What Goes Up...Continues to Go Up: Momentum in Commercial Real Estate
Forecasting Price Appreciation via Cap Rates

by

Frank Kettler

B.A., Economics and Political Science, 2013

Colgate University

Submitted to the Program in Real Estate Development in Conjunction with the Center for Real Estate in Partial Fulfillment of the Requirements for the Degree of Master of Science in Real Estate Development

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ABSTRACT

In equity markets, dividend yields are highly correlated with future returns, largely through capital appreciation. Taking the same logic and applying it to the commercial real estate market -- could cap rates therefore predict future appreciation return? This paper finds that absolute cap rates are not significantly correlated with future appreciation or depreciation. However, regressions of first-differenced cap rates on future price appreciation find strong statistical significance at one, two, and three-quarter forecasts. The relation is strongest at a two-quarter forecast, declining at four-quarter forecasts and thereafter.

These findings support a case for momentum in commercial real estate pricing. Pricing movements, via cap rate changes, predict future appreciation or depreciation. The statistical results show that changes in cap rates are inversely correlated with future price appreciation or depreciation. When cap rates shift downward, properties tend to appreciate in future quarters, on average. And when cap rates shift upward, properties tend to depreciate in future quarters, on average.

The analysis is bifurcated by asset type and market size. When analyzing this relation on an asset-class level, the predictive power of cap rate changes on future appreciation and depreciation is strongest in retail. Additionally, this relation is stronger in Primary CSAs than in Secondary CSAs.

Astute investors should keep a close watch on the capital markets as they implement portfolio management strategies. While not to be utilized in isolation, these findings on momentum should be taken in context of a greater acquisition and disposition strategy.

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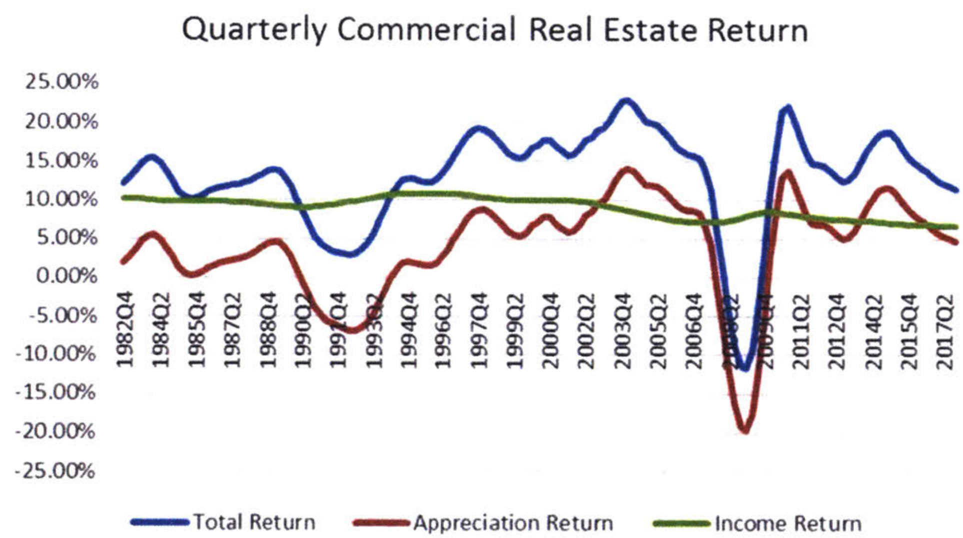
CHAPTER 1: INTRODUCTION

When looking at the menu of investable assets, investors have three main choices – equities, bonds, and alternatives. Depending on their type of 'hunger,' investors pursue return based on either capital appreciation or current income. Equities typically offer appreciation return, with bonds delivering income return. As a key player in the world of alternative investments, commercial real estate provides a unique blend of both appreciation and income return.

Since the 1980s, the commercial real estate industry has endured multiple cycles, with corresponding quarterly total returns ranging from -11.7% to 22.8% (a 34.5% range). Clearly there are good times and bad. Over the same time period, appreciation returns ranged from -19.7% to 14.2% (a 33.9% range), with income returns at a tighter range of 6.7% to 10.9% (a 4.2% range). As shown, the volatility of appreciation has a significant effect on total return.[1]

Figure 1.1



Source: Costar

Each year, thousands of commercial real estate properties transact in the capital markets. Investors compare the relative value of transactions by looking at the ratios of NOI to purchase price, commonly known as cap rates. With some minor differences, cap rates are equivalent to dividend yields in the equity markets, or the annual dividend paid out as a percentage of share prices. There has been a multitude of research on the predictive power of dividend yields on future equity market returns. In short, regressions of dividend yields on future appreciation returns are highly significant, illustrating the predictive strength of dividend yields on future return. If dividend yields can predict future equity returns, could cap rates predict future commercial real estate price appreciation? By understanding the volatility of appreciation, investors could more adequately predict total returns and gain a better understanding of market timing.

This paper will expand upon prior research on the relation between dividend yields and future return, by applying the same logic to cap rates in the commercial real estate market. As we move into a rising rate environment, combined with historically low cap rates, the findings should provide both private, and institutional investors, with forward-looking guidance on commercial real estate pricing. Additionally, the analysis takes the differences in primary and secondary markets, as well as differences between commercial real estate asset types, into account. This added bifurcation provides relative value guidance within the commercial real estate market.

First, this paper regresses cap rates on future appreciation return, in hopes of finding parallel relations to that of dividend yields and return in equity markets. Next, from a theoretical standpoint, this paper dissects the academic inputs into cap rates. Using the Gordon Growth Model as a foundation, it illustrates the effects of cap rates changes in an 'all-else-equal' environment. While far from reality – as all else is never equal – this provides context for any statistical findings.

CHAPTER 2: LITERARY REVIEW

2.1 Froland

Due to data availability, or lack thereof, there was minimal quantitative research on cap rates prior to the 1980s. Froland (1987) took the one of the first dives into the analysis of cap rates by comparing cap rate movements with the yields of other major asset classes. He used quarterly cap rate data for apartments, retail, office, and industrial properties from the 1970s through 1986.

Notably, his research found strong correlations with mortgage rates, bond rates, and P/E ratios. This is intuitive, as higher mortgage rates would decrease the price levered investors could pay for an asset, holding all else constant. It is interesting to note that as yields on fixed income decrease, prices for commercial real estate increase (via lower cap rates) – while equity markets exhibit the opposite effect. It is possible that the real estate and fixed income markets compete for capital, while equity markets exist in a complementary manner.

Conversely, inflationary expectations and the percentage change in real GNP were inversely related to cap rates. Given the inflation hedging attributes of commercial real estate, increasing inflation expectations would drive prices up (via lower cap rates). And as real GNP expands, commercial real estate prices tend to increase, along with most financial assets. While Froland's findings do not directly address the relation between cap rates and future appreciation, they provide context on the underlying components of cap rates, and what drives their movements.[2]

2.2 Cochrane

The impetus for this thesis is driven by research on the relation between dividend yields and equity market returns. As a primary example, Cochrane (2011) regressed dividend yields on future returns and future dividend growth. He found that dividend yields are highly correlated with future returns. However, he found no correlation with future dividend growth. Therefore, the correlation between dividend yields and future returns are largely driven by capital appreciation. Cochrane claimed that, "high prices, relative to dividends, have reliably preceded many years of poor returns. Low prices have preceded high returns…This is the true meaning of return forecastability."[3] In effect, the price one pays for an asset, via a ratio of its cash flow to cost, has a direct inverse relation to future returns.

According to Cochrane, "previously, we thought returns were unpredictable, with variation in price-dividend ratios due to variation in expected cash flows. Now it seems all price-dividend variation corresponds to discount-rate variation."[3] Cochrane illustrated that when consumption, output, and investment are low, with high unemployment and failing businesses – common in downturns – prices are typically low (via high discount rates) with high expected returns. Conversely, when consumption, output, and investment are high, with low unemployment and growing businesses – common in growth periods – prices are typically high (via low discount rates) with low expected returns. Therefore, bubbles are driven by underestimated discount rates and overestimated cash flow growth rates. This logic is perfectly illustrated with residential real estate. Per Cochrane, "high prices relative to rents mean low returns, not higher subsequent rents." [3] The economy is mean reverting to a long-run growth path, moving virtually all asset classes with it. Therefore, cash flow growth expectations at peaks and troughs generally turn out to be wrong.[3]

2.3 Plazzi, Torous, Valkanov

Plazzi, Torous, and Valkanov (2010) were some of the first to take the relation of dividend yields and equity market returns, and apply it to commercial real estate. While there are some key differences between the two asset classes – notably, heterogeneity, transaction costs, carrying costs, illiquidity, tax issues, and inability to sell short – there are similarities in the way current yields predict future return.

The theoretical foundation behind their analysis of the predictive power of cap rates, lies in the co-movement of rents and prices. Even if near term movement is unpredictable, if rents increase relative to underlying asset values, then capital will be attracted to the higher yields, bidding up prices and returning respective cap rates to steady state equilibrium (assuming consistent risk). Therefore, even though rents and prices appear unpredictable when evaluated individually, cap rates, in the form of their ratio, are mean-reverting.

In other words, if at a certain time, the ratio exceeds its unconditional mean, mean-reversion implies that either expected returns are high or that expected rent growth is low – or a combination of the two. In theory, high cap rates predict future price increases, while low cap rates predict future price decreases. This is the same logic past applied to equity markets via dividend yields.

After using a generalized method of moments procedure, they found that for apartments, retail, and industrial properties, cap rates capture time variation in expected returns but not expected rent growth rates. In contrast, office property cap rates did not capture time variation in expected returns, but mildly captured expected rent growth rates. Additionally, their analysis found that the expected returns of apartments, retail, industrial, and office properties have similar exposure to macroeconomic variables, yet their rent growth rates differ in their correlation to expected return.[4]

2.4 Beracha and Downs

While the research on momentum in commercial real estate is limited, Beracha and Downs (2015) utilized NCREIF data to assess the ex-post performance of constructed value and momentum commercial real estate portfolios. Their hope was to apply equity portfolio construction logic to commercial real estate portfolio construction in order to determine any parallels in pricing performance.

They used absolute cap rates as proxies for value. Low cap MSAs were included in growth portfolios, with high cap rate MSAs included in value portfolios. This logic echoes the price-to-earnings ratio commonly utilized in equity portfolio construction.

Similarly, momentum portfolios were constructed based on MSAs with high past performance, defined as the total return for the most recent year. Conversely, negative-momentum portfolios included MSAs with low past performance.

On both a raw, and risk-adjusted basis, momentum portfolios and value portfolios outperformed negative-momentum and growth portfolios. Notably, the value premium increases in importance in a downturn, while economic expansion drives the momentum premium.[5]

2.5 Linneman

Looking at the subcomponents of cap rates, Linneman (2015) analyzed the effects of rising interest rates on cap rates. He argued that changes in the real estate risk premium component of cap rates primarily drive changes in cap rates. While the real estate risk premium has multiple subcomponents, the liquidity portion has the largest effect on cap rates, mostly due to its countercyclical nature. Specifically, Linneman notes the control that lenders have on the marginal cost of capital. For instance, if lenders change origination volume, spreads, or LTV levels, marginal cost of capital is directly affected. This, in turn, affects liquidity, the real estate risk premium, and finally, cap rates.

Linneman regressed macroeconomic factors such as the 10-Year Treasury, a mortgage lending liquidity proxy, real GDP, the unemployment rate, and inflation on NCREIF cap rates. His analysis showed that even with rising interest rates, increased mortgage flows can cause cap rates to decrease via higher LTVs, lighter loan covenants, and narrower mortgage spreads. For instance, by increasing LTVs, the weighted average cost of capital can decrease for highly levered buyers, even with higher index rates. In sum, his findings show that cap rates are primarily driven by the flow of mortgage funds, instead of absolute interest rates. It is interesting to note that Linneman's findings hinge on leverage, while he uses NCREIF data for his analysis, which reflect cap rates and returns on an unlevered basis.[6]

CHAPTER 3: METHODOLOGY AND DATA

3.1 NCREIF

Until the late 1970s, aggregate data on commercial real estate pricing was effectively non-existent. Transactions occurred in opaque markets, largely driven by private investors. Beginning with NCREIF's development of the NCREIF Property Index ("NPI") in 1977, transparency was brought to the commercial real estate industry.[7]

These developments not only enabled quantitative analysis on the commercial real estate industry, but also greatly increased institutional investor appetite in commercial real estate as an asset class. Investors could now not only track commercial real estate performance (to itself and other asset classes), but could also compare managers to their peers. These improvements in the flow of information attracted more institutional capital, thus increasing the demand for better information – a true positive feedback loop. Since then, NCREIF has compiled quarterly data on over 30,000 properties, and other data providers such as CoStar and RCA have entered the market.

The NPI tracks core institutional properties (with occupancies greater than 60%) across the US on a quarterly, unlevered, value-weighted basis. Properties owned by tax-exempt institutions (mostly pension funds) and held in a fiduciary environment, comprise the property-level data. The return metrics are accounted for using market-value accounting standards, rather than actual cost. Respective market values are determined via appraisals, or estimates of current market value based on recent sales of comparable properties, replacement cost, and other appraisals of similar assets. NCREIF summarizes the NPI formula as, “an internal rate of return (IRR) for the property each quarter as if the property was purchased at the beginning of the quarter and sold at the end of the quarter and NOI being received monthly and any capital expenditures and partial sales occurring mid quarter.”[7]

It is important to clarify that the NPI reflects investment returns from a single type of investor, and therefore, may not be representative of the market as a whole. Additionally, the market value accounting standards tend to lag actual transactional data – appraisal lags smooth indices, reducing volatility. And finally, the stabilized nature of the properties included in the index, as well as the exclusion of distressed sales, biases the data upwards. All that being said, the majority of quantitative research on the commercial real estate industry tends to utilize NCRIEF’s NPI. While NPI data is robust, it offers a very niche view of a much more dynamic market.[7]

3.2 CoStar

Consisting of approximately 2.3 million sales transactions valued in the aggregate at approximately $5.7 trillion, CoStar’s property index is constructed using repeat-sales methodology. By measuring pricing movement based on actual transaction prices, this methodology is considered a more accurate measure of real estate pricing. According to CoStar, “when a property is sold more than once, a sales pair is created. The prices from the previous and most-recent sales are then used to calculate price movement for the property. The aggregated price changes from all of the sales pairs are used to create a price index.”[1]

Further contrasting the NPI, CoStar’s index includes all investor types, painting a clearer picture of total market dynamics. While constant-quality indices, such as the NPI, have some benefits, they artificially skew returns. Additionally, Costar’s index includes distressed sales, further alleviating the upward bias existent in the NPI.[1]

Even with these key differences, there are some similarities between the indices. First, both are measured on an unlevered basis. Since different investors have different leverage appetites, as well as access to debt, un-levering the data creates a true ‘apple-to-apples’ comparison. Second, both indices deduct capital expenditures from return. Cap rates value properties based on the ratio of NOI to purchase price, neglecting a key component of total return – capital expenditures. By deducting an estimate of capital expenditures, returns reflect a more accurate total cash flow picture. And finally, both report value-weighted returns, weighing price changes by the value of each transaction. In contrast, an equal-weighted index weights every transaction equally, taking an average, regardless of the value of the transaction. Both types of indices provide analysts with different insights. An equal-weighted index is heavily influenced by lower-value transactions with high frequency. In contrast, a value-weighted index places greater weight on high-value transactions.

3.3 CSAs

The analysis examines the data in three ways. First on a national, aggregate level. Second, by asset type. And third, by market type – primary Combined Statistical Areas ("CSA") and secondary CSAs.

The US Office of Management and Budget ("OMB") defines a CSA as, "consisting of various combinations of adjacent metropolitan ("MSA") and micropolitan areas, with economic ties measured by commuting patterns."[8] MSAs are regions with populations over 50,000 with close economic ties and one or two major cores. Similarly, micropolitan areas are labor market areas clustered around urban cores with populations between 10,000 and 50,000 people. For context, there are 171 CSAs, 388 MSAs, and 536 micropolitan areas within the US.[8]

For the purpose of this analysis, "Primary CSAs" are defined as CSAs encompassing more than 8 million people per updated 2017 census estimates (based off the most recent census in 2010). These include: (1) New York City at 24 million people, (2) Los Angeles at 18.75 million people, (3) Chicago at 10 million people, (4) Washington DC at 9.75 million people, (5) San Francisco at 8.75 million people, (6) Boston at 8.25 million people.[8]

"Secondary CSAs" are defined as CSAs encompassing more than 3.5 million. These include: (7) Dallas at 7.75 million people, (8) Philadelphia at 7.25 million people, (9) Houston at 7 million people, (10) Miami at 6.75 million people, (11) Atlanta at 6.5 million people, (12) Detroit at 5.25 million people,

(13) Seattle at 4.75 million people, (14) Minneapolis at 4 million people, (15) Denver at 3.5 million people. [8]

It should be noted that CoStar's market definitions follow the Core Based Statistical Area ("CBSA") classification system, and provide data on the top CBSAs. The OMB defines a CBSA as, "one or more adjacent counties or county equivalents that have at least one urban core area of at least 10,000 population, plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties."[9] The 929 CBSAs include the 388 MSAs and the 541 micropolitan areas.[9] For analysis purposes, the CBSAs are used as a proxy for their larger CSA counterparts, given the data limitations associated with smaller micropolitan areas.

CHAPTER 4: DATA ANALYSIS

4.1 National Aggregate

In contrast to prior studies on momentum (such as Beracha and Downs (2015)), this paper looks at the predictive power of cap rates, rather than preceding total return. Practicality is the key reason for this. Cap rates are constantly observable in the marketplace. Total returns are derived from market indices, which suffer a multitude of biases. Most importantly, due to the lagged nature of this data, investors monitoring momentum based on total return will most likely be 'too late to the party' – either failing to capture upside on acquisitions or failing to prevent downside on dispositions.

The analysis assumes that cap rates acts as a conditioning variable, successfully summarizing all other economic factors into one quantity. In other words, cap rates act as solo-state variables, capturing all relevant economic fluctuations.

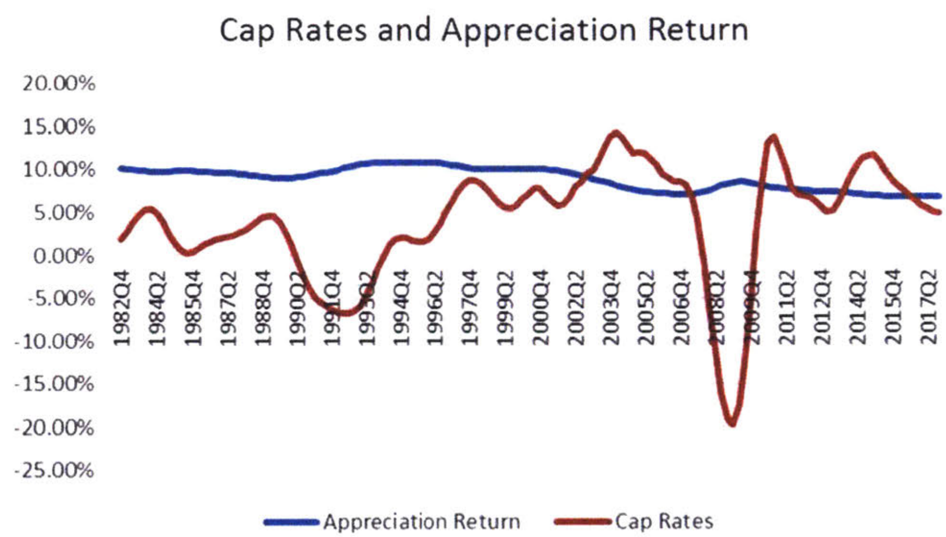
A simple OLS regression was created to determine the relation between cap rates and future appreciation return, using Costar data from Q3 1982 to Q4 2017.[1] The analysis was based on the following regression equation:

$$Y_{t+i} = \beta_0 + \beta_t X_t + e$$

$$\text{Appreciation Rate}_{t+i} = \beta_0 + \beta_t(\text{Cap Rate}_t) + e$$

The dependent variable, Y, consists of future appreciation rates, while the independent variable, X, consists of cap rates. It is important to note the composition of future appreciation rates. They consist of percentage changes in CoStar's price index, net of capital expenditures. In essence, this takes the natural log of changes in the CoStar's price index, net of capital expenditures (taking the log of data simply switches the composition from levels to rates). Thus, in effect, $Y_{t+i} = \log(Z_{t+i})$, where Z equals the level of CoStar's price index, net of capital expenditures. The following graph visually displays the relation between cap rates and appreciation return, dating back to the early 1980s.

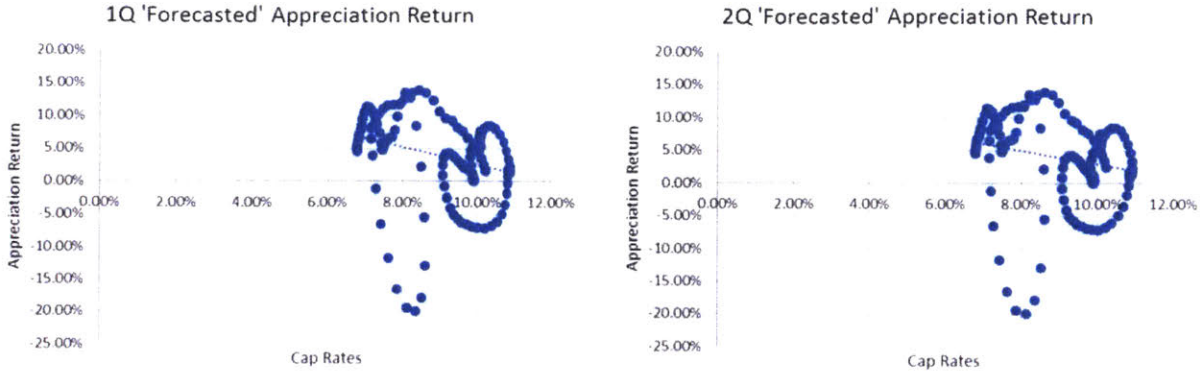
Figure 4.1



Source: Costar

Remarkably, the results were inconclusive. The R-Squared value for the one-quarter forecast was 0.0712, decreasing further to 0.0419 at a two-quarter forecast. Even though the P-values were statistically significant at 95% confidence levels, the model failed to capture much of the variation in the data (as illustrated by the low R-Squared values). For illustrative purposes, the regression results and graphical relation – or lack thereof – are included below:

Figure 4.2



Forecast	R-Squared	Standard Error	Observations
1Q	**0.0712**	0.0636	141
2Q	**0.0419**	0.0648	140

	Coefficients	*Standard Error*	*t Stat*	*P-value*
		1Q Forecast		
Intercept	0.1583	0.0367	4.3131	3.0335E-05
X Variable :	-1.3235	0.4055	-3.2641	0.00138253
		2Q Forecast		
Intercept	0.1320	0.0378	3.4878	0.00065371
X Variable :	-1.0260	0.4174	-2.4584	0.01519495

While there is effectively no relation between absolute cap rates and future appreciation return, when running the same regression with the first difference of cap rates, an interesting trend appears. The updated analysis was based on the following regression equation:

$$Y_{t+i} = \beta_0 + \beta_t(X_t - X_{t-1}) + e$$

$$\text{Appreciation Rate}_{t+i} = \beta_0 + \beta_t(\text{Cap Rate}_t - \text{Cap Rate}_{t-1}) + e$$

The dependent variable, Y, consists of future appreciation rates, while the independent variable consists of the quarterly change in cap rates. This relation is visually displayed in Exhibit H, and was run with forecasted appreciation at one to six-quarter intervals. As Exhibit H illustrates, changes in cap rates are inversely correlated with future appreciation. When cap rates shift downward, properties tend to appreciate in future quarters, on average. And when cap rates shift upward, properties tend to depreciate in future quarters, on average. The R-Squared values for each respective forecast are outlined below, as well as the percentage change from the first-quarter forecast, and the quarter-over-quarter change.

Figure 4.3

Forecast	R-Squared	Delta from 1Q Forecast	Delta from Previous Quarter Forecast
1Q	0.7928	-	-
2Q	0.8446	6.53%	6.53%
3Q	0.7861	-0.85%	-6.93%
4Q	0.6409	-19.16%	-18.47%
5Q	0.4600	-41.98%	-28.22%
6Q	0.2918	-63.19%	-36.57%

As shown, the R-Squared values increased significantly from those captured by the absolute cap rate model. The regression results are outlined in Exhibit A. The P-values were statistically significant at 99% confidence levels in every forecast. Interestingly, the two-quarter forecast exhibited the greatest statistical significance. Furthermore, the strength of the forecast, as measured by R-Squared values, started to decline after three quarters.

According to the Merriam-Webster Dictionary, momentum is defined as, "strength or force gained by motion or by a series of events."[10] These findings lay the foundation for a momentum case – when cap rates shift, they tend to forecast out a future inverse price change. Downward moving cap rates predict future price appreciation, while upward moving cap rates predict future price depreciation. This relation is strongest within the subsequent three quarters. As such, a prudent investor should keep a close watch on the capital markets and keep this relation in mind, in the context of acquisitions and dispositions.

4.2 Asset Type

While the case for momentum in the commercial real estate industry seems robust, how does each respective asset class exhibit momentum in isolation? In order to understand this pricing dynamic within asset classes, the same analysis was run on industrial, retail, office, and multifamily properties. The respective R-Squared values are summarized below:

Figure 4.4

R-Squared					
	Industrial	**Retail**	**Office**	**Multifamily**	**Average**
1Q	0.6687	0.7679	0.6285	0.7584	0.7059
2Q	0.7080	0.7969	0.7222	0.7948	0.7555
3Q	0.6483	0.7555	0.6773	0.7026	0.6959
4Q	0.5143	0.6624	0.5218	0.5183	0.5542
5Q	0.3642	0.5515	0.3403	0.3144	0.3926
6Q	0.2289	0.4421	0.1890	0.1511	0.2528
Average	0.5221	0.6627	0.5132	0.5399	

As shown, over the six-quarter sample period, retail showed the most significant R-Squared values, on average. Interestingly, the average R-Squared values of the remaining asset classes were relatively consistent. The regression results are outlined in Exhibits B, C, D, and E. Additionally, the graphical relations between these variables are included in Exhibits K, L, M, and N.

Consistent with the aggregate US analysis, the P-values were statistically significant at 99% confidence levels in every forecast and the two-quarter forecast exhibited the strongest predictive power. At this two-quarter peak, retail and multifamily displayed the highest R-Squared values. After the three-quarter forecast, the R-Squared values significantly declined. Office was the only asset class to show a higher R-Squared value for a three-quarter forecast than a one-quarter forecast. The multifamily regressions resulted in the largest decline in R-Squared values between the one-quarter forecast and the six-quarter forecast. Conversely, retail resulted in the smallest R-Squared decline. The charts below outline the percentage change from the first-quarter forecast, as well as the quarter-over-quarter change.

Figure 4.5

R-Squared Delta from 1Q Forecast					
	Industrial	**Retail**	**Office**	**Multifamily**	**Average**
1Q	-	-	-	-	
2Q	5.88%	3.78%	14.91%	4.80%	7.34%
3Q	-3.05%	-1.61%	7.76%	-7.36%	-1.06%
4Q	-23.09%	-13.74%	-16.98%	-31.66%	-21.37%
5Q	-45.54%	-28.18%	-45.86%	-58.54%	-44.53%
6Q	-65.77%	-42.43%	-69.93%	-80.08%	-64.55%

R-Squared Delta from Previous Quarter Forecast					
	Industrial	Retail	Office	Multifamily	Average
1Q	-	-	-	-	
2Q	5.88%	3.78%	14.91%	4.80%	7.34%
3Q	-8.43%	-5.20%	-6.22%	-11.60%	-7.86%
4Q	-20.67%	-12.32%	-22.96%	-26.23%	-20.55%
5Q	-29.19%	-16.74%	-34.78%	-39.34%	-30.01%
6Q	-37.15%	-19.84%	-44.46%	-51.94%	-38.35%

There are two possible explanations for the high R-Squared values in the retail regressions. First, with advent of the internet, one could say that retail has undergone greater structural changes than the other asset classes during the sampling period. These changes, and the uncertainty that comes with them, could have played a role in increasing herd mentality in the retail sector. Second, based on data from CoStar, the average transaction size for a retail asset is $1.4M, significantly less than that of the other asset classes (Office: $5.5M, Multifamily: $4.4M, Industrial: $1.9M).[1] These lower equity checks most likely result in a larger buyer pool. Perhaps, this increased liquidity allows investors to quickly react to pricing movements – entering or exiting the market faster than investors in other asset classes.

4.3 CSA

To further bifurcate the analysis, the same regression was run on Primary CSAs and Secondary CSAs. The R-Squared values for each respective forecast are outlined below, as well as the percentage change from the first-quarter forecast, and the quarter-over-quarter change.

Figure 4.6

	Primary CSAs	Secondary CSAs	Average
1Q	0.8058	0.7566	0.7812
2Q	0.8549	0.8074	0.8312
3Q	0.7965	0.7403	0.7684
4Q	0.6548	0.5812	0.6180
5Q	0.4813	0.3920	0.4367
6Q	0.3208	0.2247	0.2728
Average	0.6524	0.5837	

R-Squared Delta from 1Q Forecast			
	Primary CSAs	Secondary CSAs	Average
1Q	-	-	
2Q	6.09%	6.71%	6.40%
3Q	-1.15%	-2.15%	-1.65%
4Q	-18.74%	-23.18%	-20.96%
5Q	-40.27%	-48.19%	-44.23%
6Q	-60.19%	-70.30%	-65.24%

R-Squared Delta from Previous Quarter Forecast			
	Primary CSAs	Secondary CSAs	Average
1Q	-	-	
2Q	6.09%	6.71%	6.40%
3Q	-6.83%	-8.31%	-7.57%
4Q	-17.79%	-21.49%	-19.64%
5Q	-26.50%	-32.55%	-29.52%
6Q	-33.35%	-42.68%	-38.01%

As shown, over the six-quarter sample period, the R-Squared values in Primary CSAs exceeded their counterparts in Secondary CSAs in every forecast. On average, the Primary CSA R-Squared values were 11.8% higher than those of the Secondary CSAs. Still, they both exhibited the same relation as the aggregate US analysis – the two-quarter forecast exhibited the strongest predictive power, and after the three-quarter forecast, the R-Squared values significantly declined. Furthermore, the P-values were statistically significant at 99% confidence levels in every forecast. The regression results are outlined in Exhibit G and H, with the graphical relations displayed in Exhibits I and J.

Perhaps the higher R-Squared values are driven by the larger institutional presence in Primary CSAs. Based on RCA data dating back to 2001, on average, institutional buyers reflect 78.5% of the buyer pool in Primary CSAs (after removing the effects of user acquisitions). They comprise a slightly smaller percentage of the buyer pool in Secondary CSAs at 76.7%. In this context, institutional buyers include cross-border and public buyers. While this difference is minimal, the weighting is measured by number of properties bought, rather than volume. From a transactional volume perspective, this percentage would most likely be higher, given that institutional buyers typically transact at higher price points than private buyers.[11]

4.4 Volatility

With these results in mind, it is worth returning to the volatility of commercial real estate returns. As previously noted, since the 1980s, quarterly commercial real estate total returns ranged from -11.7% to 22.9%. This volatility is largely driven by appreciation return, ranging from -19.7% to 14.2%. Income returns were less volatile, ranging from 6.7% to 10.9%.[1]

During this time, the average depreciation rate was -7.20%, while the average appreciation rate was 6.39%. Taken together, the average price change was 3.98%. Although the average magnitude of depreciation is greater than the average magnitude of appreciation, it is also worth noting the frequency of these price changes. 82.27% of the sampled quarters exhibited appreciation, with 17.73% of the quarters exhibiting depreciation. [1]

Historical cap rate changes reflect similar characteristics. Of the sampled data, the average cap rate change was -0.02%, a two-basis point decrease. However, the average magnitude of increases was greater than that of decreases, averaging 0.08% and -0.07%, respectively. This inverse relation to that of appreciation and depreciation makes logical sense. Negative pricing movements typically exceed positive pricing movements. Also consistent with the frequency of appreciation, the majority of cap rates movements were downward. 70.42% of the quarters sampled exhibited downward cap rate movements, with 29.58% of the quarters exhibiting upward cap rate movements. [1]

This information conveys an important trend in financial markets. While negative pricing movements are typically less frequent than positive pricing movements, they are much more significant in size. It is also worth noting the historical context of the sampling period – the data used in the analysis runs from 1982 to 2017. Coming out of the energy crises that plagued the global economy in the 1970s, the US economy was at the bottom of a recession at the beginning of the sampling period. In contrast, the sampling period ends at the latter part of a 10-year expansion. Ideally, the sampling period should start and end at either a recession, or a peak. However, given the previously discussed data limitations, and minimum data requirements for statistical significance, this was not possible.

CHAPTER 5: THEORETICAL ANALYSIS

5.1 Cap Rate Components

As illustrated, changes in cap rates play a role in forecasting future commercial real estate price appreciation or depreciation. The analysis assumes cap rates are solo-state variables, summarizing all relevant economic factors. A wise investor would keep a careful watch on capital markets, and cap rate movements, in order to time acquisitions and dispositions. However, an even more astute investor would ask, what predicts the cap rate changes that predict the future price appreciation or deprecation? While there is a multitude of academic literature on cap rates drivers – and is worth its own thesis – the following section hopes to provide some greater context on the subject.

From an asset pricing perspective, the price of a commercial property should equal the present value of its future cash flow, largely driven by rents. Therefore, this relation implies that fluctuations in cap rates, via a multiple of this present value of future cash flow to price, should reflect variations in either future rents, future discount rates, or both. To illustrate this point, assume that cap rates for office buildings in Chicago are higher than those of similar office buildings in Miami. This would imply that either future discount rates in Chicago will be higher than those in Miami, or that future rents in Chicago are expected to grow at a slower rate than in Miami, or some combination of the two.

The cap rate is the most basic valuation metric in the commercial real estate industry. The cap rate formula is roughly identical to the perpetuity (an income stream that runs forever) formula in finance theory. While in theory, property cash flows extend forever, they tend to fluctuate, commonly positively, but also occasionally negatively. This is why a growth rate is applied. To illustrate this point, assuming constant discount rates, a property valued at a 12% cap rate with a cash flow stream expected to grow by 2% each year will generate the same returns as a property valued at an 8% cap rate with an income stream expected to decline by 2% per year. Occupancy growth and below-market rents commonly drive positive cash flow growth. In contrast, large capital expenditures and expiring tenants with limited backfill options commonly drive negative cash flow growth.

In its simplest form, investors look at the required return of a commercial real estate investment and the expectation of future cash flow growth. For instance, with high required return and low expected cash flow growth, investors value properties with high cap rates as they expect relatively similar future cash flows and need a high current yield to reach their required return. In this instance, high required return is a function of high risk, via cash flow volatility and uncertainty. In order to compensate for this increased risk, investors demand increased required return. As a simple illustration, the required return on a speculative ground-up development would exceed that of a stabilized office property, given the uncertainty in timing and amount of future cash flows.

Explicitly, the cap rate equals the discount rate applied to a specific property's cash flow stream minus the real long-run growth rates of those cash flow streams.

$$C = r - g$$

Cap Rate = Discount Rate – Long-term Real Growth Rate

Dissecting this equation, the discount rate equals the real long-term risk-free rate plus long-term inflation expectations plus a risk premium for real estate specific risk. This real estate specific risk can include an illiquidity premium, operating risk premium, information asymmetry premium, among others.[14]

$$r = rfr + \pi + RP_{RE}$$

Discount Rate = Real Risk-Free Rate + Long-term Inflation + Real Estate Risk Premium

Next, the long-term growth rate equals the expected real cash flow growth rate plus long-term inflation expectations.

$$g = G_{CF} + \pi$$

Long-term Growth Rate = Real Cash Flow Growth + Long-term Inflation

Via basic algebra, long-term inflation expectations are solved out of the equation, as it is an equal part of both the risk-free rate and the long-run growth rates of the cash flow streams. Therefore, cap rates are driven by: (i) the real long-term risk-free rate, (ii) risk premiums for real estate specific risk, (iii) the expected real cash flow growth rate (while this variable has an inverse relation on cap rates).[12]

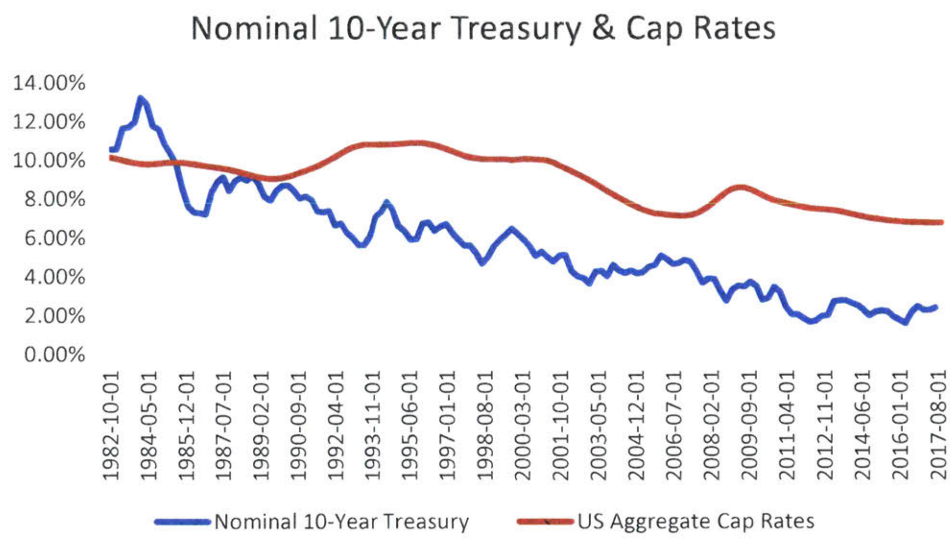
$$Cap\ Rate = (Real\ Risk\text{-}Free\ Rate + Long\text{-}term\ Inflation + Real\ Estate\ Risk\ Premium)$$
$$- (Real\ Cash\ Flow\ Growth + Long\text{-}term\ Inflation)$$

$$Cap\ Rate = Real\ Risk\text{-}Free\ Rate + Real\ Estate\ Risk\ Premium - Real\ Cash\ Flow\ Growth$$

5.2 Real Risk-Free Rate

Commercial real estate investments are long-term in nature. In order to account for this duration, the 10-year treasury is commonly considered a proxy for the risk-free rate (as opposed to a short-term rate such as LIBOR or the Federal Funds Rate). Over the past 40 years, the nominal risk-free rate has been on a consistent downward trend. The following chart illustrates the historical movements of cap rate rates and the nominal 10-year treasury.

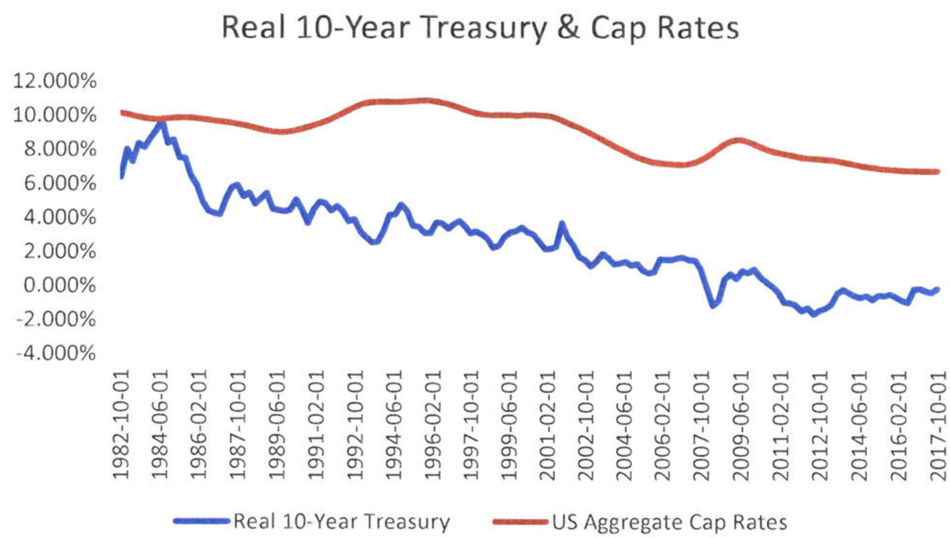
Figure 5.1



Source: Costar and Federal Reserve Economic Data

For analysis purposes, the real risk-free rate is calculated by subtracting the forward-looking 12-month inflation forecast from the current 10-year treasury rate. While also exhibiting a general downward trend, the slope is approximately two-thirds of the slope of the nominal rate. It is also worth comparing the real average of 2.73% to the nominal average of 6.33%.[1 & 13]

Figure 5.2



Source: Costar and Federal Reserve Economic Data

Given the current interest rate environment, there is only one way for rates to move – upward. Commercial real estate investors tend to focus on the raw arithmetic, showing that increased risk-free rates result in increased cap rates, and therefore, lower property values. This logic assumes and all-else-equal environment. However, the relation is more complex and typically, not all-else-equal.

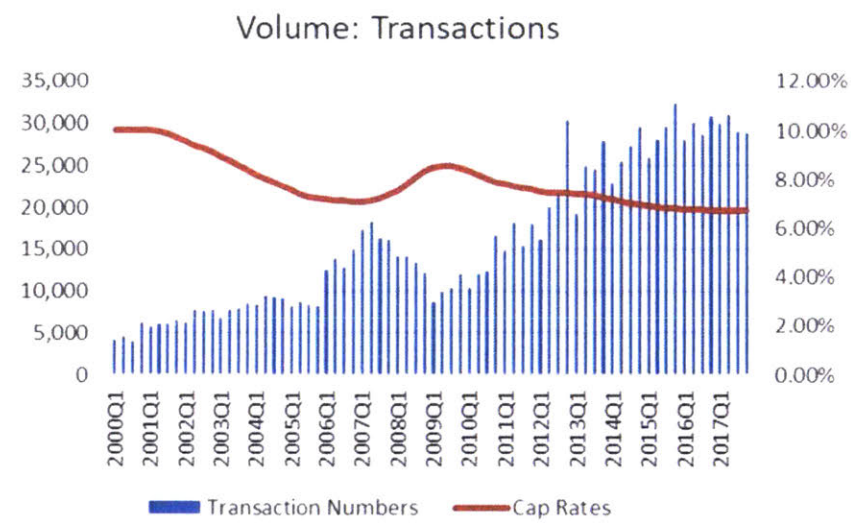
5.3 Real Estate Risk Premium

While more subjective than the risk-free rate, the second part of the cap rate equation (real estate risk premium) is largely influenced by macro forces, primarily through the capital markets. Liquidity can be used as a proxy, reflecting the aggregate view of the risk premium placed on commercial real estate by investors. When liquidity is increasing, one could assume that the capital markets view this risk as decreasing. In contrast, when liquidity is decreasing, one could assume that the capital markets view this risk as increasing.

The commercial real estate capital stack can be split into two buckets – debt and equity. The liquidity of each side could be measured individually. For instance, liquidity in the debt markets could be measured via loan issuance, leverage, spreads, or a combination. However, for the purposes of this paper, transaction volume is used as a proxy. It reflects the cumulative aspects of both parts of the capital stack – their co-existence is interdependent and culminates with transactions.

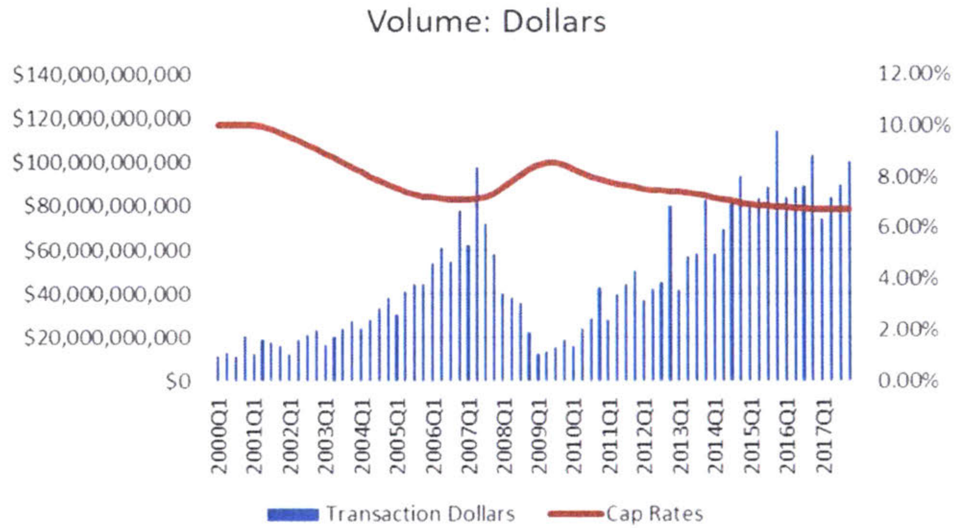
It is interesting to note that while transactional volume reflects liquidity, which reflects market sentiment regarding the real estate risk premium, this does not mean that this premium is appropriately priced. This can be illustrated by looking at transactional volume at various phases of market cycles. In a downturn, liquidity and transactions are typically low. In contrast, at the top of a cycle, liquidity and transactions are high. This would infer that at the top of cycles, the real estate risk premium is low, while at the bottom of cycles, the real estate risk premium is high. Whether this is actually true is the topic of another paper.

Figure 5.3



Source: Costar

Figure 5.4



Source: Costar

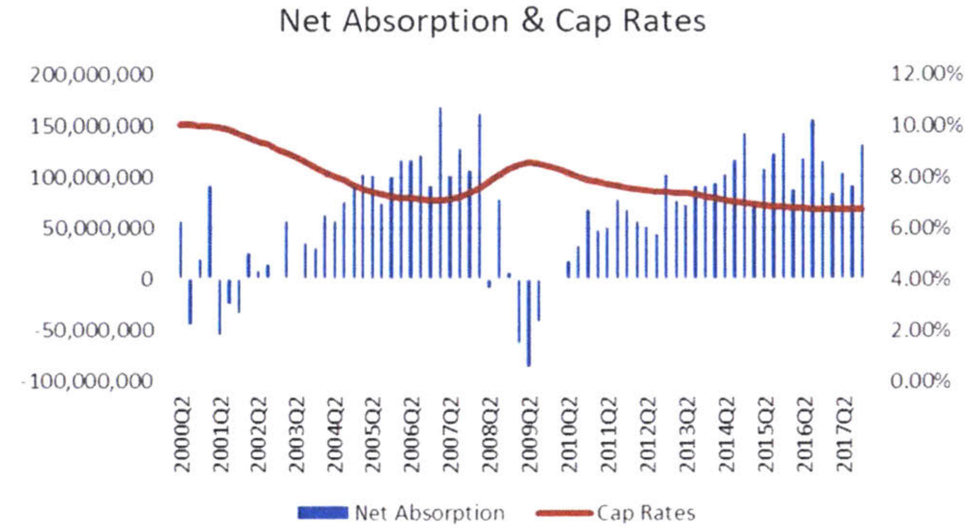
From an arithmetic perspective, increasing real estate risk premiums increase cap rates, and decreasing real estate risk premiums decrease cap rates. As the preceding graphs illustrate, measured in both transaction and volume, liquidity is inversely correlated with cap rates. When liquidity increases, cap rates tend to shift downward and when liquidity decreases, cap rates tend to shift upward.

5.4 Real Cash Flow Growth

While the real estate risk premium is largely macro-driven, micro factors influence real cash flow growth. Largely operational, this third part of the cap rate equation is driven by a combination of property-level factors such as rent, occupancy, market absorption, and tenant credit loss.

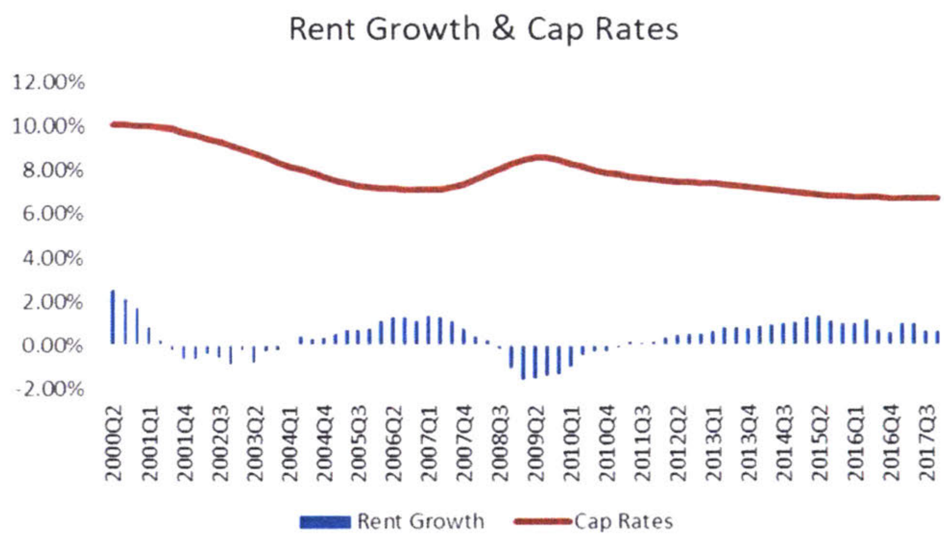
All else equal, at the bottom of a market cycle, real cash flow growth should be at its highest point. Conversely, at the top of a market cycle, it should be at its lowest point. Yet, in reality, it is highly subjective, and therefore, cycle-driving. Winning bidders are those who naively project continued real cash flow growth at the top of the cycle. While no one can perfectly time markets, irrational exuberance over-inflates pricing, as investors overpay for nonexistent cash flow growth. It is worth further emphasizing this point. Past cash flow growth only matters to the extent that it influences perceptions of future cash flow growth. For illustrative purposes, the following graphs reflect a select number of metrics that drive real cash flow growth. [1]

Figure 5.5



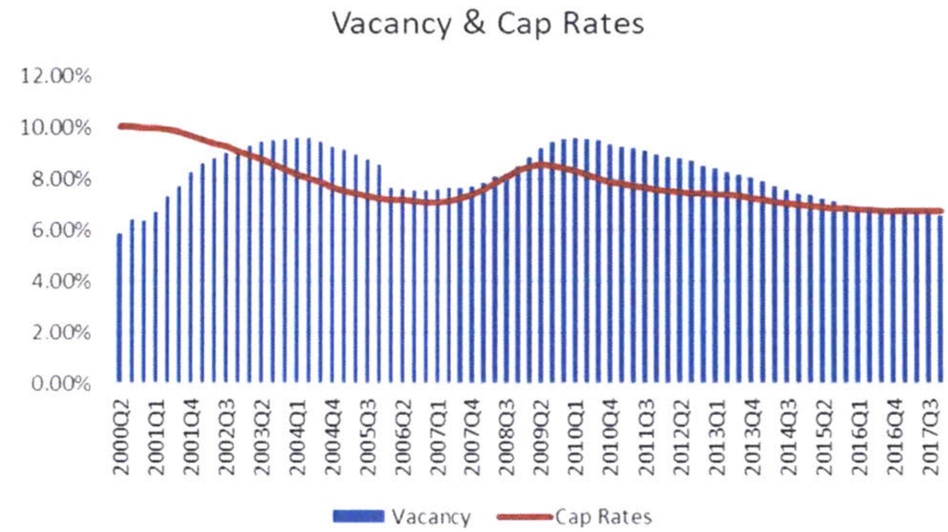
Source: Costar

Figure 5.6



Source: Costar

Figure 5.7



Source: Costar

The preceding analysis hopefully sheds greater light on the composition of cap rates and their corresponding drivers. Notably, assumptions regarding real cash flow growth play a key role in influencing the wide range of appreciation returns. Assuming rational expectations, at peaks, the real estate risk premium is low, with low real cash flow growth. At troughs, the real estate risk premium is high, with high real cash flow growth. The magnitude of cap rate movements is driven by changes in both variables, with the net effect a function of the greater move. And at times, their co-movements could be offsetting.

However, irrational biases plague investor behavior. In reality, while the real estate risk premium may be low at peaks, winning bidders underwrite continued high cash flow growth. Conversely, at troughs, the real estate risk premium is high and few investors assume rational high real cash flow growth. As such, at peaks, cap rates tend to be irrationally low, and at troughs, cap rates tend to be irrationally high. Irrational real cash flow growth expectations swing the cycle 'pendulum' above and below the rational range, causing rapid pricing corrections. As previously illustrated, while less frequent, the downward pricing swings tend to be greater in magnitude than their upward counterparts. And although upward pricing moves tend to be more common, they are also smaller in size. Therefore, investors hoping to capitalize on momentum in the later stages of business cycles should carefully diligence their cash flow growth expectations.

CHAPTER 6: CONCLUSION

This paper synergizes previous research on momentum in commercial real estate and the forecastability of equity returns based off of dividend yields. Notably, the analysis differs in two key ways from prior research on momentum. First, it utilizes repeat-sales indices, rather than appraisal-based indices. This improved data quality paints a clearer picture of the commercial real estate market as a whole. Second, it uses cap rate changes, rather than total return, as a momentum indicator. Cap rates are constantly observable in the marketplace, while total returns suffer a multitude of biases and lagging issues. By measuring momentum based on cap rates rather than total return, investors can more adequately predict future pricing movements.

The statistical results show that changes in cap rates are inversely correlated with future price appreciation or depreciation. When cap rates shift downward, properties tend to appreciate in future quarters, on average. And when cap rates shift upward, properties tend to depreciate in future quarters, on average. The strength of this forecast is strongest at a two-quarter forecast and declines after three quarters.

When analyzing this relation on an asset-class level, the predictive power of cap rate changes on future appreciation and depreciation is strongest in retail, on average over the six forecast periods. At two-quarter forecasts, retail and multifamily display the highest R-Squared values. Additionally, this relation was stronger in Primary CSAs than in Secondary CSAs.

These results illustrate the existence of momentum in the commercial real estate industry. Price movements, as illustrated by cap rates, predict future appreciation or depreciation. So, when cap rates initially shift upward, it would be prudent to ease acquisitions, as further upward moves are most likely coming. Astute investors may want to shift their portfolio management strategy toward dispositions. Similarly, when cap rates initially shift downward, investors should focus on acquisitions in order to take advantage of likely future price appreciation.

CHAPTER 7: LIMITATIONS AND SCOPE FOR FURTHER RESEARCH

Even with the ability to forecast future price appreciation or depreciation with cap rates, there are some structural issues with commercial real estate that prevent investors from being able to capitalize on this foresight. First, and most importantly, high transaction costs impede investors from entering and exiting the commercial real estate market in short intervals. These costs force investors to take a longer-term view with their commercial real estate investments. Even with this limitation, the findings from this paper should provide guidance on acquisition and disposition timing. Second, the inability to short-sell prevents investors from profiting off of depreciation. Any insight gained on future depreciation from upward movements in cap rates can only be used for downside prevention through dispositions.

This analysis uses indices at the national and city level. The infrequent nature of commercial real estate transactions prevents data on a more granular level. It is possible that certain properties may have transacted only once (if at all) since the pricing indices entered the commercial real estate market in the 1970s. Perhaps in time, as real estate data continues to evolve and increase in length, data on a more deal-specific level will become available. If, and when, that data becomes available, it would be interesting to look at momentum on a single-asset level.

Finally, although cap rates changes are correlated with future price appreciation or depreciation, in reality, there are a multitude of factors influencing real estate pricing dynamics. Thus, this analysis cannot be used in isolation. Rather, it should be taken in context of a greater acquisition or disposition strategy.

This paper opens up the topic of further research on cap rate components as detailed in Chapter 5. Research on the variability of these metrics, and corresponding cap rate movements, could provide additional insight into commercial real estate momentum.

In sum, this analysis makes a strong case for momentum in commercial real estate pricing. However, that does not mean that reversals are not possible. When things are going well, they continue to go well…until they don't…

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EXHIBIT A: USA Aggregate

Forecast	R-Squared	Standard Error	Observations
1Q	**0.7928**	0.0300	141
2Q	**0.8446**	0.0261	140
3Q	**0.7861**	0.0307	139
4Q	**0.6409**	0.0399	138
5Q	**0.4600**	0.0492	137
6Q	**0.2918**	0.0566	136

	Coefficients	*Standard Error*	*t Stat*	*P-value*
		1Q Forecast		
Intercept	0.0242	0.0026	9.2240	4.18165E-16
X Variable 1	-63.4304	2.7507	-23.0595	2.36148E-49
		2Q Forecast		
Intercept	0.0237	0.0023	10.3706	5.47828E-19
X Variable 1	-65.4655	2.3904	-27.3874	1.19181E-57
		3Q Forecast		
Intercept	0.0243	0.0027	8.9897	1.77563E-15
X Variable 1	-63.1601	2.8146	-22.4406	9.98485E-48
		4Q Forecast		
Intercept	0.0257	0.0035	7.3019	2.15466E-11
X Variable 1	-57.0367	3.6611	-15.5790	4.84722E-32
		5Q Forecast		
Intercept	0.0278	0.0044	6.3910	2.47927E-09
X Variable 1	-48.3243	4.5062	-10.7240	8.65012E-20
		6Q Forecast		
Intercept	0.0302	0.0050	6.0123	1.63449E-08
X Variable 1	-38.4863	5.1788	-7.4315	1.13667E-11

EXHIBIT B: USA Industrial

Forecast	R-Squared	Standard Error	Observations
1Q	**0.6687**	0.0367	140
2Q	**0.7080**	0.0346	139
3Q	**0.6483**	0.0381	138
4Q	**0.5143**	0.0449	137
5Q	**0.3642**	0.0516	136
6Q	**0.2289**	0.0570	135

	Coefficients	*Standard Error*	*t Stat*	*P-value*
		1Q Forecast		
Intercept	0.0214	0.0032	6.7126	4.56525E-10
X Variable 1	-63.7827	3.8216	-16.6899	6.479E-35
		2Q Forecast		
Intercept	0.0210	0.0030	6.9553	1.31772E-10
X Variable 1	-65.6478	3.6020	-18.2253	1.93352E-38
		3Q Forecast		
Intercept	0.0215	0.0033	6.4382	1.9223E-09
X Variable 1	-62.8241	3.9683	-15.8317	1.17607E-32
		4Q Forecast		
Intercept	0.0227	0.0039	5.7585	5.46442E-08
X Variable 1	-55.9685	4.6806	-11.9577	6.35859E-23
		5Q Forecast		
Intercept	0.0244	0.0046	5.3663	3.43329E-07
X Variable 1	-47.1053	5.3760	-8.7622	7.43822E-15
		6Q Forecast		
Intercept	0.0264	0.0050	5.2332	6.32513E-07
X Variable 1	-37.3412	5.9426	-6.2836	4.37945E-09

EXHIBIT C: USA Retail

Forecast	R-Squared	Standard Error	Observations
1Q	0.7679	0.0314	140
2Q	0.7969	0.0294	139
3Q	0.7555	0.0324	138
4Q	0.6624	0.0382	137
5Q	0.5515	0.0442	136
6Q	0.4421	0.0493	135

	Coefficients	*Standard Error*	*t Stat*	*P-value*
		1Q Forecast		
Intercept	0.0227	0.0028	8.1712	1.74964E-13
X Variable 1	-54.2976	2.5412	-21.3666	1.3221E-45
		2Q Forecast		
Intercept	0.0227	0.0026	8.6612	1.15302E-14
X Variable 1	-55.2177	2.3816	-23.1851	2.87835E-49
		3Q Forecast		
Intercept	0.0232	0.0029	8.0200	4.34442E-13
X Variable 1	-53.7560	2.6221	-20.5008	1.97112E-43
		4Q Forecast		
Intercept	0.0242	0.0034	7.0633	7.81899E-11
X Variable 1	-50.3501	3.0936	-16.2757	1.2293E-33
		5Q Forecast		
Intercept	0.0253	0.0040	6.3735	2.75256E-09
X Variable 1	-45.9216	3.5772	-12.8373	4.26649E-25
		6Q Forecast		
Intercept	0.0264	0.0044	5.9416	2.33353E-08
X Variable 1	-41.0759	3.9930	-10.2869	1.27775E-18

EXHIBIT D: USA Office

Forecast	R-Squared	Standard Error	Observations
1Q	**0.6285**	0.0483	140
2Q	**0.7222**	0.0419	139
3Q	**0.6773**	0.0453	138
4Q	**0.5218**	0.0552	137
5Q	**0.3403**	0.0651	136
6Q	**0.1890**	0.0724	140

	Coefficients	*Standard Error*	*t Stat*	*P-value*
		1Q Forecast		
Intercept	0.0185	0.0042	4.3925	2.21568E-05
X Variable 1	-56.3988	3.6914	-15.2785	1.82081E-31
		2Q Forecast		
Intercept	0.0176	0.0037	4.7917	4.24467E-06
X Variable 1	-60.4059	3.2005	-18.8742	6.21533E-40
		3Q Forecast		
Intercept	0.0183	0.0040	4.6101	9.17491E-06
X Variable 1	-58.4404	3.4593	-16.8936	3.30559E-35
		4Q Forecast		
Intercept	0.0206	0.0049	4.2268	4.33885E-05
X Variable 1	-51.2571	4.2231	-12.1372	2.22667E-23
		5Q Forecast		
Intercept	0.0237	0.0058	4.1117	6.81109E-05
X Variable 1	-41.3650	4.9752	-8.3143	9.14598E-14
		6Q Forecast		
Intercept	0.0270	0.0064	4.1928	4.99596E-05
X Variable 1	-30.8023	5.5343	-5.5657	1.3842E-07

EXHIBIT E: USA Multifamily

Forecast	R-Squared	Standard Error	Observations
1Q	**0.7584**	0.0421	140
2Q	**0.7948**	0.0388	139
3Q	**0.7026**	0.0469	138
4Q	**0.5183**	0.0597	137
5Q	**0.3144**	0.7138	136
6Q	**0.1511**	0.7965	135

	Coefficients	*Standard Error*	*t Stat*	*P-value*
		1Q Forecast		
Intercept	0.0390	0.0036	10.8335	3.58183E-20
X Variable 1	-65.7892	3.1611	-20.8118	2.12396E-44
		2Q Forecast		
Intercept	0.0383	0.0033	11.4698	9.13915E-22
X Variable 1	-67.2787	2.9206	-23.0355	5.83817E-49
		3Q Forecast		
Intercept	0.0387	0.0040	9.5586	7.09452E-17
X Variable 1	-63.1356	3.5223	-17.9244	1.25205E-37
		4Q Forecast		
Intercept	0.0398	0.0052	7.7029	2.55351E-12
X Variable 1	-54.1063	4.4890	-12.0530	3.64154E-23
		5Q Forecast		
Intercept	0.0417	0.0062	6.7169	4.8286E-10
X Variable 1	-42.0611	5.3650	-7.8398	1.24961E-12
		6Q Forecast		
Intercept	0.0438	0.0069	6.3055	3.92959E-09
X Variable 1	-29.1233	5.9863	-4.8650	3.18449E-06

EXHIBIT F: Primary CSAs

Forecast	R-Squared	Standard Error	Observations
1Q	**0.8058**	0.0300	141
2Q	**0.8549**	0.0261	140
3Q	**0.7965**	0.0310	139
4Q	**0.6548**	0.0405	138
5Q	**0.4813**	0.0498	137
6Q	**0.3208**	0.0572	136

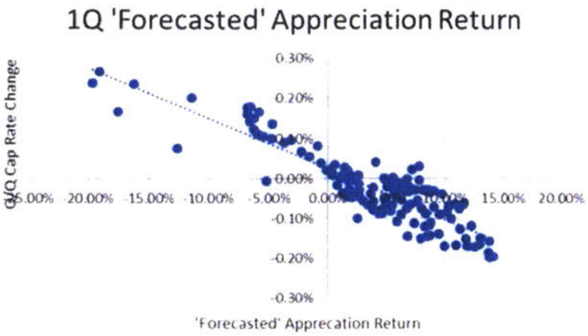
	Coefficients	*Standard Error*	*t Stat*	*P-value*
		1Q Forecast		
Intercept	0.0023	0.0026	0.8859	0.377203839
X Variable 1	-68.0766	2.8344	-24.0176	2.54271E-51
		2Q Forecast		
Intercept	0.0018	0.0023	0.7750	0.439691615
X Variable 1	-70.1348	2.4600	-28.5100	1.06553E-59
		3Q Forecast		
Intercept	0.0023	0.0027	0.8398	0.402482205
X Variable 1	-67.7166	2.9243	-23.1567	3.29207E-49
		4Q Forecast		
Intercept	0.0037	0.0036	1.0464	0.297242022
X Variable 1	-61.4087	3.8235	-16.0608	3.27581E-33
		5Q Forecast		
Intercept	0.0058	0.0044	1.3099	0.192441999
X Variable 1	-52.6491	4.7044	-11.1915	5.62368E-21
		6Q Forecast		
Intercept	0.0081	0.0051	1.5877	0.11472192
X Variable 1	-42.9790	5.4020	-7.9561	6.61438E-13

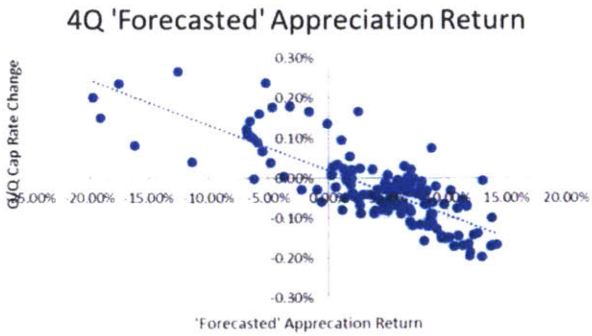
EXHIBIT G: Secondary CSAs

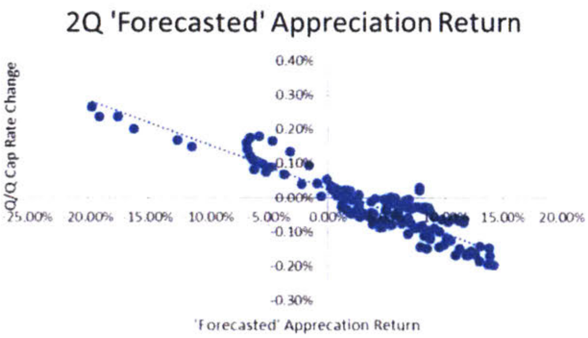
Forecast	R-Squared	Standard Error	Observations
1Q	**0.7566**	0.0291	141
2Q	**0.8074**	0.0260	140
3Q	**0.7403**	0.0303	139
4Q	**0.5812**	0.0386	138
5Q	**0.3920**	0.0467	137
6Q	**0.2247**	0.0528	136

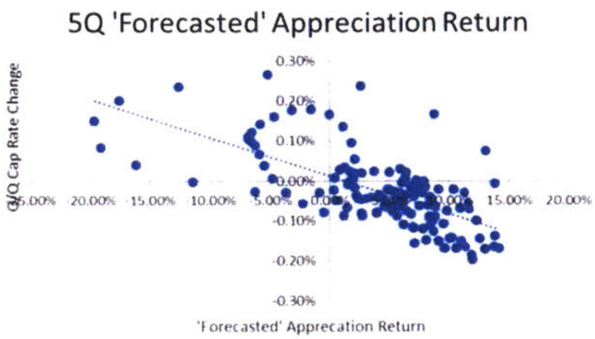
	Coefficients	*Standard Error*	*t Stat*	*P-value*
		1Q Forecast		
Intercept	-0.0077	0.0025	-3.0443	0.002793524
X Variable 1	-56.2393	2.7156	-20.7094	3.56138E-44
		2Q Forecast		
Intercept	-0.0079	0.0023	-3.4888	0.000652858
X Variable 1	-58.0258	2.4209	-23.9689	7.40517E-51
		3Q Forecast		
Intercept	-0.0072	0.0027	-2.7223	0.007332446
X Variable 1	-55.5246	2.8202	-19.6880	1.21969E-41
		4Q Forecast		
Intercept	-0.0057	0.0034	-1.6755	0.096150014
X Variable 1	-49.1902	3.5937	-13.6879	2.72963E-27
		5Q Forecast		
Intercept	-0.0037	0.0041	-0.8912	0.37440247
X Variable 1	-40.3992	4.3462	-9.2954	3.6011E-16
		6Q Forecast		
Intercept	-0.0015	0.0047	-0.3213	0.748517488
X Variable 1	-30.5793	4.9256	-6.2083	6.35828E-09

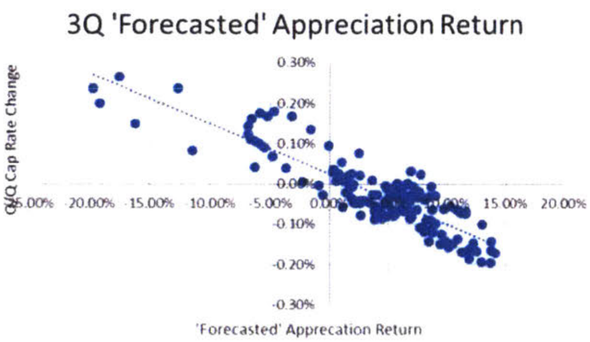
EXHIBIT H: USA Aggregate











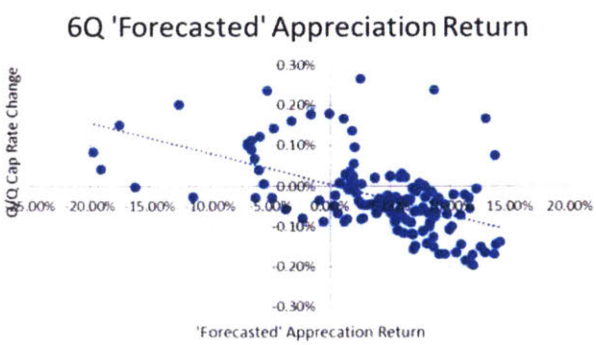
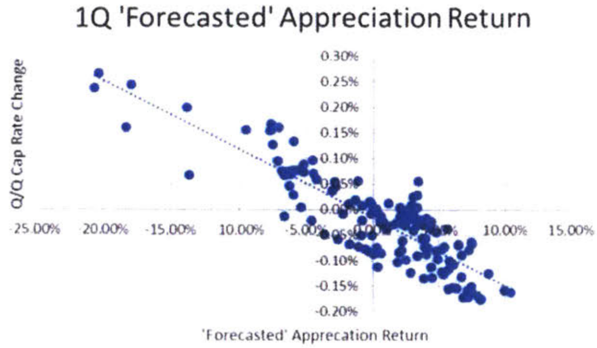
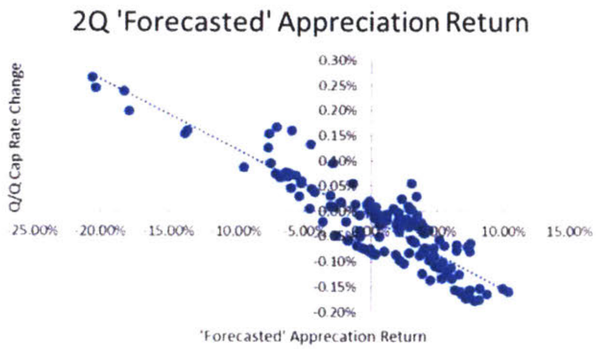
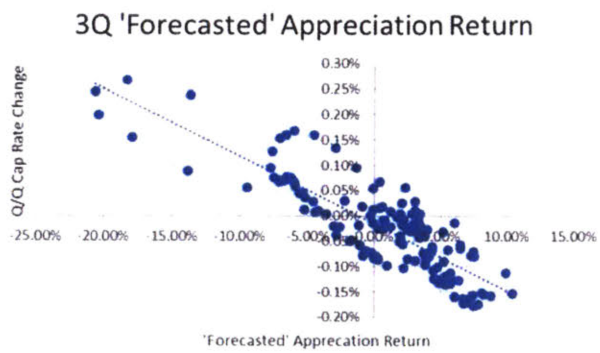
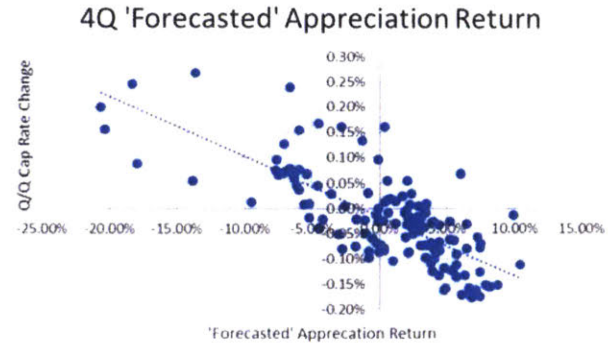


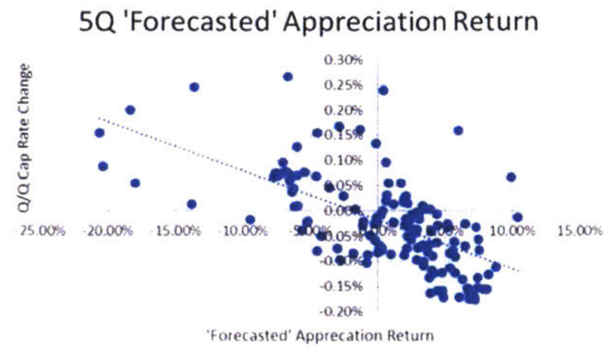
EXHIBIT I: Secondary CSAs











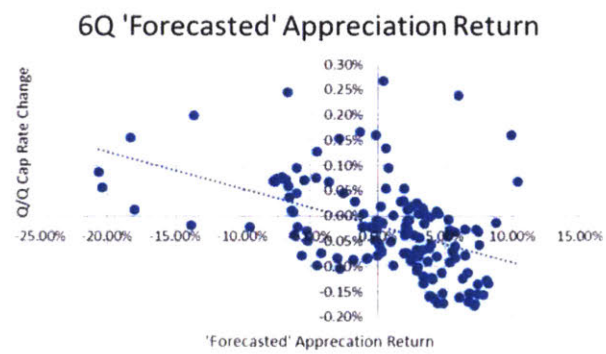
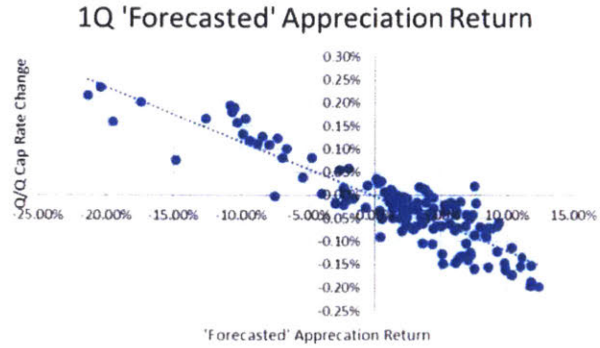
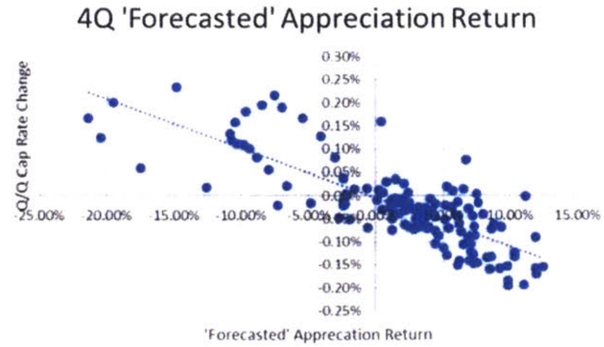
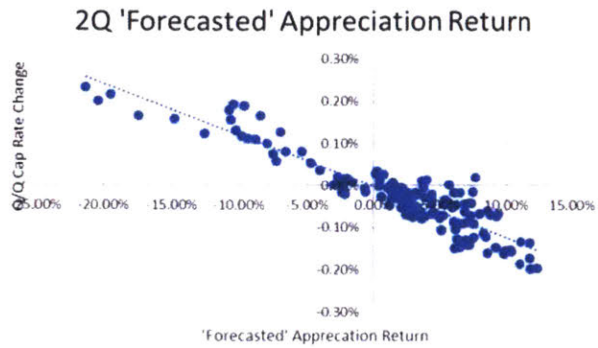
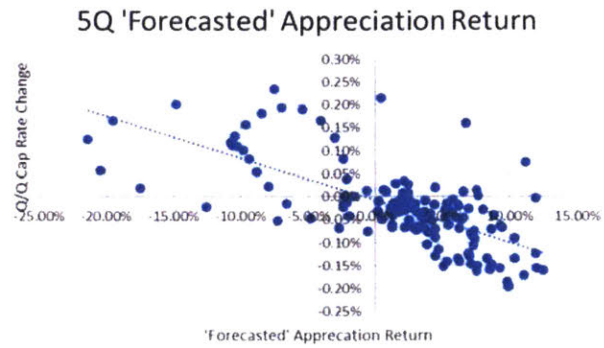


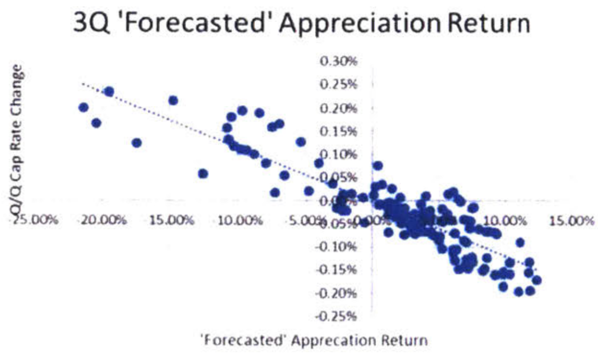
EXHIBIT J: Primary CSAs











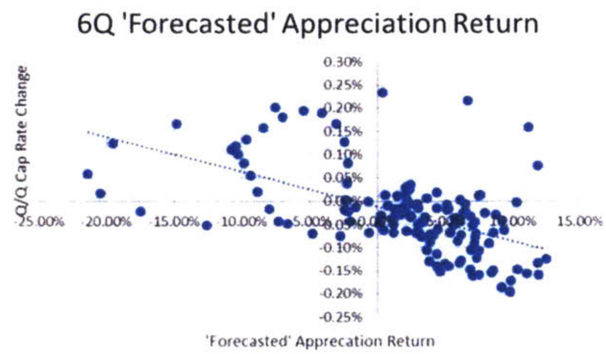
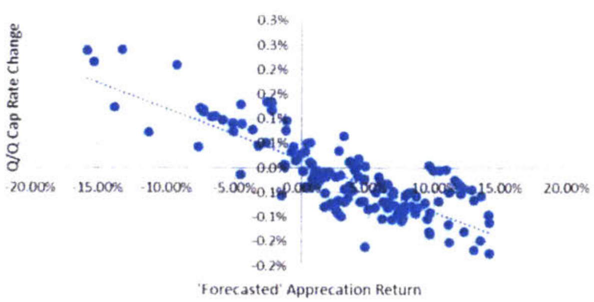
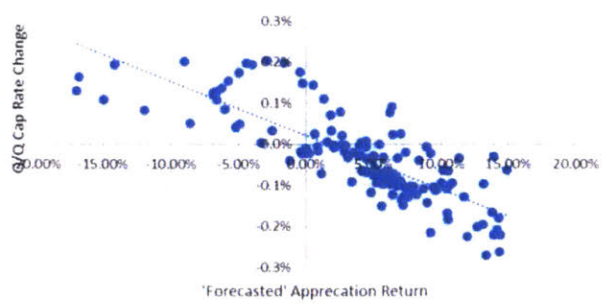


EXHIBIT K: Retail

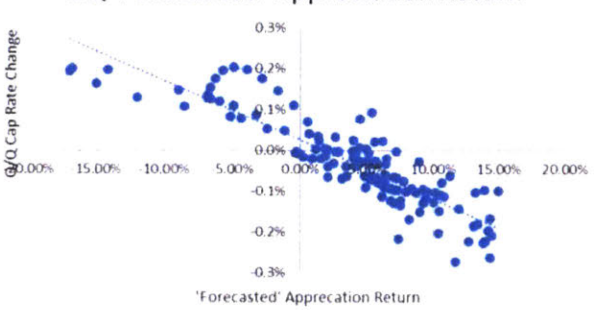
1Q 'Forecasted' Appreciation Return



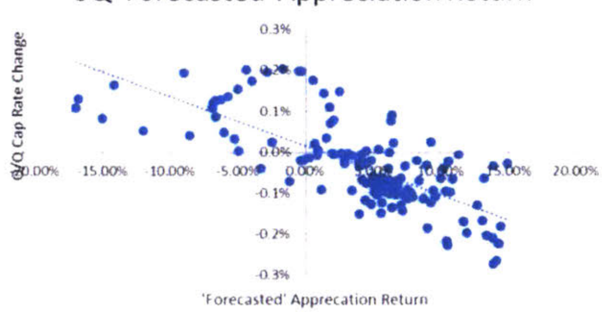
4Q 'Forecasted' Appreciation Return



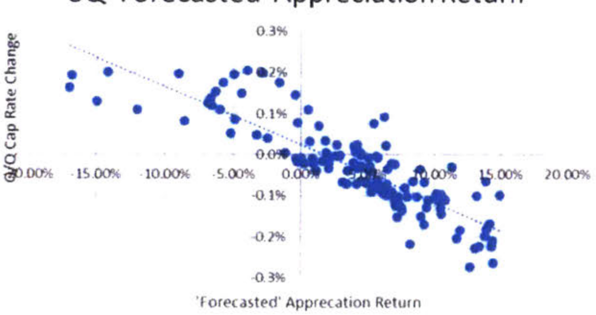
2Q 'Forecasted' Appreciation Return



5Q 'Forecasted' Appreciation Return



3Q 'Forecasted' Appreciation Return



6Q 'Forecasted' Appreciation Return

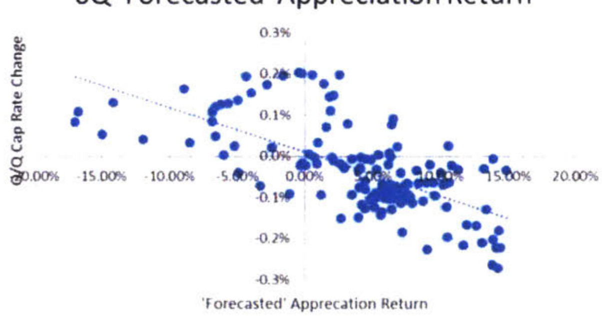
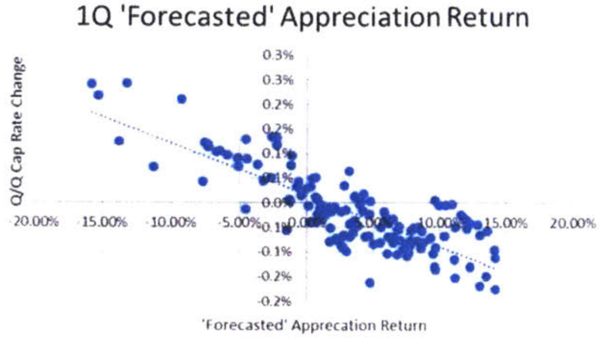
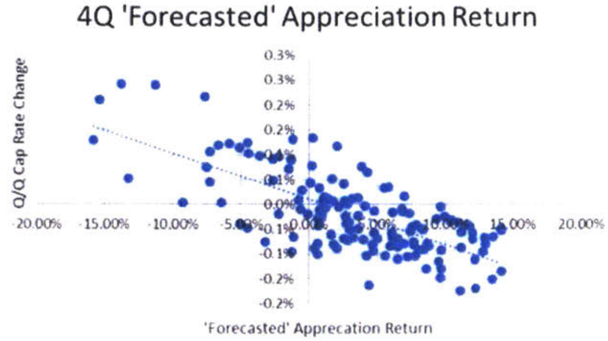
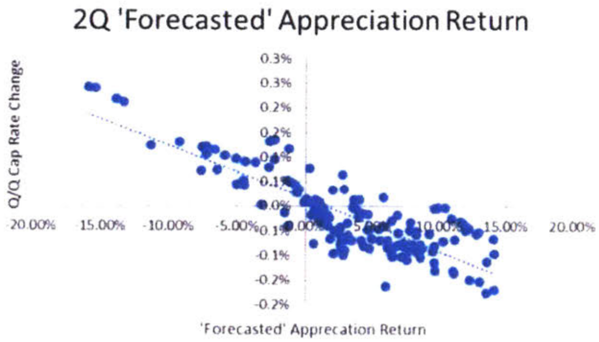
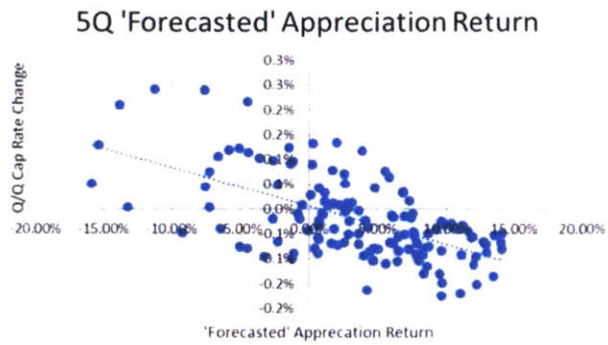


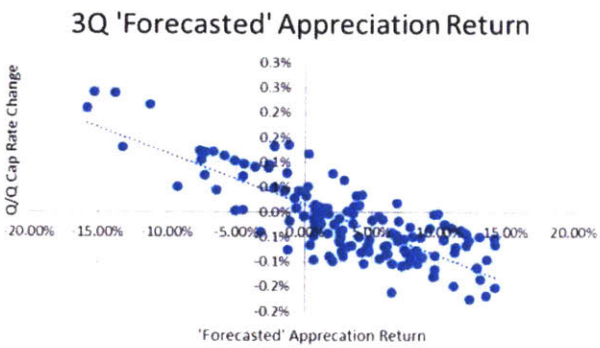
EXHIBIT L: Industrial











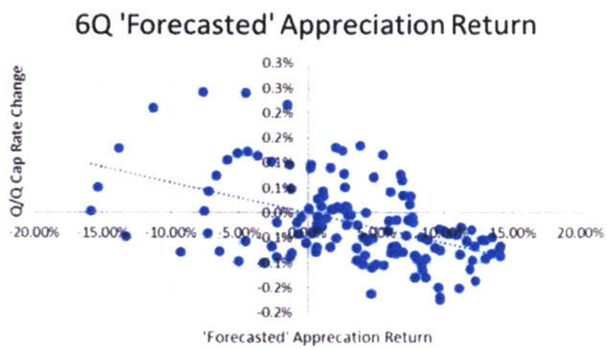
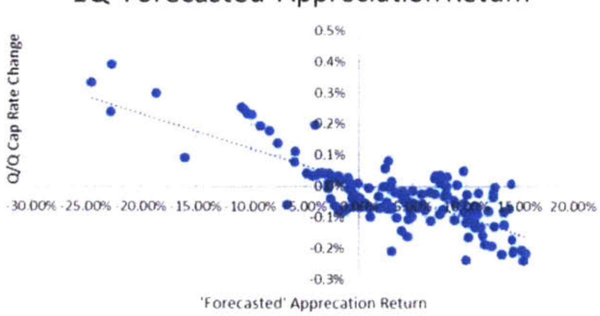
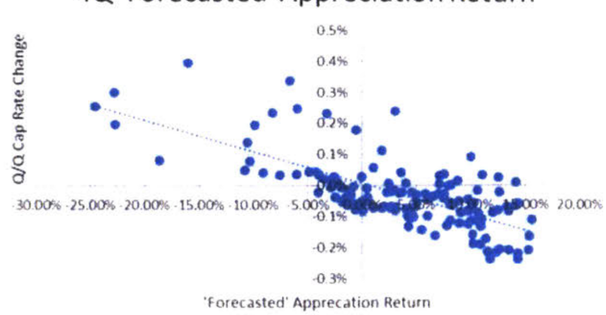


EXHIBIT M: Office

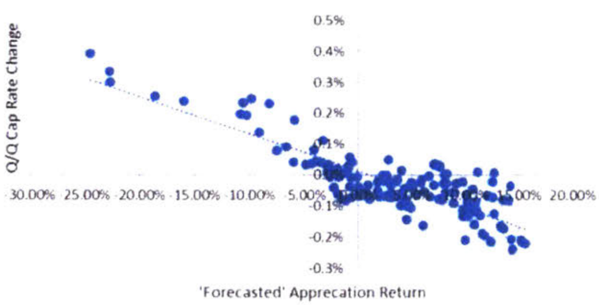
1Q 'Forecasted' Appreciation Return



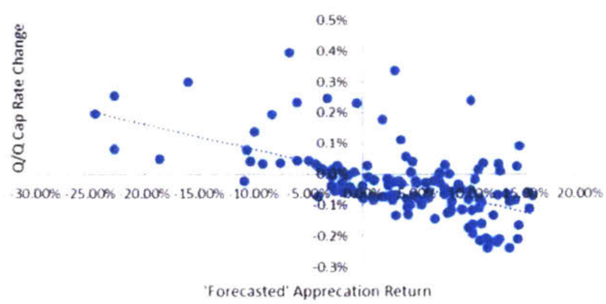
4Q 'Forecasted' Appreciation Return



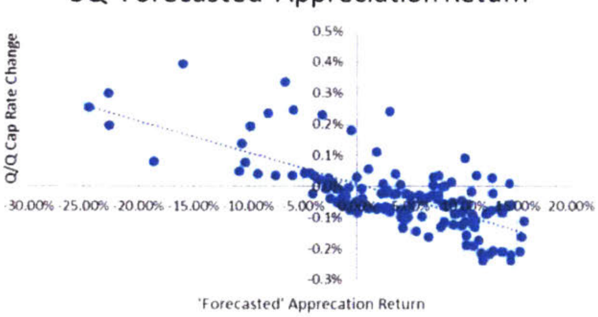
2Q 'Forecasted' Appreciation Return



5Q 'Forecasted' Appreciation Return



3Q 'Forecasted' Appreciation Return



6Q 'Forecasted' Appreciation Return

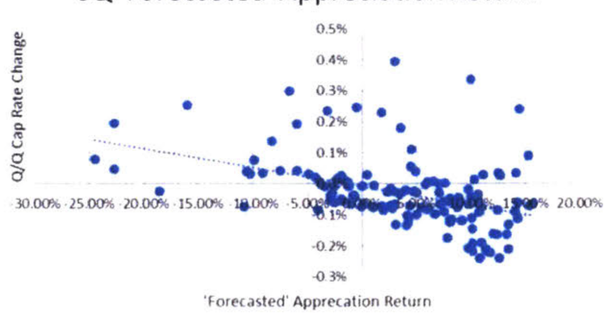


EXHIBIT N: Multifamily