NORTHERN ILLINOIS UNIVERSITY

Planned Construction as a Leading Indicator of Commercial Real Estate Price Appreciation

A Thesis Submitted to the

University Honors Program

In Partial Fulfillment of the

Requirements of the Baccalaureate Degree

With Upper Division Honors

Department of

Economics

By

Scott Frayn

DeKalb, Illinois

May 8, 2010

Abstract

I analyze the viability of planned construction as a leading indicator to commercial price appreciation through application of fundamental economic principles, and linear regression. My experience as a commercial real estate appraiser has brought me to suspect that the commercial real estate market is a thinly traded market where information asymmetries are common, and exploitation opportunities may exist. The potential leading indicators that I analyze are the Architectural Billing Index (ABI), building permits, housing starts, and the combination of all three. The regression analysis results in strong correlations between each leading indicator and commercial appreciation. The strong correlations lead me to believe that the current commercial real estate market is not a perfectly competitive market, and arbitrage opportunities may currently exist for investors who are able to analyze the market using leading indicators, and quickly enter or exit the market.

HONORS THESIS ABSTRACT
THESIS SUBMISSION FORM

AUTHOR: Scott Frayn

THESIS TITLE: Planned construction as a Leading Indicator of Commercial Real Estate Price Appreciation

ADVISOR: Dr. Stephen Karlson ADVISOR'S DEPT: Economics

DISCIPLINE: Economics YEAR: 2010

PAGE LENGTH: 23

BIBLIOGRAPHY: Yes

ILLUSTRATED: No

PUBLISHED (YES OR (NO)): LIST PUBLICATION:

COPIES AVAILABLE (HARD COPY, MICROFILM, DISKETTE): Hard Copy

ABSTRACT (100 – 200 WORDS):

University Honors Program

Capstone Approval Page

Capstone Title (print or type): Planned Construction as a Leading Indicator of Commercial Real Estate Appreciation

Student Name (print or type): Scott Frayn

Faculty Supervisor (print or type): Dr. Stephen Karlson

Faculty Approval Signature: [signature]

Department of (print or type): Economics

Date of Approval (print or type): 4/6/2010

Table of Contents

Introduction

I analyze the viability of planned construction as a leading indicator to commercial price appreciation through application of fundamental economic principles, and linear regression. I am a licensed commercial real estate appraiser, servicing the Chicagoland area. My limited experience in the field has brought me to suspect that the commercial real estate market is a thinly traded market where information asymmetries are common, and exploitation opportunities may exist. The potential leading indicators that I analyze are the Architectural Billing Index (ABI), building permits, housing starts, and the combination of all three. The regression analysis results in strong correlations between each leading indicator and commercial appreciation. The strong correlations lead me to believe that the current commercial real estate market is not a perfectly competitive market, and arbitrage opportunities may currently exist for investors who are able to analyze the market using leading indicators, and quickly enter or exit the market.

Literature review

Article 1

Baker, Kermit, and Diego Saltes. "Architecture Billings as a Leading Indicator of Construction."

This article relates to my topic in a very important way; it examines architectural data as a leading indicator to construction. It alerted me to the existence of the "Architecture Billing Index." I was originally going to call architectural firms and manually collect the data. I am glad that this data already exists. This index is maintained by the American Institute of Architects. It is created by sending a survey to many of the commercial architect companies to collect information about each business' architecture billings.

The main argument of the article is that architectural billings predict commercial construction spending. Although this is not my topic, it is related closely. What I am attempting to calculate is how well the group of developers in the United States is able to predict appreciation.

The relevant finding of the article is that architecture billings can with reasonable accuracy predict commercial real estate spending. If the Architecture Billing Index does in fact predict commercial construction spending, then it may also succeed at predicting commercial price appreciation. There is of course a strong possibility that planned construction does accurately predict construction spending, but is unable to predict commercial appreciation.

Article 2

Ling, David C. "A Random Walk Down Main Stree: Can Experts Predict Returns on Commercial Real Estate."

This article relates directly to my topic; it attempts to assess whether the concept of predicting commercial real estate price appreciation is even possible. The article opens up by saying that it appears that "skillful real estate portfolio managers can add value in the private real estate market through asset selection and investment timing" (Ling 138). Ling goes on to explain why this belief is held by so many people: "This conclusion is based on the widely held view that private (unsecured) commercial real estate markets exhibit persistent inefficiencies that can be exploited by superior investment managers. The purported inefficiencies in private real estate markets are thought to arise from an absence of centralized trading, or even price lists, a low degree of turnover in investor portfolios, a lack of transparency in the transactions that do occur, and the heterogeneity and indivisibility of commercial real estate assets" (Ling 138). These observations mean that the commercial real estate market may not be very efficient.

Ling's article is mostly based on whether the experts who provide a report in the Real Estate Research Corporation's quarterly journal, entitled Real Estate Investment Survey, is predictive of the market. Ling's findings are not encouraging. In fact Ling found that not only did the Real Estate Investment Survey not predict the market, it actually could be used as a backwards indicator. A backwards indicator is an indicator that is predicted by real estate price appreciation. This of course is no use for investors. Ling concludes that "there is no evidence that indicates managers and advisors can consistently pick winners and losers among the MSAs and aggregate property types" (Ling 151). This conclusion enforces John Keyne's research on beauty contests and markets. He found evidence that one judge will judge a beauty contestant based on how he thinks the other judges will vote. Therefore the judges are not really voting based on who they think is most beautiful, but instead they want to have the same vote as the majority. This would explain why market predictors often all say the same thing; they are making a safe guess as opposed to what they each individually believe.

These findings are evidence that experts can not effectively predict the commercial real estate market. This may mean that the commercial real estate market is competitive, with rapid discovery of information, leading to a situation with few opportunities for exploitation.

Article 3

Gallimore, Paul, and Patrick McAllister. "Expert judgement in the processes of commercial property market forecasting."

This journal article analyzes whether human judgment is used within forecasting companies when economic models are applied. It is relevant to my topic because I am creating an economic model that will attempt to predict commercial real estate growth. The question that this article brings up, in relation to my model, is "if the model that I create predicts commercial price appreciation reasonably well then would it be best to ignore human judgment, or should I still use human judgment?" I am guessing that with any economic model there will be the need for human judgment. For example the leading indicators that I am using may indicate that it is a great time to enter the real estate market, but all human judgment may disagree. It probably makes more sense to listen to human judgment than blindly follow a model.

The research in this article was conducted through interviews with the companies and those in charge of creating predictions for the commercial real estate market. After interviewing 19 people, they concluded that most companies rely heavily on economic models, but few people rely 100% on an economic model. The cases in which economic models are ignored or modified are often in extreme cases. If the model creates a result that is just not feasibly possible, the consultants will change the figure to something more reasonable.

Compare and Contrast of Articles

The first article intrigues me the most. This article is different than the other two articles because it does not address the fact of whether predicting commercial price appreciation using models is possible, it instead is an example of the process analyzing whether planned construction predicts construction spending.

Articles 2 and 3 are important to take into consideration. I am attempting to do something that these articles suggest isn't possible. The second article is the most dismal because it points out the lack of success that prestigious market analysts have in predicting commercial price appreciation.

I will still move forward with my study, hoping to find a relationship between construction spending and commercial price change, but ready to accept the fact that it may be a "random walk

down main street" with no one person being able to anticipate the cumulative effects of numerous decisions.

Is it possible to predict commercial appreciation?

For decades financial intellects such as Eugene Fama have argued that securities traded on the stock market move randomly.[1] I am not studying a regular securities market, but the concept of the random walk hypothesis is relevant to my topic. The random walk hypothesis is based on the fact that over the long run the stock market's movements are entirely random because the stock market is extremely efficient. The random walk hypothesis has been tested repeatedly, and there is a significant body of evidence to back it up.

The random walk theory seems to be the main reason why financial experts agree that markets can not be predicted, but I believe that the random walk theory does not directly apply to the commercial real estate market. Why I believe this it does not apply is because the commercial real estate market is significantly different than a securities market. The difference lies in the fact that the current commercial real estate market is far from being a perfectly competitive market. The stock market is not a perfectly competitive market either, but it is much more competitive than the commercial real estate market. The main reason that I believe that the commercial real estate market may be able to be predicted is because it does not hold the necessary elements to make a market competitive. In other words, the less competitive a market the more likely it can be predicted. I will explain why I believe the previous statement to be true, but I will first analyze the competitiveness of the commercial real estate market.

The necessary elements of a perfectly competitive market include the following: perfect information among all participants, a large number of buyers and sellers, a very similar product being offered by all sellers, no entry or exit barriers, no transaction costs, and all firms share the same goal of profit maximization.[2] When these six necessary elements of a competitive market are analyzed with regard to the commercial real estate market it is clear that the current commercial real estate market is extremely uncompetitive in nature:

1. Perfect information among all participants: The local commercial real estate market consists of a small number of people sharing a small amount of information with each other. It is difficult to find information on commercial properties other than the limited amount of

[1] See Fama, Eugene, (1965) for an overview of the random walk hypothesis.
[2] See Carlton, Dennis W., and Jeffrey M. Perloff. Modern Industrial Organization, Chapter 3.

information that is compiled when a transaction occurs. Some of these hard to find facts include rental rate, vacancy, and sometimes even the properties that are for sale in a geographic area. This lack of efficiency can be exploited by an investor who attempts to dig deeper and analyze the market more in depth. An example of an investor potentially gaining an edge on the general market by doing extra work would be someone who takes the time to analyze potential leading indicators. This additional information that he has managed to find may allow him to make more informed decisions about future appreciation.

2. Large number of buyers and sellers: The market is often dominated by relatively few commercial investors. This market where there are few participants is likely the case in small towns and growing cities where there are a small number of investors who invest in the commercial projects. This lack of efficiency can be exploited because it is a reduction in the liquidity of an investment. Therefore, if an investor wants to exit a position quickly, he will most likely have to accept a price that is below the value of the property. An investor can identify who distressed sellers are and therefore purchase properties that are below market level.
3. Homogeneous product: No portion of real estate is the same as another portion because a significant part of the value tied to real estate is the land. No two parcels of land are identical, so real estate is not a homogeneous product. Another reason that the properties listed as commercial real estate are not homogeneous is because it is rare that two properties in the same real estate market have the same design and functionality. This lack of efficiency can be exploited by an investor who focuses all of his research on one or two different commercial property types. This narrowing of property types will allow him to know that specific niche market better than the average commercial investor. In a sense, the investor would eliminate the heterogeneous types of commercial real estate because he would only focus on a homogeneous group of properties. There is a chance though that all investors could compete for this knowledge and therefore no single investor would be able to be more knowledgeable than the general market.
4. No entry or exit barriers: There are two significant barriers to entry into the commercial real estate market. The first is the capital to invest with. There are many potential investors who would like to purchase real estate but would need to gather a large sum of money in order to enter the market. The next barrier to entry is knowledge. In order to gain the knowledge to make informed decisions in the commercial real estate market, an investor must have extensive experience in the field. This lack of efficiency can be exploited because barriers to entry block new firms from entering a market profitably. Barriers to entry help protect a monopoly position for the existing firms in an industry and therefore maintain abnormal

profits even in the long run.[3] In order to exploit the opportunity of high barriers to entry, an investor must overcome the barriers to entry. If an investor educates himself and builds up enough capital to enter the market he has overcome the barriers to entry and will be in a position for long-term profits.

5. Transactions are costless: There are a significant number of fees that are accrued when buying or selling a property. These include the real estate agent's commission, loan processing fees, and licensing fees. These fees often end up being over five percent of the property value, which results in each transaction being expensive.
6. All firms maximize profits: The commercial real estate market is an odd market because the owners of the properties are often more concerned with the business value than the property value and/or the cash flows tied to the rental income of the property. For example, many commercial buildings are owner occupied. An owner occupied piece of real estate will probably not be sold if the commercial real estate market is approaching a period of depreciation because the owner does not want to relocate the business that he is operating within his property. This lack of efficiency can be exploited because some investors are not looking at the income producing capabilities of a property and are therefore willing to pay more than market value when entering or sell for less than market value when exiting. As stated before, this willingness to somewhat disregard market movements in property value most likely arises from many property owners focusing on the business value as opposed to the property value.

The above statements suggest that the commercial real estate market might be far from efficient. The random walk argument is based on the fact that the stock market's movements are entirely random over the long run because the stock market is extremely efficient.[4] If a market is not efficient, then the market is not random. If a market is not random, then the market may be able to be predicted. The commercial real estate market is not efficient, and therefore the commercial real estate market may be able to be predicted.

The remaining sections of this article evaluate the effectiveness of several planned construction leading indicators to effectively predict property values under the hypothesis that real estate markets do not value properties competitively; therefore asset price fluctuations are predictable.

---

[3] See Carlton, Dennis W., and Jeffrey M. Perloff. Modern Industrial Organization, Chapter 4.
[4] Fama, Eugene "Random Walks in Stock Market Prices."

Empirical Method

My method is focused on predicting commercial real estate in a way that is applicable from an investment standpoint. The next paragraphs explain the specifications that I follow in my research.

Specifications

Why planned construction

Investors undertake projects in anticipation of profits. Planned construction is thus a logical leading indicator because it is a possibility that the cumulation of all investors who drive the construction of real estate understand the current supply and demand of the real estate market and therefore will not begin a project unless the future is favorable. The opposite of the previous statement of course also holds true.

Another reason that planned construction may be able to predict the overall market is because development is riskier than most other aspects of real estate. Development is risky because it is one of the most illiquid forms of real estate investing; usually it is usually only profitable to sell a property once the construction is complete so an investor would not be able to remove his stake in the development until the project was completed. Then, even after completion, it may take an additional six to 12 months before he is able to sell his newly constructed property. The time period from initial development to selling the property may be upwards of two years. The long required holding period makes developing a property very risky, and thus requires a high rate of return. Because of this high required rate of return, it makes sense that an investor who constructs properties will be one of the first real estate investors to begin rejecting projects when the market first shows signs of instability because the potential projects will not show as high of returns. A developer rejecting projects would result in a lowering of planned construction, therefore accurately predicting a downward trend in appreciation. This logic may not hold true in an up-trend, though; as the market begins turning around, development may be the last form of real estate investing that turns around. This prolonged growth in development may occur because developers will still have a high required rate of return relative to other investors. Therefore, as the market begins to become more stable and appreciation begins to turn positive, it will be the developers who will still hold the greatest required rate of return, and it therefore may be the developers who wait the longest to re-enter the market. This reasoning leads me to believe that the model I am creating may be able to accurately predict recessionary periods but it may not be able to predict growth periods as well.

Geographic area

The geographic region that I analyze in my study is the entire United States. An assumption that I am making is that the research can be localized, and still obtain similar results. I expect the study to be geographically scalable because it will be the same fundamental principles driving construction and appreciation, just on a smaller scale. If this assumption does not hold true, then the conclusions of this article will not be as useful for investing because investors are interested in the future appreciation of the commercial real estate market on a more geographically micro-level as opposed to a national level.

Residential indicators to predict commercial appreciation

I employ three separate planned construction leading indicators to predict commercial appreciation: the Architectural Billing Index (ABI), 1-unit building permits, and housing starts. I then use all three in a multiple linear regression. Two of my three variables are tied to residential construction. The use of residential planned construction to predict commercial appreciation does not initially make sense, but further analysis reveals that planned residential construction may be relevant to predicting commercial appreciation.

The two main reasons I used residential indicators are as follows: (1)Commercial appreciation tends to move in tandem with residential appreciation. (2)Residential planned construction leading indicators are readily available to the public whereas commercial planned construction leading indicators are difficult to find, cost a significant amount of money, and in some cases seem to not be recorded.

The first reason for using residential data arises from the fact that residential and commercial appreciation have moved in tandem in the past. This correlation is shown mathematically by running a simple regression between the two. The date range used to draw the following data is the 6-month period changes in commercial and residential appreciation ranging from the beginning of 2001 to the end of 2009. The regression data are as follows:

Commercial vs. Residential Appreciation	
Intercept	-0.02
Slope	1.73
F test	9.70
Significance of F	0.01
Durbin-Watson	1.62
Observations	18
R-squared	0.38

It not only mathematically makes sense that the two move together, but it also intuitively makes sense; there are many interrelations among residential and commercial appreciation and construction. For example, imagine that commercial sales are decreasing. This decrease in sales will result in decreasing wages to home owners or home owners being laid off. The decreasing commercial sales will result in lower demand for commercial real estate, thus driving the price of commercial real estate down. The home owners receiving lower wages and being laid off will result in lower demand for residential real estate, thus driving the price of residential real estate down. Another intuitive reason that residential and commercial appreciation move together is because of the similarity between inputs. Often the largest "input" required to build a property is the land that a property rests on. Other inputs include the construction materials and work labor hours. For example if the price of residential properties in an area rise, then all land in the area almost certainly will have a higher value because any of the land could potentially be used for residential construction.

The fact that one group of the economy affects another group of the economy and the fact that the inputs are so similar for commercial and residential construction help solidify what is seen in the data: a strong correlation between residential and commercial appreciation. Because of this correlation, I am comfortable using residential planned construction leading indicators in an attempt to predict commercial appreciation.

The second reason for using residential data arises mainly from the fact that the government takes on the burden of recording many vital statistics regarding the residential market. The government does not put as much of an effort into recording commercial real estate data.

Method

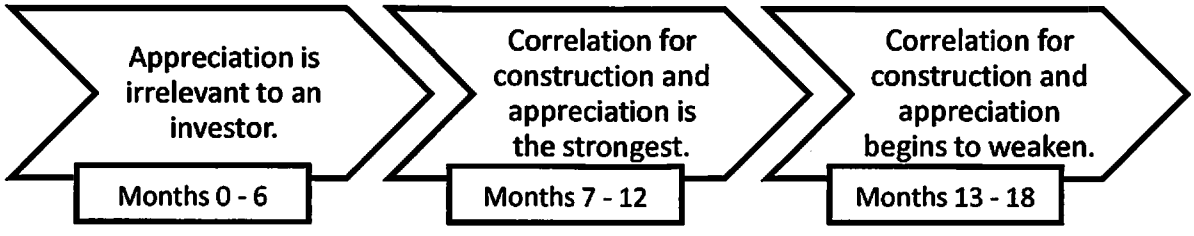
My main tool of analysis is a simple, staggered, linear regression between planned construction and appreciation. To find commercial real estate appreciation I used MIT's Center for Real Estate

Commercial Property Price Index.[5] I then subtracted inflation from each period of commercial appreciation to arrive at an inflation adjusted commercial appreciation for each period.[6] The dates provided by the Commercial Property Price Index spanned from the beginning of 2000 to the end of 2009. I then predicted the inflation adjusted commercial appreciation by running a linear regression between the three leading indicators and the inflation adjusted commercial appreciation.

Relevant months correlation

The months' appreciation that I attempt to predict are the months that are seven through 12 months away from the current month. If an investor wanted to enter a position, he would not be able to immediately begin benefiting from appreciation because it takes a period of time to go through the process of a commercial real estate purchase. Some of the entry steps are to select a geographic market to enter, select a property to purchase, determine how much a property is worth, and go through a negotiation process. If an investor wanted to exit a position, he would not be able to immediately remove himself from the market because of the process surrounding the exit from a commercial property. Some of the exit steps are to find a commercial real estate agent, determine an asking price, find a buyer, etc. I am making an assumption that both the entry and exit processes from the commercial real estate market takes about six months. Therefore, from the time when an investor decides to enter or exit the market, the next six months' appreciation is somewhat irrelevant. It is irrelevant because if he is entering the market he will not be able to obtain appreciation over the next six months because of the purchasing process. Alternatively, if he was exiting the market, he would be forced to bear the burden of the position for about six months as he goes through the selling process. I do not attempt to predict the next six months' appreciation because of its irrelevancy.

After eliminating the first six months of appreciation from my study, I then used linear regression to find the time period where the strongest correlation lies between planned construction and appreciation. The strongest correlation between planned construction and appreciation lies within the six month period between month seven and 12.



[5] See the database titled "Commercial Property Price Index", http://mit.edu/cre/research/credl/rca.html
[6] See the database titled "Consumer Price Index", ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt

As the timeline above illustrates, analyzing the six month period starting six months from the day of the prediction makes the most sense. Therefore my working hypothesis is that plans go into place with the expectation of gains in months seven through 12.

Candidate leading indicators

Architectural Billing Index

The Architectural Billing Index (ABI) is collected, created, and distributed by the American Institute of Architects (AIA).The ABI is a compilation of architectural billings from about 300 firms. An architectural billing is created when a developer requests the creation of building plans for a future project. The participating firms indicate to the AIA the change in billings by following signals: "significantly increased (five percent or more), remained about the same, or significantly decreased (five percent or more)."[7] After collecting this data the AIA then creates the index. "The Architectural Billing Index is computed as a diffusion index, with the monthly score calculated as the percent of firms reporting a significant increase, plus half the percent of firms reporting no change. Comparisons are always to the previous month."[7] The equation can be written as follows:

$$ABI = (\%\ of\ firms\ reporting\ increase) + 0.5*(\%\ firms\ reporting\ no\ change)$$

This means that on average the ABI should report a score of 50. As an example, assume that 10% of firms report an increase in billings, 20% report a decrease in billings, and 70% report no change in billings. The ABI would be calculated as follows:

$$ABI = (10.00) + 0.5*(70.00)$$

$$ABI = 45$$

In the above example of an ABI of 45, this means that overall the number of billings has decreased for the current period, relative to the previous period.

For my analysis I use the 6-month percentage change in the ABI. Why I use percentage change, instead of raw numbers, is because the ABI is calculated by a comparison of one period's billings, to another period's billings. Because of the comparison from one period to the next, it makes sense that I use the change in the index from one year to the next. For the remaining two leading indicators I have

[7] See the Article titled "Business Activity at US Architectural Firms as a Leading Indicator for the Construction Industry," page 9

access to the raw numbers, so I use the raw numbers as opposed to the percentage change from the previous period.

The ABI is the first available recorded step that an investor has access to, to use as a planned leading indicator. An architectural billing is not a serious commitment when it comes to constructing a building; so after requesting a billing, it is understandable that a developer may walk away from a project if it is not as profitable as his initial analysis showed, and many developers do just that. This lack of commitment on the developer's part makes the ABI's strength in predicting the commercial real estate market potentially weak. The underlying principle that I assume still holds with regards to the ABI though; an architectural billing would not occur unless a developer anticipated future real estate appreciation.

1-unit building permits

Building permits are documents that developers must obtain from the local government when building or renovating properties. A building permit is essentially a legal document that records the government permitting the construction of a new building, or a renovation. In this study I excluded renovations, and building permits for properties with more than 1-unit.[8]

I used the raw number of building permits, in 1000's, authorized in the entire United States for each six month period in question. The relevant building permits data spreads from the beginning of 2000 to midway through 2009.

A building permit is a sign of commitment that a developer intends to go through with the planned construction. This signals that the developer believes the market will continue improve in the future.

Housing starts

Housing starts are recorded by the governments when a real estate project actually begins. A housing start is just a recording of the construction starting.[9] This potential leading indicator will be the last single leading indicator that I analyze because it is closest to the property actually being constructed.

---

[8] See database titled "Housing Units Authorized by Building Permits", http://www.census.gov/const/www/C40/table1.html

[9] See database titled "Quarterly Starts and Completions by Purpose and Design", http://www.census.gov/const/www/newresconstindex.html

Commercial housing starts are not recorded on a national level. I therefore used residential, single family, built for fee simple, housing starts.

I used the raw number of housing starts authorized in the entire United States for each six month period in question.

A strength of using housing starts, in comparison to other planned construction leading indicators is that if a developer comes to the stage where he is actually starting construction, then he is certainly going to attempt to complete the project. The fact that the developer actually begins construction is a signal that the developer believes the market will continue to improve in the future.

Data

In this section I will briefly explain the data that I analyze, and the resulting correlations.

Table 1

Data Used in Analysis

[a] 6 Month Intervals	[b] Commercial Appreciation (% change)	[c] Inflation (% change)	[d] Inflation Adjusted Commercial Appreciation (% change)	[e] Commercial Architectural Billing Index (% change)	[f] 1-Unit Building Permits (thousands)	[g] Total Housing Starts (thousands)
Jun-00	N/A	2.4%	N/A	1.4%	627.8	780.8
Dec-00	N/A	0.9%	N/A	-5.8%	570.4	743.7
Jun-01	3.9%	2.3%	1.6%	-5.9%	643.5	783.7
Dec-01	-0.3%	-0.7%	0.5%	-1.8%	592.1	774.5
Jun-02	1.5%	1.8%	-0.3%	4.2%	666.6	821.6
Dec-02	6.9%	0.6%	6.3%	3.6%	665.9	840.1
Jun-03	2.1%	1.5%	0.5%	0.4%	714.2	844.6
Dec-03	4.9%	0.3%	4.6%	-1.5%	747.0	955.4
Jun-04	6.1%	2.9%	3.2%	13.1%	831.1	948.7
Dec-04	9.6%	0.3%	9.3%	-8.4%	782.3	976.0
Jun-05	11.6%	2.2%	9.4%	10.1%	847.2	1008.5
Dec-05	2.8%	1.2%	1.6%	2.2%	834.7	1029.9
Jun-06	6.0%	3.1%	2.9%	1.7%	791.2	971.6
Dec-06	2.3%	-0.5%	2.8%	0.4%	587.0	802.0
Jun-07	7.6%	3.2%	4.3%	-1.1%	565.5	720.0
Dec-07	0.7%	0.8%	-0.1%	0.1%	414.5	611.0
Jun-08	-10.2%	4.2%	-14.4%	-23.4%	334.8	504.5
Dec-08	-5.2%	-3.9%	-1.3%	-18.1%	240.8	384.0
Jun-09	-22.8%	2.6%	-25.4%	8.0%	202.3	261.4
Dec-09	-15.8%	0.1%	-15.9%	9.2%	231.8	278.6

In Table 1, Column [a] holds the relevant time periods. Each time period consists of six-months. Column [b] holds the unadjusted commercial appreciation. Column [c] holds the inflation for each six month period. Column [d] represents the inflation adjusted commercial appreciation.[10] Columns [e], [f], and [g] hold the three leading indicators to be analyzed.[11,12,13]

[10] See "Commercial Property Price Index", http://mit.edu/cre/research/credl/rca.html
[11] See "Architectural Billing Index", http://www.aia.org/practicing/economics/AIAS076265
[12] See "Housing Units Authorized by Building Permits", http://www.census.gov/const/www/C40/table1.html
[13] See "Quarterly Starts and Completions by Purpose and Design", http://www.census.gov/const/www/newresconstindex.html

Analysis

Referring to Table 1, Columns [e], [f], and [g] are used as leading indicators to column [d]. For example, the row of data in columns [e], [f] and [g] that hold the values, -1.1%, 566, and 720, respectively, predict the cell in column [d] that holds the value -14.4%. For an explanation of why this particular staggered linear regression is used, please refer to the section of this report titled "Relevant months".

Table 2
Regression Summary Data
(t-statistics in parentheses)

	(Model 1)	(Model 2)	(Model 3)	(Multiple Model)
Intercept	0.01	-0.27	-0.33	-0.23
ABI slope	0.8009			0.5052
	(0.49)			2.20
Permits slope		0.0004		-0.0004
		(-4.79)		-0.70
Starts slope			0.0004	0.0006
			(-4.96)	1.18
F-test	23.41	23.47	24.81	11.37
Significance of F	0.0002	0.0002	0.0001	0.0005
Durbin-Watson	1.88	2.59	2.31	1.63
Observations	18	18	18	18
R-squared	0.59	0.59	0.61	0.71

Table 2 holds the regression data from four linear regression models. The four models are described as follows:

Model 1: Linear regression using the ABI (column [e]) to predict inflation adjusted commercial appreciation (column [d]).

Model 2: Linear regression using building permits (column [f]) to predict inflation adjusted commercial appreciation (column [d]).

Model 3: Linear regression using housing starts (column [g]) to predict inflation adjusted commercial appreciation (column [d]).

Multiple Model: Multiple linear regression using the ABI, building permits, and housing starts (columns [e], [f], and [g]) to predict inflation adjusted commercial appreciation (column [d]).

Specification checking

Table 2 holds some values that warrant recognition. The values that I will discuss include the number of observations, the F-tests, the Durbin-Watson statistics, and the R-squared values.

The number of observations necessary to arrive at a generally accepted normal distribution is 30. The number of observations in my models is 18. There is a possibility that the correlation figures observed occurred by simply by chance because of the small sample size.

An F-test is a statistical test to see if the relationship happened by chance. A high F-test value, and a low p-value suggests that the correlations did not happen by chance. All of the models have a high F-test value, and the p-values of less than 0.01, which suggests that the regression outcomes did not happen by chance.

A Durbin-Watson statistic is used to measure the possibility of autocorrelation in the residuals from a regression line. Autocorrelation is the possibility that errors within the sample set reinforce or offset the strength of the regression systematically. A Durbin-Watson statistic of over 2.00 is associated with a possibility of autocorrelation. Models 2 and 3 have a Durbin-Watson statistics above 2.00. This may be because of negative autocorrelation or over-corrections. This fact should be taken into consideration when analyzing the strength of these correlation results.

Each model's R-squared value indicates the percentage of the movements in the Y-variable, (column [d]), that can be explained by the X-variable(s), (columns [e], [f], [g]). The R-squared values associated with all of the models are remarkably strong. The strongest R-squared value is seen in the Multiple Model with a value of 0.71. Using this R-squared value as an example, it would follow that 71% of the movement in [d] is explained by [e], [f] and [g].

All models have fewer than 30 observations, all models pass the F-test, two of the four models may have autocorrelation according to the Durbin-Watson test, and all models have a very strong R-squared value. The four models presented above are solid given the small sample sizes.

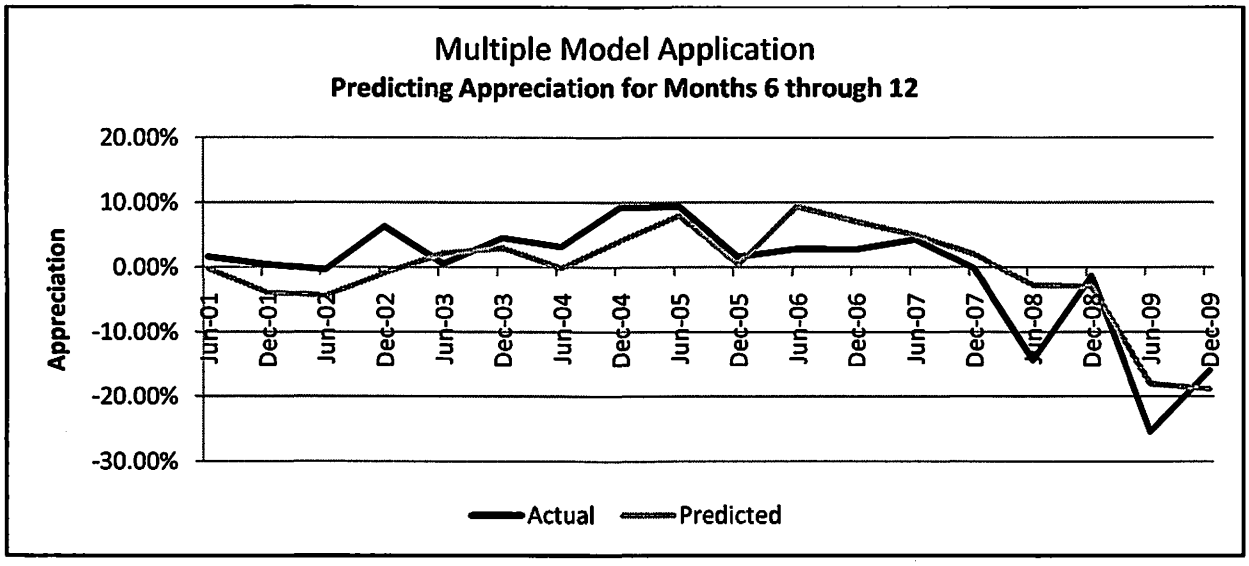
Investor application

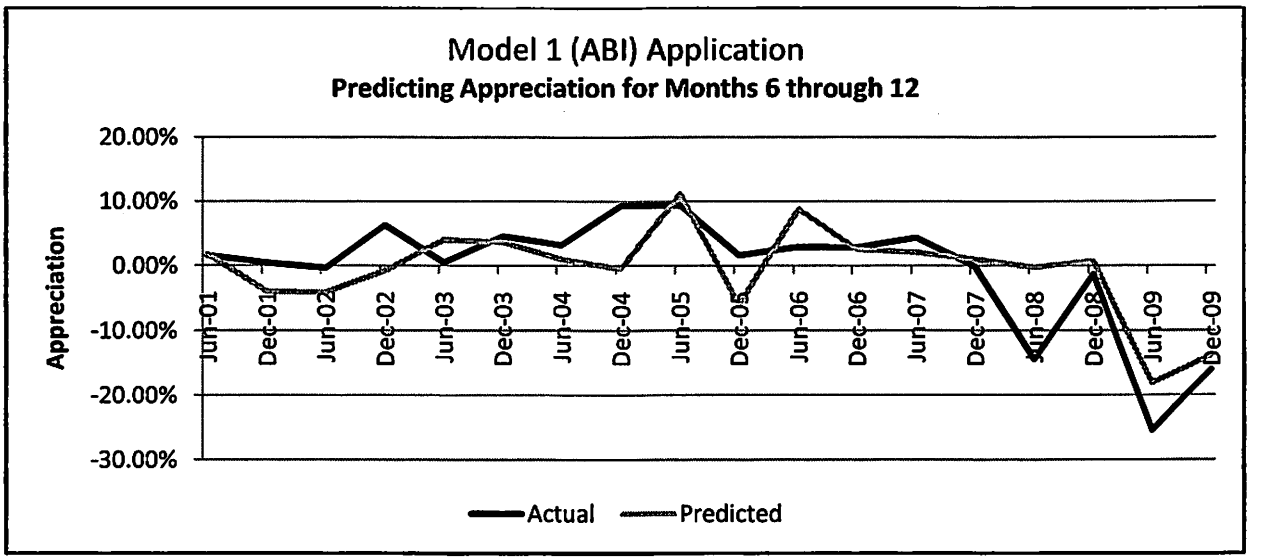
The purpose of this section is to use the Multiple Model to predict past commercial real estate appreciation from the perspective of an investor during the time period beginning with the end of 2000 and ending with the end of 2009.

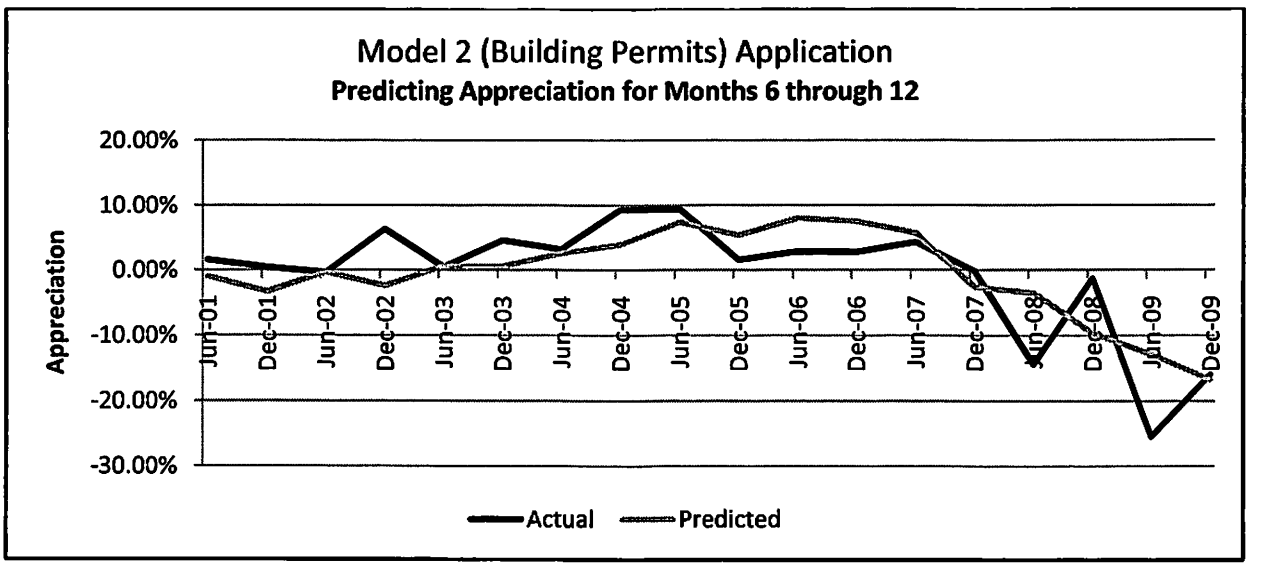
Assume that an investor who holds a position in commercial real estate beginning at the start of 2001. His position appreciates and depreciates at the rate of the national commercial real estate market. He makes decisions as to when to enter and exit the position based on the predicted appreciation of the Multiple Model. There is a 6-month lag following each decision to simulate the illiquidity of an investment in commercial real estate.

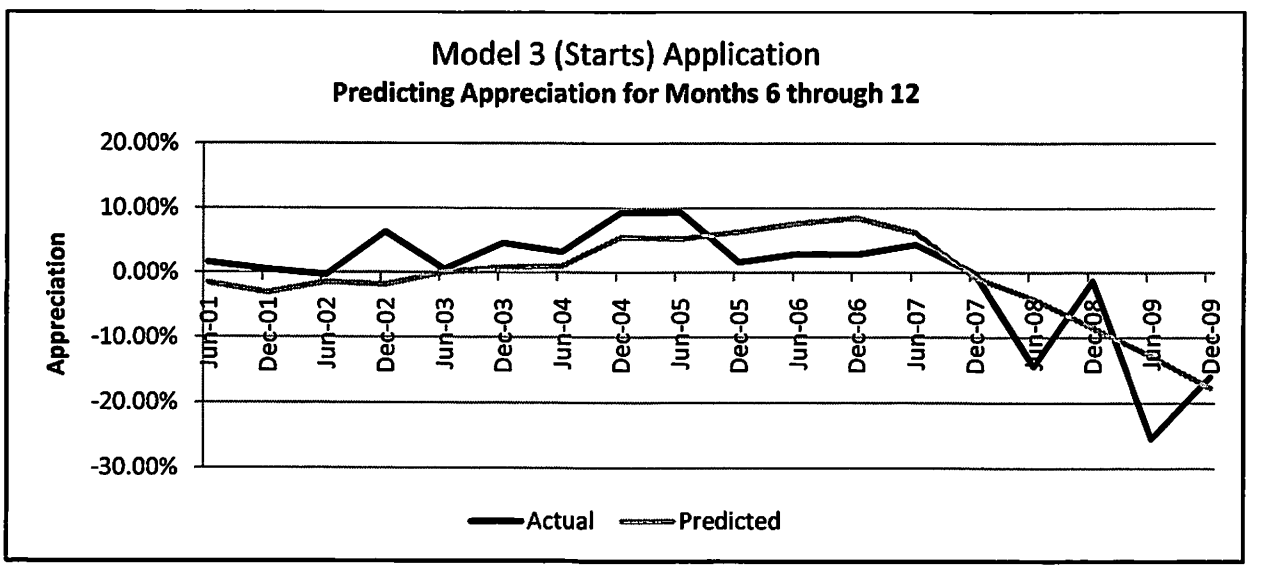
As explained in detail earlier in this report the investor has access to the predicted values 6 months prior to when the predicted time period begins. For example the prediction for the appreciation of the 6 months ending Jun-07 is available at the end of June-06. Imagine you are this investor, and you make your decisions as to when you should enter, exit, or remain in the market purely based on the predictions shown in the following graphs using the previously discussed models.

From the beginning of 2001 to the end of 2009, these models would have been useful for making real estate investing decisions. We will see if they continue to accurately predict the national commercial real estate market in the years to come.




Model 1 (ABI) Application
Predicting Appreciation for Months 6 through 12
Appreciation
20.00%
10.00%
0.00%
-10.00%
-20.00%
-30.00%
Jun-01
Dec-01
Jun-02
Dec-02
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Dec-06
Jun-07
Dec-07
Jun-08
Dec-08
Jun-09
Dec-09
Actual
Predicted


Model 2 (Building Permits) Application
Predicting Appreciation for Months 6 through 12
Appreciation
20.00%
10.00%
0.00%
-10.00%
-20.00%
-30.00%
Jun-01
Dec-01
Jun-02
Dec-02
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Dec-06
Jun-07
Dec-07
Jun-08
Dec-08
Jun-09
Dec-09
Actual
Predicted


Model 3 (Starts) Application
Predicting Appreciation for Months 6 through 12
Appreciation
20.00%
10.00%
0.00%
-10.00%
-20.00%
-30.00%
Jun-01
Dec-01
Jun-02
Dec-02
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Dec-06
Jun-07
Dec-07
Jun-08
Dec-08
Jun-09
Dec-09
Actual
Predicted

Predictions for the year of 2010

Below is a table of the predictions for the two 6-month periods of 2010 derived from Models 1, 2, 3, and the Multiple Model.

2010 Predicted Appreciation		
	Dec-09 to Jun-10	**Jun-10 to Dec-10**
Model 1	7.08%	8.02%
Model 2	-18.27%	-17.07%
Model 3	-22.65%	-21.96%
Multiple Model	-15.77%	-15.60%

Model 1 predicts positive growth, yet models 2 and 3 predict extreme negative growth. There are several reasons why this discrepancy may exist.

It may arise from the fact that Model 1 is based on the percentage change from each period. The reason for the ABI being calculated using a percentage changes is because the raw number of architectural billings is unavailable, so I used a percentage change of the Architectural Billing Index. A percentage change can be positive, even though the value of the underlying is very low. This positive change in the ABI leads to a predicted positive appreciation. The other leading indicators are calculated as a raw number per period, as opposed to a percentage change from the previous period. Therefore, relative to the past several years of data, the leading indicators are at a very low value, even though they may have increased some since last period. Because the numerical indicators are at relatively low values, the predicted appreciation is relatively low.

The Multiple Model, as expected, is in between the extreme values of the other three models. It will be interesting to see if this model does in fact continue to successfully predict appreciation, or if it will fail to predict appreciation as the economy eventually turns to positive appreciation.

Predicting appreciation in the future

I expect that the ability to predict the commercial real estate market will deteriorate over time. The first reason that I believe this is because the real estate market is continuously becoming more

efficient. One of my main hypotheses of why the commercial real estate market can be predicted was because the commercial real estate market is inefficient. If these inefficiencies are greatly reduced from the market, then it the commercial real estate market will become more difficult to predict. The second reason that I believe the commercial real estate market will become more difficult to predict in the future is because if it is possible to predict the market, then there will probably be more and more investors who attempt to predict the commercial real estate market with the growing amount of information that is available to the public. If everyone attempts to follow the same leading indicators then it is a setup for unwanted volatility. For an example let's say all investors notice that planned construction is starting to increase. According to this article that means that positive appreciation is coming soon. If investors think appreciation is coming soon then they will all attempt to enter the market at the same time, artificially driving prices up. Then when they realize that the rental demand is not there to meet the surplus of new developments, and high real estate prices, there will be a severe market correction.

Summary

The strong correlations that resulted in all four models of planned construction as leading indicators of commercial appreciation lead me to believe that the commercial real estate market may in fact not move randomly. The examination of potential lack of competition within the commercial real estate market may in fact actually exist.

The strong correlations may of course also occur purely by chance due to the small sample size of my analysis. It is possible that appreciation before my sample, and appreciation in the future, will not be strongly correlated with the planned construction. If this is the case then the efficient market theory will be further exemplified.

In the years to come I will to use planned construction to aid in my decisions regarding real estate, but I will in no way rely purely on the predictions of the group of investors and developers that drive real estate construction. Instead I will use the potential predictive powers of planned construction as a tool, but will make sure to complete due diligence in all other aspects as well, and I hope anyone reading this article does the same.

Future Research

One of the larger problems with my analysis is that the data does not go back far enough. As the years progress more data will be able to be analyzed and the conclusions of this article will be either weakened, or solidified.

This data set does not answer the questions as to whether or not this model will be able to be downsized to a smaller geographic area. For example, if a real estate investor operates on the north side of Chicago, will this model still work?

In addition to only using planned construction leading indicators, it would also be beneficial to analyze commercial real estate appreciation using non-planned construction leading indicators. Other possible indicators include the average spread between the original asking price and the closing price of real estate. This indicator is not directly related to planned construction, so if it were to be used in a model along with planned construction, it would "diversify" the type of indicators used to predict appreciation. This potentially would aid in finding accurate results because if for some reason the entire planned construction market did not accurately predict future appreciation, maybe the spread between the asking price and closing price would still predict appreciation, therefore decreasing the error in the results.

Acknowledgements

Thank you, Dr. Stephen Karlson, for guiding me through the process of creating this article and for being instrumental to my success at Northern Illinois University.

References

"AIA Architecture Billings Index (ABI)." *Architect Billing Index*. American Institute of Architects, Oct. 2009. Web. Oct. 2009. <http://www.aia.org/practicing/economics/AIAS076265>.

Baker, Kermit, and Diego Saltes. "Business Activity at US Architectural Firms as a Leading Indicator for the Construction Industry." *Cost Engineering* 48.2 (2006): 9-14. Print.

Carlton, Dennis W., and Jeffrey M. Perloff. *Modern Industrial Organization (4th Edition) (Addison-Wesley Series in Economics)*. New York: Addison Wesley, 2004. Print.

"Consumer Price Index." U.S. Department Of Labor, Sept. 2009. Web. Sept. 2009. <ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt>.

Fama, Eugene F. "Random Walks in Stock Market Prices." *Financial Analysis Journal* 21.5 (1965): 55-59. Print.

"Housing Units Authorized by Building Permits." *U.S. Census Bureau - Manufacturing, Mining, and Construction Statistics*. U.S. Census Bureau, Sept. 2009. Web. Sept. 2009. <http://www.census.gov/const/www/C40/table1.html>.

Ling, David C. "A Random Walk Down Main Street: Can Experts Predict Returns on Commercial Real Estate." *JRER* 27.2 (2005): 137-54. Print.

MIT's Center for Real Estate. "Moodys/REAL Commercial Property Price Index (CPPI)." *Commercial Property Price Index*. MIT Center for Real Estate, Sept. 2009. Web. Sept. 2009. <http://mit.edu/cre/research/credl/rca.html>.

"Quarterly Starts and Completions by Purpose and Design." *U.S. Census Bureau - Manufacturing, Mining, and Construction Statistics*. U.S. Census Bureau, Sept. 2009. Web. Sept. 2009. <http://www.census.gov/const/www/newresconstindex.html>.