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REITs and Stock Market Cointegration

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REITs AND STOCK MARKET COINTEGRATION

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Abstract

Real Estate is popular among investors looking for attractive total returns, predictable price movements, and low correlations to the general equity markets. The financial crisis of 2007 led by real estate mortgage defaults led to a universal bear market, and a credit freeze which impacted REITs ability to raise capital. REITs long viewed perception as a distinct asset class was questioned as a result. Research analyzing REITs long run trends find evidence of an existing long run relationship between REITs, and the S&P. This paper employs the same cointegration framework of prior studies using a longer sample period, and favors the conventional view of REITs as a distinct asset class.

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Chapter 1: Introduction

Real estate as an asset class has been known to provide above average returns with relatively steady and predictable cash flows, and has been through most market periods relatively uncorrelated to other asset classes, making it a desirable asset to integrate in an investment portfolio. Investing directly in real estate prior to the Real Estate Investment Trust Act of 1960 was limited mainly to institutional investors due to the acquisition costs associated with purchasing physical real estate. The securitization of real estate in the 1960's gave access to retail investors to invest indirectly in income producing real estate such as: office buildings, shopping malls, hotels, and apartment buildings by purchasing shares of publically traded real estate investment companies known as Real Estate Investment Trusts (REITs). REIT shares are traded like common stock while still representative of the underlying real estate managed by the investment company. NAREIT notes that REITs are increasingly becoming available in tax deferred retirement plans, and that over 50 million Americans are investing REITs through their 401K Plans (NAREIT®, the National Association of Real Estate Investment Trusts® Website). The differentiating factor between REITs and other asset classes is that they have been able to generate total returns comparable to those of the S&P 500 index while maintaining a bundle of benefits uncommon to stocks, namely: lower correlation with the S&P, increased price steadiness and predictability, and limited risk.

Despite the attractive characteristics encapsulated in REITs the financial crisis, which began in 2007 marked a sharp reversal in the low correlation trend that REITs had enjoyed relative to the market as defined by the S&P 500. NAREIT (NAREIT®, the National Association of Real Estate Investment Trusts® Website) notes that despite increased correlation between REITs and the broad market it should continue to provide strong diversification opportunities moving forward as commercial real estate is a distinct asset class. In addition, REITs require specialized knowledge of the specific markets it is investing in as well as specialized management of the properties and are required to pay-out consistent dividends in order to maintain tax-exempt status; a “guarantee” not viable in all S&P 500 companies. There is a certain confidence derived from owning companies strong enough to consistently pay and grow dividends, and as Devos, Spieler, and Tsang (2012) discovered a large portion of REITs did not take advantage of the Laws passed during the crisis to elect stock-dividend paying options over paying cash dividends in order to alleviate potential cash-flow restrictions. REITs are attractive to investors as a vehicle of differentiated income as REITs are unaffected by interest rates the way bonds are since they are after all, a liquid form of Real estate investment. Overall REIT investors are “paid to wait” and the literature asserts that REITs are an integral part of a well-diversified portfolio. Yet, since the unprecedented mortgage driven financial crisis my examination employing simple correlation analysis coveys that REIT returns have been highly correlated with stock returns potentially implying that there is truly no added benefit to investors, unique from other stock alternatives.

Fundamentally, real estate as an asset class is unique; however, REITs, which trades like stocks, are not exempt from market sentiment as the mortgage crisis ascertained. Interestingly, there is also evidence by Peterson and Hsieh (1997) suggesting that the return variation in EREITs is impacted by the same risk factors that influence common stock. There is also evidence by Clayton and Mackinnon (2003) that the REIT market went from being led by the same economic factors as large cap stocks during 1979-1984, and that its return process correlated more strongly with the underlying real estate returns during the time period 1992-1998. More recent research from Anderson, Guirguis, and Shilling (2009) and Boudry, Coulson, Kallberg, and Liu (2011) finds that the financial market has become part of the long run relationship explaining the movements in the REIT return generating process. An increasing cointegrated relationship between REITs and the equity market mark a decrease in its diversification abilities within a portfolio.

The main purpose of my thesis is to examine what appears to be a meaningful shift in the behavior of REIT returns as a result of the Financial Crisis beginning in 2007 in relation to the broader market as defined by the S&P 500. A reversal in the way REITs correlate to equity markets has implications on the diversification opportunities viable within a portfolio, thus, decreasing then "stabilizing" power they have historically been known to have. Consequently, investors may have to rethink the purpose REITs have within a portfolio, and investors favoring real estate investments may have to accustom themselves to the idea that REIT returns are linked to the financial markets.

Employing the co-integration approach I find evidence that the S&P-500, Equity REITs (EREITs), and Mortgage REITs (MREITs) have a long run equilibrium path independent of each other. Furthermore, I find that prior studies pointing towards a long run relationship between the S&P-500 and REITs may be misguided as result of the financial recession that produced a severe bear market across all asset classes.

Chapter 2: Literature Review

Since the Financial Crisis that began in 2007 portfolio construction themes have centered on favoring securities with better betas, and corporations with strong fundamentals such as large-cap companies known for their commitment to paying cash dividends.. The Financial Crisis produced fundamental shifts in the way investors make choices among varying investments, specifically in the REIT sector, a "flight to quality" has been documented by various researchers (Devos et al., 2012; Eichholtz et al., 2011). By following REIT institutional ownership trends Devos et al. (2012) show a shift in tastes and preferences towards REITs with lower risk characteristics. Eicholtz (2011) notes that the quality of governance matters in times of crisis when effective risk-management is an important performance determinant in contrast to pre-crisis times when governance did not appear to be a key variable in REIT performance. Furthermore, Devos, Spieler, and Tsang (2012) and Liu and Tsang (2009) investigate how REITs behave under the crisis environment reflective of high capital constraints, and the resounding result is that REIT corporations favor satisfying dividend requirements; a key metric money managers look at in evaluating a company's resilience. Devos, Spieler, and Tsang (2012) found that only a minority of REITs took advantage of stock dividends to minimize the dividend burden while Liu and Tsang (2009) found that cash constrained REITs will more than often engage in Real Earnings Management (REM) to satisfy dividend obligations. The behavior of REITs seems to suggest that they favor consistency in dividend payouts in order to signal future performance. In light of the economic environment where investors favor dividend growing firms this appears optimal. Research conveys shifts toward greater transparency, better governance, and more recently NAREIT (NAREIT®, the National Association of Real Estate Investment Trusts® Website) noted a trend towards de-levering. Overall, this literature seems to show that given shifts in preferences of investors in conjunction with effective management by REITs, REITs appear viable investment vehicles to hedge against bear markets. In other words, it seems to suggest that a major objective of REIT management is to convey the continued stability of REITs.

Most research evaluating REIT performance shows that they have historically outperformed common stock, and historical data from NAREIT (NAREIT®, the National Association of Real Estate Investment Trusts® Website) convey that the REIT index has outperformed S&P 500 in most periods. The data I use shown in Table 1 shows that between the years 1980-2012 EREITs outperform the S&P-500 on a compounded basis by 1.26 basis points with a geometric return of 12.24 vs. the S&P of 10.98. Ott, Riddiough, and Yi (2005) traced the REIT IPO boom in 1992 noting that REITs were able to add value to investors over and above their cost of capital through aggressive investments funded primarily through equity and debt. Much of the research available in REIT performance demonstrates that REITs have a tendency to produce returns over and above common stock found in the S&P 500, and small cap stocks driven by high REIT dividend yields. REITs are required to distribute 90% of their total revenues in dividends to shareholders, and they have consistently grown dividends through time accounting for a big portion of an investor's total return. One would assume that the variation in REIT dividends would explain most significantly the REIT return generating process. Surprisingly, utilizing the three factor model developed by Fama and French (1993,1996), Peterson and Hsieh (1997) undertake an investigation analyzing excess premiums in both Equity and Mortgage REITs, and show that EREIT performance is significantly related to the same stimuli driving stock returns The results show that much of the variation in REIT total returns is explained by the same factors which impact financial securities, this of course, contrary to the presumed non correlated nature of REITs as a distinct asset.

So, the dichotomy in the literature seems to be between the literature that suggests that REITs are an effective way to diversify a portfolio against market risk factors, and the literature that suggests that

REIT risk factors are linked to those of the general market. The extant literature directly analyzing these questions provides mixed results. Recent analysis by Simon and Ng (2009) makes the case that general linear analysis does not suffice in evaluating whether REITs are successful in protecting a portfolio against market downturns, and applies a mixed copula framework that conveys that the financial crisis only had a limited impact on the tail dependencies (i.e., the probability of extreme events). They further postulate that REITs are in fact an effective way by which to diversify a portfolio over foreign commons stock. The fact that REITs show a lower probability of extreme events is in line with the position that real estate is a stable asset class distinct from the general market, however, in light of the recent financial recession investors may hold the sentiment that REITs are not immune to market cycles. The fact of the matter is that *it is* a security. He, Webb, and Myer (2003) examine REIT return characteristics over a 27 year period in relation to varying interest rate proxies and find that EREITs are most sensitive to high yield corporate bonds which are known to produce equity-like returns. Other research interested in analyzing the unique REIT data return generating process by Ross and Zisler (1991), Mengden and Hartzell (1986), Ennis and Burik (1991), and Gyourko and Keim (1992) finds that REIT returns are largely correlated with equity returns. Research employing an cointegration framework such as the analysis into the REIT return generating process by Boudry, Coulson, Kallberg, and Liu (2011) looks into the co-integration relationships through time between REITs, direct real estate, the S&P-500, and the Russel-2000. Their results suggest that REITs and real estate share a similar long-term equilibrium; supporting positions that postulate that REITs behave like their underlying assets. More interestingly, their results suggest that securitized and un-securitized real estate markets react to the equilibrium path of the equity markets. Their result confirms findings by Guirguis and Shilling (2009) who find that REIT returns share a long run relationship with equity markets.

Chapter 3: Data and Methodology

3.1 Variables

The key goal of this thesis is to track the relation between REITs and the S&P 500. The reason for focusing on the return behavior of REITs relative to the S&P 500 is because REITs are regarded as high-yielding equities where the typical investor is income focused, and expects modest gains; the S&P 500 is representative of these high-yielding securities. REITs are either Equity REITs which invest in income generating properties, Mortgage REITs which invest into a pool of mortgages, or Hybrid REITs which diversify between EREITs and MREITs.

So, the variables of interest are total asset returns for: 1) EREITS; 2) MREITS; and 3) the S&P 500 as a broad market measure. To capture for the entire REIT story as the descriptive statistics will focus on time period between 1980-2012 and will be organized within time frames characterizing different trends according to the evolution of REITs. A study assessing REIT performance by Ott, Riddiough, and Yi (2005) revealed significant differences between the old-REIT (1981-1992), and new-REIT (1993-1999) eras where most value-added investments occurred in the new-REIT era by newer firms. My study will account for the differences in these REIT eras in analyzing total returns in the following way: old-REIT (1980-1992), new-REIT (1993-1999), Pre-Crisis (2000-2006), Financial Crisis (2007-2008), and Post-Crisis (2009-2012). The time series analysis will focus on the entire time period between 1980-2012 utilizing index data for each variable. The index and total return data for EREITs and MREITs were obtained from the official NAREIT® website. The index and total return data for the S&P 500 were obtained from the official Standard&Poors website.

3.2 Descriptive Statistics

Table 1 presents summary statistics for the entire sample period (1980-2012) using monthly returns. The first moment was adjusted by the number of years in the sample such that it conveys annual average returns. EREITs provided the highest average returns at 13.18% while the S&P 500 generated a return of 11.74%. Furthermore, MREITs are the lowest performing at 8.13% and diversification between MREITs and EREITs i.e., all-REITs (AREITS) at 11.82%. However, this average is still higher than the return of the broad market. Investment returns are more accurately reflected by compounding, therefore, the geometric return formula is used to calculate the average rate of return per period compounded over all time periods. Again, the results support research that EREITs perform better than the general market. The standard deviation of EREITS is 50% and is higher than the 46% standard deviation of the S&P 500; this is contrary to the standard view that EREITs have lower volatility than the general market although this may be a consequence of the Financial Crisis. The standard deviation for EREITs at 50% is lower than the volatility in MREITs at 55%. Interestingly, the mix between EREITs and MREITs as shown in AREITs has a lower standard deviation than its counterparts at 49% vs. EREITs at 50%, and MREITs at 55%. All of the variables appear to be asymmetric from the normal distribution to the right of their means as left tails are longer; in financial theory negative skewness is generally associated with increased probability of negative returns and hence a rational investor should have a bias away from negative skewness. Following this logic I find that contrary to the conclusions derived from Simon and Ng (2009) that my results indicate that a rational investor should be biased towards the S&P 500 over REITs assuming they are substitutes. Furthermore, AREITs as shown by the Kurtosis of 8.175 vs. the S&P Kurtosis of 2.436 has fatter tails indicating higher than normal chances of a positive or negative realization. The Kurtosis for EREITs is 9.481 vs. MREITs of 3.31 indicating that EREITs are at increased risk of extreme shocks. Again, meaning that in the event of extreme shocks REITs in general will overreact in contrast to the broader market; this is consistent with the research by Boudry, Coulson, Kallberg and Liu (2011) who state that the S&P leads REIT markets.

In order to capture the whole REIT story as presented by the literature the following data is organized according to the unique timeframes specified earlier. Table 2 presents time-weighted returns for each specified time frame. A somewhat different picture emerges in analyzing total returns given the different time frames specified. During the slow growth era (old-REITEra) of REITS I find that they provided holding period returns of about 14.22% (EREITS), but not higher than the 15.11% of the S&P 500. Surprisingly, during the new-REIT era characterized as the period of time in which most value added investment flooded the REIT sector they performed sub-par to the prior period at 8.16% holding period returns, and underperformed relative to the S&P which generated a 20.24% rate of return during the same period. This may be indicative of adjustments as newer firms entered the competitive landscape. Subsequent to this there was an explosion in REIT performance in the Pre-Crisis era where REITs as a whole outperformed the broader market. It is also notable that MREITs outperformed EREITs, probably as a result of the housing bubble characteristic of this time period right before its collapse with pre-crisis period returns of 24.37% vs. EREITs 22.27%. In fact, during the financial crisis I find that MREITs suffered the sharpest decline relative to other EREITs with an average negative 37% return vs. an average negative 27% EREITs returns. However, REITs as a whole had a sharper decline than the S&P 500's negative 18% total returns which may be expected given the earlier reported excess kurtosis. After the financial crisis I find resurgence in EREIT performance relative to the broad market outperforming it by 4.36 basis points with a total return of 19.56 % vs. the S&P-500 at 15.2%.

3.3 Simple Correlation

To better grasp any shifts in the behavior of the general market in relation to REITs pair-wise correlations were traced throughout each time frame, and are presented in Table 3. The evolution of the correlations convey that EREITs were largely uncorrelated with the broad market prior to the Financial Crisis, the financial crisis marked a reversal in this trend as conveyed by the sharp increase in the correlation between EREITs, and the S&P-500. As the results convey a 1 percent movement in the S&P during the pre-crisis period would induce 30.16% variation in EREITs total returns whereas during the crisis this variation would increase to 78%. There are arguments that state that there was "no hiding" from the financial crisis, and that all asset classes universally suffered. However, the post crisis period shows an even higher correlation of EREITs to the S&P 500 (i.e., 83%). The financial crisis and subsequent period shows a significant increase in the correlation between EREITs, and the S&P 500. Contrary to the reports briefed in (NAREIT®, the National Association of Real Estate Investment Trusts® Website) which ascertained a reversal in the increase correlation between S&P and REIT indices as a result of the financial crisis my results show a complete opposite in that total returns for EREITs have in fact become more correlated.

The only exception has been MREITs in that they consistently marked low correlations to the S&P 500 with the biggest changes occurring after the financial crisis. During the crisis a one percent change in the S&P would have induced a 33% change in MREITs total returns. This is interesting because as previously stated MREITs suffered the largest losses during the financial crisis period meaning that its sharp decline was probably a result of the nature of the financial crisis that was mortgage based. The post-crisis period marked a sharp increase in the correlation of MREITs to the S&P to 68% given a one percent change in the S&P.

3.4 Trend

If one were to superficially look at the total return data it would be difficult to make any inference of any patterns; In order to smooth out the total return data I employ a basic simple moving average technique in order to trace total return trends between the variables of interest throughout the entire sample period. Simple moving average assumes that the total return from the beginning of the period is just as important as the total return at the end of the period, thus applying equal weights to all total returns across the entire interval. Furthermore, it is important to note that moving average is a popular use among technicians as it indicates the direction that the variable of interest may take given a lag.

It is interesting to note from the trends (shown in Graph 1 and 2) that during the bullish technological driven equity market between years 1998-1999 EREITs had a negative total return trend, and conversely between the years 2000-2001 S&P bear market EREITs had a positive total return trend. The REIT Modernization Act which went into effect in 2001 allowed REITs to own 100% of the stock of taxable REIT subsidiaries (TRS). Taxable REIT subsidiaries taxed at the corporate level contribute to REITs earnings by engaging in non-rental, ancillary business activities such as leasing, property management, or merchant development. This flexibility contributed to the attractiveness of REITs during a time when equity markets were depressed.

During the crisis starting in 2007 these trends appear to converge, and persist on the same upward direction post 2009. This can be seen graphically in Graph 1 and Graph 2. On the other hand, the trend for MREITs is not as clearly tied to the S&P 500 although it appears to follow a similar pattern; what is clearly conveyed is that it has the strongest bullish trend as a result of the housing bubble leading up to the financial crisis. This is seen in Graph 3.

3.5 Methodology

Portfolio managers achieve diversification successfully by selecting investment assets with low correlations; the cointegration framework gives deeper direction by providing insight into the long-run relationships between stochastic processes. In other words, although two asset classes may not seem correlated in the present they may oscillate towards a common long run trend and thus implying a shared long run equilibrium. The cointegration framework provides the ideal platform to address the economic question whether the REITs total return generating process is impacted by similar stimuli as stocks are, or supporting the long held view that REITs are being representative of real estate and have a distinct equilibrium path.

Common time series analysis differences I(1) variables before they are used in linear regressions to adjust for spurious regressions. However, differencing I(1) limits the depth of the possible analysis. Engle and Granger (1987) postulated that the linear combination of two I(1) processes generally produces a I(1) process, however, in the event the linear combination of these non-stationary processes produced a I(0) process they are said to be cointegrated. Such relationships are interpreted as long run equilibrium since they will consistently converge whenever there are departures therefrom. Assuming two stochastic I(1) processes:

$$Yt = V0 + V1Zt + Et$$

$$Xt = \delta 0 + \delta 1Zt + Nt$$

there may exist a linear combination of them which is stationary such that:

$$\delta Xt - V1Yt + Constant = I(0)$$

in which their difference is stationary.

In testing for cointegration I will use Johansen's (1991, 1995) system maximum likelihood method of cointegration analysis which involves the specification of a vector autoregressive model (VAR) in its vector error corrected form. The VAR approach is nonstructural and treats each endogenous variable in the system as a function of its lagged value. The specification of a VAR model involves a set of variables, a decision on lag length, and decision on whether to include any deterministic trends. The resulting VAR would look like the following:

$$y_t = v + b_1 y_{t-1} + b_2 y_{t-2+} \ldots b_p y_{t-p+} \; et$$

where Yt is a K vector of all endogenous variables defined by a I(1) data generating process (S&P, EREITS, MREITS), V is a D vector of parameters, A1...Ap are *KXK* matrices of parameters, end et is a vector of innovations and are uncorrelated with their own lagged values and uncorrelated with all right hand side variables. Naturally, since only lagged variables of the endogenous appear on the right hand side OLS will yield consistent estimators, and be efficient since all equations contain same regresors *i.i.d.* The VECM model allows us to write a system that captures the cointegrated relationships while avoiding unit roots; after differencing the prescribed equation by subtracting Yt-1 from both sides the VAR is transformed into an error correction model as follows:

$$\Delta yt = \Pi yt-1 + \Sigma(p-1i=1)\Phi * i\Delta yt-i + v + et$$

where $\Pi = \alpha\beta'$ such that the betas contain the cointegrating equations and the alphas specify the speed of adjustment towards cointegrating relationship. More specifically, β defines the long run relationship while α measures the rate at which the variables adjust to that long run relationship. In the case for $\Pi = \alpha\beta'$ where the rank of *Π* (cointegrating relationships) as defined by calculating its eigenvalues such that *Rank* $(\Pi) = m$ I know that the rank will be between $0 < m < K$ where m identifies the number of linear combinations which are stationary implying common long run trends. In the event Π had $m=0$ this would imply a linear combination of I(1) VAR processes which are not stationary; in other words no existing coitnegrated relationships. The other exreme where the rank of Π has $m=K$ would imply Xt has no unit root where $(K-M)=0$ stochastic trends.

Chapter 4: Estimation and Empirical Results

4.1: Unit Root Tests

The co-integration framework needs two non-stationary processes in order to be successfully employed. In order to evaluate the properties of the variables of interest: S&P, EREITS, and MREITs I employ the augmented Dickey-Fuller (ADF) test and the Ng and Perron test. Although the ADF unit root test is widely accepted among economists Ng and Perron (2001) found that this test suffers from severe size distortions which lead to an incorrect rejection of the Null Hypothesis of a unit root; this is especially a problematic issue in the case of negative moving average components.

The results for each variable of interest using the Augmented Dickey-Fuller test fail to reject the Null hypothesis in favor of a unit root implying that the cointegration framework can be applied to test the hypothesized long run equilibrium between the broad market and REITs. The decision rule in using the Dickey-Fuller test is that if the calculated DF statistic is less than the critical values I cannot conclude to reject Ho=0 (Unit Root). The results are shown for each variable in Tables: 4-6.

In Table 4 the Augmented Dickey Fuller test for the S&P reports a test statistic of .700185 which is a less than the critical values of 3.446, 2.86, 2.57 at the 1%, 5%, and 10% levels respectively. This means I cannot reject null hypothesis of a Unit Root. Table 5 reports the results for level series EREITs unit root test showing similar results with a test statistic of .9782 vs the critical values of 3.446, 2.86, 2.57 at the 1%, 5%, and 10% levels respectively again favoring a non-stationary process. Table 6 reports the results for MREITs Augmented dickey fuller test with a test statistic of 1.1010 vs. the critical values of

3.446, 2.86, 2.57 at the 1%, 5%, and 10% levels respectively once more in favor of a non-stationary process.

For a robustness check the Ng-Perron test will be specified using a modified information criterion (MIC) to enhance results since they note (2001) that the standard lag structures as defined by the Akaike's information criteria (AIC), Schwarz's Bayesian information criteria (SIC), and Hannan and Quinn information criteria (HQIC) have inferior size properties in the presence of MA disturbances.

The Ng-Perron unit root accepts the null hypothesis of a unit root given that the calculated statistics are higher than the critical values. In all three tests I see that based on the (MZ_{α}^{GLS}, , MZ_{t}^{GLS}. MSB ^{GLS} and MP_{t}^{GL}) that they are greater than the critical values therefore failing to reject the null hypothesis in favor of non-stationarity. The MZ_{α}^{GLS}, , MZ_{t}^{GLS}. MSB ^{GLS}, and MP_{t}^{GLS} for EREITs as shown in Table 7 are .25997, .13594, .52292, 21.3739 respectively vs. their critical values of -8.10, -1.98, .233, 3.17 at the 5% level respectively, thus accepting the null hypothesis of a unit root. The MZ_{α}^{GLS}, , MZ_{t}^{GLS}. MSB ^{GLS}, and MP_{t}^{GLS} for MREITs as shown in Table 8 are -.10412, -.06241, .59940, 24.0648 respectively vs. their critical values of -8.10, -1.98, .233, 3.17 at the 5% level respectively, thus accepting the null hypothesis of a unit root at the 5% level. The MZ_{α}^{GLS}, , MZ_{t}^{GLS}. MSB ^{GLS}, and MP_{t}^{GLS} for the S&P as shown in Table 9 are .87821, .82096, .93481, 60.5193 respectively vs. their critical values of -8.10, -1.98, .233, 3.17 at the 5% level respectively, thus accepting the null hypothesis of a unit root at the 5% level.

4.2: Optimal Lag Structure

In order to execute the Johansen's procedure I need to determine the optimal lag length of the VAR. This is a straightforward process by which the lag length of the VAR in its level form is decided such that the information criterion is minimized in this case evaluating the: Akaiki (AIC), Schartz (SIC), Hanna-Quinn (HQIC), and log likelihood information criteria. The results are conveyed below in Table: 10.

Each of the tests to identifies the optimal lag structure which eliminates serial correlation at the 5% level; however, as one can see although the inference is the same, the results show big discrepancies. For example, both the SC and the HC indicate an optimal lag order of 1 in the VAR representation at the 5% level, whereas the AIC points to an optimal lag structure of 5 lags. On the other hand, it is also customary that the optimal VAR length be chosen by implementing the likelihood ratio test as defined (LM) which identifies an optimal lag structure of 7 at the 5% level. There has been much debate among econometricians suggesting that both under specification and over specification of lag structure negatively impacts cointegration test results. The literature suggests that AIC is known to overstate the lag structure whereas the SC and HC are known to be more consistent, thus, standard practice has been to favor the SC and HC statistics in the event of discrepancies. Therefore, 1 lag will be used the VAR representation.

4.3: Cointegrating Factor Tests.

The next step in the estimation process using Johansen's (2008) methodology is to identify the number of co-integrating vectors CIVs, in order to do this I employ the Trace, and the Maximum Eigenvalue test statistic defined by:

$$LRtr(m \;\; k) = -T \sum log(1 - Li)$$

$$LRmax(m + 1) = -T \, log(1 - lr + 1)$$

where the significance of Li will determine the appropriate number of m eigenvalues of matrix ∏. The results are reported in Table 11. The failure to reject for either the trace statistic or the maximum eigenvalue against the null hypothesis of *m* implies fewer cointigrated relationships. The results for the trace statistic as well as the Maximum Eigenvalue identify 0 CE's cointegrating relationships at the 5% level; they fail to reject against the null hypothesis of at no CE's cointegrating relationships indicating there are 0 cointegrating relationships.. This result is contrary to the results conveyed by Boudry, Coulson, Kallberg ,and Liu (2011) and Guirguis and Shilling (2009) who assert that financial markets are a factor to REITs long term return generating process. In order to compare and contrast I will run through the procedure to identify cointegrating relationships between REITs and the S&P restricting the time frame to the year 2009 which is similar to the Boudry, Coulson, Kallberg and Liu (2011) sample period.

4.4 Estimation Results (1980-2009)

The results focusing on the time period between 1980-2009 yields to an optimal lag structure as specified by the adopted SC and HQ statistics of 2 lags as reported in Table 12. In testing for the rank of cointegration using the trace, and maximum eigenvalue statistic the results indicate the presence of 1 (CE) cointegrating relationship consistent with the results of Guirguis and Shilling (2009), and Boudry, Coulson, Kallberg, and Liu (2011) which suggests the existence of a cointegrating relationship between REITs and the financial markets. The results are displayed in Table 13. The results from the normalized cointegrating coefficients convey in Table 14 show that the S&P loads onto MREITs negatively, and onto EREITs positively. This is consistent with research assuming a positive directional relationship between EREITs and the S&P. There is no clear answer as to why the S&P loads negatively onto

MREITs; an explanation for this may be that the demand dynamics for MREITs are more closely tied to interest rate bearing assets. As previously stated MREITs are investment trusts, which invest into pools of Mortgage loans, thus its risk characteristics are altogether different.

4.5 VECM (1980-2009)

The natural progression after developing the VAR representation is the ECM model. For obvious reasons the ECM representation is unnecessary for the data sample under investigation spanning from 1980-2012 given the lack of cointegrating relationships. However, I will finalize the exercise using the data set limited to the year 2009 to analyze the dynamics not captured in the data set that spans the longer time period. The VECM shown in Table 15 displays the following coefficients:

1.000000*MREITst -3.497725*SNP

1.000000*EREITst .626439*SNP

Furthermore, the adjustment coefficients for the S&P, MREITs, and EREITs are -1.2%, -.03%, and -9.28%, respectively with MREITs being statistically insignificant. This indicates a -9.28% and -1.2% disequilibrium is adjusted from EREITs and from the S&P on a monthly basis, respectively. Further, I find that REITs and the SNP adjust towards a long run relationship. This suggests that there is something unique to the time period prior to 2009. Or, alternatively, there is something special about the later time period.. I hypothesize that the financial crisis that produced a universal collapse of financial assets is the cause for which this cointegrating relationship appears, and that the post recession period marked a return to normality (no cointegration). In order to test my hypothesis I simply run through the cointegration framework once more, while focusing on the period between 1980-2005 capturing the: Old

REIT era, new-REIT era, and the period before the recession. The reason for excluding 2006 is because this was the year in which according to the Case-Shiller Index the downfall of the mortgage bubble commenced as a result of increased foreclosure levels; the early innings of the financial crisis.

4.6: VECM (1980-2005)

The results of this analysis are shown in Table 16. The sample period between 1980 lead to an optimal lag structure of 2 by the AC and the HC in the VAR representation. More interestingly, the tests for the number of cointegrating relationships produced mixed results. While the trace statistic indicates the existence of a single cointegrating relationship the maximum eigenvalue statistic points contradicts this by indicating zero cointegrating relationships.

The ECM descriptive statistics shown in Table 17 investigating the relation between the S&P and REITs points towards insignificant results as measured by the T-Statistics, both in the coefficients, and the adjustment measurements. The VECM results in conjuncture with the inconsistency in rank tests point towards a weak case for cointegration during the sample period indicating the mortgage crisis accelerated what appeared to be increased co-movements between the variables.

Chapter 5: Conclusion and Remarks

The investigation undertook both basic correlation analysis common among practitioners, and used the cointegration approach in an attempt to understand the behavior of REITs return generating processes in relation to the S&P. The simple analysis using Total Return data traced the behavior of total returns over different sample periods and showed that REITs, in general outperform the S&P-500, and that its returns became highly correlated to the S&P from the financial crisis period and onwards. The cointegration procedure using total price index data focusing on the sample period between 1980-2012 points towards the rejection of any cointegrating relation between the three non-stationary variables. This supports the view that the S&P equity market and REITs are distinct asset classes. To be more precise, the results suggest that the S&P, EREITs, and MREITs all share an equilibrium path independent of each other. It is interesting to note that the increasing simple-correlations between the S&P and the REIT variables do not translate to the existence of a cointegrating equation between the variables. REIT total returns may be comparable, and in some cases exceed the S&P but its return generating process follows its unique equilibrium path.

In addition, I further investigate the inconsistency with prior studies that suggest that the S&P and REITs return generating process are linked. This led me to the hypothesis that the limitations of their data not accounting for post recession adjustments may have been the reason for this. In employing the cointegration framework for the period 1980-2009 I find results supporting the existence of a cointegrating relationship between the S&P and EREITs, but not MREITs. However, the same approach restricting the sample period before the crisis between years 1980-2005 yields a weak case for cointegration supporting my view that the uniqueness of the financial recession produced what appeared to be shift towards the convergence of equilibrium paths between the S&P and REITs.

References

Anderson, Randy, Hany Guirguis and James Shilling. 2009. Price discovery and the dynamics among private real estate, REITs, stocks and bonds: A re-examination.Working paper, DePaul University.

Boudry, Walter I., Coulson, N. Edward, Kallberg ,Jarl G. and Liu , Crocker H. 2011. On the Hybrid Nature of REITs. The Center of Real Estate and Finance. Working Paper 2011-001

Clayton, Jim, and Greg MacKinnon. 2003. The relative importance of stock,bond and real estate factors in explaining REIT returns. Journal of Real Estate Finance and Economics 27. 39-60.

Devos, Erik., Spieler C. Andrew, and Tsang, Desmond, 2012, Elective Stock Dividends and REITs: Evidence from the Financial Crisis, Forthcoming

Dickey, D.A and W.A. Fuller. 1979. Distribution of the Estimate for AutoregressiveTime Series with a Unit Root. Journal of the American Statistical Association 74:427–431.

Engle, Robert. F. and Clive. J. W. Granger. 1987. Co-integration and error correction: Representation, estimation and testing. Econometrica 52. 251-276

Gyourko, J., and D. Keim. (1992), What does the Stock Market Tell Us About Real Estate Returns?, AREUEA Journal, 20, 457-485.

Eichholtz, P., N. Kok, and E. Yonder. 2010. Real Estate, Governance, and the Global Economic Crisis. University of Pennsylvania Press, forthcoming

Fama, Eugene F, 1998. Market efficiency, long-term returns, and behavioral finance, Journal of Financial Economics, 49, 283-306

Fama, Eugene F., and Kenneth R. French, 1992.The cross-section stock returns, Journal of Finance 47, 427-465

Fama, Eugene F., and Kenneth R. French, 1995. Size and Book-to-Market Factors in Earnings and Returns, Journal of Finance, 50, 131-155

Fama, Eugene F., and Kenneth R. French, 1993.Common risk Factors in the returns on stocks and bonds, Journal of Financial Economics 33, 3-56

Fama, Eugene F., and Kenneth R. French, 1996.Miltifactor Explanations of Asset Pricing Anomalies, Journal of Finance, 51. 55-84

Fama, Eugene F., and Kenneth R. French, 1996. The CAPM is Wanted, Dead or Alive, Journal of Finance, 51, 1947-1958

Frank, Murray Z., and Vidhan K. Goyal, 2003, Testing the Pecking Order Theory of Capital Structure, Journal of Financial Economics, pp 217 – 248.

Fama, Eugene F. and Kenneth R. French, 2002, Testing Trade-Off and Pecking Order Predication about Dividends and Debt, Review of Financial Studies, Vol. 15, No. 1, pp 1 – 33.

Hansen, H. and S. Johansen. 1999. Some Tests for Parameter Constancy in Cointegrated VAR Models. Econometrics Journal 2: 306–333.

He, Ling T., Webb, James. R, Myer, F.C. Neil. 2003. Interest Rate Sensitivities of REIT Returns, International Real Estate Review, Vol 6, 1-21

Harrison, M D., Panasian A. C, and Seiler, M. 2011.Further Evidence on Capital Structure of REITs. Real Estate Economics, forthcoming

Ott, Steven H, Riddiough, Timothy J., Yi, Ha-Chin, 2006, Finance, Investment and Investment Performance: Evidence from the REIT Sector, Real Estate Economics, V33, 203-235

Ng, S. and P. Perron. 2001. Lag Length Selection and the Construction of Unit Root Tests with Good Size and Power. Econometrica 69: 1519–1554.

Peterson, James D., and Hsieh, Cheng-Ho, 1997, Do Common Risk Factors in the Returns on Stocks and Bonds Explain Returns on REITs?, Real Estate Economics, 321-345

Phillips, Peter, and Pierre Perron. 1988. Testing for unit root in time series regression. Biometrika 75. 335-346.

Pindyck, Robert S., and Daniel L. Rubinfeld. "Econometric Models and Economic Forecasts." (1997). Print.

R Edelstein, P Liu, D Tsang, 2008, Real Earnings Management and Dividend Payout Signals: A study for U.S Real Estate Investment Trusts, Annual Conference.

Ross, S., and R. Zisler. (1987a). Managing Real Estate Portfolios Part 2: Risk and Return in Real Estate, New York: Goldman Sachs.

Ross, S., and R. Zisler. (1987b). Managing Real Estate Portfolios Part 3: A Close Look at Equity Real Estate Risk, New York: Goldman Sachs.

Ross, S., and R. Zisler. (1991), Risk and Return in Real Estate, Journal of Real Estate Finance & Economics, 4, 175-190.

Seiler, Michael, James Webb, and F. C. Neil Myer. 2001. Can real estate portfolios be rebalanced/diversiÖed using equity REIT shares? Journal of Real Estate Portfolio Management 1. 25-42

Z Feng, C Ghosh, CF Sirmans, 2007, On the Capital Structure of Real Estate Investment Trusts (REITs), Journal of Real Estate and Finance

Yunis, Nafeesa, 2009, Increasing Convergence Between U.S. and International Securitized PropertyMarkets: Evidence Based on Cointegration Tests. Real Estate Economics, V37, 383- 411

Appendix

Table 1: Total Period: 1980-2012 (Based on Monthly Data)

Descriptive	S&P	AREITS	EREITS	MREITS
Average	11.7426494	11.82162742	13.17647729	8.125087557
GEO	10.98095885	10.85118039	12.23991204	6.457715375
STDEV	0.45897947	0.48985699	0.50581139	0.54760455
Skewness	-0.7730253	-0.886321041	-0.829650552	-0.93781270
Kurtosis	2.436551901	8.175733796	9.481511901	3.314815542
JB	44.45216726	491.3587179	734.8637921	59.38038884

Notes: The monthly total return data for the S&P corresponds to the period 1980:01-2012:12; AREITs corresponds to the period 1980:01-2012:12; for EREITs to the period 1980:01-2012:12; for MREITs to the period 1980:01-2012:12.

Table 2: Annual Holding Period Returns

Series	OLD ERA	NEW ERA	PRE CRISIS	FIN CRISIS	POST CRISIS
S&P	15.11015182	20.24018695	2.291066023	-18.5781086	15.34722793
AREITS	11.44063311	8.162817937	21.9846728	-28.2431741	19.56766247
EREITS	14.21778171	8.943259599	22.27103684	-27.5426032	19.70780925
MREITS	6.247789238	0.687994799	24.37964361	-37.0708276	17.01013429

Notes: The holding period returns were calculated using a Geometric Mean. The monthly total return data for the S&P corresponds to the period 1980:01-2012:12; AREITs corresponds to the period 1980:01-2012:12; for EREITs to the period 1980:01-2012:12; for MREITs to the period 1980:01-2012:12.

Table 3: Simple Correlation Results

	OLD ERA	New Era	Pre Crisis	Fin Crisis	Post Crisis
Series	S&P	S&P	S&P	S&P	S&P
AREITS	0.6989	0.4435	0.3079	0.7866	0.8419
EREITS	0.6823	0.4123	0.3016	0.7813	0.8303
MREITS	0.5594	0.4501	0.2831	0.3330	.6830

Notes: Table Reports correlations for the REIT total return data in the analysis for each REIT era against the S&P. The monthly total return data for the S&P corresponds to the period 1980:01-2012:12; AREITs corresponds to the period 1980:01-2012:12; for EREITs to the period 1980:01-2012:12; for MREITs to the period 1980:01-2012:12.

The Augmented Dickey-Fuller Test: Tables 4-6

Table 4: S&P UNIT ROOT TEST

Null Hypothesis: S&P has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=16)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.700185	0.8440
Test critical values:	1% level	-3.446692	
	5% level	-2.868638	
	10% level	-2.570617	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(S&P)
Method: Least Squares
Date: 04/05/13 Time: 11:51
Sample (adjusted): 1980M02 2012M12
Included observations: 395 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
S&P(-1)	-0.002853	0.004074	-0.700185	0.4842
C	5.367374	3.545883	1.513692	0.1309

R-squared	0.001246	Mean dependent var	3.278785
Adjusted R-squared	-0.001295	S.D. dependent var	38.07829
S.E. of regression	38.10294	Akaike info criterion	10.12351
Sum squared resid	570570.9	Schwarz criterion	10.14366
Log likelihood	-1997.393	Hannan-Quinn criter.	10.13149
F-statistic	0.490259	Durbin-Watson stat	1.839953
Prob(F-statistic)	0.484226		

Notes: Table reports the ADF Unit Root test on the index data for the S&P. The decision rule is that given the calculated ADF test statistic t* < ADF critical value I cannot not reject null hypothesis, i.e., unit root exists.

Table: 5 EREITS UNIT ROOT TEST

Null Hypothesis: EREITS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=16)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.978211	0.7620
Test critical values:	1% level	-3.446692	
	5% level	-2.868638	
	10% level	-2.570617	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EREITS)
Method: Least Squares
Date: 04/05/13 Time: 11:50
Sample (adjusted): 1980M02 2012M12
Included observations: 395 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EREITS(-1)	-0.006790	0.006941	-0.978211	0.3286
C	2.827501	2.089573	1.353148	0.1768

R-squared	0.002429	Mean dependent var	0.957215
Adjusted R-squared	-0.000109	S.D. dependent var	16.75494
S.E. of regression	16.75585	Akaike info criterion	8.480423
Sum squared resid	110338.2	Schwarz criterion	8.500569
Log likelihood	-1672.884	Hannan-Quinn criter.	8.488405
F-statistic	0.956897	Durbin-Watson stat	1.810666
Prob(F-statistic)	0.328572		

Notes: Table reports the ADF Unit Root test on the index data for EREITs. The decision rule is that given the calculated ADF test statistic t* < ADF critical value I cannot not reject null hypothesis, i.e., unit root exists.

Table 6: MREITS UNIT ROOT TEST

Null Hypothesis: MREITS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=16)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.101093	0.7166
Test critical values:	1% level	-3.446692	
	5% level	-2.868638	
	10% level	-2.570617	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MREITS)
Method: Least Squares
Date: 04/05/13 Time: 11:52
Sample (adjusted): 1980M02 2012M12
Included observations: 395 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MREITS(-1)	-0.006499	0.005902	-1.101093	0.2715
C	4.452408	2.996173	1.486032	0.1381

R-squared	0.003076	Mean dependent var	1.688481
Adjusted R-squared	0.000539	S.D. dependent var	32.52130
S.E. of regression	32.51254	Akaike info criterion	9.806179
Sum squared resid	415426.7	Schwarz criterion	9.826326
Log likelihood	-1934.720	Hannan-Quinn criter.	9.814161
F-statistic	1.212406	Durbin-Watson stat	1.834642
Prob(F-statistic)	0.271530		

Notes: Table reports the ADF Unit Root test on the index data for MREITs. The decision rule is that given the calculated ADF test statistic t* < ADF critical value I cannot not reject null hypothesis, i.e., unit root exists.

NG-Perron Unit Root Test: Tables 7-9

Table 7: EREITS UNIT ROOT TEST

Null Hypothesis: EREITS has a unit root
Exogenous: Constant
Lag length: 0 (Spectral GLS-detrended AR based on Modified SIC, maxlag=16)
Sample: 1980M01 2012M12
Included observations: 396

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		0.25997	0.13594	0.52292	21.3739
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	280.9212

Notes: Table reports the Ng-Perron test on the index data for EREITs as a robustness check. The decision rule is that given the calculated Ng-Perron test statistics t*> t-critical asymptotic critical values I cannot reject the null hypothesis, i.e., unit root exists. The lag length is based in a modified Schwarz's Bayesian information criteria.

Table 8: MREITS UNIT ROOT TEST

Null Hypothesis: MREITS has a unit root
Exogenous: Constant
Lag length: 0 (Spectral GLS-detrended AR based on Modified SIC, maxlag=16)
Sample: 1980M01 2012M12
Included observations: 396

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-0.10412	-0.06241	0.59940	24.0648
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	1057.797

Notes: Table reports the Ng-Perron test on the index data for MREITs as a robustness check. The decision rule is that given the calculated Ng-Perron test statistics t*> t-critical asymptotic critical values I cannot reject the null hypothesis, i.e., unit root exists. The lag length is based in a modified Schwarz's Bayesian information criteria.

Table 9: S&P UNIT ROOT TEST

Null Hypothesis: S&P has a unit root
Exogenous: Constant
Lag length: 0 (Spectral GLS-detrended AR based on Modified SIC, maxlag=16)
Sample: 1980M01 2012M12
Included observations: 396

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		0.87821	0.82096	0.93481	60.5193
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	1454.603

Notes: Table reports the Ng-Perron test on the index data for the S&P as a robustness check. The decision rule is that given the calculated Ng-Perron test statistics t*> t-critical asymptotic critical values I cannot reject the null hypothesis, i.e., unit root exists. The lag length is based in a modified Schwarz's Bayesian information criteria.

Table 10. Optimal Lag Structure (Full Sample)

VAR Lag Order Selection Criteria
Endogenous variables: EREITS MREITS S&P
Exogenous variables: C
Date: 04/05/13 Time: 11:57
Sample: 1980M01 2012M12
Included observations: 386

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7564.041	NA	2.14e+13	39.20746	39.23821	39.21966
1	-5357.082	4368.177	2.42e+08	27.81908	**27.94206***	**27.86785***
2	-5342.174	29.27583	2.35e+08	27.78846	28.00368	27.87381
3	-5332.955	17.95882	2.35e+08	27.78733	28.09478	27.90926
4	-5325.136	15.11107	2.36e+08	27.79345	28.19314	27.95195
5	-5312.079	25.03279	2.31e+08*	**27.77243***	28.26435	27.96751
6	-5308.003	7.750459	2.37e+08	27.79794	28.38209	28.02960
7	-5296.364	**21.95194***	2.34e+08	27.78427	28.46065	28.05250
8	-5289.218	13.36484	2.36e+08	27.79388	28.56250	28.09869
9	-5285.390	7.101409	2.43e+08	27.82067	28.68153	28.16206
10	-5281.691	6.803868	2.50e+08	27.84814	28.80123	28.22610

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Notes: Table reports Likelyhood Ratio (LC), Akaike;;s information criteria (AIC), Schwarz's Bayesian information criteria (SC), and Hannan and Quinn information criteria (HQ) for the p-th order VAR models. EREIT is the Equity REIT index, MREITs the Mortgage REIT index, and the S&P the S&P 500 index. The optimal lag lengths based on each criterion are in bold.

Table 11: Cointegration Rank Test (Trace, and Max Eigenvalue): Full sample

Date: 04/06/13 Time: 19:42
Sample (adjusted): 1980M03 2012M12
Included observations: 394 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: EREITS S&P MREITS
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.054866	35.47697	42.91525	0.2260
At most 1	0.027445	13.24410	25.87211	0.7190
At most 2	0.005769	2.279506	12.51798	0.9490

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.054866	22.23287	25.82321	0.1390
At most 1	0.027445	10.96460	19.38704	0.5170
At most 2	0.005769	2.279506	12.51798	0.9490

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Notes: Table reports Johansen's trace and maximum eigenvalue tests. EREIT is the Equity REIT index, MREITs the Mortgage REIT index, and the S&P the S&P 500 index. The null hypothesis tests for the number of cointegrating vectors (CIVs) designated by hypothesized number of cointegrating equations (Ces). Both Trace test, and Maximum-Eigenvalue test against the null hypothesis at the 5% level.

Table 12: 1980-2009 Optimal Lag Structure

VAR Lag Order Selection Criteria
Endogenous variables: EREITS S&P MREITS
Exogenous variables: C
Date: 04/06/13 Time: 20:10
Sample: 1980M01 2009M12
Included observations: 349

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-7904.771	NA	9.62e+15	45.31674	45.34988	45.32993
1	-5846.083	4070.185	7.62e+10	33.57067	33.70323	33.62344
2	-5789.533	110.8309	5.80e+10	33.29818	**33.53015***	**33.39052***
3	-5777.529	23.32105	5.71e+10	33.28097	33.61235	33.41288
4	-5767.569	19.17749	5.68e+10	33.27547	33.70626	33.44696
5	-5753.177	27.46461	5.50e+10	33.24457	33.77478	33.45563
6	-5738.431	27.88649	5.33e+10	33.21164	33.84126	33.46228
7	-5721.750	**31.25781***	5.10e+10*	**33.16762***	33.89666	33.45784
8	-5719.302	4.546759	5.29e+10	33.20517	34.03362	33.53496
9	-5711.274	14.76620	5.32e+10	33.21074	34.13861	33.58010
10	-5708.460	5.128429	5.52e+10	33.24619	34.27347	33.65513

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Notes: Table reports Likelyhood Ratio (LC), Akaike's information criteria (AIC), Schwarz's Bayesian information criteria (SC), and Hannan and Quinn information criteria (HQ) for the p-th order VAR models. EREIT is the Equity REIT index, MREITs the Mortgage REIT index, and the S&P the S&P 500 index. The optimal lag lengths based on each criterion are in bold.

Table 13: 1980-2009 Cointegration Rank Test (Trace, Max)

Date: 04/06/13 Time: 20:18
Sample (adjusted): 1980M05 2009M12
Included observations: 356 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: S&P MREITS EREITS
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.078237	44.13957	42.91525	0.0375
At most 1	0.036662	15.13734	25.87211	0.5631
At most 2	0.005157	1.840572	12.51798	0.9775

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.078237	29.00223	25.82321	0.0184
At most 1	0.036662	13.29677	19.38704	0.3047
At most 2	0.005157	1.840572	12.51798	0.9775

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Notes: Table reports Johansen's trace and maximum eigenvalue tests. EREIT is the Equity REIT index, MREITs the Mortgage REIT index, and the S&P the S&P 500 index. The null hypothesis tests for the number of cointegrating vectors (CIVs) designated by hypothesized number of cointegrating equations (Ces). Both Trace test, and Maximum-Eigenvalue test against the null hypothesis at the 5% level.

Table 14: (1980- 2009) Uncorrected VAR Cointegration Results

1 Cointegrating Equation(s):	Log likelihood	-5884.147	
Normalized cointegrating coefficients (standard error in parentheses)			
S&P	MREITS	EREITS	@TREND(80M02)
1.000000	-3.801400	0.657629	-10.05061
	(0.93480)	(0.13415)	(2.49589)
Adjustment coefficients (standard error in parentheses)			
D(S&P)	-0.012018		
	(0.00272)		
D(MREITS)	-0.003124		
	(0.00235)		
D(EREITS)	-0.073237		
	(0.01837)		

Notes: Table reports results for Uncorrected VAR Cointegration results for the sample period 1980:01-2009:12. The results report $\Pi = \alpha\beta'$ where the adjustment matrix alpha and the cointegrating matrix beta are given. EREIT is the Equity REIT index, MREITs the Mortgage REIT index, and the S&P the S&P 500 index

Table 15: Vector Error Correction Model (1980-2009)

Vector Error Correction Estimates
Date: 04/06/13 Time: 20:48
Sample (adjusted): 1980M04 2009M12
Included observations: 357 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
S&P(-1)	1.000000		
MREITS(-1)	-3.497725		
	(0.79233)		
	[-4.41447]		
EREITS(-1)	0.626439		
	(0.11289)		
	[5.54925]		
@TREND(80M01)	-10.11815		
	(2.15784)		
	[-4.68902]		
C	877.5598		
Error Correction:	**D(S&P)**	**D(MREITS)**	**D(EREITS)**
CointEq1	-0.012857	-0.002944	-0.092840
	(0.00270)	(0.00234)	(0.01863)
	[-4.76873]	[-1.25844]	[-4.98456]
D(S&P(-1))	0.022687	0.135964	1.182073
	(0.05916)	(0.05134)	(0.40869)
	[0.38348]	[2.64843]	[2.89235]
D(MREITS(-1))	-0.207758	0.089729	-0.879474
	(0.05746)	(0.04986)	(0.39694)
	[-3.61580]	[1.79957]	[-2.21565]
D(EREITS(-1))	0.015482	0.044127	0.084488
	(0.00843)	(0.00731)	(0.05823)
	[1.83673]	[6.03280]	[1.45096]
C	2.754674	0.046470	14.00692
	(1.85880)	(1.61304)	(12.8411)
	[1.48196]	[0.02881]	[1.09079]
R-squared	0.090776	0.193868	0.119439
Adj. R-squared	0.080443	0.184707	0.109432
Sum sq. resids	430611.8	324270.9	20550515
S.E. equation	34.97612	30.35167	241.6240
F-statistic	8.785781	21.16321	11.93626
Log likelihood	-1773.059	-1722.431	-2463.039
Akaike AIC	9.961115	9.677487	13.82655
Schwarz SC	10.01542	9.731797	13.88086

Mean dependent	2.837563	1.242381	17.65493
S.D. dependent	36.47392	33.61443	256.0393
Determinant resid covariance (dof adj.)		5.01E+10	
Determinant resid covariance		4.80E+10	
Log likelihood		-5909.964	
Akaike information criterion		33.21548	
Schwarz criterion		33.42186	

Notes: Table reports results for VECM for the sample period 1980:01-2009:12. The results report $\Pi = \alpha\beta'$ where the adjustment matrix alpha is defined by CointEq1 in Error Correction section, and the cointegrating matrix beta is defined by CointEq1 in Cointegratinging Eq section EREIT is the Equity REIT index, MREITs the Mortgage REIT index, and the S&P the S&P 500 index

Table 16: 1980-2005 Cointegration Rank Test (Trace, Max)

Date: 04/07/13 Time: 14:16
Sample (adjusted): 1980M04 2005M12
Included observations: 309 after adjustments
Trend assumption: Quadratic deterministic trend
Series: S&P MREITS EREITS
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.075326	35.49013	35.01090	0.0444
At most 1	0.034036	11.29101	18.39771	0.3646
At most 2	0.001910	0.590879	3.841466	0.4421

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.075326	24.19912	24.25202	0.0508
At most 1	0.034036	10.70013	17.14769	0.3359
At most 2	0.001910	0.590879	3.841466	0.4421

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Notes: Table reports Johansen's trace and maximum eigenvalue tests. EREIT is the Equity REIT index, MREITs the Mortgage REIT index, and the S&P the S&P 500 index. The null hypothesis tests for the number of cointegrating vectors (CIVs) designated by hypothesized number of cointegrating equations (Ces). Both Trace test, and Maximum-Eigenvalue test against the null hypothesis at the 5% level.

Table 17: Vector Error Correction Model (1980-2005)

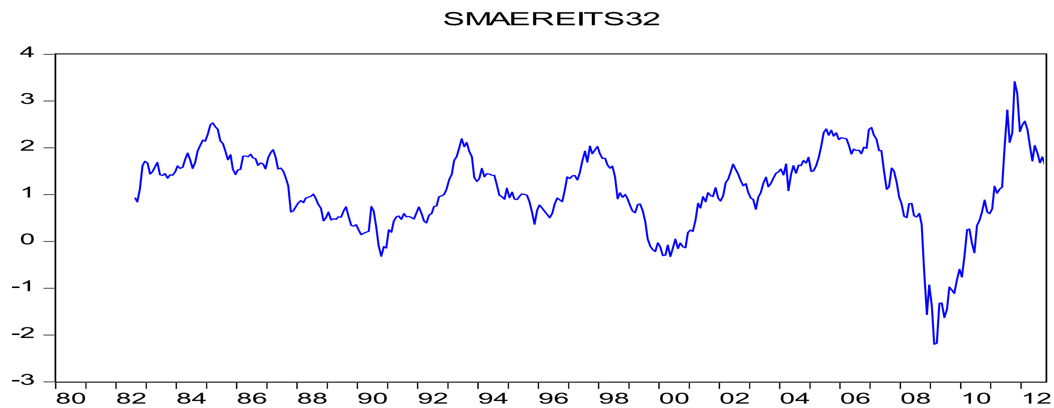
Vector Error Correction Estimates
Date: 04/07/13 Time: 14:19
Sample (adjusted): 1980M03 2005M12
Included observations: 310 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
S&P(-1)	1.000000		
MREITS(-1)	1.333748		
	(2.89508)		
	[0.46069]		
EREITS(-1)	1.716607		
	(0.70595)		
	[2.43164]		
@TREND(80M01)	-34.71366		
C	1096.086		
Error Correction:	**D(S&P)**	**D(MREITS)**	**D(EREITS)**
CointEq1	-0.001127	-0.002913	0.009140
	(0.00139)	(0.00125)	(0.00444)
	[-0.81238]	[-2.33859]	[2.05951]
D(S&P(-1))	-0.037153	0.016878	0.400062
	(0.05950)	(0.05344)	(0.19039)
	[-0.62442]	[0.31584]	[2.10125]
D(MREITS(-1))	-0.161601	-0.087272	0.060491
	(0.08659)	(0.07777)	(0.27708)
	[-1.86626]	[-1.12221]	[0.21831]
D(EREITS(-1))	0.035876	0.035288	-0.207905
	(0.02483)	(0.02230)	(0.07946)
	[1.44465]	[1.58220]	[-2.61632]
C	2.465400	0.031474	-16.42683
	(3.70582)	(3.32824)	(11.8582)
	[0.66528]	[0.00946]	[-1.38527]
@TREND(80M01)	0.006067	0.012651	0.267372
	(0.02099)	(0.01885)	(0.06716)
	[0.28904]	[0.67115]	[3.98113]
R-squared	0.014937	0.024348	0.079398
Adj. R-squared	-0.001265	0.008301	0.064256
Sum sq. resids	316178.4	255030.7	3237430.
S.E. equation	32.24997	28.96406	103.1961
F-statistic	0.921916	1.517303	5.243730
Log likelihood	-1513.632	-1480.319	-1874.197

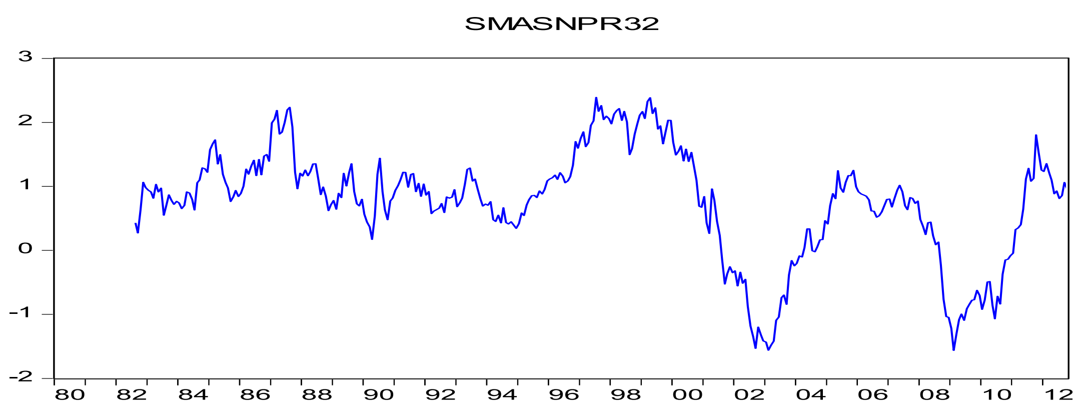
Akaike AIC	9.804076	9.589153	12.13030
Schwarz SC	9.876397	9.661474	12.20263
Mean dependent	3.660097	2.636097	22.37668
S.D. dependent	32.22959	29.08503	106.6805
Determinant resid covariance (dof adj.)	4.26E+09		
Determinant resid covariance	4.02E+09		
Log likelihood	-4747.381		
Akaike information criterion	30.76375		
Schwarz criterion	31.01687		

Notes: Table reports results for VECM for the sample period 1980:01-2005:12. The results report $\Pi = \alpha\beta'$ where the adjustment matrix alpha is defined by CointEq1 in Error Correction section, and the cointegrating matrix beta is defined by CointEq1 in Cointegratinging Eq section. EREIT is the Equity REIT index, MREITs the Mortgage REIT index, and the S&P the S&P 500 index

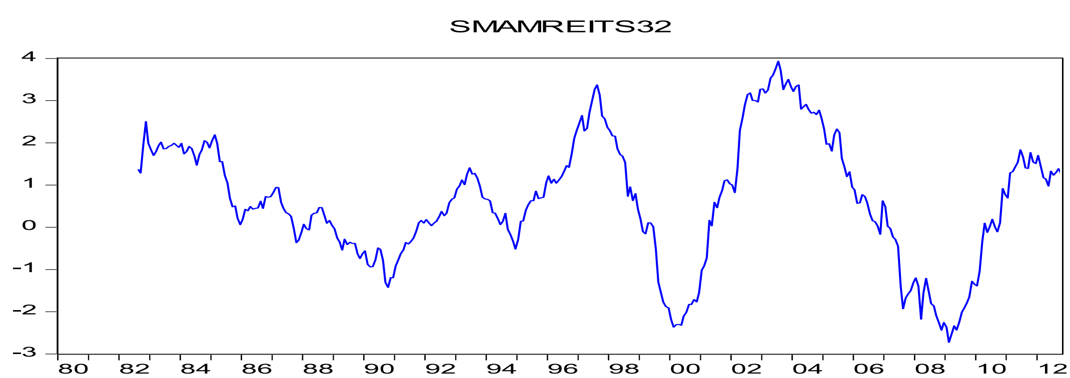
Graph 1. EREITs 32 Period SMA:



Graph 2. S&P-500 32 Period SMA:



Graph 3. MREITs 32 Period SMA:



Notes: Table reports simple moving average for the sample period 1980:01-2012:12 using total return data for each of the variables of interest. EREIT is the Equity REIT total return sample, MREITs the Mortgage REIT total return sample, and the S&P the S&P 500 total return series.

Vita

Jessie E. Felix was born in Los Angeles, California, where he lived only for 5 years before his parents moved to El Paso, Texas. He graduated from Ysleta High school in El Paso, Texas, in 2005. In 2009, he received a Bachelor of Business Administration degree with a concentration in Economics from the University of Texas at El Paso. He has worked as a graduate teaching assistant at the department of Economics and Finance at the University of Texas at El Paso. Shortly thereafter he worked for Merrill Lynch Wealth management where he worked as an Investment Advisor for high net worth individuals. Most recently, he decided he will be establishing his career with Vanguard Asset Management where he will continue to provide prudent investment advise to high net worth, and ultra high net worth families and businesses.