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REIT Momentum and Characteristic-Related REIT Returns

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Abstract Recent evidence confirms that in factor-model examinations of the cross-section of REIT returns, REIT momentum emerges as the dominant driver. Acknowledging the importance of momentum, the current study explores whether and how REIT return patterns are linked to the underlying characteristics of the REITs themselves, in the manner of Daniel and Titman's (Journal of Finance 52(1):1–33, 1997, Journal of Portfolio Management 24(4):24–33, 1998) characteristics model. Over the period 1993 through 2009, we find that after controlling for momentum, book-to-market, institutional ownership, and illiquidity are all strongly associated with REIT returns while size and analyst coverage are not. We further extend prior research by examining the influence of changes in interest rate cycles on REIT returns, and find that the characteristic-return relationships are heavily influenced by interest rates.

Keywords Real Estate Investment Trusts (REIT) · Return momentum · Characteristics models · Factor models · Monetary policy

Introduction

REITs as an asset class have become an increasingly important part of well diversified portfolios for both individual and institutional investors. Although REITs are very different from non-REIT equities in many ways, it has been shown that REIT and non-REIT equity returns have striking similarities. For example, both Chui et al.

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(2003a, b) and Derwall et al. (2009) use factor models to show that REIT returns are dominated by a momentum effect. The momentum effect in non-REIT equity returns has been described as an anomaly that evades rational explanations by asset pricing models. Such factor-model findings suggest that REIT returns and equity returns are similar with respect to the momentum effect. There exists, however, an alternative empirical framework with which to examine cross-sectional determinants, that being the "characteristics" framework of Daniel and Titman (1997, 1998).

In this study, we reexamine the influence of momentum and other characteristics on REIT returns using the Daniel and Titman framework and find clear distinctions between our evidence for REIT returns and prior studies' findings for non-REIT equity returns.[1] One of the starkest contrasts is found when comparing characteristic sorted portfolios across different interest rate environments

Motivation and Empirical Framework

The ubiquitous Fama and French (1993) and Carhart (1997) factor models used to explain patterns in the cross-section of stock and REIT returns rely on a risk, or covariance story. Specifically, the return premium for value stocks over growth stocks is due to the observation that value stocks covary similarly among themselves and with the underlying factor that proxies for risk. Though ubiquitous, factor models are not without controversy. Among the criticisms is that they are empirically motivated and have no theoretical linkage to the underlying fundamental drivers of returns. While there is much empirical support for factor models, Lewellen et al. (2010), among others, are highly critical of many of the tests and demonstrate that the results from them can be misleading.[2]

Daniel and Titman (1997, 1998) provide an alternative framework for explaining cross-sectional stock return patterns. They show that it is the underlying characteristics of the stocks (e.g., low book-to-market versus high book-to-market ratios), rather than the return covariance with a risk factor, that are responsible for cross-sectional return differences. Thus, Daniel and Titman offer a characteristics story, rather than strictly a covariance story. Like factor models, Daniel and Titman's characteristics model also has detractors (see, for example, Davis et al. 2000, and the subsequent "rebuttal" by Daniel et al. 2001).

Derwall et al. (2009), as well as earlier work by Chui et al. (2003a, b), extend non-REIT examinations to an examination of the cross section of REIT returns. Perhaps the most notable and consistent finding in these studies is that REIT momentum emerges as the dominant determinant of the cross-section of REIT returns. The competing variables examined in their tests (and in earlier studies they build upon) include size, book-to-market, momentum, volume, turnover, and analyst coverage, as well as the use of the Fama and French (1993) and Carhart (1997) models.

[1] For robustness, in untabulated results we conducted our analysis on all non-REIT firms with market capitalizations greater than $75 million. We find results consistent with prior literature in that returns have a significantly positive relationship with momentum and illiquidity and a significantly negative relationship with institutional ownership and analyst coverage. Size and book-to-market have the expected signs but are insignificant.

[2] We are not aware of a critical examination of the factor model methodology that focuses solely on REITs.

Interestingly, however, an extension of Daniel and Titman's (1997, 1998) approach to this issue is missing, providing a key motivation for our study.

In this study, we follow Derwall et al. (2009), Chui et al. (2003a, b), and earlier studies on the cross-section of REIT returns, and reexamine whether and how REIT characteristics are related to REIT returns, while controlling for the importance of momentum. Our interest is not in testing an asset pricing model in the sense of looking for "alpha." While Derwall et al. (2009) use factor models to provide important insights regarding momentum's influence on REIT fund performance measurement and comparison, the use of factor models in this study would not have furthered our understanding of the drivers of REIT returns. Instead, we seek to explore the drivers of REIT returns in Daniel and Titman's characteristics framework while accounting for the now well-established momentum effect. We are not aware of any studies that do this. Our extension updates Chui et al. (2003a) data by nearly a decade and introduces institutional ownership, a variable known to influence the existence of a value premium,[3] as a new variable not widely examined in REITs. We also contribute to the literature by examining the inter-temporal influences of interest rate levels, driven by Federal Reserve policy rates, on cross-sectional REIT returns and characteristics. While past studies have found the Fed's policy stance to be related to the level of REIT returns, we are unaware of studies that examine the influence of changes in policy rates on the relations between firm characteristics and REIT returns in a cross-sectional setting.

The Characteristics

Beyond the studies mentioned above, a vast literature examines the cross-sectional patterns of expected stock and REIT returns. Among the variables found to be most strongly related empirically to (non-REIT) stock returns are size and book-to-market equity (Fama and French 1992), momentum (Jegadeesh and Titman 1993), liquidity (Brennan et al. 1998; Liu 2006; and Korajczyk and Sadka 2008), institutional ownership (Nagel 2005), analyst coverage (Hong et al. 2000; Diether et al. 2002), and monetary policy (Jensen et al. 1996; and Jensen and Mercer 2002).

Among the variables found to be most strongly related empirically to REIT returns are size and book-to-market equity (Peterson and Hsieh 1997), momentum (Chui et al. 2003b; Hung and Glascock 2008, 2010), liquidity (Clayton and MacKinnon 2000; Cannon and Cole 2011), institutional ownership (Wang et al. 1995), analyst coverage (Chui et al. 2003a; Devos et al. 2007), and monetary policy (Chen et al. 2011; Chang et al. 2011). Each of these studies provide motivation for the particular variables they investigate, but in general the REIT literature has followed the non-REIT asset pricing literature to similarly motivate the variables. Given the findings of these studies, we examine the role of each of these variables.[4]

[3] See Phalippou (2008) for recent evidence.

[4] We do not examine idiosyncratic volatility for several reasons. First, measuring idiosyncratic risk requires, by definition, an assumed factor (risk) model. We are, however, simply examining return differences on portfolios with different characteristics, a la Daniel and Titman (1998), and choose to remain agnostic regarding factor models. Second, Hung and Glascock (2010) provide evidence that differences in idiosyncratic risk are positively related to momentum returns, which we implicitly control for in our double sorting procedures.

Our sample consists of all equity REITS from the CRSP database listed by PERMNOs in Feng et al. (2011) over the period 1993–2009.[5] We calculate monthly observations of each of the characteristics for every REIT in our sample, and define them as follows. Size (MV) is the month-end product of common shares outstanding and price per share from CRSP. Book-to-market (B/M) is calculated as the book value of common equity from Compustat in year t-1, where the year starts in June and ends in May, divided by the firm's market capitalization in December of year t-1. Momentum (MOM) is the compounded 6-month stock return from month t-7 to month t-2. Illiquidity (ILL) is the standardized turnover-adjusted number of zero daily trading volumes over the prior 12 months as defined in Liu (2006).[6] Institutional ownership (IO) is measured as the percent of shares outstanding held by institutions in the previous quarter as reported in the Thomson Reuters Institutional Holdings database. Analyst Coverage (COV) is defined as a binary indicator variable taking on the value of one if the firm had one or more analyst estimates in IBES, and zero otherwise.

A key contribution of this study is our use of the characteristic-sort procedure of Daniel and Titman (1997, 1998). This procedure, unlike a factor model approach, allows us to easily examine the influence of interest rates, a second key contribution presented later in the study. At the end of every month we rank all REITs on each of the characteristics and assign each REIT to one of three portfolios. The "*High*" portfolio contains the 1/3 of REITs with the highest value of the particular characteristic and the "*Low*" portfolio contains the 1/3 of REITs with the lowest value of the particular characteristic.[7] Following Derwall et al. (2009), we then obtain the next month's return on every REIT and calculate equally-weighted returns for the *High, Medium,* and *Low* portfolios. This procedure is repeated for every month in the

[5] There is little disagreement that the financial crisis of the last few years has had a major impact on financial markets and participants' investment decisions. Whether 'this time is different' is debatable, and not something we are prepared to take up in this study. We do, however, wish to allow for the possibility that the crisis might have produced anomalous and unknown pricing relationships during this period. To that end, we initially select August 2007 as the end of the sample because it is the first month (during the crisis period) that the Federal Reserve's FOMC conducted unscheduled meetings (two in fact), and the first cut in policy rates came in this month (i.e., the prior policy rate change was an increase in July 2006). This change-in-direction in Federal Reserve policy rates becomes important in our subsequent analyses. In unreported results using this truncated sample, we find qualitatively similar results to those reported over the full period. Similarly, we selected 1993 as the beginning of the full sample as this is the beginning of the modern REIT era. In the Appendix we report the summary statistics and results of the analysis incorporating the earlier REIT sample beginning in 1982 and running through 1992.

[6] Our liquidity measure is analogous to LM12 from Liu (2006). Our liquidity measure is highly correlated with the standard turnover measures with correlation coefficients between 0.60 and 0.80, depending on the turnover measure and time period used. However, we prefer LM12 because it incorporates several dimensions of liquidity, which include turnover, the continuity of trade or lock in risk, the trading quantity, and the cost of trading. See Liu (2006) for a more thorough discussion.

[7] For robustness, we also examined portfolios where the sample was sorted into fifths or halves. Qualitatively similar results were found using both methodologies and are not reported. While using fifths often increases the spread between high and low portfolios, the reduction in observations in each portfolio also increases the likelihood that the results can be driven by an outlier. We feel that using thirds is more informative than halves because it demonstrates a relationship's monotonicity or lack thereof.

sample. By focusing on one-month holding periods, we minimize the impact of momentum on the return measurement[8] (thereby allowing us to measure the effect of the other characteristics), but still allow for momentum in the construction of the portfolios.

Table 1 provides summary statistics for each of the characteristic variables. The sample contains 311 REITs from 1993 to 2009, resulting in 35,198 firm-year-month observations. Consistent with previous studies of REIT markets, the typical firm in our sample has a market capitalization of approximately $1.5 billion with an average Book-to-Market ratio of 0.855. Not surprisingly, we also observe a dramatic increase in REIT market values preceding the financial crisis and a stunning reversal in Book-to-Market values after its onset. Finally, the summary statistics in Table 1 readily illustrate the dramatic increase in liquidity, Institutional Ownership, and Analyst Coverage of REIT markets during our sample period.

Table 2 further delineates the attributes of our sample and presents the correlation coefficients between each pair of firm characteristics. While the vast majority of observed correlations are statistically significant, only four characteristic pairs exhibit coefficient estimates greater than 0.25 in absolute value. Specifically, Market Value appears to be positively correlated with both Institutional Ownership (ρ=0.413) and Analyst Coverage (ρ=0.386), while Institutional Ownership is inversely related to Illiquidity (ρ=−0.383) and directly related to Analyst Coverage (ρ=0.522).

The characteristic sorted REIT returns for the *High, Medium,* and *Low* portfolios formed on each of the characteristics are provided in Table 3. We present mean monthly returns, standard deviation of monthly returns, median returns, and p-values from t-tests of whether the REIT returns in the *High* versus *Low* portfolios are different. Consistent with the existing literature, the descriptive analysis of our results focuses on differences in mean returns across portfolio characteristics. Given the relatively small portfolio groupings in some years, particularly when sorted on multiple characteristics, we acknowledge the potential for a small group of outliers to materially influence individual results. As such, throughout our analyses we also report median portfolio returns. In general, the results from the two alternative metrics are qualitatively similar.[9]

The t-tests reveal significantly different mean returns on *High* versus *Low* portfolios when formed on Momentum, Institutional Ownership, and Illiquidity. As such, we implicitly control for Momentum in our subsequent analysis through a double sorting procedure. As expected, low Institutional Ownership portfolio mean returns are shown to be higher than high Institutional Ownership portfolio returns. Also as expected, mean returns from portfolios of illiquid REITs are significantly higher than mean returns from portfolios of liquid REITs. Market Value, Book-to-Market, and Analyst Coverage do not appear to be significantly related to average portfolio returns in this univariate setting.

[8] This difference in calculations is why the Momentum returns we report are not as large as those found in previous studies.

[9] We thank an anonymous referee for bringing this point to our attention.

Table 1 Summary statistics

Year	REITs	Market value equity	Book to market	Illiquidity	Institutional ownership	6 month return	Analyst coverage
1993	172	205	2.399	23.886	23.72 %	17.17 %	17.04 %
1994	213	234	1.343	18.391	33.97 %	4.83 %	6.97 %
1995	215	262	1.373	16.578	36.96 %	4.41 %	3.36 %
1996	219	357	0.894	15.615	38.78 %	10.31 %	4.19 %
1997	221	586	0.723	12.175	43.93 %	15.77 %	5.29 %
1998	216	739	0.727	9.295	43.99 %	0.62 %	5.78 %
1999	200	715	0.913	9.404	42.19 %	−1.22 %	15.26 %
2000	187	756	1.036	9.727	40.98 %	2.64 %	10.92 %
2001	180	873	1.163	9.919	39.93 %	10.94 %	35.33 %
2002	173	1010	0.980	9.089	45.56 %	7.50 %	56.53 %
2003	173	1146	1.058	9.039	51.58 %	9.42 %	65.41 %
2004	182	1542	0.666	5.342	59.99 %	12.32 %	71.44 %
2005	179	1807	0.557	4.119	64.31 %	11.53 %	78.19 %
2006	172	2310	0.587	5.394	68.30 %	8.23 %	80.43 %
2007	151	2652	0.506	5.050	70.83 %	5.39 %	82.05 %
2008	129	2101	0.628	6.990	72.85 %	−8.29 %	81.82 %
2009	124	1535	1.315	6.491	71.21 %	−2.15 %	87.53 %
Average	168	1495	0.855	7.324	57.07 %	5.12 %	60.45 %

The sample contains 311 unique equity REITs from 1993 to 2009. This results in 35,198 firm-year-month observations. Market value of equity is calculated by multiplying shares outstanding and the end of month price from CRSP. The book-to-market ratio uses prior year book values and current month market values. Illiquidity is calculated following Liu (2006). Institutional ownership is the percent of shares outstanding held by institutions. The 6-month stock return is a compounded return from t-7 to t-2. Analyst coverage is the percent of REITs with analyst coverage in IBES

Table 2 Correlations

	Market value equity	Book to market	Illiquidity	Institutional ownership	6 month return
Book to market	−0.113 (0.000)				
Illiquidity	−0.165 (0.000)	0.204 (0.000)			
Institutional ownership	0.413 (0.000)	−0.189 (0.000)	−0.383 (0.000)		
6 month return	0.035 (0.023)	0.019 (0.353)	0.004 (0.407)	−0.032 (0.086)	
Analyst coverage	0.386 (0.000)	−0.090 (0.064)	−0.238 (0.000)	0.522 (0.000)	−0.012 (0.026)

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Table 3 Characteristic sorted REIT returns

	Equally weighted return	Standard deviation	Median return	Momentum return	Book to market	Institutional ownership	Illiquidity	Analyst coverage	Market value equity
MV_L	1.05 %	5.55 %	0.95 %	5.18 %	1.554	25.20 %	29.955	26.63 %	108
MV_M	1.20 %	5.98 %	1.40 %	6.48 %	0.738	55.40 %	1.086	46.50 %	593
MV_H	1.35 % (0.321)	5.92 % (<.0001)	1.70 % (0.022)	7.48 %	0.569	66.30 %	0.229	51.38 %	2619
B/M_L	1.18 %	5.01 %	1.13 %	7.56 %	0.382	57.56 %	4.419	43.62 %	1696
B/M_M	1.20 %	5.50 %	1.30 %	6.45 %	0.700	53.41 %	5.966	45.01 %	1170
B/M_H	1.26 % (0.462)	6.92 % (<.0001)	1.52 % (0.189)	5.29 %	1.819	37.37 %	21.748	36.62 %	458
MOM_L	1.26 %	7.59 %	1.23 %	−10.37 %	1.196	46.54 %	13.782	38.98 %	840
MOM_M	1.19 %	5.28 %	1.53 %	5.62 %	0.772	52.41 %	6.590	43.64 %	1245
MOM_H	1.18 % (0.001)	4.62 % (<.0001)	1.43 % (0.527)	23.96 %	0.959	49.72 %	11.250	41.61 %	1248
IO_L	1.42 %	4.70 %	1.41 %	7.01 %	1.356	17.18 %	21.326	29.92 %	431
IO_M	0.98 %	5.83 %	1.26 %	5.55 %	0.827	51.61 %	3.024	49.64 %	1115
IO_H	1.12 % (0.063)	6.63 % (<.0001)	1.32 % (0.659)	6.94 %	0.620	80.67 %	0.711	52.22 %	1833
ILL_L	1.02 %	7.17 %	1.16 %	5.76 %	0.782	66.01 %	0.000	49.79 %	1337
ILL_M	1.13 %	5.78 %	1.38 %	6.74 %	0.866	56.12 %	0.062	48.33 %	1527
ILL_H	1.46 % (0.001)	4.24 % (<.0001)	1.35 % (0.023)	6.79 %	1.250	24.83 %	31.132	26.26 %	461
COV_0	1.15 %	3.73 %	1.35 %	6.27 %	1.050	32.22 %	22.038	0.00 %	451
COV_1	1.10 % (0.351)	7.25 % (<.0001)	1.80 % (0.001)	5.31 %	0.791	65.18 %	0.268	100.00 %	1891

P-values from t-tests between equity REIT returns from low and high portfolios are reported in parentheses. Returns are monthly. Market value (MV) of equity is calculated by multiplying shares outstanding and the end of month price from CRSP. The book-to-market (B/M) ratio uses prior year book values and current month market values. Illiquidity (ILL) is calculated following Liu (2006). Institutional ownership (IO) is the percent of shares outstanding held by institutions. The 6-month stock return is a compounded return from t-7 to t-2. Analyst coverage (COV) is the percent of REITs with analyst coverage in IBES

Interestingly, results obtained from examining median returns are somewhat different. Specifically, Market Value, Illiquidity, and Analyst Coverage all appear to be positively related to median returns, while Momentum and Institutional Ownership lose their previously reported significance levels.

Federal Reserve Monetary Policy and Policy Rates

Jensen and Mercer (2002) and Becher et al. (2008) provide evidence supporting a link between cross-sectional stock returns and changes in the Federal Reserve's policy rates. Specifically, they show that return premiums associated with cross-sectional characteristics (such as book-to-market) are generally higher in periods of falling policy rates which, if the policy stance is counter-cyclical, will more typically coincide with periods of economic slowdown and periods of lower consumption. Jensen and Moorman (2010) find inter-temporal variation in the return premium to illiquid stocks that is directly related to the same Federal Reserve policy rates. Buetow and Johnson (2001) examine the level (rather than the cross section) of REIT returns and Fed policy rates and find that REIT returns are significantly higher in periods of falling policy rates versus periods of rising policy rates, while Darrat and Glascock (1989) conclude that a measure of monetary policy (Granger) causes changes in real estate returns.

In contrast, Mueller and Pauley (1995) find little relation between interest rates and REIT returns, while Chen et al. (2011) full sample results fail to identify significant linkages between EREIT returns and monetary policy changes. Interestingly, Chen et al. (2011) also demonstrate that the influence of monetary policy on EREIT returns may well be contingent on market states (bull vs. bear markets) and expected returns. Specifically, using quantile regression, they conclude monetary policy changes only significantly influence EREIT returns during bull markets when investors possess relatively low expectations for future real estate price increases.

From a traditional real estate valuation perspective, required returns and capitalization rates in commercial property markets are determined by a variety of factors including income growth expectations, capital market risk premiums, and equilibrium market interest rates.[10] Based on this evidence, we control for Fed policy rates in the analysis via the creation of characteristic-sorted portfolios over periods of falling policy rates (expansive monetary policy) versus periods of rising policy rates (restrictive monetary policy).

Following Jensen et al. (1996), we classify every month as either an expansive policy month or a restrictive policy month. The rule is: expansive policy phases of the cycle begin when a discount rate decrease follows a discount rate increase, and ends with the next discount rate increase; restrictive policy phases of the cycle begin when a discount rate increase follows a discount rate decrease, and ends with the next

[10] Recent studies find that there may be additional drivers of cap rates, such as investor sentiment (Clayton et al. 2009) or growth of debt within the economy (Chervachidze and Wheaton 2010).

Table 4 Characteristic sorted REIT returns conditioned on monetary policy

	Restrictive		Expansive	
	Mean	Median	Mean	Median
MV_L	0.87 %	0.88 %	1.17 %	0.97 %
MV_M	1.04 %	0.67 %	1.30 %	1.68 %
MV_H	1.41 % (0.020)	1.52 % (0.001)	1.32 % (0.265)	1.77 % (0.031)
B/M_L	1.24 %	1.15 %	0.91 %	1.50 %
B/M_M	0.98 %	1.24 %	1.12 %	1.36 %
B/M_H	1.11 % (0.362)	1.09 % (0.419)	1.82 % (0.066)	1.72 % (0.298)
MOM_L	0.99 %	0.95 %	1.25 %	1.73 %
MOM_M	1.12 %	1.00 %	1.23 %	1.79 %
MOM_H	1.25 % (0.002)	1.26 % (0.037)	1.14 % (0.489)	1.48 % (0.168)
IO_L	1.00 %	1.24 %	1.68 %	1.73 %
IO_M	0.95 %	0.94 %	1.00 %	1.47 %
IO_H	1.32 % (0.185)	1.18 % (0.596)	1.00 % (0.000)	1.42 % (0.095)
ILL_L	0.90 %	0.64 %	1.10 %	1.43 %
ILL_M	1.16 %	1.03 %	1.12 %	1.39 %
ILL_H	1.27 % (0.045)	1.09 % (0.002)	1.76 % (0.011)	1.50 % (0.172)
COV_0	1.19 %	1.10 %	1.13 %	1.51 %
COV_1	1.02 % (0.485)	0.55 % (0.001)	1.13 % (0.773)	1.25 % (0.331)

P-values from t-tests between equity REIT returns from low and high portfolios are reported in parentheses. Each month is classified as either an expansive policy month or a restrictive policy month according to discount rate changes. Returns are monthly. Market value (MV) of equity is calculated by multiplying shares outstanding and the end of month price from CRSP. The book-to-market (B/M) ratio uses prior year book values and current month market values. Illiquidity (ILL) is calculated following Liu (2006). Institutional ownership (IO) is the percent of shares outstanding held by institutions. The 6-month stock return is a compounded return from t-7 to t-2. Analyst coverage (COV) is the percent of REITs with analyst coverage in IBES

discount rate decrease. This approach is followed by numerous researchers; for a recent example see Buetow et al. (2009).

Table 4 provides summary statistics for the *High, Medium,* and *Low* portfolios formed on each of the characteristics in both restrictive and expansive monetary policy environments. We present mean and median monthly returns, and p-values from t-tests of whether the REIT returns in the *High* versus *Low* characteristic sorted portfolios are different, for both policy environments. With respect to mean returns, the policy environment does not appear to alter the relation of Illiquidity or Analyst Coverage sorted portfolio returns. That is, the relations look similar in both restrictive and expansive environments, with Illiquidity increasing returns and Analyst Coverage being unrelated to mean returns.

Regarding size, we see that large REITs significantly outperform small REITs in a restrictive environment, yet when rates are falling in an expansive environment this return difference is statistically insignificant. This result is inconsistent with the

evidence for non-REIT common stocks, where premiums are larger during periods of loosening monetary policy. [11]

Next, we observe that high Book-to-Market REITS (marginally) outperform low Book-to-Market REITs during periods of expansive credit, but this relationship is non-existent during restrictive periods. Given the marginal significance of this relationship, we refrain from drawing strong conclusions as to the consistency with broader finance literature findings. Turning to Momentum, we find winner portfolios outperform loser portfolios during restrictive periods, but no differences are observed during expansionary policy periods. This result is again inconsistent with the findings for non-REITs, where Jensen and Mercer (2002) and Becher et al. (2008) find return premiums are more significant during periods of monetary expansion.

Finally, the relationship between Institutional Ownership portfolio returns is also impacted by the monetary policy environment. Specifically, low Institutional Ownership portfolios provide higher portfolio returns when rates are falling in expansive environments, while no significant return differences are found during restrictive monetary policy environments. This latter result is consistent with the finding for non-REIT common stocks that higher returns are required on stocks less-held by institutional investors when the Fed is loosening.

To summarize, in periods of falling policy rates under an expansive monetary policy, when cross-sectional risk premiums are typically different (higher), we find significantly higher mean returns on REITs with 1) higher Book-to-Market ratios, 2) lower Institutional Ownership and 3) higher Illiquidity. In periods of rising rates under a restrictive monetary policy, when cross-sectional risk premiums are typically not different (lower), we find significantly higher mean returns on REITs with 1) larger Market Value, 2) higher Momentum, and 3) greater Illiquidity. Thus, like the evidence found for non-REIT common stocks, there is clear support for the hypothesis that REIT characteristics are related to returns differently depending on macroeconomic conditions, in this instance being proxied by the Fed policy-rate cycle. However, for several of these characteristics, the relation runs in the opposite direction from that found for non-REIT common stocks.

Double Sorts

Like Chui et al. (2003a), we next present the results from a double-sort procedure. They form characteristic-based portfolios (first on size, then separately on analyst coverage, turnover, and finally book-to-market), and then sub-divide these portfolios into two momentum portfolios (past winners versus past losers) to report the effect of each of the characteristics on the momentum profits. Because it is clear that momentum continues to be a dominant characteristic (for example, see Fama and French's

[11] One possible explanation for this observed result is the unique regulatory environment in which REITs operate. Specifically, in order to retain pass-through status with regard to federal income taxation, REITs must distribute at least 90 % of taxable income to their shareholders in the form of dividends. As such, REITs generally cannot fund growth endogenously through retained earnings and must therefore systematically return to the capital markets. Thus, in periods of restrictive credit, large, transparent REITs may have an easier time continuing to obtain credit on favorable terms. See, for example, Capozza and Seguin (1999), Ambrose and Linneman (2001) and Danielsen et al. (2009).

Table 5 Momentum and characteristic sorted REIT returns

	MOM_L		MOM_M		MOM_H	
	Mean	Median	Mean	Median	Mean	Median
MV_L	1.00 %	0.58 %	1.03 %	1.05 %	1.00 %	1.02 %
MV_M	1.46 %	1.38 %	1.18 %	1.39 %	1.22 %	1.26 %
MV_H	1.31 % (0.402)	1.53 % (0.005)	1.35 % (0.866)	1.91 % (0.002)	1.31 % (0.129)	1.73 % (0.036)
B/M_L	0.89 %	1.31 %	1.22 %	1.49 %	1.05 %	1.45 %
B/M_M	1.28 %	1.00 %	1.00 %	1.72 %	1.04 %	1.22 %
B/M_H	1.66 % (0.032)	1.40 % (0.525)	1.37 % (0.176)	1.57 % (0.237)	1.45 % (0.323)	1.64 % (0.183)
IO_L	1.52 %	1.42 %	1.36 %	1.64 %	1.31 %	1.43 %
IO_M	1.21 %	1.29 %	1.08 %	1.39 %	0.95 %	1.18 %
IO_H	0.95 % (0.041)	1.04 % (0.061)	1.05 % (0.646)	1.45 % (0.749)	1.17 % (0.875)	0.98 % (0.024)
ILL_L	0.75 %	0.90 %	1.04 %	1.55 %	1.05 %	1.26 %
ILL_M	1.31 %	1.35 %	1.17 %	1.51 %	1.18 %	1.09 %
ILL_H	1.71 % (0.000)	1.29 % (0.042)	1.35 % (0.080)	1.54 % (0.863)	1.31 % (0.162)	1.41 % (0.448)
COV_0	1.43 %	1.13 %	1.89 %	1.44 %	1.11 %	1.11 %
COV_1	1.39 % (0.497)	1.01 % (0.393)	1.12 % (0.136)	1.23 % (0.376)	0.83 % (0.384)	1.08 % (0.843)

P-values from t-tests between equity REIT returns from low and high portfolios are reported in parentheses. To control for momentum (MOM), portfolios are formed by first sorting on momentum and then the respective characteristics. Returns are monthly. Market value (MV) of equity is calculated by multiplying shares outstanding and the end of month price from CRSP. The book-to-market (B/M) ratio uses prior year book values and current month market values. Illiquidity (ILL) is calculated following Liu (2006). Institutional ownership (IO) is the percent of shares outstanding held by institutions. The 6-month stock return is a compounded return from t-7 to t-2. Analyst coverage (COV) is the percent of REITs with analyst coverage in IBES

2011 recent evidence), we instead reverse the order of the double-sorts and explore the influence of the characteristics after controlling for momentum. This is also consistent with our empirical approach in which we examine only the next-month return after portfolio formation. That is, we do not measure the impact of momentum, which plays out over several more months than our return horizon.

Table 5 presents mean monthly returns, median monthly returns and p-values from t-tests for return differences across the portfolios. In examining mean returns, the first entries indicate that in both loser and winner portfolios, Market Value does not appear to be related to returns. This is also the case for the previously reported univariate results before controlling for the monetary policy environment. Similarly, in both the loser and winner portfolios, the performance of low (no) Analyst Coverage REITs is indistinguishable from that of high (covered) Analyst Coverage REITs. This is again consistent with the univariate results. Thus, controlling for Momentum does not appear to alter the return relationships for Market Value and Analyst Coverage, which again is inconsistent with the evidence for non-REIT common stocks. In loser portfolios, the high Book-to-Market portfolio provides significantly higher returns than the low Book-to-Market portfolio. However, there is no significant return difference observable

in winner portfolios. Similarly, in loser portfolios the low Institutional Ownership portfolio again provides significantly higher returns than the high Institutional Ownership portfolio, while there is no significant return difference in winner portfolios. Regarding liquidity, we see that the less-liquid portfolio outpaces the more-liquid portfolio in loser portfolios, but once again there is no significant return difference in winner portfolios. Thus, in the portfolios of REITs with the lowest momentum, there is a mean return premium associated with higher Book-to-Market values, less Institutional Ownership, and greater Illiquidity. However, these return premiums disappear in portfolios of REITs with the highest Momentum.

Double Sorts with Fed Policy Rates

We next present the results from a double-sort procedure incorporating monetary policy. Similar to our results presented in Table 5, we form characteristic-based portfolios (sorting first on momentum, then separately on each of the remaining characteristics). We then compare the portfolios formed in restrictive versus expansive monetary policy periods to report the effect of each of the characteristics after incorporating monetary policy.

Table 6 presents mean monthly returns and p-values from t-tests for average REIT return differences across the portfolios. With respect to Market Value, placing our findings in the context of Table 4, the significant relationship for Market Value in the restrictive monetary environment appears to be robust across Momentum portfolios. Continuing, in both the loser and winner portfolios, the performance of low Book-to-Market REITs is indistinguishable from that of high Book-to-Market REITs during restrictive environments. On the other hand, during expansionary periods and within loser portfolios, high Book-to-Market REITs marginally outperform their low Book-to-Market counterparts. This is again consistent with the results in Tables 3 and 4. Thus, controlling for Momentum does not appear to significantly alter the return relationships for Market Value and Book-to-Market. In winner portfolios in restrictive monetary policy periods, the high Institutional Ownership portfolio provides significantly higher returns than the low Institutional Ownership portfolio. During expansionary times, high Intuitional Ownership firms exhibit significantly lower returns than their low Institutional Ownership counterparts. This latter result is robust across both winner and loser portfolios, and again clearly demonstrates the potential impact of monetary policy on REIT return relationships. Regarding Illiquidity, as in Tables 4 and 5, we see that the less-liquid portfolio outperforms the more-liquid counterpart in loser portfolios across both the restrictive and expansive monetary policy environments. In winner portfolios, no significant return differences are found during either monetary policy environment. Finally, portfolio returns sorted on Analyst Coverage appear invariant to our Momentum and monetary policy environment groupings.

To summarize, in the portfolios of REITs with the lowest Momentum, there is a return premium associated with higher Market Values during restrictive policy

Table 6 Momentum and characteristic sorted REIT returns conditioned on monetary policy

	MOM_L		MOM_M		MOM_H	
	Mean	Median	Mean	Median	Mean	Median
Panel A: Restrictive monetary policy environment						
MV_L	0.92 %	0.40 %	0.79 %	0.83 %	1.00 %	0.94 %
MV_M	0.70 %	0.09 %	1.12 %	1.04 %	1.24 %	0.91 %
MV_H	1.36 % (0.034)	1.16 % (0.003)	1.44 % (0.008)	1.57 % (0.002)	1.49 % (0.016)	1.68 % (0.002)
B/M_L	1.13 %	0.87 %	1.18 %	1.11 %	1.27 %	1.26 %
B/M_M	0.93 %	0.87 %	0.96 %	1.53 %	1.12 %	1.15 %
B/M_H	0.98 % (0.625)	0.92 % (0.778)	1.19 % (0.815)	1.12 % (0.869)	1.31 % (0.986)	1.33 % (0.754)
IO_L	1.00 %	1.19 %	1.05 %	0.97 %	0.93 %	0.78 %
IO_M	0.91 %	1.15 %	1.08 %	0.84 %	1.22 %	1.15 %
IO_H	0.97 % (0.686)	0.61 % (0.036)	1.23 % (0.150)	1.66 % (0.074)	1.47 % (0.010)	1.56 % (0.001)
ILL_L	0.50 %	0.64 %	0.95 %	1.20 %	1.20 %	1.22 %
ILL_M	1.00 %	0.89 %	1.19 %	0.77 %	1.25 %	1.02 %
ILL_H	1.46 % (0.000)	1.14 % (0.001)	1.20 % (0.027)	1.29 % (0.616)	1.28 % (0.764)	1.52 % (0.382)
COV_0	0.68 %	0.88 %	0.86 %	0.61 %	0.78 %	0.78 %
COV_1	0.31 % (0.128)	0.42 % (0.283)	0.97 % (0.167)	1.01 % (0.066)	0.80 % (0.638)	1.19 % (0.053)
Panel B: Expansive monetary policy environment						
MV_L	1.20 %	1.22 %	1.52 %	1.20 %	1.29 %	1.00 %
MV_M	1.64 %	1.28 %	1.37 %	1.87 %	1.36 %	1.30 %
MV_H	1.08 % (0.394)	1.30 % (0.741)	1.40 % (0.258)	1.88 % (0.043)	1.19 % (0.961)	1.60 % (0.001)
B/M_L	1.01 %	1.64 %	1.41 %	1.70 %	1.13 %	1.41 %
B/M_M	1.16 %	1.02 %	1.17 %	1.48 %	1.05 %	1.15 %
B/M_H	1.83 % (0.074)	1.60 % (0.818)	1.72 % (0.199)	1.82 % (0.559)	1.71 % (0.235)	1.67 % (0.464)
IO_L	1.58 %	1.59 %	1.79 %	2.02 %	1.68 %	1.27 %
IO_M	1.35 %	1.41 %	1.18 %	1.51 %	1.03 %	1.16 %
IO_H	0.89 % (0.028)	1.23 % (0.376)	1.15 % (0.039)	1.50 % (0.001)	1.00 % (0.042)	1.27 % (0.961)
ILL_L	0.91 %	1.04 %	1.36 %	1.71 %	1.06 %	1.18 %
ILL_M	1.23 %	1.61 %	1.29 %	1.70 %	1.23 %	1.22 %
ILL_H	1.78 % (0.008)	1.42 % (0.022)	1.63 % (0.142)	1.73 % (0.751)	1.57 % (0.270)	1.26 % (0.499)
COV_0	2.01 %	1.46 %	1.50 %	1.34 %	1.58 %	1.34 %
COV_1	2.04 % (0.683)	1.49 % (0.711)	1.72 % (0.294)	1.50 % (0.106)	1.52 % (0.566)	0.93 % (0.058)

P-values from t-tests between equity REIT returns from low and high portfolios are reported in parentheses. Each month is classified as either an expansive policy month or a restrictive policy month according to discount rate changes. Returns are monthly. Market value (MV) of equity is calculated by multiplying shares outstanding and the end of month price from CRSP. The book-to-market (B/M) ratio uses prior year book values and current month market values. Illiquidity (ILL) is calculated following Liu (2006). Institutional ownership (IO) is the percent of shares outstanding held by institutions. The 6-month stock return is a compounded return from t-7 to t-2. Analyst coverage (COV) is the percent of REITs with analyst coverage in IBES

environments, higher Book-to-Market and lower Institutional Ownership during expansionary environments, and higher Illiquidity regardless of a restrictive or

expansive monetary policy environment. In portfolios of REITs with the highest momentum, there are mean return premiums associated with larger Market Values during periods of restrictive monetary policy, while high Institutional Ownership portfolios exhibit significantly higher returns during restrictive periods of monetary policy and significantly lower mean returns during expansionary periods.

Conclusion

In this paper, we examine the patterns of cross-sectional REIT returns based upon both the underlying characteristics of the individual firms, and the underlying Federal Reserve policy rate environment in which they operate. Specifically, using a sample of equity REITs over the period January 1993 through December 2009, we find significant return differences across portfolios of firms sorted on measures of Momentum, Institutional Ownership, and Illiquidity. Consistent with the results of the previous literature on non-REIT firms, organizations characterized by either lower levels of Institutional Ownership, or greater Illiquidity, exhibit higher portfolio returns.

More intensive analysis of these relationships, in which we condition our portfolio construction upon the (restrictive or expansive) monetary policy and policy rate environment facing the firms, reveals similar results for our Illiquidity characteristics. Interestingly, while the unconditioned relationship between firm size and portfolio returns is statistically insignificant, when conditioned upon a restrictive monetary policy environment we find larger REITs significantly outperform their smaller counterparts. Once again, this result is inconsistent with the existing evidence for non-REIT stocks, where Market Value premiums are typically larger during periods of expansive monetary policy, and may be due to the unique regulatory environment in which REIT firms operate. Similarly, both our Book-to-Market and Institutional Ownership results appear to be influenced by Fed policy rates, as our characteristic sorted portfolio returns along these dimensions exhibit significant differences only during falling rate periods.

Finally, employing a double-sort procedure, where firms are first sorted into portfolios based upon Momentum terciles and then separately on their individual characteristics, we find evidence that the observed relationships between higher returns and 1) higher Book-to-Market ratios, 2) lower levels of Institutional Ownership, and 3) greater Illiquidity are driven by our low Momentum (i.e., "loser") portfolios. While these Illiquidity results appear consistent across alternative policy rate environments, the Book-to-Market and Institutional Ownership metrics do not. Specifically, evidence of significant mean return premiums accruing to high Book-to-Market REITs is confined to lower momentum portfolios during periods of expansive monetary policy. Turning to our Institutional Ownership results, consistent with expectations, during periods of falling policy rates firms with low Institutional Ownership outperform their high Institutional Ownership counterparts. This result holds

regardless of Momentum tercile. On the other hand, during periods of rising policy rates, Institutional Ownership appears unrelated to characteristic sorted returns for portfolios of both low- and medium-Momentum REITs, while our high-Momentum portfolios actually exhibit an unexpected positive relationship between realized returns and Institutional Ownership. In sum, we view these results as strongly supportive of the notion that the determinants of characteristic-sorted REIT returns diverge markedly from those of non-REIT common stocks, and further, that such relationships are related to the Federal Reserve policy rate environment faced by these firms.

Appendix

1982 to 1992 Subsample

Table 7 Panel A: summary statistics

Year	REITs	Market value equity	Book to market	Illiquidity	Institutional ownership	6 month return	Analyst coverage
1982	38	102	1.044	24.935	13.12 %	3.69 %	5.58 %
1983	40	149	0.849	18.173	16.55 %	24.85 %	22.59 %
1984	44	154	0.739	19.191	16.32 %	6.25 %	28.86 %
1985	57	173	0.680	18.917	20.76 %	12.54 %	27.41 %
1986	72	205	0.701	16.861	17.80 %	9.26 %	25.46 %
1987	80	199	0.875	17.062	19.60 %	2.50 %	26.81 %
1988	86	176	1.092	26.267	21.16 %	1.46 %	29.12 %
1989	89	184	1.117	25.551	24.33 %	0.77 %	25.02 %
1990	93	140	1.338	32.672	21.85 %	−11.33 %	22.08 %
1991	114	141	2.579	35.256	19.46 %	8.50 %	22.33 %
1992	119	150	2.495	33.724	16.10 %	4.38 %	19.01 %
Mean	76	161	1.228	24.419	18.82 %	5.72 %	23.12 %

The sample contains 119 unique equity REITs from 1982 to 1992. This results in 9,470 firm-year-month observations. Market value of equity is calculated by multiplying shares outstanding and the end of month price from CRSP. The book-to-market ratio uses prior year book values and current month market values. Illiquidity is calculated following Liu (2006). Institutional ownership is the percent of shares outstanding held by institutions. The 6-month stock return is a compounded return from t-7 to t-2. Analyst coverage is the percent of REITs with analyst coverage in IBES

Table 8 Panel B: characteristic sorted REIT returns 1982-1992

	Equally weighted return	Standard deviation	Median return	Momentum return	Book to market	Institutional ownership	Illiquidity	Analyst coverage	Market value equity
MV_L	0.33 %	4.30 %	0.27 %	2.70 %	2.028	6.23 %	59.428	5.20 %	19
MV_M	0.96 %	3.71 %	0.75 %	5.18 %	1.016	18.02 %	10.852	25.83 %	73
MV_H	1.65 % (0.006)	4.14 % (<.0001)	1.26 % (0.000)	9.29 %	0.623	26.46 %	4.117	39.53 %	390
B/M_L	1.26 %	4.20 %	1.09 %	8.18 %	0.384	21.56 %	21.936	37.16 %	328
B/M_M	1.03 %	3.29 %	0.94 %	6.90 %	0.900	21.22 %	23.476	23.09 %	105
B/M_H	0.57 % (0.057)	4.80 % (<.0001)	0.62 % (0.097)	2.12 %	2.386	9.55 %	31.886	12.26 %	69
MOM_L	0.77 %	4.98 %	0.47 %	−12.80 %	1.601	16.24 %	29.367	16.16 %	129
MOM_M	1.12 %	3.60 %	1.14 %	5.77 %	1.001	19.03 %	22.260	28.12 %	158
MOM_H	1.07 % (0.598)	3.51 % (<.0001)	1.07 % (0.055)	23.98 %	1.118	18.36 %	21.409	28.37 %	205
IO_L	0.91 %	4.59 %	0.66 %	5.36 %	2.088	3.67 %	33.063	26.35 %	51
IO_M	1.57 %	4.31 %	1.13 %	8.49 %	0.853	15.27 %	13.624	67.76 %	154
IO_H	1.36 % (0.146)	4.46 % (<.0001)	0.96 % (0.191)	8.26 %	0.644	36.76 %	9.748	76.91 %	254
ILL_L	1.06 %	4.27 %	0.89 %	6.42 %	1.085	20.88 %	0.000	23.11 %	272
ILL_M	1.01 %	4.35 %	0.83 %	6.35 %	1.281	17.80 %	2.480	35.05 %	173
ILL_H	0.99 % (0.841)	3.87 % (<.0001)	1.02 % (0.633)	4.75 %	1.356	14.15 %	70.317	12.93 %	46
COV_0	0.79 %	3.70 %	0.75 %	4.68 %	1.304	12.67 %	29.781	0.00 %	147
COV_1	1.47 % (0.032)	4.64 % (<.0001)	1.09 % (0.238)	7.62 %	1.022	23.14 %	5.849	100.00 %	213

P-values from t-tests between equity REIT returns from low and high portfolios are reported in parentheses. Returns are monthly. Market value (MV) of equity is calculated by multiplying shares outstanding and the end of month price from CRSP. The book-to-market (B/M) ratio uses prior year book values and current month market values. Illiquidity (ILL) is calculated following Liu (2006). Institutional ownership (IO) is the percent of shares outstanding held by institutions. The 6-month stock return is a compounded return from t-7 to t-2. Analyst coverage (COV) is the percent of REITs with analyst coverage in IBES

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