

Problem Set 1 *Real Estate Economics*

Objective: The objective of this assignment is to introduce students to how to analyze real estate trends vis-à-vis using raw data from various sources. Students will learn how the underlying real estate market is related to the capital markets and also the product market. Lessons that the student should take away from this assignment include but are not limited to the following:

- Students will learn the difference between using data based on **expectations** and data that merely reflect realizations
- Which metrics are leading indicators of real estate trends
- A good portion of real estate data is either quarterly or reported with time lags. As such, the search for good real estate proxies that act as an early warning signal reported weekly or monthly is the key to spotting and taking advantage of trends.



Assignment: Download the `refin_econstats_fall2004.xls` file from my website and use the downloaded spreadsheet to answer the following questions. Please highlight your answers in **yellow** and turn in a hard copy of your results. ***This is an individual assignment.***

1. Percentage Net Shift (12 points): The percentage net shift technique is used as a measure of economic growth and is related to the shift share method. This method is superior to measuring the growth of markets using either *absolute* or *relative* changes in growth¹. The distinctive feature of the shift method is that it can measure the relative gains and losses of individual market areas compared with the total market. To demonstrate this approach, we will use the following data:

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8
	Retail Sales (000s)		Actual Change	Expected Change	Net Shift	Absolute Net Shift	Percentage Net Shift
	1958	1963	(ΔV_i)	[E(ΔV_i)]	(N_i)	N_i	(P_i)
New England							
Massachusetts	6241867	7431169	1189302	1365992	-176690	176690	-2
Maine	1031037	1185386	154349	225636	-71287	71287	-1
.....
Far West							
Washington	3418571	4042629	624058	748132	-124074	124074	-2
Oregon	2137084	2679337	542253	467687	74566	74566	1
Nevada	408373	707120	298747	89370	209377	209377	3
California	19947936	26888554	6940618	4365476	2575142	2575142	43
Total (All States)	198342328	241748255				11961135	

Step 1: Calculate the Actual Change. Note: The data is located in the “Disp Per Capita Income (State)” worksheet.

$$\Delta V_i = \text{Column 3} - \text{Column 2} = 7431169 - 6241867 = 1189302$$

Step 2: Calculate the Expected Change.

$$E(\Delta V_i) = \text{Column 2} * [(\text{Sum of Column 3}/\text{Sum of Column 2}) - 1]$$

$$= 6241867 * [(241748255/198342328)-1] = 1365992$$

Step 3: Calculate the Net Shift

$$N_i = \text{Actual Change} - \text{Expected Change} = \text{Column 4} - \text{Column 5} = \text{Column 6}$$

$$= 1189302 - 1365992 = -176690$$

Step 4: Take the Absolute Value (ABS) of the Net Shift

$$|N_i| = \text{ABS}(\text{Column 6}) = |-176690| = 176690 = \text{Column 7}$$

Step 5: Calculate the Percentage Net Shift

$$P_i = [\text{Net Shift}/(\text{Sum of Absolute Net Shift}/2)]*100$$

$$= [\text{Column 6}/(\text{Sum of Column 7}/2)]*100 = [-176690/(11961135/2)]*100 = -2.95$$

Perform a percentage net shift analysis. In particular, calculate the percentage net shift for the period encompassing 1995 vs. 1999 and also for the period of 1999 and 2003 in addition to the period 1995 vs. 2003. Denote whether the appropriate state exhibited Growth or No Growth over the 2 consecutive time intervals. Redo the analysis for the various BEA regions. Discuss which states and regions exhibited positive economic growth over both periods. Your output should resemble the following done over an alternative time period:

		1997-1999	1999-2001	1997-2001			
		Percent	Percent	Percent			
State	BEA Region	Net	Net	Net	1997-1999	1999-2001	1997-2001
Alabama	Southeast	-2.3	-2.3	-2.9	No Growth	No Growth	No Growth
Alaska	Far West						
Wyoming	Rocky Mountain						
		1997-1999	1999-2001	1997-2001			
		Percent	Percent	Percent			
		Net	Net	Net	1997-1999	1999-2001	1997-2001
		Shift	Shift	Shift			
	New England						
	Midwest						
	Great Lakes						
	Plains						
	Southeast						
	Southwest						
	Rocky Mountain						
	Far West						

¹Absolute measures tend to overstate (understate) the growth of larger (smaller) markets. In contrast, relative percentage measures overstate (understate) the growth of smaller (larger) markets.

2. Conditions in the Capital Market (11 points):

Drivers of Interest Rates: A Review of Economic Basics

- a. Credit Spreads and the Mortgage Interest Rate: Calculate and plot the bond spread (Baa – Aaa) against the mortgage interest rate on 30 year fixed rate mortgages using a Lines on 2 Axes graph option located in Custom Type graphs. What do bond spreads measure and why do mortgage interest rates increase (fall) as bond spreads rise (decline)? Hint: what are the components of interest rates?



- b. Rate of Inflation and the Mortgage Interest Rate: Calculate and plot inflation and core inflation (excludes food and energy components) and plot both of these inflation metrics against the mortgage interest rate on 30 year fixed rate mortgages using a Lines on 2 Axes graph. Why is inflation important with respect to mortgage interest rates? Does it matter whether we look at inflation or core inflation?

- c. Availability of Credit and the Mortgage Interest Rate: The composition of bank portfolios² e.g., the proportions of assets held in marketable securities (invested in treasury bills and notes) relative to the total of loans and leases on a seasonally adjusted basis

$$\text{Investment to Loans} = \frac{\text{Total Investments at All Commercial Banks}}{\text{Total Loans and Leases at Commercial Banks}}$$

is one metric of credit availability and provides investors with a sense of when the real estate market is heating up. Using the Loans and Investments variables, calculate the Investment to Loans ratio. Plot your calculated Investment to Loans ratio against the mortgage interest rate using the Lines on 2 Axes. What is the relationship (if any) between the asset composition in the balance sheet of banks, in particular, their investments in ST government securities and loans to real estate, agriculture, etc. and the rate at which banks lend money on mortgages?

²Bank regulators look at three ratios that must be kept above minimum values. One of these is the **capital ratio** which is the ratio of a bank's equity to a risk-weighted sum of the bank's assets. The weightings are 0 for reserves, 0 for government securities, 0.2 for loans to banks, and 1.0 for ordinary loans. A minimum capital ratio of 8% is required. Thus, the Investment to Loans can be thought of as investment in risk free assets (no default risk) relative to investment in risky assets.

The Availability of Credit

- d. Consumer Confidence and the Availability of Credit: Graph the Investment to Loans ratio that you calculated above against the consumer confidence index. Are the expectations of banks and consumers regarding the economy similar? Does one group appear to be a leading indicator of the other group? Please discuss.
- e. Property Returns and the Availability of Credit: Graph the Investment to Loans ratio against the quarterly return on NCREIF properties (this variable is labeled All Property Returns) using a Lines on 2 Axes graph. Note: Since the availability of credit metric is a monthly time series and the property returns are quarterly, make a copy of the "EconData" worksheet, highlight the entire column containing quarterly data and then use **Data** → **Filter** → **AutoFilter**. Next, pull down the filtering box that now appears in the worksheet and select the **(NonBlanks)** option. You are now able to graph the results. Caveat: if you undo the NonBlanks option, your newly constructed graph will disappear. Does the availability (or lack thereof) of financing influence property returns? Please discuss.



3. Looking at Pain and Bailout: Loan Delinquencies (11 points)

- a. Credit Spread and Loan Delinquencies: Graph the bond spread (Baa – Aaa) against quarterly Loan Delinquencies using a Lines on 2 Axes. What is the relationship (if any) between widening bond spreads (Baa - Aaa) and the delinquency rate on real estate loans? Does one series tend to be a "leading" indicator of the other series or do the two series tend to co-move together? This is important since data on loan delinquencies for each calendar quarter become available approximately sixty days *after* the end of the quarter. What is the contemporaneous correlation between these two series? To calculate the correlation coefficient use the CORREL function in Excel.
- b. Loan Delinquencies and Returns on Commercial Property: Graph the relationship between the quarterly loan delinquencies and quarterly returns on all commercial properties³ (All Property Returns from NCREIF). What happens to property returns as delinquencies increase (decrease)? Why should this occur? Please explain the economic relationship.
- c. Using Credit Spreads in lieu of Loan Delinquencies: Is it a good proxy? Graph the relationship between the Bond Spread (Baa-Aaa) and the returns on all

³NCREIF (National Council of Real Estate Investment Fiduciaries) reports returns on institutional grade commercial properties calculated using property cash flows and appraisal based values. We used this as a proxy for the return on direct real estate investment e.g., as if we had purchased the "bricks and mortar".

commercial properties. What happens to property returns as credit spreads widen (tighten)? Do credit spreads appear to be a good proxy for loan delinquencies?

4. A Closer Look at Property Submarkets: The Office Sector (11 points)

a. The Growth in Office Employment (Demand) and the Return on Office Properties:

One of the primary drivers of office property returns in theory is the growth rate in office-using employment because labor is a factor of production. Calculate the quarterly growth rate in Office-Using Employment and graph this growth rate relative to the quarterly NCREIF returns on office properties using a simple line chart. Besides this, calculate the correlation coefficient. Please discuss the graph.

b. Anticipated Corporate Profits (EPS) and the Return on Office Properties: From a theoretical perspective, how are anticipated corporate profits (using the forward-looking earnings per share (EPS)) related to the returns on office properties (think economics)? Plot the quarterly growth rate in forward looking EPS against office property returns. Does the graph validate this? Why or why not. Please discuss.



c. The Impact of a Change in Oil Prices on Office Property Returns:

Graph the relationship between the quarterly change in the price of oil and the return on NCREIF office properties. What is the impact of a change in oil prices on office property returns? Since change in oil prices tend to be quite volatile (this is why economists started to focus on core inflation which excluded food and energy costs), add a 4quarter moving average trendline to the growth rate in oil prices so that you can see the relationship more clearly. To add a trendline to your graph, right click⁴ on the line in your graph that you want to add a trendline to, select **Add Trendline...** → **Moving Average** → change the Period from 2 to **4** then click OK.

d. Investing in Office Properties as an Inflation Hedge: Plot the annualized rate of inflation (multiply the quarterly inflation rate * 4; inflation here includes food and energy costs), together with the occupancy rate on office properties (1- vacancy rate/100) and the quarterly return on NCREIF office properties using a Lines on 2 Axes graph option. What is the relationship between inflation, occupancy rates and returns on office properties? When should real estate be an inflation hedge? When isn't real estate an inflation hedge? Please discuss.

5. A Closer Look at Property Submarkets: The Industrial Sector (11 points)

a. Industrial Productivity and the Vacancy Rate for Industrial Properties:

Prepare a Lines on 2 Axes graph and discuss how is industrial productivity as measured by the ISM Purchasing Manager's Index (expected near term productivity) and Capacity Utilization for Manufacturing firms (realizations of actual productivity) are

⁴Your mouse has two buttons, one on the left and the other on the right. Click the right button on mouse.

related to the vacancy rate on industrial properties? What is the one factor that is missing from this chart?

- b. Investing in Real Estate: Securities or “Bricks and Sticks” or Does it Matter? Prepare a Lines on 2 Axes graph of quarterly returns on Industrial REITs (real estate investment trust), quarterly returns on NCREIF Industrial properties (proxy for investing in the bricks and mortar), and the industrial vacancy rate. How are returns on industrial properties related to the market for industrial space? Does this relationship hold regardless of whether we invest in securities (REITs) or in the underlying properties? Does one return series tend to "lead" the other? What could account for this?

6. A Closer Look at Property Submarkets: The Retail Sector (11 points)

- a. The Role of Personal Disposable Income per Capita on Retail Property Returns: Prepare a simple line chart and discuss to what extent (if any) is the rate at which disposable income per capita increases related to returns on NCREIF retail properties.



- b. Property performance and the Confidence to Shop till You Drop: Graph Consumer Confidence against the quarterly returns on NCREIF retail properties using a Lines on 2 Axes graph. Why would consumer confidence impact on the retail property returns? Why isn't it enough to merely consider consumers disposable income?
- c. GAFO Sales and Retail Property Returns: Generate a simple line graph showing the quarterly growth in GAFO⁵ sales and the quarterly returns on NCREIF retail properties. How good a signal is the growth rate in GAFO retail sales compared to either the growth rate in personal disposable income per capita or consumer confidence metric in predicting returns on retail properties?

7. A Closer Look at Property Submarkets: The Housing Market (11 points)

- a. The Role of Credit Availability and the Level of Interest Rates on Housing Starts: On a Lines on 2 Axes graph, show what role credit availability has on housing starts and permits. How does the availability of credit (or lack thereof) influence housing starts? On another graph, show and discuss the relationship between the level of mortgage interest rates and housing starts/permits. Which seems to have a greater influence on when builders apply for building permits and start construction on a house, the availability of credit or the level of interest rates?

⁵GAFO includes the following: General merchandise stores (NAICS 452), Apparel: Clothing and clothing accessories stores (NAICS 448), Furniture and home furnishings stores (NAICS 442), Electronics and appliances stores (NAICS 443), Sporting goods, hobby, book and music stores (NAICS 451), and Office supplies, stationery and gift stores (NAICS 4532).

- b. Housing Starts and Consumer Confidence: Prepare a Lines on 2 Axes graph showing whether consumer confidence (or lack thereof) influences housing starts. Why do the two series appear to diverge somewhat since March 2001?

8. Real Estate Investing Revisited: Securities vs. “Bricks and Sticks” (11 points). Prepare a graph showing how quarterly REIT returns (all properties; use the Equity REIT Total Return Index to calculate the return series) co-vary with the returns from NCREIF properties (AllProperty Returns column in EconData worksheet). To see the relationship more clearly, add a 4 period moving average Trendline to the quarterly REIT returns. Is investing in securitized real estate similar to investing directly in the underlying properties? Does one series tend to lead the other series? Please discuss.

Using a similar logic, graph the quarterly REIT returns for a specific property type against the quarterly NCREIF return for that property type. Does a similar relationship tend to hold for each property type?

9. The Landlord-Tenant Relationship: Monitoring the Solvency of Tenants (11 points).

- a. One Day Price Reaction to Financial News on Kmart: Calculate the one day price change to the financial news on Kmart⁶ using the “9a. News Events (KMart)”, “DailyPrices RetailREITs”, and the “KMart Exposure” worksheets. Question: Does news about Kmart's woes have a similar impact on all landlords who have Kmart as a tenant? Please discuss.



- b. The Symbiotic Relationship of Landlord and Tenant: Draw a Lines on 2 Axes graph showing the price of Kmart over time to the prices of Malan (MAL) Realty and Agree (ADC) Realty. Does the stock price of Kmart's landlords, especially Malan Realty and Agree Realty who have at least a 24% exposure in terms of their revenues, reflect Kmart's financial woes? Why is it important to relate the news and stock price performance on your tenants especially those that are publicly traded in the stock market to the real estate market?

Once again, please highlight your answers in **yellow** and turn in a hard copy of your results together with a disk containing your spreadsheet with your name on it. ***This is an individual assignment.***

⁶ Kmart filed for Chapter 11 bankruptcy protection on January 22, 2002. At the time of the news announcement, Kmart will expected to seek court approval to terminate leases on 350 of its 2,100 stores which have been closed or sublet to other tenants. Analysts expected up to 400 additional closings of underperforming stores. Why is this important for a real estate investor who invests in retail properties? Leases will be renegotiated as well as rejected, presenting a wild card: As many bankrupt retailers do, one would expect Kmart to use the threat of lease rejection to force landlords to lower rents on many locations. Landlords must decide whether they wish to accept lower rent (on a potentially less than attractive location) or face the prospect of a vacant location.