td>
<td>0.01587***</td>
<td>3.85</td>
<td>0.28325****</td>
<td>3.19</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
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<td>0.36080****</td>
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<tr>
<td>11</td>
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<tr>
<td>12</td>
<td>12</td>
<td>0.01017***</td>
<td>5.21</td>
<td>0.41204****</td>
<td>7.93</td>
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</table>

To further analyze the sources of contrarian effect in the REIT markets, we use Lo & Mackinlay’s(1990) analytical framework to decompose contrarian returns into three components: overreaction component, cross-autocorrelation component and cross-sectional return-variation component. Table 4 presents the evidence about the sources of contrarian effect of REITs. Specifically, we find that, first, the overreaction component, denoted by O in Table 4, is a significant component of contrarian returns of REITs as long as the contrarian returns are significantly positive. This is consistent with the behavioral Financial Economics(Kahneman & Tversky, 1982; DeBondt & Thaler, 1985) that investors facing uncertainty in the security markets overreact to the news related to the intrinsic value of securities. The presence of overreaction implies that returns of past winners will go down while those of past losers will go up. As a result, a contrarian trading strategy will be profitable.
Table 4: Decomposition of returns of contrarian portfolios over the test periods

\( E(\pi) \) is the test-period return of the contrarian portfolio (Lo & Mackinlay, 1990; Conrad & Kaul, 1998). C is the cross-autocorrelation component. O is the overreaction component. \( \sigma^2 \) is the cross-sectional return-variation component. \( J \) is the number of months of the ranking period. \( K \) is the number of months of the test period. \( t \)-values are reported in parentheses. Returns reported below are monthly returns. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

<table>
<thead>
<tr>
<th>( J )</th>
<th>( K )</th>
<th>( E(\pi) )</th>
<th>C</th>
<th>O</th>
<th>( \sigma^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0.0001491**</td>
<td>0.000753**</td>
<td>-0.000470</td>
<td>0.0001330</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.4575)</td>
<td>(2.4574)</td>
<td>(-1.4286)</td>
<td>(1.8293)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0.0001824</td>
<td>0.000787</td>
<td>-0.000338</td>
<td>0.0002663*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.5998)</td>
<td>(1.1926)</td>
<td>(-0.4897)</td>
<td>(2.0532)</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>0.0002443</td>
<td>0.001114</td>
<td>-0.0004751</td>
<td>0.0003940**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.0174)</td>
<td>(1.0640)</td>
<td>(-0.4375)</td>
<td>(2.5456)</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>0.0003794</td>
<td>-0.000721</td>
<td>0.0016379</td>
<td>0.0005368***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.3035)</td>
<td>(-0.3747)</td>
<td>(0.7852)</td>
<td>(2.4746)</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
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<td>-0.005949*</td>
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<td>0.0005775*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.9711)</td>
<td>(-1.8364)</td>
<td>(2.1152)</td>
<td>(2.2969)</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>0.0012639**</td>
<td>-0.010606**</td>
<td>0.0124034**</td>
<td>0.0005359*</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>(-2.3782)</td>
<td>(2.5313)</td>
<td>(2.0053)</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>0.0020927**</td>
<td>-0.013642***</td>
<td>0.0161028***</td>
<td>0.0003688*</td>
</tr>
<tr>
<td></td>
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<td>(-2.9039)</td>
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<td>(1.8811)</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
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<td>0.0166410**</td>
<td>0.0002714**</td>
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<td></td>
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<td>(2.3103)</td>
<td>(-2.6091)</td>
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<td>(2.5719)</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>0.0029456**</td>
<td>-0.013091*</td>
<td>0.016640*</td>
<td>0.0001690**</td>
</tr>
<tr>
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<td></td>
<td>(2.2768)</td>
<td>(-2.0017)</td>
<td>(2.0576)</td>
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</tr>
<tr>
<td>10</td>
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<td>0.0001036**</td>
</tr>
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<td></td>
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<tr>
<td>11</td>
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<td>0.0047481***</td>
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<td>0.0001138**</td>
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<td></td>
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<tr>
<td>12</td>
<td>12</td>
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</tr>
<tr>
<td></td>
<td></td>
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<td>(-3.2341)</td>
<td>(3.4412)</td>
<td>(4.1819)</td>
</tr>
</tbody>
</table>

Second, Table 4 suggests that contrarian profitability of REITs can be driven by the cross-autocorrelation effect, denoted by C in Table 4. Over the test periods from 5 months through 12 months, all the three components (i.e., overreaction component, cross-autocorrelation effect component and cross-sectional return-variation component) are significantly different from zero. It is noted that absolute values of the estimates of the cross-autocorrelation effect components are approximately the same as those of the overreaction components. This implies that the importance of the cross-autocorrelation effect component is approximately the same as that of the overreaction component. The finding that the estimate of cross-autocorrelation component is significantly negative implies that the observed contrarian returns of REITs would have been even larger if the cross-autocorrelation effect were absent. For example, the contrarian portfolio of \( J \) (i.e., ranking period) = 12 months and \( K \) (i.e., test period) = 12 months would have been 0.0257707 (= 0.0255430+...
0.0002277) per month if the cross-autocorrelation component’s coefficient were 0. Furthermore, two lines of argument are related in this regard: Lo & Mackinlay(1990) and Vijh(1994). Lo & Mackinlay(1990) argue that because of the non-synchronous trading phenomenon in which distinct securities are not frequently traded, returns of liquid stocks “lead” those of less-liquid stocks. If this lead-lag effect is present, C is positive. In contrast, Vijh(1994) argues that if there exists a price pressure phenomenon, in which a group of investors buy or sell a basket of stocks with similar characteristics, C will be negative. In Table 4, C is significantly negative as long as the contrarian returns are significantly positive. Therefore, the evidence in Table 4 is consistent with the notion that investors in the REIT markets exhibit a herding behavior(Vijh, 1994) as they act together in buying or selling REITs and, thus, the cross-autocorrelation component is negative. Finally, the importance of the cross-sectional return-variation component generally tends to decrease as the duration of holding period (i.e., test period) of contrarian portfolios increases. For example, the estimates of cross-sectional return-variation component of J=5 to 6 and K= 5 to 6 are higher than 0.00053 while those of J= 11 to 12 and K= 11 to 12 are generally below 0.00023.

Our study is related to prior papers in several ways. First, we find that contrarian effect exists in the REIT markets. This is consistent with Cooper et al.(1999), who find that contrarian portfolios using REITs are many times more profitable than the associated transaction costs. Our evidence is also consistent with the notion that REITs and stocks are traded in the same major exchanges and, therefore, a similar return phenomenon (i.e., contrarian effect) can be observed in both REITs and common stocks. Second, our study finds that investor overreaction contributes to the contrarian effect in the REIT markets, as evidenced by the significantly positive autocorrelation component we find in this study. Although our evidence is consistent with Cooper et al.(1999), our methodology differs from that of Cooper et al. In contrast to Cooper et al.(1999), who rely on the observations of return reversal, we decompose contrarian returns into three components. Our approach has advantage over that of Cooper et al.(1999) because our approach can differentiate the cross-correlation effect (which is due to the security trading phenomenon, Lo & Mackinlay, 1990) from the investor overreaction effect. Third, we find that REITs are not the same as common stocks (Lin et al., 2010, and Ghosh et al., 1996). Although we find that factors other than investor overreaction can explain the contrarian effect in the REITs markets, they do so in a manner that is different from those in the stock markets. Specifically, Lo & Mackinlay(1990) find that, in the stock markets, the lead-lag effect among stocks (i.e., returns of liquid stocks lead those of less-liquid stocks) contributes to the contrarian effect. We find that, in the REIT markets, the lead-lag effect does not explain the contrarian effect. A possible reason for this result is that we analyze monthly-return data. The lead-lag effect may not occur for monthly-return data. Another possible reason is that REITs are less diverse than common stocks and, therefore, non-synchronous trading problem among REITs is not as sever as that among common stocks. We do find that our evidence (that the cross-autocorrelation component is significantly negative) is consistent with Vijh(1994), who finds that when a group of investors buy or sell a basket of securities with similar characteristics, the returns of these securities will be negatively cross-autocorrelated. Our evidence is consistent with the notion
that REITs can be best described as a basket of securities with similar characteristics that are subject to a price pressure related to a group of investors. Fourth, we find that the cross-sectional return-variation effect significantly reduces the contrarian profitability of REITs. This result may be due to the fact that contrarian trading strategies buy low-mean-return REITs and sell high-mean-return REITs. As a result, in the absence of any investor overreaction and cross-autocorrelation effects, contrarian return will decrease by the cross-sectional dispersion in the mean returns of REITs. This contrarian profitability will disappear if all REITs have identical mean returns. This intuition is similar to the logic provided by Conrad & Kaul (1998) to explain how the momentum portfolios will gain by the amount of cross-sectional return-variation of stocks.

In summary, we find empirical evidence supportive of Hypotheses One, Two, and Four. However, our evidence is inconsistent with the lead-lag-effect version (Lo & Mackinlay, 1990) of Hypothesis Three. We find that REITs are subject to the contrarian effect. Investor overreaction contributes to the contrarian effect in the REIT markets as in the stock markets. In addition, cross-sectional return-variation negatively affects the contrarian effect in the REIT markets. However, lead-lag effect (Lo & Mackinlay, 1990) does not appear to cause the contrarian effect in the REIT markets. Instead, our evidence is supportive of Vijh’s (1994) argument that a group of investors may rush to buy or sell a basket of securities with similar characteristics (i.e., REITs in our study). Our evidence may help investors to better understand REIT return dynamics and better manage portfolios involving REITs.

6. Conclusions

This paper analyzes the sources of contrarian profitability in the REIT markets. Although extant literature documents that investor overreaction explains the contrarian effect in the REIT markets, little attention has been paid to other factors that may contribute to the contrarian profitability of REITs. We find that, in addition to investor overreaction, cross-autocorrelation effect and cross-sectional return-variation effect lead to REITs’ contrarian effect. Further analysis indicates that the observed REITs’ contrarian returns would have been even larger if the cross-autocorrelation effect were absent. In addition, we find that cross-sectional return-variation effect significantly reduces the contrarian profitability of REITs. Finally, the relative importance of cross-sectional return-variation effect generally decreases as the duration of holding period of contrarian portfolios increases. Overall, our results indicate that investor overreaction is not the only reason why the contrarian effect exits in the REIT markets. Cross-autocorrelation effect and cross-sectional return-variation effect also contribute to the contrarian effect in the REIT markets.
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