

Problem Set 1 *Real Estate Macromarket Analysis*

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 to construct market indicators. Students will learn how the underlying real estate market is related to capital markets. Both the market for space and return performance will be examined in looking at the underlying real estate market. In examining capital markets, we will look at both the market for real estate debt as well as securitized real estate equity.

Assignment: Download the real estate data from my website (MktStats2002.xls) 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. Shift Share Analysis: The shift share approach decomposes/partitions job growth into 3 drivers of growth. Using the worksheet labeled "Industry Emplymnt by State", perform a shift share analysis from a regional perspective. More specifically, aggregate states into regions using the various Bureau of Economic Analysis (BEA) categories. Next perform shift share analysis on these regions. An example of what your final output table should look like follows:

	Number of Jobs Industry Effect	Number of Jobs Regional Effect	Number of Jobs National Effect	Total New Jobs	Percent(%) Industry Effect	Percent(%) Regional Effect	Percent(%) National Effect	Percent(%) Total New Jobs
Far West								
Great Lakes								
Mideast								
New England								
Plains								
Rocky Mountain								
Southeast								
Southwest								

Discuss which regions have experienced job growth in all three categories e.g. as a result of their industry mix (their portfolio of industries within the region), their regional effect and as a consequence of the growth in the national economy. Also discuss which regions have lost jobs as a result of their industry mix or economic base.

In addition to this, perform a shift share analysis on all states that comprise the Southwest BEA region. Following is an example of what your final output table should resemble:

	Number of Jobs	Number of Jobs	Number of Jobs	#	Percent(%)	Percent(%)	Percent(%)	Percent(%)
	Industry	Regional	National	Total	Industry	Regional	National	Total
	Effect	Effect	Effect	New Jobs	Effect	Effect	Effect	New Jobs
Arizona								
New Mexico								
Oklahoma								
Texas								

Please discuss whether all states in the Southwest region have shared in the region's prosperity. If not, which states have prospered? Which states haven't done as well? Note: In practice, you would do a shift share analysis on each metropolitan statistical area (MSA) over time and graph these results as shown in your lecture handouts.

2. Percentage Net Shift: The percentage net shift technique is used as another 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
			Actual	Expected	Net	Absolute	Percentage
	Retail Sales (000s)		Change	Change	Shift	Net Shift	Net Shift
	1958	1963	(ΔV_i)	[E(ΔV_i)]	(N_i)	N_i	(P_i)
New England							
Massachusetts	6241867	7431169	1189302	1365992	-176690	176690	-2.95
Maine	1031037	1185386	154349	225636	-71287	71287	-1.19
.....
Far West							
Washington	3418571	4042629	624058	748132	-124074	124074	-2.07
Oregon	2137084	2679337	542253	467687	74566	74566	1.25
Nevada	408373	707120	298747	89370	209377	209377	3.50
California	19947936	26888554	6940618	4365476	2575142	2575142	43.06
Total (All States)	198342328	241748255				11961135	100

Step 1: Calculate the Actual Change.

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

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.

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 using the data in the worksheet labeled "Personal Income". In particular, calculate the percentage net shift for the period encompassing 1992 vs. 1998 and also for the period of 1998 and 2000. Denote whether the appropriate state exhibited Growth or No Growth over the 2 consecutive time intervals. Redo the analysis for the various BEA regions. Your output should resemble the following:

	1992-1998	1998-2000		
	Percent	Percent		
	Net	Net		
State	<u>Shift</u>	<u>Shift</u>	<u>1992-1998</u>	<u>1998-2000</u>
Alabama	-1.8	-3.8	No Growth	No Growth
Alaska				

Wyoming				
	1992-1998	1998-2000		
	Percent	Percent		
	Net	Net		
	<u>Shift</u>	<u>Shift</u>	1992-1998	1998-2000
New England				
Mideast				
Great Lakes				
Plains				
Southeast				
Southwest				
Rocky Mountain				
Far West				

Discuss which states and regions exhibited positive economic growth over both periods. Is this analysis consistent, in general, with the results from your shift share analysis?

To complement this, perform percentage net shift analyses using the Real Gross State Product and also Retail Sales. For the Real GSP, look at the 1993 vs. 1996 time period and also the 1996 vs. 1999 interval. For Retail Sales, examine the change from 1993 to 1998². Denote whether the appropriate state exhibited Growth or No Growth over time interval(s) examined. Redo the analysis for the various BEA regions. Are your results more or less consistent (robust) regardless of whether you use personal income, real gross state product, or retail sales? Are the results from this analysis also consistent in general with the results from your shift share analysis?

Use Excel to draw a separate map of the percentage net shift by state for personal income, real gross state product, and retail sales respectively. To use the map function in Excel, highlight the area that contains all of the states and the accompanying percentage net shift in Excel and then click on the "globe" icon. If you do not see a globe icon on your toolbar, click on the Tools submenu ⇨ select Customize ... ⇨ click on **I**nsert in the Categories box and in the Commands box, select Map ⇨ drag the map icon to the toolbar above.



What does an examination of your maps reveal about growth? Do states exhibit consistent growth across all the 3 dimensions?

3. Finding Opportunities using a Growth versus Vacancy Metric: Real estate analysts frequently graph either a one year or 5 year growth in employment (X-axis) against current vacancy (Y-axis) to see where potential opportunities exist. In an analogous fashion to the price-earnings to growth (PEG) ratio used in investments, they are seeking locations that have high growth and low vacancy. As a benchmark, they calculate the average growth rate and also the average vacancy rate for all SMSAs. SMSAs which have a growth rate that exceeds the average growth rate and a vacancy rate which is less than the average vacancy rate are considered fast growing/having pent up demand. Using the data in the worksheet labeled "MSA Growth", highlight those MSAs that were "hot" markets in the second quarter of the year 2000. Did any of these "hot" markets continue to be "hot" one year later (in 2001) or did overbuilding occur within the year causing vacancy rates to rise dramatically?

²The reason for the difference in time periods is due to the free data sources that we use. The numbers reported are the latest figures available. There are other data sources that provide more up to date information but NYU doesn't subscribe to these services.

4. Relating the Market for Space with Conditions in the Capital Market:

a. Space Market Index (SMI): SMI measures the change in jobs (demand) relative to the change in stock ratio (supply). The comparison is considered relative to its own long term average using a 3 year rolling measure (2 years of history and one year of forecast). An SMI > 1 implies an above average climate for performance e.g., demand > supply. Mike Miles and David Guilkey developed this metric since they felt that the vacancy rate was relatively “sticky”. Using the data in the worksheet labeled “Space Market Components” calculate the Space Market Index. To calculate the SMI, we shall use the following data where STOCK is the number of total square feet (supply) and employment is the measure of demand:

	A	B	C	D	E	F	G	H	I
1									
2			Year to Year	Rolling		Year to Year	Rolling		
3			Change in	Average of		Change in	Average of		
4	Date	STOCK	Stock	Stock	Employment	Employment	Employment	Ratio	smi
5	70.1	11786883			48702.75				
6	70.2	11881307			48318.97				
7	70.3	11982668			48062.61				
8	70.4	12080798			47838.38				
9	71.1	12188195	3.404731		47866.4	-1.717257			
10	71.2	12295738	3.488099		47962.34	-0.7380723			
11	71.3	12400643	3.488157		48204.53	0.2952854			
12	71.4	12504223	3.50494		48520.64	1.426181			
13	72.1	12625719	3.589735		49050.06	2.472842			
14	72.2	12754049	3.727396		49557.02	3.324858			
15	72.3	12883220	3.891551		50023.51	3.773456			
16	72.4	13027881	4.187846	4.079934	50641.11	4.370241	2.630336	0.644701	0.35698
17	73.1	13196402	4.520007	4.244573	51326.75	4.641567	3.060725	0.721091	0.39928
18	73.2	13362920	4.77394	4.411981	51881.88	4.691282	3.34925	0.759126	0.42034
19	73.3	13532861	5.042536	4.576388	52377.72	4.706209	3.432937	0.750141	0.41536
20	73.4	13723604	5.340267	4.725142	52827.51	4.317446	3.261712	0.690289	0.38222

Step 1: Calculate the Year to Year Change in Stock.

$$\Delta\text{STOCK} = [(\text{Stock}_{T+1}/\text{Stock}_T)-1]*100 = [(12188195/11786883)-1]*100 = 3.404731$$

Step 2: Calculate the Rolling Average of Stock using 2 prior years and 1 year in the future³.

$$\text{Average}(\Delta\text{STOCK}) = \text{Average} (C9:C20) = 4.079934$$

³The data on the total square feet is obtained from F.W. Dodge through a subscription-based service. F.W. Dodge provides forecasts of future supply in addition to historical data.

Step 3: Calculate the Year to Year Change in Employment.

$$\begin{aligned}\Delta\text{Employment} &= [(\text{Employment}_{T+1}/\text{Employment}_T)-1]*100 \\ &= [(47866.4/ 48702.75)-1]*100 = -1.717257\end{aligned}$$

Step 4: Calculate the Rolling Average of Employment using 2 prior years and 1 year in the future.

$$\text{Average}(\Delta\text{Employment}) = \text{Average (F9:F20)} = 2.630336$$

Step 5: Calculate the ratio of the Rolling Average of Employment to the Rolling Average of Stock.

$$\begin{aligned}\text{Unstandardized Space Market Index} &= \frac{\text{Rolling Average of Employment}}{\text{Rolling Average of Stock}} \\ &= 2.630336/ 4.079934 = 0.6447008\end{aligned}$$

Step 6: Calculate the Space Market Index by dividing the Unstandardized Space Market Index by the factor 1.14574.⁴ In our example, we use 1.806 as our factor given the time period over which we calculated this data.

$$\begin{aligned}\text{Space Market Index} &= \text{Unstandardized Space Market Index} / 1.806 \\ &= 0.6447008/1.806 = 0.35698\end{aligned}$$

Once again, **for purposes of this assignment, use 1.14574.**

Plot your calculated Space Market Index against Office Vacancy Rates using a Lines on 2 Axes graph option located in Custom Type graphs. Office Vacancy Rates for the United States is located in the worksheet labeled "Vacancy". Does the evidence support Miles and Guilkey's claim that vacancy rates are sticky?

b. Conditions in the Capital Market: Some REIT analysts look at the composition of bank portfolios e.g., the proportions of assets held in marketable securities and the total of loans and leases on a seasonally adjusted basis to get a sense of when the real estate market is heating up. In particular, the ratio they use is

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

⁴This factor is obtained by taking the rolling average of the unstandardized space market index over the time period from the start of our data until one year prior to the end of our data.

Using the data in the worksheet labeled “Loans & Investments”, calculate the Investment to Loans ratio.

Plot your calculated Space Market Index against the Investment to Loans ratio using the Lines on 2 Axes graph option located in Custom Type graphs. Discuss how the Investment to Loans ratio should behave as the real estate market for space as proxied by the Space Market Index starts to heat up. Is one ratio a leading indicator of the other ratio? If so, which index leads and which index lags?

5. Relating Return Performance in the Underlying Real Estate Markets with the Market for Space and with Conditions in the Capital Market:

To proxy for return performance in the underlying commercial real estate market, we will use NCREIF returns.

Plot your calculated Space Market Index against the quarterly NCREIF returns using the Lines on 2 Axes graph option located in Custom Type graphs. Discuss how the conditions in the market for space are related to real estate returns. More specifically, how should real estate returns behave relative to the market for space?

Next, plot conditions in the capital market as proxied by the Investment to Loans ratio against the quarterly NCREIF returns using the Lines on 2 Axes graph option located in Custom Type graphs. Discuss how the conditions in the capital markets are related to real estate returns.

6. Relating Returns on Securitized Real Estate to the Performance in the Underlying Real Estate Markets, the Market for Space, and Conditions in the Capital Market:

A well-known problem with using NCREIF returns as an indicator of real estate conditions is that these returns are appraisal based which dampens the volatility of returns. Using the equity REIT returns in the worksheet labeled “NAREIT”, calculate quarterly returns. Next, calculate a 4 quarter moving average (MA(4)) and also an 8 quarter moving average (MA(8)). The reason for calculating a moving average is because NCREIF returns are “smoothed” due to the appraisal process and as such, we also want to “smooth” REIT returns in comparing conditions in the securitized market with conditions in the underlying real estate market. Graph quarterly returns on Equity REITs against NCREIF returns. Also graph the Equity REIT returns using 4 quarter moving average against NCREIF returns. In addition to this, graph the Equity REIT returns using an 8 quarter moving average against NCREIF returns. Discuss how returns on securitized real estate are related to returns on the underlying property market. In particular, do REIT returns lead, lag, or co-move contemporaneously with returns on the underlying property markets?

Next, plot your calculated Space Market Index against using an 8 quarter moving average of Equity REIT returns using the Lines on 2 Axes graph option located in Custom Type graphs. Discuss how the conditions in the market for space are related to securitized real estate returns. Do REIT returns lead, lag, or co-move contemporaneously with conditions in the market for space?

Finally, plot your calculated Investments to Loan ratio against using an 8 quarter moving average of Equity REIT returns using a Lines on 2 Axes graph option located in Custom Type graphs. Discuss how the conditions in the capital market are related to securitized real estate returns. Do REIT returns lead, lag, or co-move contemporaneously with conditions in the capital market?

7. Interest Rate Spreads on CMBS: Credit spreads over a 10 year Treasury bond are frequently examined to ascertain the degree to which uncertainty exists with respect to the economy. In fact, researchers have found that increases in the BBB over the 10 year Treasury bond is a good predictor of recessions. There is also additional information embedded in interest rates associated with commercial mortgage backed securities. For example, AAA rated CMBS tranches (bonds) have a higher yield than AAA rated corporate bonds because of prepayment risk (the risk that the borrower will refinance his or her mortgage). While AAA rated CMBS tranches are subject to prepayment risk, the lower rated CMBS tranches are more prone to default risk especially in a senior-subordinated structure.

Using the data located in the worksheet labeled "CMBS Spreads", calculate the BBB - AAA CMBS Spread and also the BBB - AAA Corporate Bond Spread.⁵ Next, regress the CMBS Spread (Y variable) on the Corporate Bond Spread (X variable) and keep the residuals. The residuals represent the CMBS Spread adjusted for movements in the Corporate Bond Spread e.g., the unique real estate component. Plot the residuals on a graph. Discuss the extent to which variations in CMBS spreads can be accounted for by movements in corporate bond spreads. Also discuss whether August 1998, when Russia defaulted on some of its sovereign debt and allowed its currency to depreciate, resulting in large losses for investors in foreign exchange markets, had an impact on the residuals e.g., the CMBS spread adjusted for movements in Corporate Bond spreads (please look at your graph of the plotted residuals).

Using the delinquency data on commercial real estate loans from the worksheet labeled "Delinquency", plot the delinquency rate against the CMBS Spread either adjusted or unadjusted for movements in the corporate bond market using a Lines on 2 Axes graph option located in Custom Type graphs. For the period subsequent to the Russian bond crisis, discuss whether CMBS spreads contain any information on the anticipated delinquency rate for commercial real estate loans. To support your contention, calculate the correlation coefficient between the CMBS spread and the delinquency rate from the fourth quarter of 1998 through the second quarter of 2001 using the `correl()` function in Excel.

⁵ Observe that the corporate bonds are yields to maturity whereas the CMBS are spreads over a 10-year treasury bond.