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Investor Return in REITs: Evidence of Market Timing and Capacity Constraints

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INVESTOR RETURN IN REITS: EVIDENCE OF MARKET TIMING AND CAPACITY CONSTRAINTS

A Dissertation

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ABSTRACT

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This dissertation studies the returns earned in Real Estate Investment Trusts (REITs) from the point of view of the average investor. Traditional buy-and-hold returns while appropriate as a measure of return for financial asset may not adequately reflect the returns of the average individual investor because they do not take into account the capital flows in and out of an asset. Just as their name suggests, these are the returns one would earn if one buys a financial asset or portfolio at the beginning of a period and holds the investment until the end without making changes to the amount or composition of the investment. Most investors however make contributions, withdraw or rebalance their portfolios, making buy-and-hold returns unsuitable for measuring the returns of individual investors. Depending on how they time their cash flows, individual investors could perform significantly better or worse than the financial asset they are investing in. In addition capacity constrains to the return generating mechanism could be revealed as investors increase their cash involvement into an asset.

Dollar weighted returns and dollar weighted average returns are alternative measures that accounts for all cash flows in and out of the investment. By contrasting investor centered returns to the conventional buy and hold returns this dissertation sheds light on the overall ability of investors to time the REIT market and the capacity constraints that they encounter

DEDICATION

I am incredibly grateful for all the help, support, and encouragement of my family which made the completion of my doctoral studies possible. For this reason, I dedicate this dissertation to my parents: my father Peter Guetchev, who encouraged me never to give up and would have loved to see this final version and my mother Pravda Guetcheva, who always cheered me on, to my son Peter Damianov who liked to inquire how the “big project” was progressing, and last but not least to my husband Damian Damianov who fully supported me in this endeavor.

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All errors remaining here are entirely mine.

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CHAPTER I

INTRODUCTION

1.1 Investor Returns Concept

REITs have generated spectacular returns and been in the news as a superb investment vehicle. The National Association of Real Estate Investment Trusts (NAREIT) reports that in 2011, the total returns of listed U.S. equity REITs were approximately four times those of the broader stock market as measured by the S&P500. Moreover, NAREIT points out that equity REITs have also outperformed the S&P 500 for the past 1-, 3-, 10-, 15-, 20-, 25-, 30-, and 35-year periods.[1]

But how much have investors really profited? By contrasting investor centered dollar weighted measures of return[2] to the conventional buy and hold returns (BHR), in this dissertation we will examine the existence of capacity constraints in a REIT's return generating mechanism and the overall ability of investors to time the market.

Why are alternative measures of return needed? What part of the picture are we missing by focusing on buy and hold returns exclusively? BHR is the traditional measure of return in both financial literature and practice. Just as its name suggests, it is the return one would earn from buying a financial asset or portfolio at the beginning of the period and holding the

[1] See http://www.reit.com/Articles/2011-REIT-Returns-Increase-Four-Times-More-than-SP500.aspx
[2] We utilize two investor return measures in this dissertation: dollar weighted return or DWR and dollar weighted average returns or DWAR

investment until the end of the period without making any changes to the amount or composition of the investment. An additional assumption is that any dividends earned during the period are immediately reinvested in the same financial assets. Most investors, however, make contributions, withdraw or rebalance their portfolios from time to time, making BHR unsuitable for measuring the returns of individual investors. The dividend reinvestment assumption might also pose some additional practical limitations related to the divisibility of the investment. It might be impractical or impossible, especially for the individual investors to reinvest their dividends in the same financial asset or portfolio composition. Another feature of BHR is that (in the absence of dividends), it is determined solely by beginning and ending market values. Within-period returns and the fund size are irrelevant. Intuitively, a fund which starts with a low capitalization and gets high returns, then grows in size and starts generating lower returns, does worse for the average investor than a comparable one which generates low returns in the beginning and high returns when its size increases. A better representation would require a measure that takes into account not only the periodic returns, but the size of capital used to generate these returns. We need to introduce a new return metric capable of dollar weighting the returns.

Dollar weighted returns (DWR), also known as asset weighted or investor returns, are an alternative measure more suitable for capturing the experience of the average investor. Essentially, DWR is based on the intuition of considering an investment in financial assets just like any other investment project. Typically for an investment project we have an initial investment and periodic cash flows in and out of the investment during its lifetime. Looking at the entire flow of funds in and out of the investment over the years we can calculate the internal rate of return (IRR) that would make the present value of this capital flow zero. DWR is an

estimate of the average return earned by a dollar, invested in the fund at any time, not just the beginning.

DWR is not a substitute for BHR, but rather can be used in combination with BHR. BHR could both overstate or understate the actual returns earned by an investor. Consider an investor who buys a particular firm's securities, and encouraged by the good performance decides to add more at the peak value of the security only to see the security's values plummet. This investor will have a lower return over the same period of time compared to the return of a buy and hold investor, who did not add anything to their portfolio. In the opposite scenario, an investor who increased their exposure before a major upswing will have outperformed the buy and hold investor. These examples illustrate that the difference between DWR and BHR depends greatly on the timing of investors. Note that if investor contributions were random at both market highs and lows, the tow returns would be similar, as positive and negative influences would cancel each other out (Dichev, 2007). Thus, the gap between these measures, often referred to as the dollar gap or performance gap (PG) in the literature, offers an insight into the overall ability of investors to time the market.

An alternative explanation for the dollar gap would be a capacity constraint phenomenon. Any particular return generating strategy cannot be pursued with an indefinite amount of funds. Sooner or later high return generating opportunities will be depleted. Over time a fund manager may run out of investment opportunities and returns would naturally get lower as more money is invested. This could also contribute to a gap between BHR and DWR.

The existence of capacity constraints is well recognized by practitioners. J.P. Morgan Asset Management keeps a list of funds that are closed or restricted to investors specifically due to capacity constraints. In order to protect the interests of investors, "J.P. Morgan Asset

Management (Europe) may find it necessary to limit the size to which a fund is allowed to grow. This might arise for example, when the investment manager is of the view that allowing further inflows into the fund might have a significant impact on fund performance." They note that capacity constraints are "more likely to arise with funds following a highly specialized investment objective and with a concentrated investment portfolio - however other reasons may also give rise to capacity limits in a fund".[3]

Although widely acknowledged to exist in practice, capacity constraints have not yet received due coverage in the financial literature. Ciccotello, Green, Ling and Rakowski (2011) develop a methodology that separates the timing and capacity effects on the gap between the dollar weighted measure and buy-and-hold measure.

The importance of distinguishing between buy-and-hold returns and dollar weighted investor returns has recently captured the attention of practitioners and academics alike. As of 2006 Morningstar, a leading investment research firm, has started reporting dollar-weighted returns for a number of their products. It also frequently features articles comparing investor returns to buy and hold returns.[4] The gap between dollar weighted return and buy-and-hold return has also received much attention in the recent financial literature (see Dichev, 2007; Friesen and Sap, 2007; Keswani and Stolin, 2008; Dichev and Yu, 2011; Ciccotello et al., 2011). Current literature on this gap has focused on mutual funds, hedge funds and overall market indices. As Dichev and Yu (2011) point out in their methodology section, their general methodology is about funds, but "these could be hedge funds or mutual funds and the intuition is exactly the same, and

[3] See http://www.jpmorganassetmanagement.lu/ENG/Capacity_Constraints

[4] See the Morningstar Investor Return Factsheet available at http://corporate.morningstar.com/cf/documents/MethodologyDocuments/FactSheets/InvestorReturns.pdf and various news articles regularly published by the company, for example "Bad timing eats away at investor returns" available here: http://news.morningstar.com/articlenet/article.aspx?id=325664 and "Did you do as well as your fund" available here: http://news.morningstar.com/articlenet/article.aspx?id=303206

very same capital flows effects and reasoning apply for analogous situations in stock investments, venture capital, real estate investments, bonds, retirement portfolios and so on." The dollar gap and its implication on investor timing ability and management capacity constraints has however not been investigated for a number of asset classes. As Friesen and Sapp (2007) note "Our analysis so far has focused on the timing ability of equity fund investors, for which we have documented substantial underperformance. However, these results may not necessarily extend to other asset classes having different return and risk characteristics." In fact their analysis of timing performance in alternative assets where they look at bond and money market funds shows a much smaller magnitude of the dollar gap. A particularly notable omission in the literature is the investment in real estate.

1.2 Real Estate and REITs

Why do we choose to focus on real estate? The value of the US real estate sector is greater than that of all domestic equities. As Macromarkets Inc., a financial technology company specializing in real estate, reports at the end of 2009 the combined value of residential and commercial real estate in the US was $22.6 trillion, vs. $15.1 trillion value for the entire US equity. This makes US real estate one of the largest asset classes in the world.

The interest in real estate investment and its importance for the financial sector has peaked since the 2007-2008 largely real estate market led financial crisis. For many individual investors, investment in real estate represents a substantial share of their portfolio of investments. As a result, understanding real estate markets and investor returns is important both from an academic as well as a practical viewpoint.

While a large proportion of real estate is not securitized, this paper will focus on Real Estate Investment Trusts or REITs. Analyzing REITs provides the unique opportunity to explore the specifics of real estate dynamics, utilizing various tools for financial analysis. Although REITs represent a relatively small subsample of the overall real estate segment, analyzing REITs can give us an accurate assessment of the general situation in real estate. A number of articles find that REIT returns are a good proxy for real estate returns and move closely with appraisal based real estate indices (see Gyourko and Keim, 1992; Gyourko and Keim, 1993; Mei and Lee, 1994, Barkham and Geltner, 1995; Giliberto and Mengden 1996; Clayton and MacKinnon, 2001; Clayton and Mackinnon, 2003).

Another motivation to focus on REITs is that they are generally perceived as "low risk-low return" defensive stocks and thus are likely to exhibit a different pattern of returns and flows (see Glascock, 1991; Glascock, Michayluk and Neuhauser, 2004). In addition, investment in REITs is found to be a substitute to investment in stocks. In a series of Granger causality tests, Subrahmanyam (2007) finds that order flows and returns in the stock market negatively forecast REIT order flows and returns. The finding that capital flows towards REITs when stock markets are down and leaves REITs when the stock markets are up, shows a cash-flow dynamic contrary to all the other asset classes previously explored in the investor returns literature. This negative relationship between cash flows in REITs and stocks further adds to our motivation to examine investor returns in REITs.

REITs are also a particularly suitable candidate for investigating the difference between buy-and-hold and dollar weighted returns due to their regular cash distributions. REITs are obliged by law to distribute 90% of their earnings as dividends. Thus, to keep a buy-and-hold position investors have to constantly reinvest these dividends back into the REIT, which is impractical and unlikely.

REITs are also a prime candidate for investigating capacity constraints due to their specialized investment objective. At the very least, REITs invest exclusively in real estate, but their investment objective is frequently even more specific as REITs often specialize in either specific property types (e.g. retail REITs, residential REITs, office REITs or healthcare REITs) or in a specific geographic location. The following Chapter II will go in more detail over the history of REITs and their characteristics.

CHAPTER II

REIT CHARACTERISTICS AND BRIEF HISTORY

2.1 Legal Establishment, Characteristics and Types

REITs were created with the enactment of the Real Estate Investment Trust Act in 1960 (Jarchow 1988, p. 19). The goal of this legislation was to provide mainstream investors access to investing in large-scale income producing real estate via purchasing and selling liquid securities.[5] Prior to the establishment of REITs, investment in large-scale real estate was available exclusively to institutional investors and wealthy individuals who had the means to finance large projects. Publically traded REITs in particular offer many additional benefits like increased liquidity and transparency resulting from compliance with the Securities and Exchange Commission (SEC) reporting rules and regulations (McCall, 2001).

REITs can be viewed as the real estate equivalent of mutual funds. Just like mutual funds hold portfolios of securities, REITs hold portfolios of income producing domestic and foreign real property or mortgage loans. Individual investors pool their resources and invest in a REIT, which in turn uses the proceeds to acquire a diversified portfolio of real estate properties or mortgages. The REIT Act of 1960 essentially gave REITs the same tax treatment that existed for mutual funds. The intention of this tax code is to give individual investors in REITs a lot of the same benefits they would have had if they owned the real estate held by the trust directly. Key to

[5] See: http://www.reit.de/english/reit.htm.

achieving this benefit is avoiding double taxation at both the organizational REIT level and individual level once the proceeds are distributed. A company that qualifies as a REIT is permitted to deduct dividend payments to its shareholders from its taxable corporate income. In order to be eligible for REIT status, a company needs to fulfill a number of criteria specified in the Internal Revenue Code. These criteria can broadly be divided into three categories: (i) income and asset tests, intended to guarantee that REITs invest primarily in real estate assets; (ii) distribution tests, designed to ensure that REITs distribute virtually all of their taxable income to their shareholders; and (iii) ownership tests, which aimed to ensure that REIT shares are widely held, thus offering a viable mechanism for the general public to invest (McCall, 2001). The major criteria that a REIT needs to fulfill to qualify for REIT status are as follows:

- Invest at least 75 % of its total assets in real estate
- Derive at least 75 % of gross income as rent from real property or interest payments from mortgages on real property
- Real property must not be held primarily for sale in the ordinary course of business
- Distribute at least 90 % of its annual taxable income as dividends to its shareholders
- Ownership restriction: no fewer than 5 investors can hold 50% or more of the shares (lifted in 1993)

Historically, due to the tax benefits, REITs have remitted 100 % of their taxable income as dividends thus paying no corporate taxes. Since the mechanism of avoiding double taxation is through the payment of dividends, REITs have no means of passing down losses as tax benefits to their investors. An important initial restriction in the operation of REITs was that they could

not manage the properties they owned themselves and had to employ property management firms and outside advisors. This limitation has gradually been relaxed and eliminated completely with the passage of the 1986 Tax Reform Act.

Based on the composition of their assets, the National Association of Real Estate Investment Trusts (NAREIT) classifies REITs into three categories:

- Equity REITs have direct ownership of rental income-producing real estate (frequently shopping centers, office buildings, apartments, warehouses). Currently, equity REITs are the prevailing type of REIT. Equity REITs could employ different business strategies and hold various types of real estate portfolios. Some specialize in particular kinds of properties such as hospitals or hotels. Other focus on a particular geographical region. In addition to profiting from current rental income, shareholders could benefit from appreciation in the value of the properties when rents increase.
- Mortgage REITs make or own loans and other obligations that are secured with real estate collateral.
- Hybrid REITs have both direct ownership of real estate and mortgages as their assets[6].

Compared to investing in regular corporations, REITs offer the significant benefit of avoiding double taxation. Nevertheless, it took nearly three decades for REITs to achieve mainstream acceptance among US investors.

[6] As of 2010 the number of hybrid REITs has decreased significantly and the NAREIT Hybrid REIT index has been discontinued, source http://www.reit.com/IndustryData/US-REIT-Industry-MarketCap.aspx

2.2 Brief History of REITs[7]

The first REITs were established immediately after the passage of the act in 1960. Within a year of its signage there were six REITs, three of which continue to exist today. In 1965 Continental Mortgage Investors became the first REIT to be listed on the New York Stock Exchange. Still, during the entire 1960s the REIT industry was in its early infancy with a total of 10 REITs of any size (Block 1998, p. 121). REIT portfolios were very small with the largest REIT at the time, REIT of America, operating $44 million and all REIT investments totaling slightly over $200 million (Block 1998, p. 122).

The period 1969-1974 saw the first REIT industry expansion, fueled largely by an increase in the number of mortgage REITs and the assets they held. Establishing mortgage REITs was far more popular than setting up equity REITs for two main reasons. The first lies in the restriction on equity REITs who could not manage their properties themselves. Instead they had to hire outside property management firms, which created potential conflicts of interest and limited the value they could create for their owners. The second was that during that period, banks, thrifts and insurance companies could not engage in construction and development lending directly (Chan, Erickson and Wang, 2003, p. 17). Thus, a lot of institutions, including major banks like Bank of America, Chase, Wachovia and Wells Fargo, got involved in sponsoring their own REITs and acting as their advisers. In the first half of the 1970s, REIT assets increased from about one billion to twenty billion dollars (Block 1998, p 123). The industry grew large enough that in January 1972 the first index specifically tracking the performance of REITs, the NAREIT REIT Index, was launched.

[7] This section unless otherwise noted uses information from the NAREIT publication 50 years of REITs available at http://www.reit.com/timeline/timeline.php

Most of the newly-formed mortgage REITs however, were highly leveraged, using little equity and lots of borrowed funds to finance construction loans. In 1973, when the US entered a severe recession due to stark increases in oil prices after the formation of the Organization of Petroleum Exporting Countries (OPEC) and high government spending in the Vietnam War, nonperforming REIT assets rose. In addition, the US had high inflation and rising interest rates. Since a lot of the mortgage REITs had financed long-term mortgages with short-term debt like commercial papers, rising interest rates were detrimental to profitability (Chan et al. 2003, p. 18). Many of the highly leveraged mortgage REITs entered bankruptcy proceedings. Mortgage REIT share prices collapsed. Equity REITs were less affected as real estate prices remained relatively stable (Block 1998, p 124). Still, total REIT market capitalization went from a peak value of nearly $7 billion in 1972, to $1.5 billion in 1974 (Chan et al. 2003, p 19). This episode cast a shadow over the entire REIT industry and made investors wary of investing in them afterwards.

Tax code restrictions that REITs face helped set the stage for the crisis and the slow recovery. REITs were conceived as a passive investment vehicle and had to use advisors to make their investing decisions which could pose a problem in and of itself. Advisors (frequently banks) base their fees on the gross amount of funds loaned, and thus have an incentive to push REITs to borrow so that they could make new loans, ignoring shareholder's best interest (Chan et al. 2003, p. 18). Another problem comes from the requirement to distribute at least 90% of taxable income back to the shareholders as dividends. As REITs need to distribute essentially all of their taxable income on an annual basis, they cannot expand naturally with their own earnings. Consistent with the pecking order hypothesis (Myers and Majluf, 1984) which states that in order to grow, firms will first use their own internally generated earnings, then issue new debt and

finally resort to issuing new equity, REITs which are unable to use their own funds, resort to new debt and end up in a high leverage situation.

Throughout the latter half of the 1970s REITs slowly recovered from the crisis. Surviving REITs took advantage of low priced properties made available by financially distressed REITs. Some mortgage REITs converted into equity REITs by foreclosing on the properties they held mortgages for and taking over the ownership (Chan et al. 2003, p. 26). By the end of the seventies REIT market capitalization stood at about $3 billion: more than double, from its 1974 low of $1.5 billion, but less than half of its pre-crisis level of $7 billion.

The crisis also brought about some changes in legislation which gave REITs greater flexibility. In 1974, Congress enacted foreclosure property rules that allowed a REIT to operate independently for 90 days any properties they have acquired in a foreclosure procedure, before having them operated by an independent contractor. The Tax Reform Act (TRA) of 1976 also made a number of changes in the tax provisions regarding REITs. The most important was a modification that allowed REITs to carry operating losses forward for a period of eight years. REITs were also allowed to hold property for sale, provided they were acting as investors rather than dealers in the sale. In order to facilitate a distinction between REITs and real estate dealers, REITs were subject to a 100% income tax on the gains from the sale unless the sale satisfied certain requirements. These requirements included, among others, that the REIT held the property for at least 4 years prior to the sale, did not make improvements to the property in the four years prior to the sale of more than 30% of the sale price, and did not sell more than 7 properties or 10% of the total value of REIT properties during the year (Chan et al. 2003, p. 25). Finally, REITs could now be established as corporations, whereas initially they could only be set up as business trusts. Still, these changes were deemed insufficient by many as evidenced by the

slow REIT recovery. REITs could not operate their properties independently or pass down losses to their shareholders.

In the early 1980s the REIT industry continued its relatively slow, but steady growth. The greatest expansion was in equity and hybrid REITs as a lot of REITs sought real property investment. The US entered another recession in 1980, prompted by sharp interest rate increases in an attempt to control inflation from the seventies, as well as the Iranian revolution which once more raised oil prices significantly. The US economic weakness continued throughout the early eighties. The 1981 Economic Recovery Act established tax breaks for property investors which included shortened depreciation periods and possibilities to pass on operating losses (Chan et al. 2003, p. 26). REITs however could not benefit from this new legislation. This encouraged the creation of another type of real estate investment entities, which competed with REITs for investor money - the Real Estate Limited Partnerships (RELPs). Due to the fact that RELPs could pass on losses and could participate in projects that REITs traditionally could not (like land development), RELPs quickly became very popular with investors slowing down the growth of the REIT sector (Chan et al. 2003, p.27).

In 1986 a new tax reform, the Tax Reform Act (TRA) of 1986, further expanded REITs' authorities and eliminated the tax advantages that had given rise to RELPs. REITs were granted managerial control over their properties and allowed to provide “customary services for tenants” without using independent contractors (Chan et al. 2003, p 28). Thus REITs could save on fees they had previously paid to third parties. They could also make investment decisions internally, rather than externally. Becoming self-managed gave REITs the opportunity to improve efficiency and to align closer the interest of management and shareholders. Furthermore, the TRA of 1986 eliminated the major tax advantage of limited partnerships: the possibility to use

losses from partnerships to offset gains in other income. This greatly increased popularity of REITs and throughout the 1980s their market capitalization increased from around $3 billion to over $11 billion (Chan et al. 2003, p.27).

The year 1989 was the beginning of a major downturn in real estate markets. REITs' share prices started falling even before prices of private real estate declined substantially. REIT returns were negative in 1989 and 1990 was one of the worst years on record, with REIT returns averaging -20%. Mortgage REITs specializing in offices, condominiums and hotels suffered the worst losses as there had been some overbuilding for these properties. Total REIT market capitalization decreased from a high of about $11 billion to about $8 billion in 1990 (Chan et al. 2003, p. 19). The crisis however did not last long and by 1991 REITs were back in the black and total REIT market capitalization had recovered.

The remainder of the 1990s was a very successful period for REITs. Between 1990 and 1995 the number of REITs grew from 119 to 219. This growth was due to an increase in the number of equity REITs, while the number of mortgage REITs, which dominated initially, declined. Several factors contributed to the popularity of equity REITs. The availability of low-priced properties in the early 1990s was an opportunity for equity REITs to acquire them cheaply. After the tax reform of 1986 REITs could be managed internally and operate their own properties cutting down on fees paid to third parties. Finally, in 1993 there was another tax reform that lifted the ownership restriction initially imposed on REITs: that 50% of the shares can be held by no less than 5 investors. This greatly increased REITs attractiveness to pension funds and other large investors (Chan et al. 2003, p. 30). A large number of studies consider the early 1990s the beginning of a new era in REIT history (see Ziering, Winograd and McIntosh, 1997; Mueller, 1998; Clayton and MacKinnon 2001; Clayton and MacKinnon, 2003; Ott,

Riddiough and Yi, 2005; Downs and Patterson, 2005; Lee, Lee and Chiang, 2008; Chiang, Jiang and Lee, 2009; Chiang 2010; and Liow and Addae-Dapaah, 2010)

REIT popularity continued to grow. In 1991 New Plan became the first publicly traded REIT to cross the market capitalization of $1 billion. REITs total market capitalization grew exponentially, reaching over $100 billion by 1997. The REIT Simplification Act of 1997 and the REIT Modernization Act of 1999 further extended services REITs could provide (for example provide cable TV to tenants). REITs were also allowed to own taxable subsidiaries that could provide additional services REITs themselves could not provide. At the end of the 1990s the REIT industry had a total market capitalization of $130 billion and about 210 publicly traded REITs (Chan et al. 2003, p 19).

As REITs gained on popularity and market capitalization, they started getting more exposure and analyst coverage. In October 2001 Standard & Poor's began including REITs in the S&P 500 index. Since then publically traded REITs have been included in a number of other general market indices. As of December 2012 there are 14 REITs included in the S&P 500.[8]

After the burst of the "dot com" bubble, REITs became even more popular with investors seeking a safe haven for their money. Interest rates were kept low by the FED to help the economy recover and the value of real estate increased tremendously (Cutson et al. 2011, p. US 10). At times when returns on the financial markets were relatively low between 2000 and 2006, the FTSE NAREIT all REIT index continuously gained over 15%, peaking at 38.5% in 2003. By the end of 2006 public REIT market capitalization was over $430 billion (Cutson et al. 2011, p US 11).

[8] See http://www.reitmonitor.com/atlantis/reitwebrpt.nsf/UID/F2B64C56046B416285256DFA00645654?OpenDocument

The 2007 credit crisis greatly affected REITs. In 2008 the FTSE NAREIT all REIT index lost over 37%, making this the worst year for REITs since 1974. Market capitalization fell from a high of over $430 billion to $190 billion.

In response to the subprime mortgage crisis, in 2008 the 110th Congress passed the Housing and Economic Recovery Act (H.R 3221) and the Emergency Economic Stabilization Act (H.R. 1424). The Housing and Economic Recovery Act authorizes the Federal Housing Administration to guarantee up to $300 billion in subprime mortgages. In order for lenders had to participate in this program, they need to reduce mortgages at least to 90% of the property's current value[9]. The Emergency Economic Stabilization Act was signed into law "to provide authority for the Federal Government to purchase and insure certain types of troubled assets for the purposes of providing stability to and preventing disruption in the economy and financial system and protecting taxpayers".[10] The main purpose of the Act is to "provide authority and facilities that the Secretary of the Treasury can use to restore liquidity and stability to the financial system of the United States." The Act is also intended to "protect home values" and "preserve home ownership" while at the same time "maximize returns to the taxpayer." Part of this bill is the Troubled Asset Relief Program which gives authority to the Treasury to purchase "troubled assets" (residential and commercial mortgages as well as mortgage backed securities) from financial institutions in order to provide liquidity and restore confidence in the credit markets.

In 2009 the REIT industry rebounded and funds started to flow into this sector again. By the end of 2009 REITs experienced an inflow of over $20 billion (Cutson et al., 2011, p. US-10). During the period of 2008 - 2011 the composite REIT equity market capitalization increased

[9] Available at www.hud.gov
[10] The act is available at http://www.gpo.gov/fdsys/pkg/BILLS-110hr1424enr/pdf/BILLS-110hr1424enr.pdf

from about $191 billion to about $450 billion reflecting both staggering returns and capital inflows. Similar growth was experienced both for equity and mortgage REITs. The number of equity REITS increased from 113 in 2008 to 126 in 2010, and to 130 in 2011. Market capitalization more than doubled for the time period 2008-2011 reaching a level of more than $407 billion. Market capitalization in the smaller mortgage REIT sector increased from about $14 billion in 2008 to $42 billion. The number of mortgage REITs increased from 20 to 30 in the same period.[11] The FTSE NAREIT Real Estate Index of all publicly traded REITs increased from 2,127.27 in December 2008 to 3,710.61 in December 2011. The equity index increased from 5,097.46 to 9,040.81 and the mortgage index increased from 434.31 to 647.56 (NAREIT).

For 2012 REIT returns were 20.14 % compared to 16 % for the S&P 500, 15.91 percent for NASDAQ and 7.26 % for the Dow Jones Industrial Average. Average dollar traded daily volume was $4.2 billion in December 2012, compared to $654 million ten years earlier in December 2012. For 2012 $45.8 billion was raised in secondary equity common and preferred share offerings and $1.8 billion in initial public offerings.[12] Overall during the latest economic recovery REITs have been very successful both in absolute terms and relative to other assets.

[11] See http://www.reit.com/IndustryData/US-REIT-Industry-MarketCap.aspx
[12] See the January 2013 edition of REITWatch available at http://returns.reit.com/reitwatch/rw1301.pdf

CHAPTER III

LITERATURE REVIEW

This dissertation analyzes the historical performance of REITs from the perspective of the individual investor. REITs are a liquid (publicly traded) asset class which offers shareholders a vehicle for investment in income-producing real estate properties (Equity REITs) and in real estate lending (Mortgage REITs). REIT shares provide the shareowners with a regular income as REITs distribute at least 90% of their annual taxable income to investors according to IRS regulations. These regular outflows and the inflows of capital through IPOs and secondary offerings of REITs potentially create a gap between the return of the fund and the return of the average shareholder. This dissertation explores to what extent the flow of capital in and out of REITs creates a mismatch between the average return on the asset and the returns for the shareholders. By presenting an alternative, more accurate measure of returns in REITs centered on the experience of the investor, this dissertation contributes to the steadily growing research on the link between capital flows and returns.

The dissertation is related to three major strands of literature. The first one is the relationship between returns and cash flows, as the gap between BHR and DWR arises as a result of cash in- and outflows. Both studies of major cash flows such as IPOs, SEOs and share repurchases and overall relationship between cash flows and returns, tend to show that cash flows are poorly timed. This strand of literature is described in more detail in section 2.1. The

second strand of related literature is on market timing and whether abnormal returns can be generated. Most studies again suggest that managers or investors are unlikely to be able to time the market. Our study is most closely related to the papers by Dichev (2007), Friesen and Sapp (2007), Dichev and Yu (2011) and Ciccotello et al. (2011), which develop the dollar weighted measures and examine how they relate to buy-and-hold returns for market indices, mutual and hedge funds. These works are discussed in section 2.2. Finally, this dissertation contributes to the literature on real estate, REITs as financial assets and determinants of REIT returns as summarized in section 2.3.

2.1 Relationship between Returns and Cash Flows

As cash in and outflows are the major source of discrepancy between the traditional buy-and-hold measure of return and investor centered dollar weighted returns, our study fits into the literature examining key capital in- and outflows and subsequent returns. Major cash inflows, namely IPOs and SEOs tend to underperform. A series of studies documents IPO underperformance, especially in the short run. Ibbotson (1975) reports that initial public offerings underperform by approximately 1% per month in the second through fourth years post IPO. Ritter (1991) finds that issuing firms significantly underperform a portfolio of matching firms, up to three years after the IPO. Loughran and Ritter (1995) report significant underperformance for both IPOs and SEOs even five years after the actual issue. In fact, quantitatively their study finds that in order to have the same wealth after five years investors need start with 44% more funds if they invest in the issuing firms compared to investing in the non-issuing ones. Investigating SEOs only, Spiess and Affleck-Graves (1995) find underperformance relative to firms that did not issue equity which persists even after controlling for trading system, offer size, age and book-to-market ratio.

Studies of IPOs in REITs report similar findings of underperformance, although the evidence is more mixed and the magnitude of the underperformance tends to be smaller. In one of the earliest studies on REITs and new stock issuance Howe and Shilling (1988) find that the typical negative abnormal returns surrounding the announcement known from other assets persists. Wang, Chan and Gau (1992) find that new REIT issues underperform the matching sample of REITs over the first 190 days of trading. In addition they note that for the most part buyers of REIT IPOs are individual rather than institutional investors. Ling and Ringaert (1997) document that REIT IPOs in the 1970s and 1980s underperformed, but REIT IPOs in the 1990s outperformed matching REITs. They attribute this difference to the greater institutional involvement in REIT IPOs during the 1990s. Buttimer, Hyland and Sanders (2005) examine equity REIT IPOs in the 1980-2001 period. Their findings show a smaller initial return on REITs relative to non-REIT IPOs and no evidence of long-run underperformance. They believe this is due to the greater transparency of REITs and their assets relative to other companies.

For cash outflow transactions the opposite appears to be true. Multiple studies suggest a positive abnormal return for share repurchases. While this is mostly a short run phenomenon, frequently attributed to managerial signaling, agency costs, or difference in capital gain and dividend tax (Masulis, 1980; Lakonishok and Vermaelen, 1990). Ikkenberry, Lakonishok and Vermaelen (1995) report that the phenomenon is not short-lived. Over the period of 4 years after the repurchasing announcement, value firms experience an average abnormal return of 45%. Studies of share repurchases in REITs suggest a similar phenomenon. Brau and Holmes (2006) point out that due to the fact that REITs distribute most of their income as dividends, the personal income hypothesis cannot hold. They point to signaling as the most plausible explanation for positive abnormal returns resulting from share repurchases. Adams, Brau and

Holmes (2007) also find positive abnormal returns around share repurchasing announcements in REITs, although they find no support for the signaling hypothesis. Overall, studies of major cash in and outflows and subsequent returns show that a return measure adjusted for within-period cash flows is likely to show a lower return than the unadjusted buy-and-hold return.

This study proposes a metric that more accurately reflects actual investor returns. The ultimate goal of any investor is to improve the returns they earn. Essentially, there are two major ways to achieve this: by selecting superior securities or by properly timing cash flows. Each of these methods has received substantial literature coverage. The gap between the proposed dollar weighted measure and the traditional buy-and-hold measure can be used to gain insight into investors' ability to boost returns by timing their contributions and withdrawals.

2.2 Market Timing

Most of the literature on enhancing returns, in particular in the early stages, has focused on examining the ability of mutual fund managers to outperform the market. Starting with Jensen's 1968 and 1969 seminal papers which introduce the first risk-adjusted measure of managerial performance, a number of studies have examined the ability of mutual fund managers to generate abnormal returns. The greater part of academic studies conclude that mutual funds do not exhibit significant stock-picking abilities (see Henrickson 1984; Chang and Lewellen, 1984; Malkiel 1995). Daniel, Grinblatt, Titman and Wermers (1997) distinguish between managerial selectivity, which is a manager's ability to select stocks that outperform the average stock with similar characteristics and timing, which is a manager's ability to invest in certain stocks when they outperform and to divest when they do not. Their results show that some mutual funds, aggressive growth mutual funds in particular, have some selectivity, but no timing ability. Bollen and Busse (2001) analyze the market timing ability of mutual funds managers using daily instead

of monthly returns. They discover that mutual funds managers are able to accurately time the market by increasing their exposure to a market index (value-weighted index including NYSE, AMEX, and Nasdaq stocks) prior to high returns and decrease their exposure prior to market declines. The authors also suggest that daily data are more accurate and the tests based on such data are more powerful compared to the tests based on the customarily used weekly and monthly data.

Edelen (1999) suggests that it could be the investors rather than the managers who are to blame for the subpar performance of managers in open end mutual funds. He argues that in an open end mutual fund capital flows force the manager to engage in liquidity motivated trading: that is selling stocks he or she otherwise would not have when investors request money and overinvesting in stocks when there are large investor capital inflows. When this indirect cost of investor liquidity is taken into consideration, the abnormal negative market timing effect turns statistically insignificant. Other studies however find that investors choose wisely and propose the "smart money" hypothesis, which suggests that funds that experience cash flow infusions should subsequently be able to outperform the market. Gruber (1996) finds evidence supporting "smart money" hypothesis. His study of open end mutual funds discovers that new cash flows earn returns that are superior to the overall returns in a fund. Similarly, using a large sample of equity funds, Zheng (1999) reports that funds receiving more cash significantly outperform funds that experiencing investor cash outflows. The "smart money" effect is called into question by Frazzini and Lamont (2008). They interpret the inflows and outflows of capital from mutual funds as a measure of individual sentiment and uncover that reallocating capital across different mutual funds causes investors to lose money in the long run. They dub this the "dumb" money effect.

This dissertation contributes to the "smart" vs. "dumb" money discussion by providing an alternative methodology to assess overall investor ability to strategically time their capital flows. While other studies of cash flows look at the issue of timing indirectly by comparing returns in funds that receive cash-flows to returns in funds that do not, our methodology lets us compare the impact that cash flow timing had on the actual return of the average investor in a financial asset earned, compared to the return generated by the same financial asset. We use DWR to measure the performance of fund REIT investors, and contrast this measure to the time weighted returns which measure the performance of the REIT. Our research is most closely related to the rapidly expanding strand of literature that develops the concept of dollar weighted investor returns as a more accurate measure of the actual experience of investors with implications about their timing ability.

Dollar weighted or investor return is essentially the internal rate of return generated by a financial asset over the investigated period. To calculate this internal rate of return one needs to know the cash in- and outflows during each sub-period. Capital in and outflows could come in a variety of ways, say, via SEOs, dividend payments or share repurchases and depend on the level of aggregation. If an entire industry, as in our case the REIT industry is examined, the entrance of a new REIT would constitute a cash inflow for this industry, and the disappearance of a REIT a cash outflow. Thus directly examining all potential sources of capital flow to get to the particular flow for a period is not feasible. A paper by Dichev (2007) suggests that capital flows can be estimated indirectly. The change in market capitalization across two consecutive periods could be attributed to either internally generated returns or external flows. By controlling for returns, we can estimate the net flows, even though we are not able to actually point out the flow sources. Dichev (2007) employs this method to calculate flows in and out of NYSE/AMEX,

NASDAQ and 19 of the 25 largest international stock markets. He finds that investor returns were significantly lower than BHR in all countries but one (Canada), where the difference between the returns is insignificant. The difference between BHR and DWR is 1.3% for NYSE/AMEX, 5.3% for NASDAQ and an average of 1.5% for the sample of 19 leading international markets. These differences are of not only statistical, but also economic significance and in particular for NASDAQ suggest that aggregate timing is the key deciding factor in investor performance.

Keswani and Stolin (2008) point out some robustness issues with the analysis in Dichev (2007). Splitting his NYSE/AMEX sample in 3 sub-periods, they find a negative performance gap in the first one only. They also use the London Share Price Database -- a UK database similar to CRSP for the -- and find that DWR are actually higher than BHR. The authors also examine a relationship between the performance gap and the business cycle. They find that for the NYSE/AMEX sample investors returns are lagging behind BHR during recession periods only, while during expansion periods investors are slightly ahead of BHR. Despite challenging Dichev (2007)'s actual empirical findings, the authors still point out that "Dichev's intuition is appealing and the point he raises is an important one" as well as that "the effect of cash flow timing on investor performance is worthy of attention."

Several subsequent studies compare investor returns and BHR for different classes of financial assets. Friesen and Sapp (2007) examine the issue using equity mutual fund data at the individual fund level over the 1991-2004 period. They find poor investor timing; overall DWR are 1.56% less per year compared to BHR. Bad investor timing is observed for both actively managed and index funds. Moreover, better performing funds, as measured by their alphas, are associated with a greater gap between fund and investor returns, which essentially eliminates any

potential gains to the investors from choosing superior funds. Although their evidence of inferior investor timing for equity mutual fund investors holds across various specifications, they still suggest this may not be the case for other assets. For comparison they study bond and money market funds and find that the average performance gap is much smaller for bond funds and nearly non-existent for money market funds.

Ciccotello, Green, Ling and Rakowski (2011) develop a dollar weighting methodology which is not based on the internal rate of return. Rather, they use weighted arithmetic averages and the percentage change in assets due to flows to weigh periodic returns. Similarly they compare their weighted arithmetic measure of return, which is more suitable to describe investor experience, to the equally weighted (time weighted) average returns that characterize fund returns. In addition they argue that the difference between the two measures could be attributed to two potential sources: investor timing or capacity constraints which make it impossible for managers to employ new capital contributions in an equally profitable manner as old ones. They further refine their methodology to isolate these two effects. Their empirical findings on mutual funds show that dollar weighted average returns are about 1.5% lower than corresponding time weighted average returns for all categories of mutual funds with the exception of index funds. Both timing and capacity considerations play a role in explaining this gap. The magnitude of the timing effect tends to be greater than the capacity constraint effect, but both are statistically significant. In our study we use the methodology from Ciccotello et al. (2011) to provide additional robustness to our results.

Dichev and Yu (2011) compare DWR and BHR for hedge funds using the methodology developed in Dichev (2007) and Friesen and Sapp (2007). Their sample includes 11,000 hedge funds over the period of 1980-2008. Depending on the period used and additional fund

specifications (including hedge funds with available history of over 5 or 10 years, splitting the sample in two, dividing hedge funds in quintiles based on alpha, excluding 2008 as an outlier, etc.), they find that dollar-weighted returns are between 3% and 7% lower than corresponding buy-and-hold returns. When using the full sample, hedge fund dollar weighted returns are an average of 6% per year, which is lower than the S&P 500 return over the same period and only slightly higher than the risk-free rate.

2.3 REIT Returns, Flows and Relationship with the Business Cycle

Up until now investor returns in real estate and real estate related securities have not been examined. This is a central omission as estimates show the value of the US real estate sector is greater than that of all domestic equities. REITs are securitized real estate and offer the opportunity to employ traditional financial methodology. Although REITs represent a relatively small sub-segment of the real estate sector, several studies suggest that REITs can be representative of the real estate sector as a whole.

Giliberto (1990) is one of the first studies to reveal a fundamental link between returns on equity REITs and unsecuritized real estate returns. He shows that over the 1978-1989 period quarterly Russell-NCREIF and NAREIT returns are significantly positively correlated after removing stock and bond market influences from the two return series. Gyourko and Keim (1992, 1993) find that stock returns on REITs and real estate-related companies are good proxies for appraisal based real estate returns. Lagged returns of real estate stocks are actually able to explain the behavior of current period appraisal based series, suggesting that the stock market is able to convey information about real estate in a timelier manner than appraisal based indices which are limited by infrequent property appraisals. Barkham and Geltner (1995) also analyze the relationship between securitized and unsecuritized real estate. They analyze data from the US

and UK markets in the 1970-1992 timeframe. In both the US and the UK, they find evidence that the securitized and unsecuritized series exhibit similar patterns over time "suggesting a strong fundamental link across the two market structures". Mei and Lee (1994) also show that the returns on appraisal based indexes such as the Russell NCREIF index and equity REIT returns are driven by a common real estate factor. Giliberto and Mengden (1996) demonstrate that the cash flows of REITs and publically traded real estate are highly positively correlated. This finding suggests that performance of REIT performance is not fundamentally different from the performance of unsecuritized real estate. Clayton and MacKinnon (2001) find that beginning with the 1990s a significant positive relationship between REIT returns and real estate returns is observed. Clayton and Mackinnon (2003) examine the relationship between REITs, other financial assets and real estate. Their findings show that since the 1990s the REIT market is most strongly related to real estate factors, although their findings do suggest that previously REITs were most closely related to large cap stocks. Glascock, Mihaylchuk, and Neuhauser (2004) conclude that although in the short term REITs exhibit many stock-like characteristics, "long term characteristics must be identical for real property and REITs since REIT income is derived from real property earnings". Dollar weighted returns as applied in this paper are essentially a "long horizon time series phenomenon" (Dichev, 2011). Thus, although with caution, results from our study could be interpreted as having a bearing for the overall real estate market.

A large segment of the research on REITs suggests that REITs are frequently viewed as "low risk-low return" defensive stocks and thus are likely to exhibit a different pattern of returns and flows throughout the business cycle. Glascock (1991) finds that REIT betas vary with market conditions: REIT betas are higher during up markets and lower during down markets. Such finding implies that REITs are likely to be less affected during market declines that

accompany recessions and could have smaller performance gaps, or even performance gaps which indicate investors actually did better than their assets. Glascock, Michayluk and Neuhauser (2004) examine the performance of REITs around the stock market crash of October 1997. They find that REITs experienced significantly lower decreases during the market decline and on average declined by half as much as the overall stock market. Subrahmanyam (2007) finds that stock market returns are negatively related to REIT flows: cash flows into REITs increase during down markets and decrease when the stock market is up.

An additional contribution of this dissertation is the analysis of investor returns in REITs in the context of the business cycle. Financial literature has shown that both returns and capital flows are related to the stages of the business cycle. For REITs in particular, the major sources of capital inflows are IPO's and SEOs which are highly pro-cyclical (Choe, Masulis, and Nanda 1993; Lowry, 2003). Keswani and Stolin (2008) find that the performance gap for mutual funds is particularly large during economic recessions. In fact they find the performance gap to be slightly favorable for investors during economic expansions and argue that it is the recessions that are driving the overall performance gap results. Given the defensive stock characteristics of REITs, this dissertation sheds light on the extent to which investor returns in a relatively conservative asset are impacted by the business cycle.

Another strand of literature important for our analysis discusses the various stages of REIT development recognized in the literature. The early 1990s are considered by many the beginning of a REIT boom (Ziering, Winograd and McIntosh, 1997; Clayton and MacKinnon 2001; Clayton and MacKinnon, 2003). In addition, Ziering et al. (1997) note that the relationship between real estate market fundamentals and REIT prices has become much stronger in the 1990s leading them to conclude that REITs have become "more like real estate and less like

stock". Mueller (1998) considers 1992 to be the beginning of "the REIT growth race" that has created "new mega-cap REIT groups". He further adds that "the new era in the evolution of REIT growth is not yet well understood nor well tested". Ott, Riddiough and Yi (2005) distinguish between old-REIT (1981-1992) and new-REIT (1993-1999) eras and find substantial differences between the two. The REIT sector experienced rapid growth in the new-REIT era, due mostly to increased firm-level investment rather than to new firm entry on the market. Their findings show that REITs provided returns above their cost of capital, but most of the value-added investment occurred in the new-REIT and was done by relatively younger firms. Most of the expansion was financed by debt and new equity issue which has direct relevance to capital flows and our study of how they affect investor returns. Downs and Patterson (2005) coin the phrases "vintage era" when referring to periods in REIT history prior to 1991 and "new era" from 1992 on. Lee, Lee and Chiang (2008), Chiang, Jiang and Lee (2009), Chiang (2010) and Liow and Addae-Dapaah (2010) all make reference to these two eras in REIT history and use the vintage and new era periods to split their samples and analyze each sub-period individually.

Recently, Case, Yang and Yildirim (2012) utilize a more current and thus longer sample and suggest that there is a third newer era in REIT development that started in October 2001. The motivation of this newest period is that REITs began being viewed as mainstream stock and were included in a number of general market indices. Prior to October 2001, REITs were not included in any widely followed general stock market indices. Standard & Poor's began including REITs in the S&P 500 index starting October 9, 2001. Since then publically traded REITs have been included in a number of other general market indices.[13]

The idea that REIT dynamics have shifted in October 2001 is also supported by their empirical findings. Case et al. (2012) use a Dynamic Conditional Correlation Model with

[13] CRSP based equally weighted and value weighted indices still exclude REITs.

Generalized Autoregressive Conditional Heteroskedasticity to investigate the dynamics of the correlations of returns between REITs and non-REIT stocks. Based on their analysis they suggest that REIT-stock correlations can be separated into three distinct periods. The first sub-period which starts with the beginning of their sample in 1978 and ends in August 1991, is characterized by high correlations that are consistently over 59%. Correlations in the second period which ends in September 2001 are substantially lower and around 30% offering greater diversification benefits to including REITs in a portfolio of stocks. During the last period, which ends with the end of their sample in 2008, correlations increase steadily reaching 59% in the end. Westerheide (2006) conducts an international study of correlations between real estate stocks and general stocks and finds a similar pattern of correlations for his US sample extending through 2005. Another earlier study also lends credibility to the idea that 2001 could be a break point in overall REIT trends. Ambrose, Lee and Peak (2007) find that REIT betas relative to the overall market increased after REITs were included in the S&P 500 and other broad stock market indexes starting in October 2001. They note that "the magnitude of these beta increases is not trivial; the beta of non-index REITs, as well as that of index REITs, almost doubles around the index addition event".

Given that cash flows are the primary cause for the discrepancy between investor returns and the returns of the underlying asset, our investigation is most closely related to the literature exploring the relationship between capital flows and returns in real estate. Mei and Saunders (1997) examine real estate investments of major US institutional investors in the 1970-1989 period. Their findings indicate that US institutional investors base their real estate investment decisions largely on past real estate and market returns, rather than on expected future returns. They engage in a "trend chasing" investment strategy of buying after high returns and selling

after low ones which subsequently hurts their performance. Using a vector autoregression (VAR) framework, Ling and Naranjo (2003, 2006) examine the relationship between REIT mutual fund returns and subsequent REIT mutual fund flows for the time period 1979-2002. Their analysis lends support to the "return chasing" hypothesis: that is cash flows are correlated with lagged returns and thus could be predicted. They find evidence that current inflows are positively and significantly related to past returns. There is, however, no evidence of a relation between current REIT flows and returns in future periods in their quarterly, monthly and weekly data series.

Finally, Subrahmanyam (2007) examines the relationship between flows in REITs and flows in the stock market and finds an inverse relationship. By comparing results in our study with previous studies on the stock market we can further examine the relationship between REITs and the stock market.

Overall, the papers most closely related to our study find that investors perform worse than the assets they are investing in. This holds for entire stock exchanges like the NYSE/AMEX and Nasdaq, equity mutual funds or hedge funds. Still, investor returns have not been investigated for a number of asset classes or specific industries. We will focus on examining investor returns in REITs. Based on existing studies exploring large cash in and outflows in REITs, which show that REITs perform similarly to other financial assets, although the magnitude of the effects tends to be smaller, we expect REIT investor returns to be smaller than buy-and-hold REIT returns albeit to a smaller extent.

CHAPTER IV

METHODOLOGY AND DATA

4.1 Return Measures

4.1.1 Buy-and-hold Return

Buy and hold returns, also called geometric returns, are the conventional method to calculate and report returns. Part of their appeal and popularity is the easily available data required to calculate them. The geometric return R_g over a number of periods t=1,…T, can be calculated using individual period returns r_t as follows:

$$R_g = [(1 + r_1)(1 + r_2) \dots (1 + r_t) \dots (1 + r_T)]^{1/T} - 1 \quad (1)$$

Note that in the formula the order in which the period returns were earned does not matter. Switching the returns in say periods 2 and 7 will not alter the final buy and hold return. Actually, although the buy-and-hold return in the above formula appears to depend on what happens during each of the periods, it is only the beginning and final values of the portfolio that matter. In-between movements are irrelevant in the buy and hold return calculation. To illustrate this, let's substitute the periodic returns r_t in (1) with the respective definitions of returns in prices.

The return in any period r_t would be defined as the difference between the stock (portfolio) price at the end of that period P_t and the stock (portfolio) price at the end of the previous period P_{t-1}, relative to the price at the end of the previous period P_{t-1}. That is:

$$r_t = \frac{P_t - P_{t-1}}{P_{t-1}} = \frac{P_t}{P_{t-1}} - 1 \quad (2)$$

$1 + r_t$ would therefore be

$$1 + r_t = 1 + \frac{P_t}{P_{t-1}} - 1 = \frac{P_t}{P_{t-1}} \quad (3)$$

Substituting this expression in the geometric return formula (1) we get:

$$R_g = \left(\frac{P_1}{P_0} X \frac{P_2}{P_1} X \dots X \frac{P_t}{P_{t-1}} X \dots X \frac{P_T}{P_{T-1}}\right)^{1/T} - 1 \quad (4)$$

After crossing off identical terms in the numerator and denominator we get an equivalent expression which shows that buy-and-hold returns depend on the starting and ending prices only.

$$R_g = (\frac{P_T}{P_0})^{1/T} - 1 \quad (5)$$

4.1.2 Dollar Weighted Return

As section 4.1.1 demonstrates, buy and hold returns can be calculated easily with minimal information necessary. Indeed, for passive investors, who really buy, hold, reinvest any dividends received and do not add anything to their position in a company, buy and hold returns would also be an accurate representation of the returns they have earned. The average investor, however, adds or withdraws funds and does not necessarily reinvest their dividends back into the company. This necessitates the use of a different measure when trying to quantify the returns earned by the average investor. A dollar weighted return is an alternative measure that takes into account fund flows in and out of the security. The dollar weighted return is based on the idea of looking at an investment in stock in the same way as an investment project. Typically, for an investment project we have an initial outflow and periodic cash flows in and out of the

investment during its lifetime. We use the entire vector of fund flows to calculate the internal rate of return (IRR) that would make the present value of this flow zero. This internal rate of return is also called dollar weighted return.

The calculation of the dollar weighted return for a particular security requires additional information, i.e. the periodic capital flows in and out of the institution that are typically not reported. Potential sources of capital flows include secondary public offerings (SEOs) when new investor funds enter the company, dividend payments or share repurchases when company funds flow to the investors or various other more complex scenarios such as security swaps.

Dichev (2007) is among the first to suggest a method to derive these fund flows indirectly using conventional data: periodic returns and market capitalization. All we need to calculate the capital flows ($\mathrm{flow_t}$) in and out of a trust for a particular period t is the market capitalization MCap at the end of this period and at the end of the previous period and the periodic return $\mathrm{r_t}$. Flows can be calculated as follows:

$$flow_t = -\mathrm{MCap_t} + (1 + \mathrm{r_t})\mathrm{MCap_{t-1}} \tag{6}$$

The intuition behind this formula is that there are two possible sources of change in market capitalization: internally generated returns or external capital flows. By controlling for returns we ensure, that any remaining change in market capitalization is due to flows. A negative $\mathrm{flow_t}$ indicates an inflow of funds from investors and a positive $\mathrm{flow_t}$ shows funds were distributed to the shareholders. All cash flows are implicitly assumed to occur discretely at the end of the month.

This method for determining capital flows has several key advantages. It is simple and poses minimal data requirements. It circumvents the problem of having to identify all possible sources of flows, e.g. a Seasoned Equity Offering, share repurchase or distribution of dividends,

etc., in order to calculate the net flow, yet gives an accurate net flow estimate over the period. Thus, its increasing popularity in both the recent financial literature (Friesen and Sapp, 2007; Dichev 2011; Ciccotello et al. 2011) and financial practice with Morningstar reporting investor return since 2006 is not surprising.

Once we have calculated the flows, we can proceed to calculate the dollar weighted return or R_{dw}. Formally, the dollar weighted return is defined as the rate of return that equates the discounted end market capitalization to the sum of the beginning market capitalization and the present value of the capital flows over the life of the REIT:

$$\frac{MCap_T}{(1+R_{dw})^T} = MCap_0 + \sum_{t=1}^{T} \frac{flow_t}{(1+R_{dw})^t} \tag{7}$$

Finding the internal rate of return requires solving higher order polynomials. This could pose a difficulty especially when there is frequent change in capital flow signs due to the possibility of multiple real solutions to the polynomial[14]. We find that this is not a problem with our sample.

The difference between buy-and-hold returns and dollar weighted returns is frequently referred to in the literature as the (dollar-weighted) performance gap or PG. Formally, we define it as:

$$PG = R_g - R_{dw} \tag{8}$$

A negative performance gap would signify that on average investors did better than the security, successfully timing their cash flows, while a positive performance gap would mean their timing hurt their returns.

[14] Marrs and Thomlinson (2006)

4.2 Additional Methodological Procedures

4.2.1 Performance Gap on Negative and Positive Cash Flows

Following Friesen and Sapp (2011) we investigate further the source of the performance gap exhibited by investors. By calculating separately the dollar-weighted returns on positive and negative cash flows into each REIT, we can explore whether investors are timing correctly their contributions, their withdrawals or both. Investors with positive timing ability will systematically invest more money prior to high returns and withdraw money prior to low returns. Thus, if investors are timing the market correctly, the dollar weighted return on negative cash flows needs to exceed the REIT's overall geometric return, while the dollar weighted return on positive flows has to be less than the geometric return.

The gap analysis for positive and negative cash flows separately precludes the possibility that gaps due to poor timing in withdrawals and gaps due to poor timing in contributions cancel each other out when data is aggregated. Consider the following scenario: in REIT A cash outflows precede high returns, while in REIT B cash inflows occur before low returns. While both of these are examples of how investor earnings are negatively impacted by timing, when returns and flows in these two REITs are lumped together it is possible that no performance gap is detected. Thus we use the following methodology to calculate the performance gaps on cash in and outflows separately.

For each fund, we define $\text{flow}_t^+ \equiv \text{Max}\,(\text{flow}_t, 0)$ and $\text{flow}_t^- \equiv \text{Min}\,(\text{flow}_t, 0)$. The dollar weighted returns for only the positive or only the negative flows can be determined as the internal rate of return that would equate the positive/negative cash flow value to the present value of these cash flows, when the actually generated returns are used for discounting.

Thus, the dollar weighted return for the positive cash-flows only R_{dw}^{+} can be found as the solution to the following future value equation:

$$\sum_{t=1}^{T} flow_t^{+}(1+R_{dw}^{+})^{(T-t)} = \sum_{t=1}^{T}[flow_t^{+} \prod_{s=t+1}^{T}(1+r_s)]\,, \tag{9}$$

where r_s stands for the individual period return previously denoted by r_t. Respectively, the dollar weighted return for only the negative cash-flows R_{dw}^{-} is the solution to the equation:

$$\sum_{t=1}^{T} flow_t^{-}(1+R_{dw}^{-})^{(T-t)} = \sum_{t=1}^{T}[flow_t^{-} \prod_{s=t+1}^{T}(1+r_s)] \tag{10}$$

For robustness and to add to the understanding of the performance gap a number of additional cross sectional analyses will be performed. A potential concern is that results could be driven by REITs of a particular size. To shed light on this issue, but maintain sufficient sample size and statistical power of the analysis we divide our funds into three groups based on market capitalization: large, medium and small. We then calculate the performance gap in each of these categories.

4.2.2 Cross-sectional Characteristics and the Performance Gap

Another question to investigate is whether the performance gap is related to the risk-adjusted performance of the REIT. We classify REITs into groups based on their risk-adjusted performance. We calculate fund alphas using the Fama and French (1993) 3-factor model augmented with Carhart's (1997) momentum factor and then classify REITs into three groups based on their risk-adjusted performance. Friesen and Sapp (2007) find evidence that mutual funds with greater alphas are associated with greater performance gaps, essentially eliminating any gains for investors from choosing outperforming mutual funds.

The performance gap could be examined by fund or by year using a value weighting portfolio of all REITs. Inspection by year could reveal if any particular events are driving the results. For each year we calculate arithmetic, geometric and dollar weighted mean monthly returns for each REIT whenever data is available throughout all 12 months of the year.

4.2.3 Value-weighted Industry Examination and Bootstrapping Procedure

We will also complete an overall industry examination by calculating a value weighted portfolio of all REITs and computing respective buy and hold and dollar weighted returns for this portfolio. To calculate a periodic value weighted return for the portfolio, we multiply the capitalization of each REIT with the next period return of that REIT that was generated with this capitalization, sum across all REITs that existed during the period, and divide by the total market capitalization of all REITs during the period. The value weighted buy-and-hold return is the geometric average of the periodic value weighted returns. We then calculate the net REIT capital flows for every period, by adding the capital flows of all REITs for that period. The resulting vector of capital flows can be used to calculate the internal rate of return of the value weighted portfolio.

Dichev (2007) and Dichev and Yu (2011) design a bootstrapping test to derive the empirical distribution of the difference between buy-and-hold and dollar weighted returns of the value weighted portfolio and test for the statistical significance of the observed difference. The dollar weighted return is determined uniquely by two vectors: the periodic returns and the periodic capital flows. The original vector of capital flows is divided by the initial market capitalization, creating a new vector where each capital flow is a percentage of the original market capitalization. This new vector of capital flows is then held constant and the periodic returns vector is reshuffled and a new simulated dollar weighted return is calculated. The buy-

and-hold return does not depend on the order in which returns were generated and thus stays the same. This process is repeated 1,000 times, generating a distribution for the dollar weighted return and hence a distribution for the difference between dollar weighted return and buy-and-hold return. This distribution can then be used to calculate the p-value of the empirically observed difference.

---Insert Table 4.1 about here---

Table 4.1 demonstrates the working of the bootstrapping procedure used to generate the distributions of dollar weighted returns works with a hypothetical example. The original data show the actual periodic returns generated by a REIT (or index), the market capitalizations divided by the original market capitalization, and capital flows divided by the initial market capitalization. Note that these three variables are not independent as the vector of scaled capital flows is derived from the periodic returns and market capitalizations using the formula

$$f_t = -MCap_t + (1 + r_t)MCap_{t-1}$$

Conversely, each vector of scaled market capitalizations could be computed using the vectors of periodic returns and capital flows and then used as inputs to compute an IRR (dollar weighted return) for this scenario. Our vector of returns for periods 1, 2 and 3 is 20%, -20% and 50% respectively, while the vector of scaled capital flows is -1 (in period 0 capital flows are always equal to the market capitalization and the minus sign shows that the flow is from investors to the fund), -1 indicating another cash infusion equal to the initial market capitalization and 0.50, indicating a withdrawal from the REIT equal to half of the initial market capitalization. The last observation in the capital flows is calculated as the period 2 market capitalization multiplied with period 3 return. The vector of ordered scaled capital flows is kept constant for the simulated observations 1 through 5 and the vector of periodic returns is

randomly reshuffled, thus generating new market capitalizations, a new last capital flow observation and hence a new dollar weighted returns. Due to the simplicity of the example only covering 3 periods, there are a total of 3! ways in which returns could be reshuffled, and we have calculated the dollar-weighted return for each of these scenarios. Dollar weighted returns range from approximately 6% to approximately 21%.

4.2.4 Performance Gap and the Business Cycle

Following Keswani and Stolin (2008) we are also going to investigate the relationship between the dollar gap and the stages of the business cycle. Using the National Bureau of Economic Research (NBER) dating of the US business cycle, we identify periods of contraction (peak to trough), periods of expansion (trough to peak), complete business cycle (peak to peak) and complete business cycle (trough to trough). We then calculate the performance gap for each of these stages of the business cycle. These performance gaps would offer further insight into when investor timing is particularly detrimental or beneficial. It would be especially interesting to see if any evidence of "irrational exuberance", e.g. a particularly large gap during economic expansions exists.

The proposed analysis of the relationship between the performance gap and the stages of the business cycle is particularly relevant when examining REITs. Previous research suggests that REITs are frequently viewed as "low risk-low return" defensive stocks and thus are likely to exhibit a different pattern of returns and flows throughout the business cycle. Glascock (1991) finds that REIT betas vary with market conditions: REIT betas are higher during up markets and lower during down markets. Such finding implies that REITs are likely to be less affected during market declines that accompany recessions and could have smaller performance gaps, or even performance gaps which indicate investors actually did better than their assets. Glascock,

Michayluk and Neuhauser (2004) examine the performance of REITs around the stock market crash of October 1997. They find that REITs experienced significantly lower decreases during the market decline and on average declined by half as much as the overall stock market.

4.2.5 Aggregate Time-Series and Industry Effect

Dichev and Yu (2011) propose a methodology to investigate further causes for the difference between buy-and-hold and dollar weighted return. They decompose the fund-level performance gap into two potential drivers. The first one, called an aggregate time series or industry effect, attributes the gap to an overall industry which is continuously growing while industry returns are falling. Dollar weighting, which gives greater weights to later returns generated with more funds will result in a lower return than the equally weighted across time buy-and-hold calculation. The second effect, labeled cross sectional, is attributed to past return chasing across different REITs.

In order to capture the relative magnitude of the two effects, the authors examine the aggregate time series effect while holding the cross sectional effect constant. This can be accomplished by calculating a hypothetical dollar weighted return (HDWR) for each REIT, where monthly returns are kept the same, but monthly capital flows are replaced by the monthly capital flows of the value-weighted portfolio, scaled by the portfolio market capitalization in the first period when the REIT enters the sample. The HDWR represents how much investors would have earned in a REIT had they followed the same pattern of investing as in the overall industry. Market capitalizations for the REIT are recalculated based on the actual returns and the new value weighted portfolio capital flows. The capital flow for the last period is calculated as the last return multiplied with the prior period market capitalization. As a result, we get a new vector of capital flows, which except for the last period is identical to the vector of capital flows for the

value weighted portfolio. We use that vector to calculate the hypothetical dollar weighted returns. The total difference between the BHR and the actual dollar weighted return can be split into two effects: the difference between the BHR and hypothetical dollar weighted return, measuring the aggregate time series effect, and the difference between the HDWR and the actual dollar weighted return representing the cross sectional effect. Formally, we can express these effects as:

$$Industry\ Effect = BHR - HDWR \quad (11)$$

$$Cross\ Sectional\ Effect = HDWR - DWR \quad (12)$$

$$PG = Industry\ Effect + Cross\ Sectional\ Effect = BHR - HDWR + HDWR - DWR = = BHR - DWR \quad (13)$$

The intuition behind this separation is that scaling the value weighted portfolio cash flows gives us an idea of how investors moved money in and out of the entire industry. The REIT's hypothetical IRR thus represents the returns that investors would have earned if cash flows into the REIT had followed the industry pattern. Any difference between the hypothetical IRR and the actual IRR would indicate funds were transferred to/received from different REITs and measure the cross sectional effect. Table 4.2 uses a numerical example to demonstrate how the industry and cross sectional effects are calculated.

---Insert Table 4.2 about here---

Let us consider a REIT with return and market capitalization data available for 6 periods. MCap at time zero will represent the initial market capitalization, and $(1 + r)_1$ will give us the return that this market capitalization generated. The first three columns of Table 4.2 contain data and computed variables used to calculate the performance gap, which we will go over for clarity.

We express all market capitalizations of the REIT as a percentage of the initial market capitalization by dividing each market capitalization by the initial one and call this Scaled MCap. Next we calculate the scaled flows using Equation (6). The first capital flow is equal to the initial market capitalization with a reversed sign. This captures the initial funds that investors put in. The minus sign is related to the definition of distribution from the point of view of the investors, and indicates that money leaves investor pockets. The last distribution is equal to the prior to last capitalization multiplied with the last return. This reflects the assumption that investors receive everything at the end of the period. The vector of capital flows is then used to calculate the IRR of the investment or the DWR. Note that scaling the distributions (and thus the capital flows) has no effect on the magnitude of the DWR. The BHR return is calculated as a geometric average of the periodic return and the difference between BHR and DWR is the performance gap (PG). In this numerical example BHR is11.92%, DWR is 11.14% and the PG comes out to 0.78%.

The next three columns of Table 4.2 explain how HDWR is calculated. To reiterate, HDWR captures the return a REIT would have earned, had the investors made their capital contributions and withdrawals following the same pattern as the overall industry. Thus we will utilize the initial market capitalization and subsequent flows from the value-weighted industry portfolio we have created. Portfolio flows are scaled again by the market capitalization of the industry index at the beginning of the coverage for the individual REIT. Next, we can rewrite Equation (6) to calculate Hypothetical Scaled Mcap using the REITs actual returns and the portfolio scaled flows. Rewriting Equation (6) gives us Equation (6a):

$$MCap_t = (1 + r_t)MCap_{t-1} \quad - flow_t \qquad (6a)$$

For HDWR r_t is the return actually generated by the REIT, while $flow_t$ is the scaled capital flow of the value weighted REIT portfolio. The Hypothetical Scaled Mcap in Period 5

and the last REIT return are used to calculate value of the Hypothetical Scaled Flows in the last period, i.e. Period 6. The Hypothetical Scaled flows are used to compute HDWR. A comparison between the value-weighted portfolio scaled flows and Hypothetical Scaled Flows reveals that the only difference between them is for the last period, i.e. Period 6. This however is sufficient to accurately reflect the impact of all actual periodic returns generated by the REIT, as this last value is impacted by all prior returns for the REIT. The Hypothetical Scaled flows are used to compute the IRR of this hypothetical investment called HDWR. In this numerical example HDWR is 11.79%.

Using Equations (11) and (12), we can calculate the Industry and Cross sectional effects, which come out to 0.13% and 0.65% respectively. These indicate that out of the entire PG of 0.78%, 0.13% could be attributed to the overall investment trend in the industry, and 0.65% are due to subpar within industry capital allocations, e.g. from one REIT into another.

4.3 Additional Return Measures, Timing and Capacity Components

4.3.1 Time Weighted Average Returns and Dollar Weighted Average Returns

Sections 4.1 and 4.2 describe the methodology used to examine the gap between time weighted, geometric returns and dollar weighted returns for REITs. This gap can be interpreted as poor/superior market timing if it is greater than/ less than zero. An additional explanation is the existence of capacity constraints related to the return generating technology. As more and more funds are available, managers find it hard to uncover additional projects that offer the same level of return. Ciccotello et al. (2011) develop a methodology to separate the timing and the capacity effects on the difference between time weighted and dollar weighted average return. The following section presents their methodology, which will be used to further investigate the

gap in returns. In addition, this similar dollar weighting measure could serve as a robustness check to our previous results.

As before let us consider a REIT with available market capitalization data MCap and periodic rate of return r_t over a number of periods t=1,…T. $MCap_{t-1}$ denotes market capitalization at the end of period t-1 and the beginning of period t. Ciccotello et al. (2011) suggest a baseline weighted arithmetic mean return as follows:

$$\bar{R} = \sum_{t=1}^{T} w_t \ r_t \ , \tag{14}$$

where w_t is the weight attributed to that period in the overall return calculation.

In the standard calculation, also known as time weighted average, all periods are given equal weights, due to their equal length, so that $w_t = \frac{1}{T}$. Thus the time weighted average or TWA can be written as:

$$TWA = \frac{1}{T} \sum_{t=1}^{T} r_t \tag{15}$$

A potential problem with this return calculation is that REIT size is excluded from the calculation, i.e. returns generated using different amounts of capital are equally weighted. A dollar weighting approach would be more appropriate as an indicator of the actual returns earned. Thus, Ciccotello et al. (2011) suggest adjusting the weights to reflect changes in size. Although it may seem intuitive to use unadjusted period market capitalizations as weights in the overall return calculation, this approach would fail to distinguish between changes in REIT size due to REIT returns and changes in REIT size resulting from funds going in or out of the fund. A more sophisticated approach that would allow us to examine the interaction between REIT flows

and returns is needed. An important feature of any such measure is that in the absence of fund flows, returns calculated using the adjusted weights should equal the standard TWA returns.

As before, capital flow $\mathrm{flow_t}$ is calculated from the consecutive market capitalizations and the periodic return using Equation (6). It is worth noting that inflows and outflows are originally defined for investors, making the definition of outflows (positive) and inflows (negative) somewhat counterintuitive from the point of view of funds. ϕ_t stands for the percentage change in REIT size due to flows, or:

$$\phi_t = \frac{-flow_t}{(1 + r_t)MCap_{t-1}}. \tag{16}$$

The negative sign in front of the percentage change serves to align the percentage changes with the traditional concept of increases in fund size as positive, and decreases as negative. The dollar weighting approach proposed by Ciccotello et al. (2011) uses the previous periodic percentage change due to flows to adjust the weight applied to each period's return. Let us denote by $\widehat{w}_1$ the non-normalized weight in period 1, which can be set to equal 1 for convenience. For each of the following periods the non-normalized dollar weight can be calculated as follows using the previous period's weight and adjusting by the percentage change due to flows so that:

$$\widehat{w}_1 = 1$$

$$\widehat{w}_t = \widehat{w}_{t-1}(1 + \phi_t), for\ t > 1. \tag{17}$$

Next, we normalize all weights so that their sum equals one, by dividing each non-normalized weight by the sum of all non-normalized weights. Thus each normalized weight $\mathrm{w_t}$ can be calculated as:

$$w_t = \frac{\widehat{w}_t}{\sum_{t=1}^{T} \widehat{w}_t}. \quad (18)$$

Thus, the dollar weighted average return DWA would equal:

$$DWA = \sum_{t=1}^{T} w_t \; r_t = \frac{1}{\sum_{t=1}^{T} \widehat{w}_t} \sum_{t=1}^{T} \widehat{w}_t \; r_t. \quad (19)$$

Note that in the absence of flows

$$\widehat{w}_1 = \widehat{w}_2 = \cdots = \widehat{w}_T = 1 \text{ and} \quad (20)$$

$$\sum_{t=1}^{T} \widehat{w}_t = T, \text{ making } TWA=DWA. \quad (21)$$

In the following section we illustrate the calculations using a numerical example for clarity, presented in Table 4.3. Consider a REIT that experiences a 10% return in the first period, 5% return in the second period, and 20% return in the third and final period as shown in the third row in the table below.

----Insert Table 4.3 about here----

The flows flow_t are calculated using market capitalizations and returns. For the sake of clarity, capital flows for period 0 and the last period 3 as used for the calculations of IRR are included, although they are not used in the dollar weighted averaging employed by Ciccotello et al. (2011).[15] The new capital flow in the last period is assumed to be zero, due to the assumption that all flows occur discretely at the end of the period. Note that the definition of flows is from the point of view of investors: inflows into the fund are negative, as they leave investor pockets and outflows from the REIT are positive as they are received by investors. Next in row 5 we

[15] The dollar weighted return for this fund would be the internal rate of return that makes the present value of the stream of flows in row 4 zero

calculate the percentage change in REIT size that is caused by flows. Percentage changes in REIT size are positive if new investor money entered the REIT (that is investors contributed to the REIT, e.g. flows were negative) and negative if investors received money (e.g. flows were positive). Using this information, we construct the non-normalized weight for each period in the sixth row. The last row presents the normalized weights.

The normalized weights show the relative REIT size as a result of direct capital inflows and not internally generated growth. Note that the second normalized weight corresponding to the second return is 0.375 and greater than the third weight corresponding to the third return which is 0.295, even though market capitalizations used to generate these returns are smaller for the second return than for the third ($1,250 and $1,300 respectively). This is because there was a large capital outflow ($350) preceding the third return. Even though capitalization grew as a result of internally generated growth the normalized weights reflect the relative REIT size as a result of external contributions, i.e. investor cash in and out of the REIT.

Now that we have clarified how the weights are determined we can proceed with the analysis of the effects. The first step in the analysis is looking at the difference between dollar and time weighted average returns. Analogous to the performance gap (but reversed) we define:

$$Diff_{total} = DWA - TWA \qquad (22)$$

4.3.2 Timing and Capacity Components

Any difference in the two measures could be attributed to either timing of flows or capacity constraints revealed by flows. Poor or superior timing of flows will result in $\text{Diff}_{\text{total}}$ that is less than zero or greater than zero respectively. Capacity constraints due to flow increases will result in a negative $\text{Diff}_{\text{total}}$. The next step in the analysis decomposes this total difference into separate timing and capacity effects to give a clearer idea of the sources of this difference.

Let us consider an N-factor return generating model:

$$r_t = \alpha + \sum_{j=1}^{N} \beta_j \, r_{j,t} + e_t \, , \tag{23}$$

where β_j is the trust's sensitivity to factor j and $r_{j,t}$ is the return to the j-th factor in period t.

Substituting r_t in the DWA Equation (19) we get:

$$DWA = \sum_{t=1}^{T} w_t \;\; r_t = \sum_{t=1}^{T} w_t \left(\alpha + \sum_{j=1}^{N} \beta_j \, r_{j,t} + e_t \right) =$$

$$= \; \alpha \sum_{t=1}^{T} w_t \; + \sum_{t=1}^{T} w_t \sum_{j=1}^{N} \beta_j \, r_{j,t} + \sum_{t=1}^{T} w_t \; e_t \tag{24}$$

Next, using the dollar weights calculated before we define dollar weighted average benchmark returns and time weighted average benchmark returns as:

$$DWA_{benchmark} = \sum_{t=1}^{T} w_t \sum_{j=1}^{N} \beta_j \, r_{j,t} \tag{25}$$

and

$$TWA_{benchmark} = \frac{1}{T} \sum_{t=1}^{T} \quad \sum_{j=1}^{N} \beta_j \, r_{j,t} \tag{26}$$

The timing effect can thus be quantified as the difference between $\mathrm{DWA}_{\mathrm{benchmark}}$ and $\mathrm{TWA}_{\mathrm{benchmark}}$. Any residual from the total difference $\mathrm{Diff}_{\mathrm{total}}$ needs to be attributed to capacity constraints. Formally:

$$Diff_{timing} = DWA_{benchmark} - TWA_{benchmark} \tag{27}$$

and

$$Diff_{capacity} = Diff_{total} - Diff_{timing} \quad (28)$$

The N-factor model used in the analysis is the 3-factor Fama and French model (Fama and French, 1993) with the addition of the momentum factor as suggested by Carhart (1997). Data for this analysis comes from Kenneth French's website[16]. The factors are size (SMB), value (HML), market (RM-RF) and momentum (MOM). Our return generating process can thus be represented as follows:

$$r_t = \alpha + \beta_{RM} * r_{RM,t} + \beta_{SMB} * r_{SMB,t} + \beta_{HML} * r_{HML,t} + \beta_{MOM} * r_{MOM,t} + e_t \quad (29)$$

The size, value, market and momentum factors are common stock factors and not REIT specific. Peterson and Hsieh (1997) examine REIT returns using the common stock factors from Fama and French (1993) and find that all of them are significant predictors, arguing that the factors that drive the size and book-to-market effects drive the same effects in REITs. In addition, for mortgage REITs only, they find that the term and default spread, which are rendered insignificant for stocks in Fama and French (1993), but have explanatory power for bonds, can also explain returns in mortgage REITs even after controlling for all other factors.

4.4 Data

The main data for the analysis come from the Center for Research in Security Prices (CRSP) database. We used the SIC code to identify REITS and downloaded monthly return, market capitalization and stock price data for all firms with an SIC code of 6798. Our sample

[16] See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

period is from January 1970 to June 2010, which in essence includes all available REIT history[17]. This resulted in an initial sample of 373 firms.

We opt to use monthly data for the analysis. Cash in- and outflows are computed on a monthly basis and assumed to occur discretely at the end of the month. On the one hand, the precise timing of cash inflows and outflows is important in calculating internal rate of return. Annual frequency greatly decreases the accuracy of determining when these flows occurred. On the other hand, calculating IRR of a REIT requires solving a polynomial equation of a degree equal to the number of observations. Das a result, daily frequency would be too computationally intensive, and greatly increase the probability of finding multiple solutions. Thus, monthly frequency is a balanced option allowing for a rather precise timing of cash flows (compared to annual data) and keeping the IRR calculation manageable (compared to daily data). In addition, large cash flows like dividend payments, SEOs, or fund entry or exit generally do not occur several times a month. The choice of monthly frequency is consistent with the data frequency used in all prior studies in this area.

An overall look at the quality of the data revealed a very low percentage of missing data. CRSP uses the following codes to designate different types of missing return data presented in Table 4.3: [18]

----Insert Table 4.3 about here----

Code -66 was only found in the very first observation when the beginning of the trust's coverage fell within our sample period. This was the case for the majority of our firms. It does

[17] Although the first REITS were created in 1960, it is not until 1972 that the industry gained enough standing to have its own index; we chose to start in 1970 to avoid the early years with too few funds. January 1970 is frequently taken to be the starting date for REIT studies (see Han and Liang, 1995).
[18] Source CRSP documentation retrieved at:
http://www.crsp.com/documentation/product/stkind/definitions/Holding_Period_Total_Return.html

not pose a problem for our analysis, as all return data are available. Similarly the -88 code was only found in the last observation for a trust if that trust ceased to exist or its coverage was discontinued within our sample period. We have 174 such trusts in our sample, rendering the analysis free of sample selection bias. The codes -77 and -99 indicate missing data within the sample period for a trust, caused by a REIT not trading on the exchange or a suspension in trading. In cases when there was only one missing monthly observation, we chose to impute the return data based on stock price and market capitalization in the surrounding periods. The stock price for the missing month is assumed to be the average of the stock prices for the previous and the following month. When a trust had missing data for two or more consecutive months, we truncated the respective trust's series, choosing to keep the longer subsample either before or after the break in coverage. We had a total of 9 cases of two or more consecutive missing returns. Finally, due to the fact that dollar weighting is a longer horizon phenomenon and to be consistent with other studies, we chose to keep only trusts with available coverage of at least 12 months. This reduced the size of our final sample to 373 REITs.

Table 4.1: Three-period example demonstrating the bootstrapping procedure used to simulate the empirical distribution of the performance gap

	Original Data			Simulated Distribution													
				Observaton 1			*Observaton 2*			*Observaton 3*			*Observaton 4*			*Observaton 5*	
Period	**1+r**	**Scaled MCap**	**Dist/ Mcapo**	**1+r**	**Scaled MCap**	**Dist/ Mcapo**	**1+r**	**Scaled MCap**	**Dist/ Mcapo**	**1+r**	**Scaled MCap**	**Dist/ Mcapo**	**1+r**	**Scaled MCap**	**Dist/ Mcapo**	**1+r**	**Scaled MCap**	**Dist/ Mcapo**
0		1.00	-1.00		1.00	-1.00		1.00	-1.00		1.00	-1.00		1.00	-1.00		1.00	-1.00
1	1.20	2.20	-1.00	1.20	2.20	-1.00	0.80	1.80	-1.00	1.50	2.50	-1.00	1.50	2.50	-1.00	0.80	1.80	-1.00
2	0.80	1.26	0.50	1.50	2.80	0.50	1.20	1.66	0.50	1.20	2.50	0.50	0.80	1.50	0.50	1.50	2.20	0.50
3	1.50	1.89	1.89	0.80	2.24	2.24	1.50	2.49	2.49	0.80	2.00	2.00	1.20	1.80	1.80	1.20	2.64	2.64
IRR			**8.08%**			**14.51%**			**18.73%**			**10.17%**			**6.31%**			**21.15%**
Geom. Return	**12.92%**			**12.92%**			**12.92%**			**12.92%**			**12.92%**			**12.92%**		

Table 4.2: Numerical example illustrating the calculation of industry and cross-sectional effects

Period	1+r	Scaled MCap	Flows/ Mcap0	VW Portfolio Scaled Flows	Hypothetical Scaled Mcap	Hypothetical Scaled Flows
0		1.00	-1.00	-1.00	1.00	-1.00
1	1.20	1.80	-0.60	0.40	0.80	0.40
2	0.80	1.24	0.20	-0.20	0.84	-0.20
3	1.50	2.26	-0.40	-0.30	1.56	-0.30
4	1.30	2.14	0.80	-0.30	2.33	-0.30
5	0.75	1.30	0.30	0.30	1.45	0.30
6	1.40	1.82	1.82	*0.30**	2.02	2.02
BHR	**11.92%**	*DWR*	**11.14%**		*HDWR*	**11.79%**
	PG=BHR-DWR					**0.78%**
	PG= Industry Effect + Cross Sectional Effect					
	Industry Effect=BHR-HDWR					**0.13%**
	Cross Sectional Effect=HDWR-DWR					**0.65%**

* Not used in any of the calculations due to the assumption that all flows occur at the end of the period

Table 4.3: Numerical example showing the calculation of flows and weights for the dollar weighted average return calculation

Period	**Formula**	**0**	**1**	**2**	**3**
MCap		1000	1250	1300	(not used)
Return			10%	30%	5%
Flow	$flow_t =$ $= -MCap_t + (1 + r_t)MCap_{t-1}$	*=-1000*	-1250+1000*(1+0.1)= = -150	-1300+1250*(1.3)= = 350	*1300*1.05*= *= 1365*
% change in size due to flow	$\phi_t = \frac{-flow_t}{(1 + r_t)MCap_{t-1}}$	----	150/1000*(1+0.1)= = 13.63%	-350/(1250*1.3)= =-21.54%	=0%
Non-normalized weight	$\widehat{w}_t = \widehat{w}_{t-1}(1 + \phi_{t-1}),$ $for\ t > 0$		1	1*(1+.1363)=1.136	1.136*(1-0.215)= = 0.892
Normalized weight	$w_t = \frac{\widehat{w}_t}{\sum_{t=1}^{T} \widehat{w}_t}$		1/(1+1.136+0.892)= =1/3.028=0.330	1.136/3.028= =0.375	0.892/3.028= = 0.295

Table 4.4: Missing data coding in CRSP return data

Code Number	**Reason For Missing Return**
-66.0	Valid current price but no valid previous price. Either first price, unknown exchange between current and previous price, or more than 10 periods between time t and the time of the preceding price t'.
-77.0	Not trading on the current exchange at time t.
-88.0	Outside the security's price range.
-99.0	Missing return due to missing price at time t; usually due to suspension in trading or trading on unknown exchange.

CHAPTER V

EMPIRICAL RESULTS

5.1 Buy-and-hold vs. Dollar Weighted Returns

5.1.1 Descriptive Statistics by Year

Table 5.1 reports the number of REITs, market capitalization, capital flows as a fraction of capitalization, buy-and-hold, dollar weighted returns, and the gap between them calculated using all funds for each year of the full sample. Descriptive statistics for the full sample as well as the subsamples 1970-1991 (old-REIT era) and 1992-2001 (new-REIT era) and 2002-2010 (most recent era) are also provided.

---Insert Table 5.1 about here---

Industry growth throughout the period is evident as both the number of REITs and capitalization experience substantial growth. Number of REITs starts at 11 and reaches a peak of 248 in 2005. Market capitalization is initially slightly less than a million and reaches its maximum of 432 billion in 2006, right before the start of the latest housing market crisis. Capital flows, or net funds that have entered or exited the industry during this period are reported as a fraction of current period capitalization to put the magnitude into perspective. Negative flows indicate that net funds are flowing from investors towards the REIT industry and positive flows indicate that funds are distributed by REITs to individual investors.

The mean buy-and-hold return over the entire sample is 14.03%, while the mean dollar weighted return is 11.01%, indicating that the average investor performed worse than the REITs they invested in. The mean performance gap is thus 3.03%. Median buy-and-hold and dollar weighted returns are 18.97% and 15.99% respectively. Consistent with the idea of inferior timing, the performance gap is positive in approximately 68% of the years.

When examining the three subsamples it is evident that the dollar gap is diminishing over time. Mean gap at 5.45% is the greatest in the initial 1970-1991 old REIT era followed by the 1992-2001 new REIT gap of 2.81%. In the most recent period 2002-2010 the mean gap is actually -2.67% which contrary to prior periods means investors in REITs earned higher returns than the REITs assets themselves. This mean is however largely influenced by the year 2009 during which the average investors was able to generate returns of 23.66% more than the buy-and-hold REIT return for the year. Median gap for 2002-2010 is still positive at 1.41% which is the smallest value for any of the sub-periods. This reduction of the dollar gap over time could be indicative of investors becoming more familiar with the workings of REITs and an overall increase in market efficiency. It is also consistent with the findings in related studies such as Dichev (2007), Friesen and Sapp (2007) Keswani and Stolin (2008), which also find larger gaps in their earlier subsamples relative to later ones.

Figure 5.1 is based on the performance gap figures from Table 5.1. Overall, we can see that most of the time the performance gap is positive, although the effect is more pronounced for the first half of the sample and is markedly reversed around the 1980 recession as well as the most recent one.

---Insert Figure 5.1 about here---

5.1.2 Individual Fund Level

Table 5.2 presents a more in-depth look at the buy-and-hold and dollar-weighted returns on the individual fund level. The mean buy-and-hold return is 3.4% and mean dollar weighted return is 2.3%. This difference is statistically significant at 5% in a two-tailed t-test, and the p-value falls further in a one-tailed t-test where the alternative hypothesis is that buy-and-hold returns are greater than dollar weighted returns. This presents some initial evidence that like investors in other previously studied assets REIT investors earn lower returns due to inferior timing. Median buy-and-hold and dollar weighted returns are 8% and 6.9% respectively, and a Wilcoxon signed rank test for difference in medians is significant at 1%. Median values are less affected by outliers and are in this case greater than respective mean values. This shows that most likely several large negative return outliers are in the sample, but those outliers are not driving the results. We would like to note that there is no value weighting and all REITs are considered equal in the tests performed.

---Insert Table 5.2 about here---

An additional analysis proposed in Dichev and Yu(2011) includes decomposing the performance gap for each individual fund into a cross-sectional and an industry effect. This involves the computation of a hypothetical dollar weighted return (HDWR) for each REIT, where the REITs own capital flows are replaced by the monthly capital flows of the value weighted portfolio while the vector of returns is kept the same. The resulting IRR is the HDWR. Since the HDWR involves the imputation of a different cash flow pattern on pre-existing returns, we have, albeit very few, cases where the IRR computation has no real solutions, or the real solution is less than -1 and thus has no meaningful interpretation. We exclude these cases

reducing the number of REITs in our sample from 373 to 370. Our results are reported in Table 5.3.

The mean and median PG is 1.01% and 0.55% respectively. It is partitioned into the industry effect (calculated as BHR-HDWR) and the cross-sectional effect (calculated as HDWR-DWR). The overall industry effect for the full sample comes out to an average of -1.2% and mean industry effect is -0.51%. This indicates that overall the REIT industry did not suffer from declining returns as its overall size increased. The cross sectional effect has an average of 2.2% and the median value is 1.03%, indicating that some return chasing across different REITs is present. These findings demonstrate that the REIT industry is favorable for investors and any negative effects on investor returns are due to allocating money differently within the industry.

---Insert Table 5.3 about here---

5.1.3 Performance Gap and the Value-weighted Portfolio

We also construct a value weighted portfolio of all funds and calculate respective buy-and-hold and dollar weighted returns for this portfolio. We calculate the value weighted return for each period by multiplying the capitalization of each REIT with the next period return of the REIT, summing across all REITs for this period and dividing by the sum of the market capitalizations of all REITs that existed during that period. The value weighted buy-and-hold return is the geometric average of the periodic value weighted returns. We then calculate the net REIT capital flows for every period, by adding the capital flows of all REITs for that period. The resulting vector of capital flows is used to calculate the internal rate of return for all REITs over the entire period. We find a value-weighted buy and hold return of 11% for the entire sample and a dollar weighted return of 9.12% and a performance gap of 1.88%. The statistical significance of this gap is assessed using the bootstrapping procedure utilized in Dichev (2007) and Dichev

and Yu (2011). Following this methodology we perform 1000 iterations to simulate the distribution of the gap. The resulting distribution is presented in Table 5.4. We find our gap of 1.88% to be slightly below the 10th percentile cutoff point of the distribution (1.92%) and thus statistically insignificant.

---Insert Table 5.4 about here---

5.1.4 Cross-sectional Characteristics and the Performance Gap

Friesen and Sapp (2007) look at the performance gap in mutual funds and find that the performance gap increases with alpha, essentially wiping out any gains to investors from the superior performance of high-alpha funds. We perform a similar analysis by calculating each REIT's alpha, separating the REITs in quintiles depending on alpha and calculating BHR, DWR and PG for each quintile. Following Friesen and Sapp (2007) we use two models to calculate the alpha: the Fama-French three factor model and the Fama-French model augmented with the momentum factor. Our findings are relatively consistent across both model specifications adding to the robustness of the analysis. The results, presented in Table 5.5 show that the performance gap is insignificant in both the best and worst alpha quintiles for both model specifications. Although the magnitude of the gap varies between -0.5% and 2.1%, high variance in both ends of the distribution render these gaps statistically insignificant. The middle quintiles show positive and significant performance gaps, consistent with prior literature findings that investor returns tend to be lower than BHR. Overall there is no pattern of performance gaps increasing with alpha.

---Insert Table 5.5 about here---

Investor returns are naturally more meaningful over longer term horizons. The number of investors who do not buy and hold, but rather rebalance their holdings naturally increases over

time. While there may be no or relatively few major cash inflows like IPOs and SEOs over a short period of time, there will be much more when looking at a longer time frame. After one period BHR and DWR will always be the same, but as time progresses more and more investors will have rebalanced their holdings and thus earned a return that differs from the BHR. The relationship between the length of coverage for the REIT and the performance gap is shown in Table 5.6. Our results show that with an increase in REIT length both BHR and DWR increase. This is likely because it is the more successful REITs that exist longer. Additionally REITs that have longer coverage are more likely to have existed during the high-inflation period of the 1980s when nominal returns were higher to compensate for the double digit inflation. The performance gap also appears to increase with coverage length. This provides further evidence that overall, even in defensive assets like REITs, investor performance is hurt by their cash in and outflow patterns.

---Insert Table 5.6 about here---

5.1.5 Performance Gap and the Business Cycle

Tables 5.7 through 5.12 shed light on the relationship between the dollar gap and the business cycle. We use the National Bureau of Economic Research (NBER) dating of the business cycle[19]. We then consider four scenarios: recession, expansion and two types of complete business cycles: calculated from peak to peak and calculated from trough to trough[20].

[19]See http://www.nber.org/cycles.html.

[20] Our data period thus contains seven recessions (Jan 1970–Nov. 1970; Nov. 1973–March 1975; Jan. 1980–July 1980; July 1981–Nov. 1982; July 1990–March 1991; March 2001–Nov 2001; Dec. 2007– June 2009), seven expansions (Dec. 1970–Oct. 1973; Apr. 1975–Dec. 1979; Aug. 1980– June 1981; Dec. 1982–June 1990; Apr. 1991–Feb. 2001; Dec. 01–Nov. 2007; July 2009–June 2010), seven peak-to-peak business cycles (Jan. 1970–Oct 1973; Nov. 1973–Dec. 1979; Jan. 1980–June 1981; July 1981–June 1990; July 1990–Feb. 2001; Mar. 2001–Nov. 2007; Dec. 2007–June 2010) and six trough-to-trough business cycles as the data ends with an expansion (Dec. 1970–March 1975; Apr. 1975–July 1980; Aug. 1980–Nov. 1982; Dec. 1982– Mar. 1991; Apr. 1991–Nov. 2001; Dec. 2001–June 2009).

For each sub-period within our sample period we include all REITs that have existed for at least two periods during that sub-period. We then calculate the capital flows and the resulting dollar weighted and geometric returns for these REITs, starting with an initial value equal to the market capitalization of the REIT during the first time it appears during that sub-period (typically that would be the start of the period, unless data for the REIT became available later on) and ending with the last period of its existence that falls within that same sub-period (frequently the end unless the REIT/REIT coverage was discontinued before the end of the cycle). We then present descriptive statistics and statistical tests on the significance of the dollar gap for each of the sub-periods in each of our four categories. We winsorize both BHR and DWR series at 5% to ensure our results are not driven by outliers. The sign and overall significance of the dollar gap stay the same in 26 out of our 27 sub-categories. The nature of our findings does not change as a result of winsorization. While we include the winsorized tables (Table 5.8; Table 5.10 and Table 5.12), in the next section we are going to present our findings prior to winsorization for greater authenticity and note if any clear differences between the two types of tables are present.

Table 5.7 shows how the performance gap of individual REITs varies throughout all recessions in our sample. The number of REITs included in each sub-period ranges from 11 early on during the 1970 recession to 228 in the 2001 recession. The last segment of the table called All Recessions combines the observations from the individual recession sub-periods, treating each REIT-recession observation as a separate one.

---Insert Table 5.7 about here---

Our results show that the performance gap is generally negative during a recession: that is investor actual return is higher than the REIT reported geometric return for the period. The average gap in a recession ranges from -.55% to -7.58%. While performance gap is insignificant

in the early smaller samples, later recessions have a sufficient number of observations to detect significance. When observations from all recessions are combined together the resulting performance gap is -2.71% and significant at the 5 percent level.

Our study is the first to point to an asset class where investor returns are higher than the returns of the asset during recessions. All prior studies find that investors perform worse than the assets they have invested in. In Keswani and Stolin (2008), the only prior paper that investigates the performance gap throughout different stages of the business cycle, the main finding is that investors underperform the assets particularly strongly during periods of recession. Their analysis focuses on a value-weighted index of all stocks traded on NYSE and Nasdaq. Our findings are contrary to theirs, as REIT investors outperform their asset, suggesting that the performance gap is indeed industry and asset specific. In line with popular belief, real estate is a particularly good investment during recessionary periods. Investor actual returns were up to 7.81% higher than the corresponding reported BHR.

One notable exception in our data is the 2007–2009 largely real estate driven recession. Before winsorizing the performance gap is negative, yet insignificant despite a substantial sample size. After winsorizing both BHR and DWR at the 5 percent the gap turns positive and is significant at the 5% level, which is the only case in our analysis of the relationship between the dollar gap and the business cycle in which the results change as a result of winsorization. This empirical finding indicates that this latest recession was somewhat different from prior ones experienced in the US. Statistical anomalies were more prevalent and investors in REITs were not able to improve their performance through superior timing.

Table 5.9 presents our results for economic expansions. With regards to periods of expansion our findings are more mixed. Most of the performance gaps for individual expansions

are statistically insignificant. The overall performance gap for all recessions is insignificant as well. Three individual recessions show statistically significant performance gaps, and out of those two gaps are negative indicating investor returns in REITs were better than pure REIT returns. The Apr. 1991–Feb. 2001 expansion is the only one that demonstrates the typical for other assets higher BHR. Overall we do not find any evidence of "irrational exuberance", e.g. substantial performance gaps during economic expansions. On the whole, our findings regarding expansions lend some additional support to the idea that REITs are an investor-friendly asset, as unlike other assets examined in the literature investor returns are not significantly lower than BHR.

---Insert Table 5.9 about here---

Table 5.11 summarizes our analysis of complete business cycles. The performance gap for full business cycles is also generally statistically insignificant. The overall performance gaps for both peak-to-peak and trough-to-trough cycles are insignificant. In the peak-to-peak category two of the performance gaps in the earlier periods are statistically significant. In the Nov. 1973–Dec. 1979 period investors returns were lagging behind the return of the asset by roughly one percent on an annual basis. During the Jan. 1980–June 1981 peak-to-peak business cycle investors did better than the asset by approximately two percent per annum. In the early 1990s through early 2000s both the peak-to-peak and trough-to-trough business cycles show statistically significant and positive performance gaps of coincidentally both equal to 1.66%, which is the strongest evidence of investor returns in REITs lagging behind asset returns in this analysis. Still the overall findings for complete business cycles indicate that overall investors could neither improve nor worsen their returns by timing their cash flows. This is in contrast to

the findings in Keswani and Stolin (2007) who find investors did worse than their asset (the entire universe of NYSE stock in this case) by approximately 2% annually.

---Insert Table 5.11 about here---

Our final conclusion of this section is that REITs do not pose any additional return losses due to poor timing and are a particularly good asset to invest in during economic downturns.

5.2 Time Weighted Average Returns, Dollar Weighted Average Returns, Timing and Capacity Effects

5.2.1 Individual Fund Level

Table 5.13 uses the alternative measures proposed by Ciccotello et al. (2011): the time weighted average returns and the dollar weighted average returns. The total difference is defined as DWAR-TWAR and we also calculate the proposed separation of the total difference into timing and capacity components. Following Case et al. (2012) we separate the sample into three subsamples: 1970-1991 or the "vintage REIT" era, 1992-2001 or the "new REIT" era and 2001-2010 or the "newest REIT" era.

---Insert Table 5.13 about here---

Similarly to our findings in section 5.1.2, time weighted average returns (TWAR) are again higher than the dollar weighted average returns (DWAR). For the full sample on an annualized basis the return means are at 9.7% and 8.9% respectively. The difference of 0.7% is statistically significant at 10% level in a two-tailed t-test. Median time weighted average returns and dollar weighted average returns are 13.3% and 12.2% respectively, and a Wilcoxon signed rank test for difference in medians is significant at 1%. This strengthens the evidence that REIT investors give up some potential returns as a result of subpar investment.

The subsamples reveal similar findings. The earlier subsamples 1970-1991 and 1992-2001, both show a TWAR average about 1.8% higher than DWAR on an annualized basis. The newest subsample, 2001-2010 though shows an insignificant gap between the two. This latest period includes the most severe recession in recent US history lending further credibility to the idea that REITs are a good defensive investment retaining value for investors during market downturns. These findings also parallel our results from the previous section using the methodology proposed in Dichev (2007). Thus our overall findings regarding investor returns appear robust and independent of the investor return measure used.

The methodology in Ciccotello et al. (2011) allows us to separate the total difference into a timing and capacity component. Timing and capacity components are also reported in Table 5.13. The analysis shows that capacity constraints appear to be a major driver of the total difference. This appears plausible given that REITs invest in real estate and there is a natural constraint on expanding real estate investments, both in terms of speed with which new property can be built, as well as space available and saturation of the particular property market segment.

5.2.2 Total Difference, Capacity and Timing Effects and the Business Cycle

Table 5.14 presents results of the analysis of TWAR, DWAR, the resulting Total Difference and how it is partitioned into timing and capacity effects during recessionary periods only. As was the case with BHR and DWR, the asset return measure TWAR tends to be lower than the investor return measure DWAR in most recession periods, although the difference is not always statistically significant. This indicates that in the case of REITs asset return understates what actual investors have earned during the most recessionary periods. The result however is not very strong. The panel that aggregates our findings for recessions shows a mean TWAR of -4.52% and a mean DWAR of 3.53%. The resulting total difference of 0.98% is statistically

insignificant. Even so these results are markedly different from other studies showing the importance of asset characteristics for investor return analysis. All other studies have shown that investor returns are significantly lower than asset returns. In fact the investigation of the gap over the business cycle in Keswani and Stolin (2008) show that the largest chunk of the gap for the overall stock market is attributable to economic downturns and investors are slightly ahead of the asset returns during economic expansions.

With regards to the timing and capacity components of the total difference we find that it is the capacity component that makes up most of the magnitude of the gap. The timing component tends to be rather small, although statistically significant for 4 out of the 7 recessions in our sample and the aggregate recessions panel. The relatively large capacity component compared to Ciccotello et al. (2011) is not surprising given the highly specialized investment portfolio of REITs, namely real estate. The investment objective is frequently even more specific as REITs tend to specialize in specific property types (e.g. retail REITs, residential REITs, office REITs or healthcare REITs) or in a specific geographic location. Real estate expansion projects naturally take time to complete and may be subject to a capacity constraint in the number of suitable locations available for completing them or the ability of the demographics to support further expansion

---Insert Table 5.14 about here---

Table 5.15 is structured in the same way as Table 5.14 but focuses on periods of economic growth. Overall conclusions are again consistent with our findings on investor returns during expansions as presented in Table 5.9. During economic expansions asset return, i.e. TWAR is usually higher than the investor return DWAR. TWAR is higher than DWAR in 5 out of the 7 expansions in our sample, although the difference is not usually large. For all expansions

TWAR is 0.55% higher than DWAR, which is marginally statistically significant at the 10% level. The magnitude of both the timing and capacity components tends to be small and insignificant. As before, the capacity component is dominant. These findings are consistent with prior literature showing that investor returns underperform the asset returns, although the magnitude tends to be smaller.

When we compare the results to those in Keswani and Stolin (2008) paper there are some major differences. They find investor returns are slightly higher than asset returns during expansions, while our findings show the opposite. Thus our overall conclusion regarding investor returns and the business cycle specifically for REITs is that REITs offer some advantages over traditional stock. While stocks deliver investor returns higher than asset returns during economic expansions, this is markedly reversed during economic downturns. Consistent with the idea that they are defensive stock, REITs are an excellent investment during recessions and investors returns are even higher than what asset REIT returns suggest.

---Insert Table 5.15 about here---

Table 5.1: Descriptive statistics: capitalization, capital flows and returns

This table presents descriptive statistics for all REITs and the entire sample period 1970-2010, as well as the subsamples 1970-1991 (Old REIT era), 1992-2001 (New REIT era) and 2002-2010 (Most Recent Era). Total capitalization for a year is the sum of the monthly capitalizations of all funds divided by 12. Buy-and-hold returns are value weighted buy-and-hold returns for this year. Capital flow for the year is the average of the monthly capital flows of all funds during the year.

Year	Number of funds	Capitalization	Capital flows/ Capitalization	Buy-and-hold return (BHR)	Dollar weighted return (DWR)	Performance Gap BHR-DWR
1970	11	982,428		8.52%	13.84%	-5.32%
1971	15	1,442,122	-0.006	7.55%	-3.45%	10.99%
1972	29	2,084,812	-0.060	-33.36%	-30.73%	-2.63%
1973	32	2,356,532	0.000	-40.22%	-36.23%	-3.99%
1974	33	1,467,552	0.005	-28.74%	-46.87%	18.14%
1975	34	1,486,622	0.003	16.25%	-14.00%	30.25%
1976	34	1,812,773	0.001	51.94%	22.04%	29.90%
1977	33	1,908,124	0.002	18.97%	15.99%	2.98%
1978	33	2,142,109	0.003	22.71%	24.15%	-1.44%
1979	34	2,598,093	0.005	40.46%	27.99%	12.47%
1980	38	3,135,224	0.003	35.74%	23.00%	12.73%
1981	38	3,599,463	0.002	-3.02%	-3.10%	0.08%
1982	40	3,547,572	0.001	68.58%	109.02%	-40.44%
1983	42	5,417,425	-0.001	35.31%	23.00%	12.32%
1984	46	5,653,157	0.000	8.22%	1.93%	6.29%
1985	61	7,995,286	-0.012	23.99%	18.04%	5.95%
1986	70	12,022,760	-0.007	21.39%	16.23%	5.16%
1987	82	14,711,349	-0.003	-3.23%	-13.40%	10.17%
1988	95	14,346,668	-0.002	15.00%	7.13%	7.87%
1989	101	16,528,452	-0.006	-4.13%	-5.63%	1.50%
1990	106	13,287,751	0.000	-22.29%	-20.23%	-2.06%
1991	117	15,175,023	-0.004	34.94%	25.87%	9.07%
1992	122	18,437,810	-0.007	17.17%	9.74%	7.43%
1993	163	29,941,888	-0.031	34.82%	30.18%	4.64%
1994	204	45,800,152	-0.020	2.43%	-1.01%	3.44%
1995	212	54,275,548	-0.009	20.99%	21.31%	-0.32%
1996	219	74,410,856	-0.013	43.78%	41.09%	2.69%
1997	236	123,437,720	-0.022	29.68%	25.34%	4.33%
1998	248	158,513,456	-0.016	-9.66%	-11.30%	1.64%
1999	246	148,422,384	0.002	-3.91%	-2.73%	-1.18%
2000	237	147,732,448	0.009	19.98%	21.24%	-1.26%
2001	232	168,148,960	0.003	26.51%	19.82%	6.69%
2002	226	189,846,768	0.000	13.21%	11.79%	1.41%
2003	226	215,716,288	-0.002	42.78%	48.08%	-5.30%

2004	246	302,899,488	-0.002	28.16%	25.38%	2.78%
2005	248	365,936,288	0.001	4.97%	11.02%	-6.05%
2006	240	432,790,400	0.006	28.55%	23.81%	4.75%
2007	217	430,399,264	0.010	-17.59%	-22.14%	4.55%
2008	191	312,088,032	0.001	-36.81%	-39.82%	3.01%
2009	182	221,767,184	-0.006	35.50%	59.15%	-23.66%
2010	175	315,617,440		20.25%	25.78%	-5.53%
1970-2010						
Mean		94,875,211	-0.004	14.03%	11.01%	3.03%
Median		15,175,023	0.000	18.97%	15.99%	3.01%
STD		130,735,972	0.012	24.66%	28.14%	11.50%
p10		1,812,773	-0.017	-22.29%	-22.14%	-5.32%
p25		3,135,224	-0.007	-3.02%	-3.45%	-1.26%
p75		158,513,456	0.002	29.68%	24.15%	7.43%
p90		312,088,032	0.005	40.46%	30.18%	12.47%
1970-1991						
Mean		6,077,332	-0.004	12.48%	7.03%	5.45%
Median		3,341,398	0.000	15.63%	10.48%	6.12%
STD		5,479,234	0.014	27.64%	31.44%	14.02%
p10		1,469,459	-0.007	-28.09%	-29.68%	-3.85%
p25		1,952,296	-0.004	-3.18%	-11.46%	-1.06%
p75		11,015,891	0.002	32.20%	22.76%	11.98%
p90		14,674,881	0.003	39.99%	25.70%	17.60%
1992-2001						
Mean		96,912,122	-0.010	18.18%	15.37%	2.81%
Median		98,924,288	-0.011	20.48%	20.53%	3.06%
STD		58,108,021	0.012	17.18%	16.36%	3.09%
p10		28,791,480	-0.023	-4.48%	-3.59%	-1.19%
p25		47,919,001	-0.019	6.12%	1.68%	0.17%
p75		148,249,900	0.000	28.89%	24.33%	4.56%
p90		159,477,006	0.003	35.71%	31.27%	6.77%
2002-2010						
Mean		309,673,461	0.001	13.22%	15.89%	-2.67%
Median		312,088,032	0.000	20.25%	23.81%	1.41%
STD		89,372,083	0.005	25.98%	31.12%	9.03%
p10		210,542,384	-0.003	-21.43%	-25.68%	-9.57%
p25		221,767,184	-0.002	4.97%	11.02%	-5.53%
p75		365,936,288	0.002	28.55%	25.78%	3.01%
p90		430,877,491	0.007	36.95%	50.30%	4.59%

Table 5.2: Individual REIT comparisons between buy-and-hold and dollar weighted returns

This table shows descriptive statistics for buy-and-hold (BHR) and dollar weighted returns (DWR) and the performance gap for the full sample of 373 REITs. P-values of two tailed and one tailed t-tests on the difference in means between BHR and DWR and a Wilcoxon singed rank on the difference in medians are also reported.

Variable	**BHR**	**DWR**	**Performance gap**
Number of REITs	373	373	373
Mean	0.034	0.023	0.010
P-value t-test (Ha: mean(diff) != 0)		0.026	
P-value t-test (Ha: mean(diff) > 0		0.013	
Median	0.080	0.069	0.005
P-value Wilcoxon signed rank test		0.000	
STD	0.180	0.201	0.090
p10	-0.184	-0.202	-0.034
p25	-0.026	-0.036	-0.010
p75	0.133	0.125	0.026
p90	0.176	0.178	0.053

Table 5.3: Industry and cross-sectional effects for individual REITs

This table presents the distributions of BHR, DWR and HDWR as well as the resulting PG, Industry and cross-sectional effects calculated for a total sample of 370 individual REITs

	BHR	**DWR**	**HDWR**	**PG**	**Industry Effect**	**Cross-sectional Effect**
	(1)	(2)	(3)	(1)-(2)	(1)-(3)	(3)-(2)
p5	-35.13%	-39.74%	-35.82%	-7.45%	-12.93%	-8.77%
p10	-18.42%	-20.19%	-17.51%	-3.52%	-7.61%	-3.59%
p25	-2.19%	-3.47%	-0.82%	-1.02%	-2.61%	-0.93%
p50	8.08%	6.99%	8.89%	0.55%	-0.51%	1.03%
p75	13.38%	12.56%	14.02%	2.53%	0.90%	3.94%
p90	18.04%	18.16%	18.87%	5.27%	2.92%	10.17%
p95	22.67%	24.19%	24.15%	10.54%	5.05%	16.93%
Mean	3.50%	2.49%	4.70%	1.01%	-1.20%	2.21%

Table 5.4: Performance gap distribution for the value weighted index generated using bootstrapping procedure

This table presents the distributions of DWR, BHR and PG generated using the bootstrapping procedure in Dichev (2007) after 1000 iterations.

Bootstrapping Distribution			
Percentile	*BHR*	*DWR*	*PG*
p5	11.00%	6.69%	4.31%
p10	11.00%	9.07%	1.93%
p25	11.00%	11.65%	-0.65%
p50	11.00%	13.68%	-2.68%
p75	11.00%	15.01%	-4.01%
p90	11.00%	15.90%	-4.90%
p95	11.00%	16.40%	-5.40%
Actual Value			
0.102	11.00%	9.12%	1.88%

Table 5.5: Performance gap and REIT alpha

This table presents our analysis of the relationship between performance gap and REIT alpha. We use the Fama-French 3 factor model and the Fama-French 3 factor model augmented with momentum to calculate alphas for individual REITs. Average REIT alpha, BHR, DWR, PG and the p-values of a t-test on the difference between BHR and DWR are reported by alpha quintiles below.

Quintiles 3 factor model	Alpha	BHR	DWR	PG	t-test
1 Best	1.71%	17.88%	18.50%	-0.63%	0.517
2	0.74%	10.20%	8.38%	1.82%	0.000
3	0.43%	8.50%	7.62%	0.88%	0.006
4	0.03%	1.65%	0.66%	0.99%	0.364
5 Worst	-1.94%	-21.25%	-23.39%	2.14%	0.226

Quintiles 4 factor model	Alpha	BHR	DWR	PG	t-test
1 Best	1.79%	16.12%	16.65%	-0.54%	0.577
2	0.83%	10.96%	9.56%	1.40%	0.001
3	0.53%	8.25%	7.24%	1.01%	0.049
4	0.11%	3.37%	1.51%	1.86%	0.026
5 Worst	-1.83%	-21.60%	-23.08%	1.48%	0.424

*P-values reported

Table 5.6: Performance gap and length of REIT coverage

This table shows the performance gap by quintiles based on length of REIT coverage in the sample. Average length in months, BHR, DWR, PG and the p-values of a t-test on the difference between BHR and DWR are reported below.

Length Quintiles	Average length (in months)	BHR	DWR	PG	t-test*
1 Shortest	38.55	-2.71%	-0.61%	-2.10%	0.087
2	79.32	0.71%	-1.15%	1.86%	0.011
3	130.59	4.44%	3.93%	0.50%	0.536
4	189.21	6.76%	4.59%	2.16%	0.061
5 Longest	337.67	7.71%	4.94%	2.77%	0.019

*P-values reported

Table 5.7: Performance gap throughout recessions before winsorization

This table summarizes our results for relationship between BHR and DWR for individual REITs calculated for recession periods only. For each US recession within our sample period, as dated by the NBER, we include all REITs that have existed for at least two periods during the recession. We then calculate the capital flows, the resulting dollar weighted returns and geometric returns for these REITs, starting with an initial value equal to the market capitalization of the REIT during the first period it appears during the recession (typically that would be the start of the recession) and ending with the last period of its existence that falls within that same recessionary period (frequently the end of the recession). The number of REITs for each recession, the distribution of BHR, DWR and PG and statistical tests on the significance of PG are summarized here.

Recession 1		**Jan. 1970 - Nov. 1970**												
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	11	5.62		-2.17		0.240	-26.73	-25.06	-22.99	-7.78	21.91	37.88	42.57	46.33
DWR	11	6.96		-3.34		0.276	-28.99	-27.30	-25.19	-8.41	25.95	42.38	49.59	55.36
PG	11	-1.34	0.275	0.50	0.722	0.038	-9.22	-7.97	-6.42	-3.08	0.97	2.20	2.24	2.26
Recession 2		**Nov. 1973 - March 1975**												
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	34	-14.71		-7.02		0.342	-73.17	-70.63	-52.28	-44.22	7.87	30.02	47.67	60.50
DWR	34	-14.16		-9.10		0.393	-75.33	-72.91	-55.81	-45.63	8.68	32.84	80.10	86.39
PG	34	-0.55	0.742	1.45	0.028 **	0.096	-37.42	-17.58	-4.95	0.05	2.86	4.35	5.11	5.22
Recession 3		**Jan. 1980 - July 1980**												
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	35	19.58		28.09		0.293	-36.42	-33.33	-24.93	-11.15	43.23	51.56	61.53	63.55
DWR	35	27.16		36.59		0.344	-41.41	-38.01	-23.98	-7.89	56.38	66.38	73.06	76.21
PG	35	-7.58	0.005 ***	-4.99	0.000 ***	0.156	-68.11	-52.01	-16.37	-9.53	1.83	3.37	4.68	4.99
Recession 4		**July 1981 - Nov. 1982**												
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	39	17.54		16.49		0.240	-29.12	-24.67	-14.57	1.60	30.51	50.52	58.75	70.26
DWR	39	18.38		19.33		0.253	-31.05	-27.12	-15.41	1.50	31.58	52.98	61.75	74.27
PG	39	-0.83	0.065 *	-0.10	0.159	0.027	-10.67	-5.35	-3.18	-1.71	0.53	1.60	1.68	2.16

Recession 5 **July 1990 - March 1991**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	106	9.78		9.81		0.493	-89.61	-49.86	-44.50	-24.37	26.53	61.14	102.72	215.33
DWR	106	11.57		9.96		0.581	-92.47	-54.21	-48.80	-27.65	29.91	69.03	126.84	275.52
PG	106	-1.79	0.076 *	0.17	0.810	0.103	-70.30	-16.92	-6.85	-3.07	3.41	4.28	4.84	7.70

Recession 6 **March 2001 - Nov 2001**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	228	20.38		17.68		0.429	-83.58	-38.28	-23.47	3.81	31.71	51.65	96.86	197.19
DWR	228	24.13		21.13		0.493	-85.70	-43.11	-27.81	4.95	36.32	59.86	116.25	239.86
PG	228	-3.75	0.000 ***	-2.88	0.000 ***	0.097	-49.49	-15.98	-9.04	-5.10	-0.27	2.64	4.79	18.04

Recession 7 **Dec. 2007 - June 2009**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	191	-31.42		-28.21		0.298	-98.05	-88.26	-73.46	-51.30	-10.46	3.04	6.03	31.49
DWR	191	-29.52		-28.83		0.500	-99.42	-89.94	-77.16	-52.19	-11.73	3.53	8.17	143.53
PG	191	-1.91	0.501	1.08	0.000 ***	0.391	-74.10	-2.52	-0.82	0.31	2.09	3.29	3.94	7.66

All Recessions

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	644	1.04		3.27		0.444	-93.52	-69.49	-50.76	-27.11	23.35	43.08	65.92	186.64
DWR	644	3.76		3.58		0.538	-94.22	-73.67	-53.02	-29.05	26.90	49.98	78.34	233.39
PG	644	-2.71	0.003 ***	-0.05	0.000 ***	0.229	-48.87	-12.35	-6.99	-3.37	1.68	3.45	4.30	8.25

† P-values reported

***,**, and * indicate significance at the 1%, 5% and 10% respectively

Table 5.8: Performance gap throughout recessions after winsorization

This table summarizes our results for relationship between BHR and DWR for individual REITs calculated for recession periods only using data winsorized at 5%. For each US recession within our sample period, as dated by the NBER, we include all REITs that have existed for at least two periods during the recession. We then calculate the capital flows, the resulting dollar weighted returns and geometric returns for these REITs, starting with an initial value equal to the market capitalization of the REIT during the first period it appears during the recession (typically that would be the start of the recession) and ending with the last period of its existence that falls within that same recessionary period (frequently the end of the recession). The number of REITs for each recession, the distribution of BHR, DWR and PG and statistical tests on the significance of PG are summarized here.

Recession 1	**Jan. 1970 - Nov. 1970**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	11	5.62		-2.17		0.240	-26.73	-25.06	-22.99	-7.78	21.91	37.88	42.57	46.33
DWR	11	6.96		-3.34		0.276	-28.99	-27.30	-25.19	-8.41	25.95	42.38	49.59	55.36
PG	11	-1.34	0.275	0.50	0.722	0.038	-9.22	-7.97	-6.42	-3.08	0.97	2.20	2.24	2.26
Recession 2	**Nov. 1973 - March 1975**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	34	-15.43		-7.02		0.319	-69.11	-69.11	-52.28	-44.22	7.87	30.02	40.03	40.03
DWR	34	-14.43		-9.10		0.379	-71.47	-71.47	-55.81	-45.63	8.68	32.84	76.36	76.36
PG	34	-1.00	0.543	1.45	0.028 **	0.095	-37.47	-36.76	-4.95	0.05	2.86	4.35	5.11	5.22
Recession 3	**Jan. 1980 - July 1980**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	35	19.80		28.09		0.288	-31.49	-31.49	-24.93	-11.15	43.23	51.56	61.53	63.55
DWR	35	27.40		36.59		0.339	-35.98	-35.98	-23.98	-7.89	56.38	66.38	73.06	76.21
PG	35	-7.60	0.008 ***	-4.99	0.000 ***	0.156	-68.11	-52.01	-16.37	-9.53	1.83	3.37	4.49	4.49
Recession 4	**July 1981 - Nov. 1982**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	39	17.25		16.49		0.226	-24.67	-24.67	-14.57	1.60	30.51	50.52	58.75	58.75
DWR	39	18.02		19.33		0.238	-27.12	-27.12	-15.41	1.50	31.58	52.98	61.75	61.75
PG	39	-0.77	0.085 *	-0.10	0.185	0.027	-10.67	-5.35	-3.00	-1.71	0.53	1.60	2.45	2.45

Recession 5 **July 1990 - March 1991**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank†*		*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	106	6.90			9.81			0.367	-49.18	-49.18	-44.50	-24.37	26.53	61.14	89.51	89.51
DWR	106	8.59			9.96			0.443	-53.88	-53.88	-48.80	-27.65	29.91	69.03	124.14	124.14
PG	106	-1.69	0.055	*	0.17	0.742		0.090	-34.63	-34.63	-6.85	-3.07	3.51	4.70	4.84	7.70

Recession 6 **March 2001 - Nov 2001**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank†*		*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	228	18.85			17.68			0.297	-35.83	-35.83	-23.47	3.81	31.71	51.65	91.51	91.51
DWR	228	21.77			21.13			0.340	-42.69	-42.69	-27.81	4.95	36.32	59.86	104.49	104.49
PG	228	-2.92	0.000	***	-2.88	0.000	***	0.055	-16.09	-12.98	-9.04	-5.10	-0.30	3.13	6.86	11.48

Recession 7 **Dec. 2007 - June 2009**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank†*		*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	191	-31.95			-28.21			0.270	-87.64	-87.64	-73.46	-51.30	-10.46	3.04	5.95	5.95
DWR	191	-32.80			-28.83			0.277	-89.61	-89.61	-77.16	-52.19	-11.73	3.53	6.78	6.78
PG	191	0.85	0.002	***	1.08	0.000	***	0.038	-27.57	-1.40	-0.83	0.31	2.01	3.03	3.94	7.66

All Recessions

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank†*		*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	644	-0.19			3.27			0.371	-87.64	-61.93	-48.14	-27.01	23.00	42.03	63.93	91.51
DWR	644	1.41			3.58			0.414	-89.61	-62.94	-50.22	-28.72	26.69	48.86	74.44	115.30
PG	644	-1.60	0.000	***	-0.10	0.000	***	0.071	-34.63	-12.98	-6.99	-3.32	1.73	3.53	4.70	7.09

† P-values reported

***,**, and * indicate significance at the 1%, 5% and 10% respectively

Any period with less than 30 observations has not been winsorized.

Table 5.9: Performance gap throughout expansions before winsorization

Table X2: This table summarizes our results for relationship between BHR and DWR for individual REITs calculated for expansion periods only. For each US expansion within our sample period, as dated by the NBER, we include all REITs that have existed for at least two periods during the expansion. We then calculate the capital flows, the resulting dollar weighted returns and geometric returns for these REITs, starting with an initial value equal to the market capitalization of the REIT during the first period it appears during the expansion (typically that would be the start of the expansion) and ending with the last period of its existence that falls within that same expansionary period (frequently the end of the expansion). The number of REITs for each expansion, the distribution of BHR, DWR and PG and statistical tests on the significance of PG are summarized here.

Expansion 1	**Dec. 1970 - Oct. 1973**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	32	-2.41		3.97		0.236	-62.37	-58.72	-43.78	-13.23	13.66	22.33	27.10	28.21
DWR	32	-2.33		4.76		0.251	-65.84	-62.18	-46.38	-14.04	15.38	23.57	30.69	32.04
PG	32	-0.08	0.826	-0.29	0.940	0.020	-3.93	-3.81	-3.43	-1.08	1.21	3.10	3.46	3.47
Expansion 2	**Apr. 1975 - Dec. 1979**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	35	19.00		15.76		0.195	-28.66	-15.31	-4.76	11.70	30.31	39.53	53.78	67.51
DWR	35	19.30		15.45		0.204	-30.85	-16.09	-5.92	12.91	32.13	41.21	54.78	68.43
PG	35	-0.30	0.266	-0.29	0.112	0.015	-3.12	-3.09	-2.40	-1.11	0.28	1.70	3.42	3.85
Expansion 3	**Aug. 1980 - June 1981**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	38	17.71		13.76		0.318	-27.40	-26.87	-16.38	0.66	25.79	56.00	80.23	122.03
DWR	38	19.99		15.40		0.364	-29.97	-29.90	-17.86	0.21	28.58	63.86	91.25	140.80
PG	38	-2.28	0.005 ***	-1.38	0.002 ***	0.047	-18.77	-11.02	-7.27	-3.54	0.26	2.10	2.32	2.78
Expansion 4	**Dec. 1982 - June 1990**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	101	1.44		3.29		0.180	-66.82	-32.80	-22.02	-7.87	14.06	19.90	25.52	51.54
DWR	101	2.17		2.46		0.200	-67.30	-32.76	-23.94	-7.91	14.06	21.86	31.27	69.26
PG	101	-0.72	0.414	-0.11	0.554	0.089	-80.10	-6.92	-4.56	-1.37	0.96	4.70	6.19	12.36

Expansion 5 **Apr. 1991 - Feb. 2001**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	291	6.37		9.50		0.158	-46.80	-27.95	-16.43	2.42	14.44	20.55	24.44	41.90
DWR	291	4.62		7.81		0.169	-52.68	-30.21	-16.45	-0.28	12.67	20.89	25.43	46.90
PG	291	1.76	0.000 ***	0.89	0.000 ***	0.055	-18.38	-4.20	-1.51	-0.21	2.73	7.15	12.93	23.55

Expansion 6 **Dec. 01 - Nov. 2007**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	288	0.11		0.13		0.208	-0.55	-0.29	-0.11	0.05	0.21	0.29	0.38	0.57
DWR	288	0.12		0.13		0.282	-0.57	-0.35	-0.14	0.04	0.21	0.30	0.44	1.18
PG	288	-0.01	0.219	0.00	0.387	0.127	-0.84	-0.06	-0.03	-0.01	0.01	0.04	0.07	0.16

Expansion 7 **July 2009 - June 2010**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	179	38.09		26.88		0.564	-67.83	-32.87	-12.84	10.78	54.88	89.16	135.62	314.77
DWR	179	40.32		28.95		0.607	-78.59	-35.26	-13.78	11.38	55.03	99.37	152.98	330.05
PG	179	-2.22	0.006 ***	-2.03	0.000 ***	0.108	-43.50	-16.21	-10.21	-4.60	-0.13	3.11	13.34	48.41

All Expansions

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	964	14.20		11.48		0.339	-52.77	-29.16	-15.34	2.76	20.94	39.05	57.04	147.76
DWR	964	14.60		-15.53		0.381	-55.76	-32.63	-16.13	1.31	21.55	43.51	63.79	168.01
PG	964	-0.27	0.201	0.51	0.593	0.097	-30.09	-7.35	-4.46	-1.52	1.38	4.56	8.07	23.80

† P-values reported

***,**, and * indicate significance at the 1%, 5% and 10% respectively

Table 5.10: Performance gap throughout expansions after winsorization

This table summarizes our results for relationship between BHR and DWR for individual REITs calculated for expansion periods only using data winsorized at 5 %. For each US expansion within our sample period, as dated by the NBER, we include all REITs that have existed for at least two periods during the expansion. We then calculate the capital flows, the resulting dollar weighted returns and geometric returns for these REITs, starting with an initial value equal to the market capitalization of the REIT during the first period it appears during the expansion (typically that would be the start of the expansion) and ending with the last period of its existence that falls within that same expansionary period (frequently the end of the expansion). The number of REITs for each expansion, the distribution of BHR, DWR and PG and statistical tests on the significance of PG are summarized here.

Expansion 1	**Dec. 1970 - Oct. 1973**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	32	-2.41		3.97		0.236	-62.37	-58.72	-43.78	-13.23	13.66	22.33	27.10	28.21
DWR	32	-2.33		4.76		0.251	-65.84	-62.18	-46.38	-14.04	15.38	23.57	30.69	32.04
PG	32	-0.08	0.826	-0.29	0.940	0.020	-3.93	-3.81	-3.43	-1.08	1.21	3.10	3.46	3.47
Expansion 2	**Apr. 1975 - Dec. 1979**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	35	19.00		15.76		0.195	-28.66	-15.31	-4.76	11.70	30.31	39.53	53.78	67.51
DWR	35	19.30		15.45		0.204	-30.85	-16.09	-5.92	12.91	32.13	41.21	54.78	68.43
PG	35	-0.30	0.266	-0.29	0.112	0.015	-3.12	-3.09	-2.40	-1.11	0.28	1.70	3.42	3.85
Expansion 3	**Aug. 1980 - June 1981**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	38	17.71		13.76		0.318	-27.40	-26.87	-16.38	0.66	25.79	56.00	80.23	122.03
DWR	38	19.99		15.40		0.364	-29.97	-29.90	-17.86	0.21	28.58	63.86	91.25	140.80
PG	38	-2.28	0.005 ***	-1.38	0.002 ***	0.047	-18.77	-11.02	-7.27	-3.54	0.26	2.10	2.32	2.78
Expansion 4	**Dec. 1982 - June 1990**													
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	101	1.44		3.29		0.180	-66.82	-32.80	-22.02	-7.87	14.06	19.90	25.52	51.54
DWR	101	2.17		2.46		0.200	-67.30	-32.76	-23.94	-7.91	14.06	21.86	31.27	69.26
PG	101	-0.72	0.414	-0.11	0.554	0.089	-80.10	-6.92	-4.56	-1.37	0.96	4.70	6.19	12.36

Expansion 5 **Apr. 1991 - Feb. 2001**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	291	6.37		9.50		0.158	-46.80	-27.95	-16.43	2.42	14.44	20.55	24.44	41.90
DWR	291	4.62		7.81		0.169	-52.68	-30.21	-16.45	-0.28	12.67	20.89	25.43	46.90
PG	291	1.76	0.000 ***	0.89	0.000 ***	0.055	-18.38	-4.20	-1.51	-0.21	2.73	7.15	12.93	23.55

Expansion 6 **Dec. 01 - Nov. 2007**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	288	0.11		0.13		0.208	-0.55	-0.29	-0.11	0.05	0.21	0.29	0.38	0.57
DWR	288	0.12		0.13		0.282	-0.57	-0.35	-0.14	0.04	0.21	0.30	0.44	1.18
PG	288	-0.01	0.219	0.00	0.387	0.127	-0.84	-0.06	-0.03	-0.01	0.01	0.04	0.07	0.16

Expansion 7 **July 2009 - June 2010**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	179	38.09		26.88		0.564	-67.83	-32.87	-12.84	10.78	54.88	89.16	135.62	314.77
DWR	179	40.32		28.95		0.607	-78.59	-35.26	-13.78	11.38	55.03	99.37	152.98	330.05
PG	179	-2.22	0.006 ***	-2.03	0.000 ***	0.108	-43.50	-16.21	-10.21	-4.60	-0.13	3.11	13.34	48.41

All Expansions

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	964	14.20		11.48		0.339	-52.77	-29.16	-15.34	2.76	20.94	39.05	57.04	147.76
DWR	964	14.60		-15.53		0.381	-55.76	-32.63	-16.13	1.31	21.55	43.51	63.79	168.01
PG	964	-0.27	0.201	0.51	0.593	0.097	-30.09	-7.35	-4.46	-1.52	1.38	4.56	8.07	23.80

† P-values reported

***,**, and * indicate significance at the 1%, 5% and 10% respectively

Table 5.11: Performance gap and complete business cycles before winsorization

This table summarizes our results for relationship between BHR and DWR for individual REITs calculated for complete business cycles. We use the NBER dating of the US business cycle and two definitions for complete business cycles: from peak to peak and from trough to trough. For each complete business cycle within our sample period we include all REITs that have existed for at least two periods during that business cycle. We then calculate the capital flows, the resulting dollar weighted returns and geometric returns for these REITs, starting with an initial value equal to the market capitalization of the REIT during the first period it appears during that business cycle (typically that would be the start of the cycle, unless data for the REIT became available later on) and ending with the last period of its existence that falls within that same cycle (frequently the end of the cycle unless the REIT/REIT coverage was discontinued before the end of the cycle). The number of REITs for each cycle, the distribution of BHR, DWR and PG and statistical tests on the significance of PG are summarized here.

Panel A: Peak-to-peak cycles

Peak-to-peak 1 **Jan. 1970 - Oct 1973**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank†*		*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	32	-2.24			3.91			0.224	-62.37	-58.72	-41.54	-13.23	11.28	22.23	27.10	28.21
DWR	32	-2.13			4.63			0.239	-65.84	-62.18	-44.00	-14.04	12.25	23.57	30.69	32.04
PG	32	-0.11	0.748		-0.49	0.736		0.019	-3.93	-3.81	-2.99	-0.96	1.03	2.88	3.46	3.47

Peak-to-peak 2 **Nov. 1973 - Dec. 1979**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank†*		*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	30	5.85			6.02			0.150	-23.18	-22.83	-19.06	-5.16	19.25	23.38	31.21	31.78
DWR	30	4.85			4.05			0.153	-24.51	-24.32	-19.69	-5.57	17.37	23.90	29.30	29.86
PG	30	1.00	0.011	**	0.92	0.004	***	0.020	-4.18	-3.43	-1.04	0.24	1.98	4.04	4.47	4.70

Peak-to-peak 3 **Jan. 1980 - June 1981**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank†*		*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	38	16.99			19.15			0.227	-25.88	-24.40	-14.26	1.69	32.45	45.99	52.79	70.77
DWR	38	18.97			20.18			0.242	-28.30	-25.78	-15.01	4.28	35.08	49.20	56.26	74.97
PG	38	-1.98	0.038	**	-1.00	0.004	***	0.057	-24.98	-13.79	-4.58	-2.39	0.58	1.34	2.16	2.71

Peak-to-peak 4 **July 1981 - June 1990**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	101	1.97		4.58		0.178	-66.82	-30.72	-22.02	-7.34	13.58	19.18	22.37	51.54
DWR	101	2.15		3.62		0.190	-67.30	-31.81	-23.94	-7.26	13.72	20.31	26.95	58.13
PG	101	-0.18	0.767	0.08	0.856	0.061	-48.16	-7.18	-3.96	-1.21	1.42	5.36	7.41	12.14

Peak-to-peak 5 **July 1990 - Feb. 2001**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	291	6.18		9.28		0.159	-48.40	-27.17	-15.18	2.42	14.42	20.01	24.16	41.90
DWR	291	4.51		7.33		0.169	-55.20	-30.21	-16.25	0.67	12.71	19.49	22.95	46.90
PG	291	1.66	0.000 ***	0.81	0.000 ***	0.053	-19.70	-4.04	-1.66	-0.21	2.59	7.18	13.33	19.10

Peak-to-peak 6 **Mar. 2001 - Nov. 2007**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	298	10.94		13.85		0.197	-64.32	-34.42	-12.10	5.50	21.11	30.49	37.66	50.92
DWR	298	10.82		13.88		0.215	-66.73	-35.64	-13.90	4.06	21.45	31.05	41.20	68.53
PG	298	0.12	0.772	-0.13	0.834	0.070	-35.03	-7.50	-3.26	-1.02	1.05	4.80	9.21	24.63

Peak-to-peak 7 **Dec. 2007 - June 2010**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	195	-13.65		-6.40		0.274	-97.99	-78.83	-54.16	-21.80	4.12	11.63	17.47	28.59
DWR	195	-11.52		-5.44		0.306	-99.41	-81.53	-54.35	-20.47	4.62	11.97	22.10	99.71
PG	195	-2.13	0.068 *	0.16	0.866	0.162	-88.58	-7.34	-3.61	-1.17	1.23	2.83	3.95	16.74

All Peak-to-Peak Cycles

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	985	3.40		7.90		0.224	-78.17	-40.01	-23.04	-5.90	16.09	23.61	30.54	50.08
DWR	985	3.36		6.88		0.237	-80.93	-42.32	-24.74	-5.64	16.07	24.74	33.24	57.74
PG	985	0.04	0.895	0.24	0.000 ***	0.090	-32.52	-6.11	-3.00	-0.87	1.55	4.41	7.54	17.96

Panel B: Trough-to-trough cycles

Trough-to-trough 1 Dec. 1970 - March 1975

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	34	-15.23		-14.96		0.226	-0.59	-55.39	-47.29	-29.63	4.33	11.06	19.29	29.95
DWR	34	-13.86		-16.92		0.283	-0.60	-57.32	-50.09	-30.67	5.09	12.57	33.39	65.83
PG	34	-1.37	0.414	0.23	0.675	0.096	-37.65	-18.12	-5.61	-1.52	1.71	2.54	6.95	8.64

Trough-to-trough 2 Apr. 1975 - July 1980

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	36	21.36		20.18		0.188	-26.88	-10.24	-4.12	13.77	33.20	39.36	46.47	63.81
DWR	36	22.09		21.90		0.194	-29.24	-11.35	-3.99	14.47	35.27	40.38	46.90	64.50
PG	36	-0.73	0.100 *	-0.36	0.128	0.026	-8.70	-7.70	-4.03	-1.13	0.54	1.70	3.30	3.53

Trough-to-trough 3 Aug. 1980 - Nov. 1982

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	39	15.61		16.11		0.159	-17.27	-13.10	-9.29	10.45	24.84	33.73	39.21	52.63
DWR	39	15.66		16.26		0.163	-17.74	-13.59	-10.16	9.23	24.47	33.01	38.60	54.21
PG	39	-0.04	0.831	0.23	0.956	0.013	-2.75	-2.12	-1.90	-1.05	0.76	1.43	1.62	2.64

Trough-to-trough 4 Dec. 1982- Mar. 1991

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	106	4.19		5.37		0.245	-67.00	-35.07	-20.39	-7.97	14.03	20.95	31.17	142.22
DWR	106	5.27		4.83		0.292	-67.22	-36.52	-24.10	-7.07	13.57	22.32	42.91	166.96
PG	106	-1.08	0.297	-0.06	0.891	0.106	-81.28	-9.44	-5.49	-1.14	1.55	4.73	7.31	27.21

Trough-to-trough 5 Apr. 1991 - Nov. 2001

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	295	7.19		10.55		0.156	-41.89	-30.86	-13.54	3.26	15.28	20.58	24.66	48.60
DWR	295	5.53		9.14		0.172	-58.70	-31.77	-15.84	1.30	14.14	20.21	25.20	48.02
PG	295	1.66	0.000 ***	0.92	0.000 ***	0.055	-13.71	-3.89	-1.93	-0.26	2.64	6.46	9.96	24.35

Trough-to-trough 6 **Dec. 2001 - June 2009**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*		*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	292	1.99		5.02			0.243	-68.73	-39.93	-29.87	-6.64	16.27	24.93	33.50	48.58
DWR	292	3.09		5.11			0.317	-69.52	-44.24	-31.24	-7.16	15.78	25.00	38.57	100.21
PG	292	-1.10	0.186	-0.28	0.132		0.142	-64.90	-10.23	-7.50	-1.82	1.34	6.55	11.35	35.42

All trough-to-trough cycles

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*		*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	802	4.99		8.81			0.217	-56.18	-36.70	-23.54	-4.35	16.01	24.50	33.36	54.28
DWR	802	5.01		8.01			0.293	-66.52	-42.24	-24.04	-4.42	15.13	25.16	34.90	100.21
PG	802	0.01	0.697	0.00	0.001	***	0.102	-33.14	-8.67	-3.54	-1.06	1.77	5.30	9.03	23.21

† P-values reported

***,**, and * indicate significance at the 1%, 5% and 10% respectively

Table 5.12: Performance gap and complete business cycles after winsorization

This table summarizes our results for relationship between BHR and DWR for individual REITs calculated for complete business cycles using winsorized data. We use the NBER dating of the US business cycle and two definitions for complete business cycles: from peak to peak and from trough to trough. For each complete business cycle within our sample period we include all REITs that have existed for at least two periods during that business cycle. We then calculate the capital flows, the resulting dollar weighted returns and geometric returns for these REITs, starting with an initial value equal to the market capitalization of the REIT during the first period it appears during that business cycle (typically that would be the start of the cycle, unless data for the REIT became available later on) and ending with the last period of its existence that falls within that same expansionary period (frequently the end of the cycle unless the REIT/REIT coverage was discontinued before the end of the cycle). The number of REITs for each cycle, the distribution of BHR, DWR and PG and statistical tests on the significance of PG are summarized here.

Panel A: Peak-to-peak cycles

Peak-to-peak 1			**Jan. 1970 - Oct 1973**											
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	32	-2.00		3.91		0.213	-0.55	-54.96	-41.54	-13.23	11.28	22.23	25.96	25.96
DWR	32	-1.92		4.63		0.229	-0.58	-58.41	-44.00	-14.04	12.25	23.57	29.30	29.30
PG	32	-0.09	0.791	-0.49	0.765	0.018	-3.58	-3.46	-2.99	-0.96	1.03	2.88	3.45	3.45
Peak-to-peak 2			**Nov. 1973 - Dec. 1979**											
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	30	5.83		6.02		0.148	-22.22	-22.22	-19.06	-5.16	19.25	23.38	30.24	30.24
DWR	30	4.81		4.05		0.151	-23.98	-23.98	-19.69	-5.57	17.37	23.90	28.33	28.33
PG	30	1.02	0.007 ***	0.92	0.003 ***	0.019	-4.18	-3.43	-1.04	0.32	1.90	3.75	4.47	4.70
Peak-to-peak 3			**Jan. 1980 - June 1981**											
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	38	16.24		19.15		0.206	-24.27	-24.27	-14.26	1.69	32.45	45.99	51.24	51.24
DWR	38	18.24		20.18		0.220	-25.57	-25.57	-15.01	4.28	35.08	49.20	54.65	54.65
PG	38	-1.99	0.035 **	-1.00	0.003 ***	0.056	-24.98	-13.79	-3.52	-2.39	0.58	1.29	1.81	1.99

Peak-to-peak 4 **July 1981 - June 1990**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	101	1.95		4.58		0.143	-28.08	-28.08	-22.02	-7.34	13.58	19.18	20.56	20.56
DWR	101	1.97		3.62		0.152	-28.93	-28.93	-23.94	-7.26	13.72	20.31	24.54	24.54
PG	101	-0.02	0.970	0.08	0.886	0.049	-32.62	-6.91	-3.99	-1.36	1.30	5.36	7.41	12.14

Peak-to-peak 5 **July 1990 - Feb. 2001**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	291	6.28		9.28		0.129	-26.57	-26.57	-15.18	2.42	14.42	20.01	24.00	24.00
DWR	291	4.73		7.33		0.131	-29.39	-29.39	-16.25	0.67	12.71	19.49	22.74	22.74
PG	291	1.55	0.000 ***	0.81	0.000 ***	0.047	-19.70	-3.92	-1.26	-0.05	2.82	6.40	9.92	17.21

Peak-to-peak 6 **Mar. 2001 - Nov. 2007**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	298	11.16		13.85		0.169	-34.40	-34.40	-12.10	5.50	21.11	30.49	37.49	37.49
DWR	298	10.94		13.88		0.182	-35.56	-35.56	-13.90	4.06	21.45	31.05	41.10	41.10
PG	298	0.22	0.465	-0.13	0.788	0.051	-17.70	-6.14	-3.61	-0.96	1.08	3.95	6.92	19.73

Peak-to-peak 7 **Dec. 2007 - June 2010**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	195	-13.14		-6.40		0.247	-76.63	-76.63	-54.16	-21.80	4.12	11.63	17.18	17.18
DWR	195	-12.08		-5.44		0.256	-79.51	-79.51	-54.35	-20.47	4.62	11.97	22.05	22.05
PG	195	-1.06	0.070 *	0.16	0.707	0.081	-43.53	-7.34	-4.67	-1.50	1.28	2.88	3.95	16.74

All Peak-to-Peak Cycles

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	985	3.57		7.90		0.199	-76.63	-34.40	-22.66	-5.90	16.09	22.81	29.31	37.49
DWR	985	3.31		6.88		0.205	-79.51	-35.44	-24.38	-5.64	16.07	22.74	29.99	41.10
PG	985	0.26	0.144	0.32	0.000 ***	0.057	-22.45	-4.88	-3.38	-0.86	1.55	3.92	7.09	16.04

Panel B: Trough-to-trough cycles

Trough-to-trough 1 Dec. 1970 - March 1975

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	34	-15.75		-14.96		0.207	-0.53	-53.50	-47.29	-29.63	4.33	11.06	12.94	12.94
DWR	34	-15.94		-16.92		0.216	-0.56	-55.62	-50.09	-30.67	5.09	12.57	14.08	14.08
PG	34	0.18	0.738	0.23	0.521	0.031	-6.40	-6.29	-4.63	-1.18	1.82	2.54	6.95	8.64

Trough-to-trough 2 Apr. 1975 - July 1980

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	36	21.32		20.18		0.140	-5.25	-5.25	-4.12	13.77	33.20	39.36	41.27	41.27
DWR	36	22.10		21.90		0.144	-5.98	-5.98	-3.99	14.47	35.27	40.38	41.62	41.62
PG	36	-0.78	0.069 *	-0.36	0.099 *	0.025	-8.70	-7.70	-4.03	-1.13	0.54	1.48	2.11	3.04

Trough-to-trough 3 Aug. 1980 - Nov. 1982

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	39	15.37		16.11		0.147	-13.93	-13.93	-11.61	10.10	24.91	35.45	43.29	43.29
DWR	39	15.45		16.26		0.151	-14.13	-14.13	-13.16	9.18	25.37	33.25	45.51	45.51
PG	39	-0.08	0.700	0.23	0.845	0.013	-2.75	-2.22	-2.11	-1.07	0.82	1.51	2.20	2.64

Trough-to-trough 4 Dec. 1982- Mar. 1991

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	106	2.47		5.37		0.156	-32.32	-32.32	-20.39	-7.97	14.03	20.95	26.46	26.46
DWR	106	2.80		4.83		0.180	-36.14	-36.14	-24.10	-7.07	13.57	22.32	38.66	38.66
PG	106	-0.32	0.651	-0.06	0.326	0.073	-50.50	-12.20	-5.91	-1.14	2.15	4.73	7.31	27.21

Trough-to-trough 5 **Apr. 1991 - Nov. 2001**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	295	7.02		10.55		0.156	-41.89	-30.86	-13.54	3.26	15.28	20.58	24.66	48.60
DWR	295	5.75		9.14		0.172	-58.70	-31.77	-15.84	1.30	14.14	20.21	25.20	48.02
PG	295	1.26	0.000 ***	0.92	0.000 ***	0.055	-13.71	-3.89	-1.93	-0.26	2.64	6.46	9.96	24.35

Trough-to-trough 6 **Dec. 2001 - June 2009**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	292	1.97		5.02		0.196	-40.45	-40.45	-30.02	-6.66	16.36	25.00	33.61	33.61
DWR	292	1.96		5.11		0.210	-45.08	-45.08	-31.76	-7.27	15.88	25.38	39.50	39.50
PG	292	0.01	0.971	-0.21	0.397	0.061	-20.76	-8.90	-5.89	-1.82	1.73	6.37	9.44	22.46

All Trough-to-trough Cycles

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank†*	*STD*	*p1 (%)*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*	*p99 (%)*
BHR	802	4.66		8.81		0.177	-40.45	-30.86	-22.30	-4.35	15.96	24.47	27.41	37.27
DWR	802	5.02		8.01		0.261	-66.71	-37.60	-24.04	-4.42	15.13	25.16	34.90	83.61
PG	802	-0.36	0.510	0.65	0.003 ***	0.153	-57.16	-10.11	-4.59	-1.08	2.00	6.56	11.38	28.65

† P-values reported

***,**, and * indicate significance at the 1%, 5% and 10% respectively

Table 5.13: Individual REIT statistics on time weighted average returns, dollar weighted average returns, total difference, timing and capacity components

This table shows descriptive statistics for time weighted average returns (TWAR), dollar weighted average returns (DWAR), the total difference (DWAR-TWAR) and the timing and capacity components for the full sample of 373 REITs. P-values on two-tailed t-tests and Wilcoxon singed rank tests on the total difference, timing and capacity components are also reported. The statistics are presented for the full sample 1970-2010, as well as the subsamples 1970-1991 (Old REIT era), 1992-2001 (New REIT era) and 2002-2010 (Most Recent Era).

Full Sample 1970-2010

Variable	*TWAR*	*DWAR*	*Total Difference*	*Timing component*	*Capacity component*
Number of REITs	373	373	373		
Mean	9.65%	8.94%	-0.71%	0.00%	-0.71%
Median	13.29%	12.17%	-0.51%	-0.03%	-0.52%
T-test*			0.068	0.803	0.071
Wilcoxon signed rank test*			0.000	0.006	0.000
STD	17.97%	18.77%	7.50%	0.29%	7.54%
p10	-3.59%	-6.11%	-5.95%	-0.19%	-5.84%
p25	6.78%	5.52%	-2.49%	-0.09%	-2.46%
p75	17.13%	15.94%	0.70%	0.06%	0.67%
p90	21.37%	22.09%	2.75%	0.18%	2.73%

1970-1991

Variable	*TWAR*	*DWAR*	*Total Difference*	*Timing component*	*Capacity component*
Number of REITs	117	117	117	117	117
Mean	6.01%	4.18%	-1.83%	0.01%	-1.84%
Median	9.31%	7.39%	-0.33%	-0.03%	-0.37%
T-test*			0.128	0.932	0.136
Wilcoxon signed rank test*			0.010	0.003	0.029
STD	23.41%	32.00%	12.93%	1.08%	13.24%
p10	-23.08%	-23.51%	-6.47%	-0.25%	-6.35%
p25	-1.42%	-2.83%	-2.39%	-0.13%	-2.37%
p75	15.60%	16.22%	0.69%	0.03%	0.72%
p90	23.35%	22.43%	3.75%	0.21%	3.88%

1992-2001					
Variable	*TWAR*	*DWAR*	*Total Difference*	*Timing component*	*Capacity component*
Number of REITs	297	297	297	297	297
Mean	13.67%	11.68%	-1.99%	-0.05%	-1.94%
Median	13.79%	12.34%	-1.25%	-0.04%	-1.21%
T-test*			0.000	0.001	0.000
Wilcoxon signed rank test*			0.000	0.000	0.000
STD	14.24%	15.23%	6.35%	0.25%	6.36%
p10	0.00%	-2.66%	-6.78%	-0.11%	-6.70%
p25	9.30%	6.18%	-3.25%	-0.07%	-3.20%
p75	18.41%	16.79%	0.16%	-0.01%	0.16%
p90	27.78%	24.58%	1.77%	0.04%	1.82%

2002-2010					
Variable	*TWAR*	*DWAR*	*Total Difference*	*Timing component*	*Capacity component*
Number of REITs	296	296	296	296	296
Mean	12.08%	12.34%	0.26%	-0.07%	0.32%
Median	13.93%	13.48%	0.00%	-0.06%	0.06%
T-test*			0.646	0.000	0.563
Wilcoxon signed rank test*			0.517	0.000	0.802
STD	25.39%	25.58%	9.60%	0.14%	9.60%
p10	-6.00%	-5.90%	-4.87%	-0.22%	-4.64%
p25	6.48%	6.00%	-1.42%	-0.12%	-1.31%
p75	21.17%	20.94%	1.07%	0.00%	1.11%
p90	28.49%	29.09%	4.10%	0.06%	4.04%

*p-values reported

Table 5.14: Total difference, timing and capacity components during recessions

This table summarizes our results for relationship between TWAR and DWAR for individual REITs calculated for recessionary periods only. For each US recession within our sample period, as dated by the NBER, we include all REITs that have existed for at least two periods during the recession. The number of REITS for each recession, the distribution of TWAR, DWAR, the total difference and the timing and capacity components are summarized here. We also report the results of statistical tests on the statistical significance of the total difference, timing and capacity components.

Recession 1		**Jan. 1970 - Nov. 1970**										
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank test†*	*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	11	4.13		4.96		0.240	-33.87	-21.31	-14.80	25.22	30.50	41.84
DWAR	11	9.01		4.09		0.260	-30.13	-24.72	-2.90	30.29	48.62	48.67
Total Difference	11	4.88	0.198	5.06	0.213	0.120	-12.97	-9.51	-6.20	15.07	18.17	25.41
Timing	11	-1.93	0.130	4.03	0.328	0.390	-4.04	-4.04	-4.04	0.82	5.49	5.50
Capacity	11	6.81	0.102	4.98	0.155	0.156	-8.96	-5.47	-4.88	19.10	22.21	29.45

Recession 2		**Nov. 1973 - March 1975**										
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank test†*	*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	34	-19.44		-17.09		0.406	-87.73	-59.86	-45.38	-2.77	31.22	55.64
DWAR	34	-9.42		-2.24		0.433	-84.51	-55.57	-38.58	13.31	45.72	67.91
Total Difference	34	10.02	0.000 ***	8.20	0.000 ***	0.108	-1.99	-0.77	2.90	16.58	23.76	25.21
Timing	34	0.94	0.000 ***	0.94	0.000 ***	0.560	0.70	0.78	0.85	1.08	1.62	1.87
Capacity	34	9.08	0.000 ***	7.26	0.000 ***	0.110	-3.58	-1.64	2.12	15.73	22.67	24.12

Recession 3		**Jan. 1980 - July 1980**										
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*	*Median (%)*	*Wilcoxon signed-rank test†*	*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	35	44.39		44.71		0.300	-61.00	27.60	24.29	68.88	84.48	91.88
DWAR	35	19.39		33.79		0.540	-78.26	-39.41	-4.05	51.01	62.90	74.98
Total Difference	35	-25.00	0.004 ***	-13.05	0.000 ***	0.470	-62.55	-51.59	-26.57	-4.58	2.02	9.18
Timing	35	-0.48	0.456	0.29	0.000 ***	0.037	-15.17	0.08	0.20	0.33	0.37	2.66
Capacity	35	-24.52	0.002 ***	-13.36	0.000 ***	0.439	-87.38	-51.94	-26.80	-4.66	2.06	8.92

Recession 4 **July 1981 - Nov. 1982**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	39	23.33			22.69			0.320	-24.43	-13.08	9.28	31.00	52.64	64.88
DWAR	39	19.74			19.82			0.230	-24.17	-7.62	7.23	30.41	51.14	58.08
Total Difference	39	-3.59	0.422		0.39	0.337		0.280	-16.52	-7.69	-1.68	4.78	8.13	9.07
Timing	39	0.12	0.742		0.47	0.000	***	0.220	-0.21	0.37	0.42	0.54	0.60	0.63
Capacity	39	-3.71	0.407		0.26	0.591		0.280	-17.01	-8.08	-2.17	5.48	8.23	9.64

Recession 5 **July 1990 - March 1991**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	106	8.54			10.16			0.440	-56.51	-42.96	-24.33	28.00	53.48	79.68
DWAR	106	12.43			15.34			0.440	-48.33	-42.26	-13.93	32.48	61.11	88.96
Total Difference	106	3.89	0.002	***	0.99	0.010	***	0.120	-11.73	-8.67	-4.08	10.34	18.67	27.40
Timing	106	0.40	0.002	***	0.57	0.000	***	0.130	0.19	0.37	0.50	0.63	0.67	0.68
Capacity	106	3.49	0.005	***	0.70	0.032	**	0.120	-12.40	-9.18	-4.65	9.95	18.24	26.72

Recession 6 **March 2001 - Nov 2001**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	228	17.95			20.25			0.440	-36.36	-21.60	3.45	35.07	55.33	79.50
DWAR	228	19.04			20.90			0.420	-37.61	-15.34	5.88	33.45	50.24	88.49
Total Difference	228	1.09	0.266		0.63	0.584		0.150	-19.31	-10.38	-5.02	5.47	11.11	21.99
Timing	228	-0.02	0.000	***	-0.02	0.000	***	0.015	-0.02	-0.02	-0.02	-0.02	-0.02	-0.01
Capacity	228	0.03	0.003	***	0.03	0.000	***	0.156	-0.17	-0.08	-0.03	0.07	0.13	0.24

Recession 7 **Dec. 2007 - June 2009**

Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	191	-21.36			-13.26			0.690	-79.15	-69.05	-34.05	2.92	13.13	29.69
DWAR	191	-22.38			-10.98			0.630	-82.16	-68.76	-33.36	2.94	12.97	26.82
Total Difference	191	-1.02	0.762		0.08	0.610		0.470	-15.88	-7.40	-3.60	4.21	7.50	13.07
Timing	191	0.16	0.007	***	0.03	0.004	***	0.010	-0.35	-0.20	-0.07	0.14	0.29	0.44
Capacity	191	-1.19	0.726		0.08	0.822		0.470	-15.93	-7.09	-3.83	3.86	7.47	13.21

All Recessions

Variable	*Observations*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	644	-4.52			3.49			0.482	-90.54	-47.00	-19.41	16.51	34.79	51.42
DWAR	644	-3.55			3.52			0.531	-88.54	-45.67	-18.28	16.07	36.99	52.07
Total Difference	644	0.98	0.441		-0.05	0.301		0.226	-14.32	-8.32	-3.92	2.71	8.44	13.98
Timing	644	0.16	0.000	***	0.09	0.000	***	0.347	-0.09	-0.04	0.03	0.23	0.35	0.52
Capacity	644	0.82	0.514		-0.30	0.154		0.224	-14.41	-8.60	-4.11	2.75	8.23	13.72

† P-values reported

***,**, and * indicate significance at the 1%, 5% and 10% respectively

Table 5.15: Total difference, timing and capacity components during expansions

This table summarizes our results for relationship between TWAR and DWAR for individual REITs calculated for economic expansions only. For each US expansion within our sample period, as dated by the NBER, we include all REITs that have existed for at least two periods during the expansion. The number of REITS for each expansion, the distribution of TWAR, DWAR, the total difference and the timing and capacity components are summarized here. We also report the results of statistical tests on the statistical significance of the total difference, timing and capacity components.

Expansion 1		**Dec. 1970 - Oct. 1973**											
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	32	-0.77			5.87			0.244	-64.67	-35.54	-11.09	14.93	22.01	28.89
DWAR	32	-1.77			5.53			0.265	-71.14	-39.41	-12.01	16.07	23.64	28.09
Total Difference	32	-1.00	0.085	*	-0.60	0.116		0.032	-6.82	-4.91	-2.25	0.67	2.84	4.13
Timing	32	-0.83	0.005	***	-0.57	0.002	***	0.015	-3.12	-1.62	-1.50	-0.05	0.80	1.26
Capacity	32	-0.17	0.718		0.18	0.808		0.026	-4.97	-3.93	-1.77	1.07	3.18	5.05

Expansion 2		**Apr. 1975 - Dec. 1979**											
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	35	24.43			21.97			0.149	9.74	10.99	15.77	29.63	45.56	54.81
DWAR	35	24.26			21.21			0.205	-27.48	9.04	15.77	35.02	50.86	61.14
Total Difference	35	-0.17	0.918		1.34	0.095	*	0.096	-15.38	-3.71	-1.10	4.23	6.34	7.91
Timing	35	0.07	0.409		-0.07	0.013	**	0.005	-0.27	-0.18	-0.08	-0.04	0.79	1.76
Capacity	35	-0.24	0.886		1.41	0.092	*	0.098	-15.11	-3.26	-1.19	4.31	6.42	7.99

Expansion 3		**Aug. 1980 - June 1981**											
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	38	17.08			16.23			0.279	-28.71	-20.66	5.59	28.88	39.43	54.37
DWAR	38	18.01			16.88			0.289	-30.13	-15.20	3.92	29.01	52.44	68.11
Total Difference	38	0.94	0.462		1.09	0.455		0.078	-12.05	-10.02	-3.79	4.35	13.74	15.54
Timing	38	0.05	0.230		0.01	0.088	*	0.003	-0.04	-0.03	-0.01	0.03	0.09	0.35
Capacity	38	0.89	0.486		1.02	0.500		0.078	-12.05	-10.05	-3.46	4.36	13.72	15.55

Expansion 4		**Dec. 1982 - June 1990**											
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	101	4.82			6.36			0.166	-23.87	-15.92	-2.83	15.70	20.02	26.84
DWAR	101	4.91			6.05			0.174	-24.51	-17.32	-3.51	15.80	22.46	26.82
Total Difference	101	0.08	0.846		0.00	0.775		0.043	-5.40	-3.93	-1.47	1.09	4.36	5.46
Timing	101	0.00	0.885		0.00	0.883		0.001	-0.19	-0.17	-0.07	0.06	0.12	0.18
Capacity	101	0.08	0.847		-0.03	0.759		0.042	-5.13	-3.83	-1.43	1.13	4.25	5.60
Expansion 5		**Apr. 1991 - Feb. 2001**											
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	291	11.28			12.12			0.134	-13.79	-4.81	7.17	17.11	22.79	29.81
DWAR	291	9.46			10.67			0.141	-16.88	-5.53	5.71	15.40	22.91	29.44
Total Difference	291	-1.82	0.000	***	-0.87	0.000	***	0.066	-10.59	-5.85	-2.71	0.27	1.57	3.91
Timing	291	-0.02	0.000	***	-0.02	0.000	***	0.000	-0.10	-0.07	-0.04	0.00	0.02	0.04
Capacity	291	-1.79	0.000	***	-0.86	0.000	***	0.066	-10.50	-5.78	-2.63	0.31	1.56	3.83
Expansion 6		**Dec. 01 - Nov. 2007**											
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	288	15.01			14.92			0.220	-18.58	-3.53	8.27	22.87	33.90	44.98
DWAR	288	14.21			15.07			0.244	-20.00	-6.73	6.54	21.79	30.68	44.57
Total Difference	288	-0.80	0.027	**	-0.51	0.000	***	0.062	-9.12	-4.62	-2.03	0.48	2.06	3.33
Timing	288	-0.04	0.000	***	-0.03	0.000	***	0.002	-0.23	-0.15	-0.08	-0.01	0.03	0.04
Capacity	288	-0.76	0.037	**	-0.45	0.000	***	0.062	-9.07	-4.57	-1.97	0.55	2.00	3.38
Expansion 7		**July 2009 - June 2010**											
Variable	*Number of REITs*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	179	44.01			37.91			0.476	-15.63	1.91	20.53	59.51	94.90	119.37
DWAR	179	36.78			30.14			0.530	-31.43	-6.33	13.75	53.90	94.56	121.99
Total Difference	179	-7.22	0.000	***	-5.38	0.000	***	0.182	-29.52	-20.97	-12.78	-0.56	7.95	15.89
Timing	179	-0.26	0.000	***	-0.23	0.000	***	0.189	-0.51	-0.38	-0.26	-0.22	-0.21	-0.20
Capacity	179	-6.96	0.000	***	-5.16	0.000	***	18.249	-29.26	-20.69	-12.55	-0.34	8.17	16.12

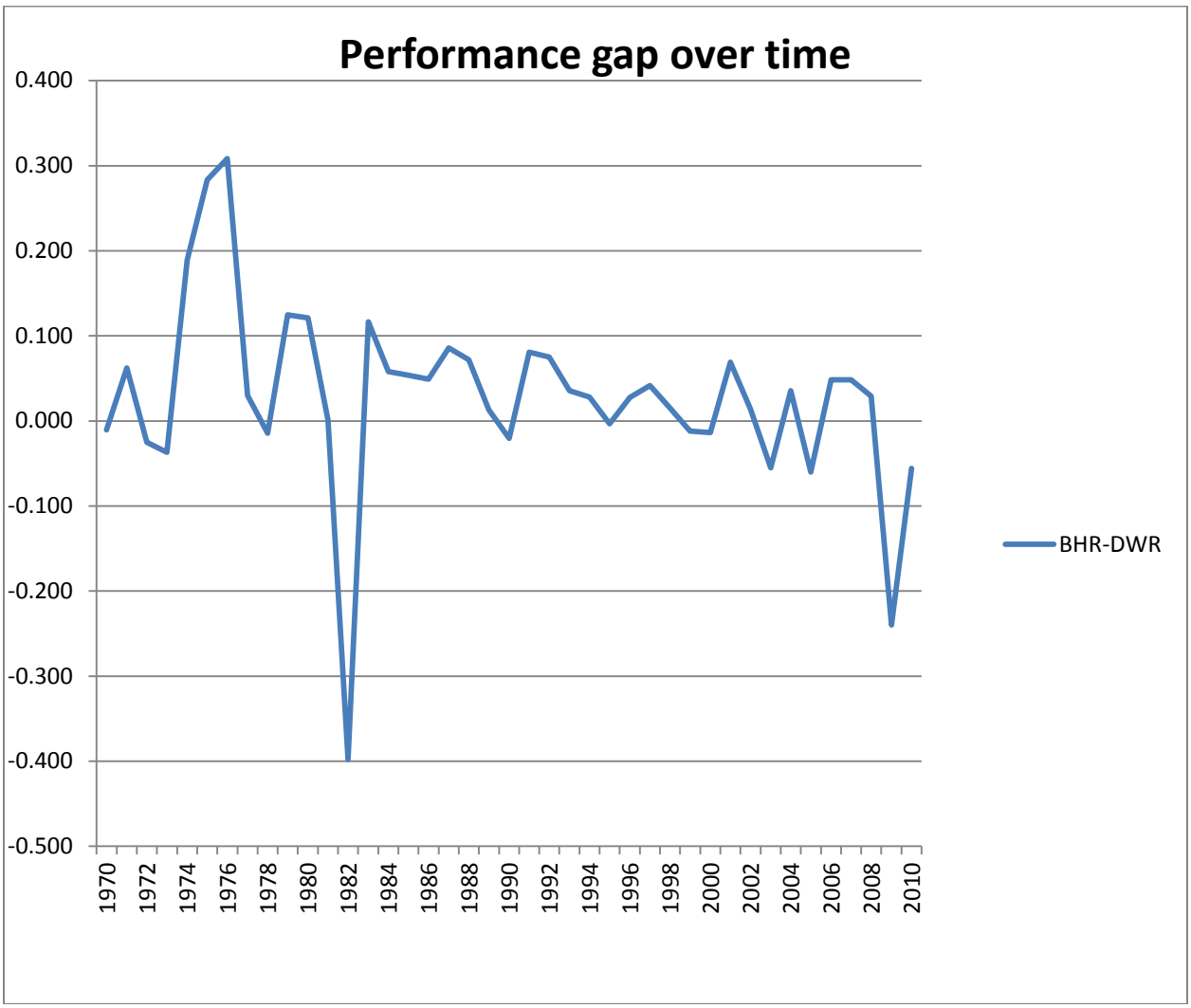
All Expansions

Variable	*Observations*	*Mean (%)*	*Two-tailed t-test†*		*Median (%)*	*Wilcoxon signed-rank test†*		*STD*	*p5 (%)*	*p10 (%)*	*p25 (%)*	*p75 (%)*	*p90 (%)*	*p95 (%)*
TWAR	964	13.03			15.05			0.170	-14.79	-1.66	9.30	20.02	24.70	32.16
DWAR	964	12.48			14.27			0.186	-14.59	-4.22	7.72	19.45	25.30	34.27
Total Difference	964	-0.55	0.056	*	-0.47	0.000	***	0.056	-8.12	-4.62	-1.91	0.78	2.83	4.92
Timing	964	-0.02	0.225		-0.03	0.000	***	0.003	-0.27	-0.19	-0.09	0.04	0.12	0.20
Capacity	964	-0.54	0.065	*	-0.44	0.000	***	0.056	-7.94	-4.59	-1.96	0.76	2.75	5.32

† P-values reported

***,**, and * indicate significance at the 1%, 5% and 10% respectively

Figure 5.1: Performance gap over time



CHAPTER VI

SUMMARY AND CONCLUSIONS

Buy-and-hold returns, while a good measure of the returns generated by a financial entity, are unsuitable to measure the returns of the average investor. Dollar weighted or dollar weighted average returns are a more suitable measure of investor returns as they take the timing of cash flows in conjunction with the returns into account. The difference between asset and investor returns can provide information about overall investor timing ability and reveal capacity constraints. This dissertation contributes to the body of knowledge regarding investor actual returns and investor timing by investigating investor returns in REITs.

Prior studies on mutual funds, hedge funds and broad market indices find without exception that investors perform worse than the assets they are investing in (see Dichev, 2007; Friesen and Sapp, 2007; Keswani and Stolin, 2008; Dichev and Yu, 2011; Ciccotello et al., 2011). We use two different measures of investor returns: the dollar weighted returns and the dollar weighted average returns and obtain similar findings using both measures lending robustness to the investigation. Our sample period is 1970-2010. We divide it into three subsamples 1970-1991, 1992-2001 and 2001-2010 corresponding to the three stages in REIT development “vintage REIT”, “new REIT” and most recent REIT era as identified in Case et al. (2012).

For the full sample our findings on REIT investor returns reveal a gap of usually less than 1% on an annualized basis. This performance gap is smaller in magnitude relative to the performance gaps of other assets previously examined which fall in the 1% to 5.3% range. The magnitude of the gap is time varying and decreasing over later subsamples. This result is in line with the idea of investors becoming savvier over time and is consistent with the findings in comparable studies. We also find scenarios, notably economic downturns, under which REIT investors are actually able to significantly outperform REIT returns.

A notable difference between REITs and other assets is revealed when examining the relationship between the performance gap and the business cycle. Keswani and Stolin's 2008 paper finds that investors in the overall stock market (NYSE and Nasdaq) perform significantly worse than their assets during economic downturns and slightly better than those assets during economic expansions. Our findings suggest the opposite is true of REITs. REIT investors perform significantly better than BHR during recessions and slightly worse than BHR during economic expansions. Thus we come to the conclusion that the performance gap where the average investor performs worse than the asset they have invested in is not a universal phenomenon, but rather dependent on (at least) the asset under investigation.

We perform an additional analysis of the gap between investor returns and asset returns and following Ciccotello et al. (2011) separate this gap into a timing and capacity component. We find that the timing component accounts for a small percentage of the overall gap, but is nevertheless usually statistically significant. The larger share of the gap can be attributed to capacity constraints. This result is not surprising given that capacity constraints are more likely to arise in highly specialized investment vehicles. By their very nature REITs specialize by investing exclusively in real estate, but they frequently specialize even further by investing in a

particular type of real estate (retail, health care, office, hotel, or residential REITs). In addition, expansion in real estate investment is subject to both the physical constraints regarding the speed with which new construction can be accomplished or the availability of space to complete the project and demographical constraints regarding whether such an expansion can be supported by the local population.

The analysis of investor returns especially relevant from a practical point of view. Individual investors are concerned about the actual returns they have earned. Investors should take into account likely reductions in the prospective returns they would earn as demonstrated by the performance gap and plan accordingly the actual savings needed to fund retirement. Overall the results of our study side with the literature recommending a more passive approach to investment as investor returns in REITs typically lag behind BHR. The magnitude of this difference has however been declining over time and is far more pronounced in earlier subsamples, making it necessary to revisit the data and this recommendation a few years from now. In addition, REITs are a particularly investor-friendly asset during economic recessions. The true magnitude of this is understated when looking at the traditional BHR. Our results show that overall for recessions actual investor returns are higher than BHR by 1.6% per annum.

Our analysis shows that the difference between asset and investor returns is declining over time. It also uncovers some key differences between REITs and other assets investigated in the literature. Further analysis of the performance gap for different assets, industries and international markets is thus warranted. Performance gap analysis of different industries could bring about industry characteristics that correspond to superior or inferior investor timing. Since REITs are frequently considered a defensive asset, analysis of other industries perceived as good defensive investments, in particular healthcare and pharmaceuticals could yield similar results.

In addition, research on the dollar gap needs to be extended to include more international evidence. Dichev (2007) is the only article that examines the performance gap in international markets. Although his study is far-reaching and includes 19 out of the 25 largest markets by market capitalization, developing markets, including large and closely followed ones like Brazil, Russia, India, China and South Africa (BRICS) are missing from the analysis. Expanding the body of knowledge on investor timing and the performance gap to include various industries and developing international markets should be the subjects of future studies.

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