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Real Estate Capital Markets

Revised: July 24, 2005

Commingled Real Estate Funds (CREFs)

Objective: The objective of this assignment is to familiarize students with some of the issues associated with commingled real estate funds (CREFs) which resemble private real estate investment trusts (REIT). Wall Street typically uses the return on CREFs as a proxy for the return on direct[1] real estate investment.

Assignment: Download the real estate data from my website (recm_cref2006.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. Seasonality in CREF Returns: (5 points) In the United States, the most frequently used index of private commercial real estate performance is that produced by the National Council for Real Estate Investment Fiduciaries (NCREIF[2]). NCREIF reports income, capital and total returns disaggregated by sector and region based on a sample of 4,224 institutional-owned properties valued at $159.2 billion as at March 31, 2005. Although the data is available on a quarterly basis, most of the properties are only valued on an annual basis, creating a potential for seasonality in the data. The lack of high frequency data is a particular problem in real estate, the high cost of appraisal precluding frequent reporting.

Does seasonality still exist in the NCREIF data given recent revisions to the index? More specifically, is there a fourth quarter "effect" (dummy variable for the fourth quarter is statistically significant) with respect to NCREIF quarterly returns? To see whether the NCREIF total return series contains quarterly seasonality, regress the NCREIF total return (this is the dependent or Y variable) against 3 quarterly dummy variables – Dum_Qtr2, Dum_Qtr3, Dum_Qtr4 where

Dum_Qtr2 = 1 if Quarter is the 2nd Quarter and 0 otherwise
Dum_Qtr3 = 1 if Quarter is the 3rd Quarter and 0 otherwise
Dum_Qtr4 = 1 if Quarter is the 4th Quarter and 0 otherwise

[1]Direct real estate investment means that the investor invests in the underlying real estate rather than investing in a share of stock which in turn owns real estate such as investing in a REIT.
[2]The website for NCREIF is http://www.ncreif.org

Following is an example of the resulting spreadsheet:

YYYYQ	NCREIF TotalReturn	Dum_Q2	Dum_Q3	Dum_Q4
19781	2.90%	0	0	0
19782	3.06%	1	0	0
19783	3.39%	0	1	0
19784	5.89%	0	0	1
19791	3.81%	0	0	0
19792	4.32%	1	0	0
19793	4.75%	0	1	0
19794	6.19%	0	0	1

To construct the quarterly dummy variables, you can use an IF statement in Excel with the following syntax:

IF(**logical_test**,**value_if_true**,value_if_false)

An example of how to actually construct the 2nd quarter dummy variable using Excel follows:

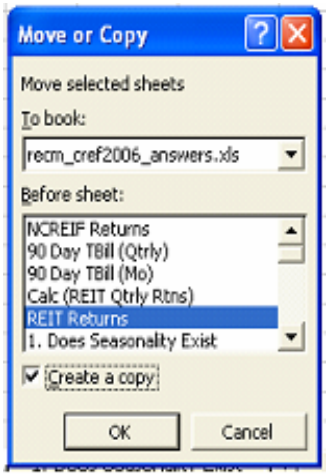
D8 fx =IF(C8=2,1,0)

	A	B	C	D	E
1					
2	**YYYYQ**	**Year**	**Qtr**	**Dum_Q2**	
3	19781	1978	1	0	=IF(C3=2,1,0)
4	19782	1978	2	1	=IF(C4=2,1,0)
5	19783	1978	3	0	=IF(C5=2,1,0)
6	19784	1978	4	0	=IF(C6=2,1,0)
7	19791	1979	1	0	=IF(C7=2,1,0)
8	19792	1979	2	1	=IF(C8=2,1,0)
9	19793	1979	3	0	=IF(C9=2,1,0)

To perform a regression in Excel, make sure the dependent Y variable (the total NCREIF returns in this problem) and the independent X variables (the quarterly dummy variables) are in columns that are adjacent to one another. Next, click on the **Tools** → **Data Analysis…** → **Regression** then click on the **OK** button. Using your cursor, highlight the appropriate column(s). If the highlighted column contains the data label in the first row, make sure to click on the **Labels** box. You can either click on an empty cell to put the resulting output in or put your output in a new worksheet that you have named.

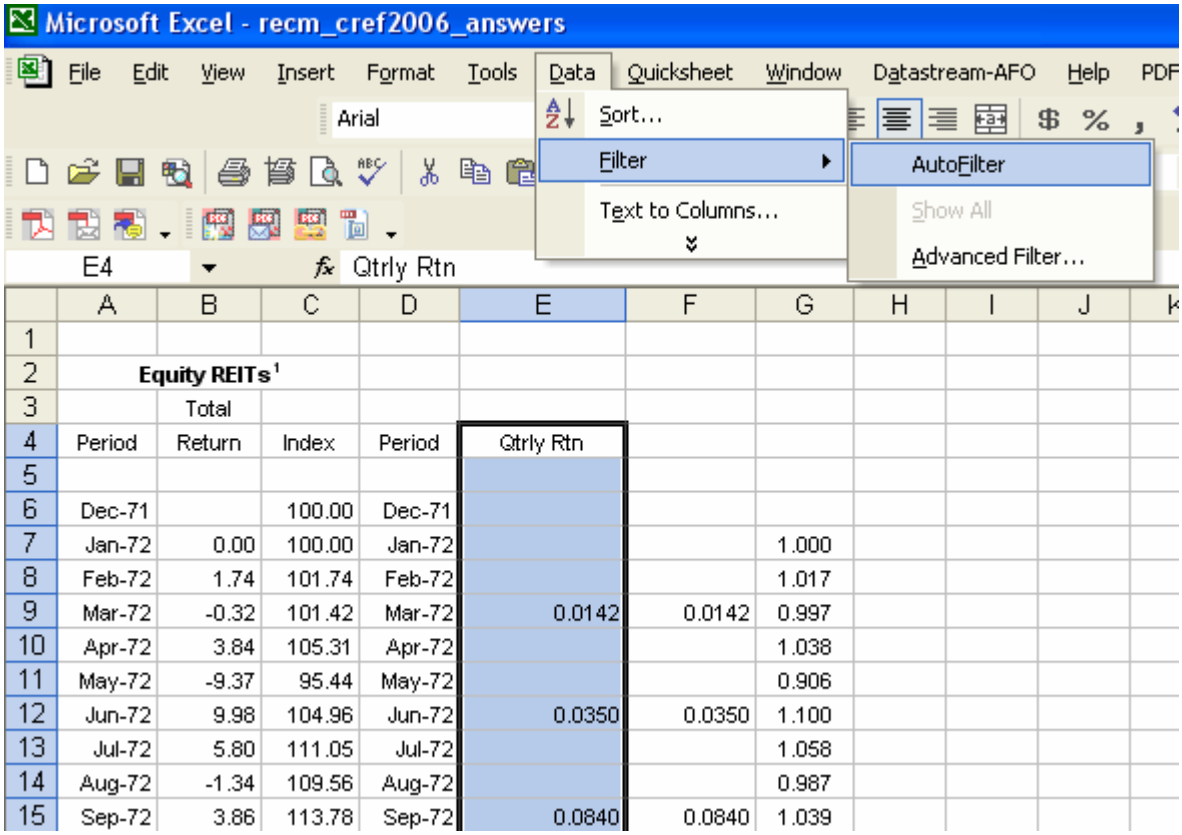
2. Relationship between CREF and REIT Returns: (25 points) Using the template **2a. MvgAvg** in conjunction with **NCREIF Returns** and **REIT Returns** worksheets, calculate the quarterly equity REIT returns starting from March 1972 through March 2005.

Hint: One way to accomplish this is to make a copy of the **REIT Returns** worksheet by right-clicking the mouse and selecting the **Move or Copy …** option. Next, click on the REIT Returns sheet in the scroll down box, click on the **Create a copy** box located on the lower left hand side, and then click on the **OK** button. Label the new sheet that you copied **Calc (REIT Qtrly Rtns)** by double clicking on the tab. To calculate quarterly returns, you can either use the equity REIT index or alternatively calculate 1 + Monthly Return and then take the product of (1+ R) for three months as shown in the following illustration:



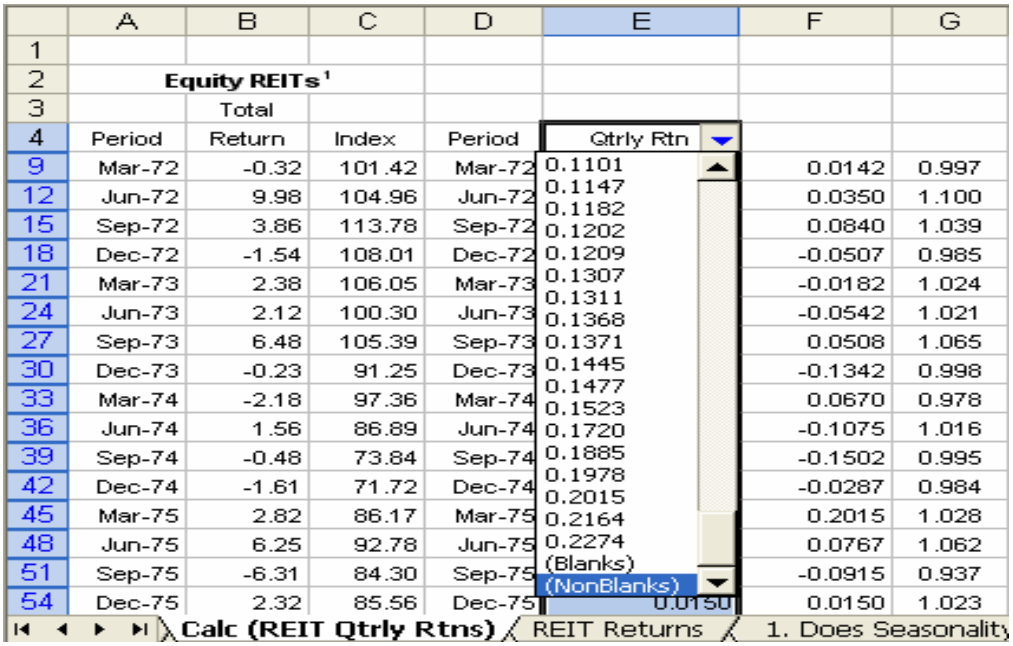
	A	B	C	D	E	F	G
1							
2		**Equity REITs**[1]					
3		Total					
4	Period	Return	Index	Perio	Qtrly Rtr		
5							
6	Dec-71		100.00	Dec-71			
7	Jan-72	0.00	100.00	Jan-72			=1+B7/100
8	Feb-72	1.74	101.74	Feb-72			=1+B8/100
9	Mar-72	-0.32	101.42	Mar-72	=C9/C6-1	=PRODUCT(G7:G9)-1	=1+B9/100
10	Apr-72	3.84	105.31	Apr-72			=1+B10/100
11	May-72	-9.37	95.44	May-72			=1+B11/100
12	Jun-72	9.98	104.96	Jun-72	=C12/C9-1	=PRODUCT(G10:G12)-1	=1+B12/100
13	Jul-72	5.80	111.05	Jul-72			=1+B13/100
14	Aug-72	-1.34	109.56	Aug-72			=1+B14/100
15	Sep-72	3.86	113.78	Sep-72	=C15/C12-1	=PRODUCT(G13:G15)-1	=1+B15/100
16	Oct-72	-2.32	111.15	Oct-72			=1+B16/100
17	Nov-72	-1.31	109.70	Nov-72			=1+B17/100
18	Dec-72	-1.54	108.01	Dec-72	=C18/C15-1	=PRODUCT(G16:G18)-1	=1+B18/100

Once you have finished your calculations, you will need to "collapse" your spreadsheet so that only rows containing the quarterly returns are showing. To accomplish this task, highlight the column that you wish to collapse → Select **Data** from the Excel menu → **Filter** → **AutoFilter** as follows:



	A	B	C	D	E	F	G	H	I	J
1										
2		Equity REITs[1]								
3		Total								
4	Period	Return	Index	Period	Qtrly Rtn					
5										
6	Dec-71		100.00	Dec-71						
7	Jan-72	0.00	100.00	Jan-72			1.000			
8	Feb-72	1.74	101.74	Feb-72			1.017			
9	Mar-72	-0.32	101.42	Mar-72	0.0142	0.0142	0.997			
10	Apr-72	3.84	105.31	Apr-72			1.038			
11	May-72	-9.37	95.44	May-72			0.906			
12	Jun-72	9.98	104.96	Jun-72	0.0350	0.0350	1.100			
13	Jul-72	5.80	111.05	Jul-72			1.058			
14	Aug-72	-1.34	109.56	Aug-72			0.987			
15	Sep-72	3.86	113.78	Sep-72	0.0840	0.0840	1.039			

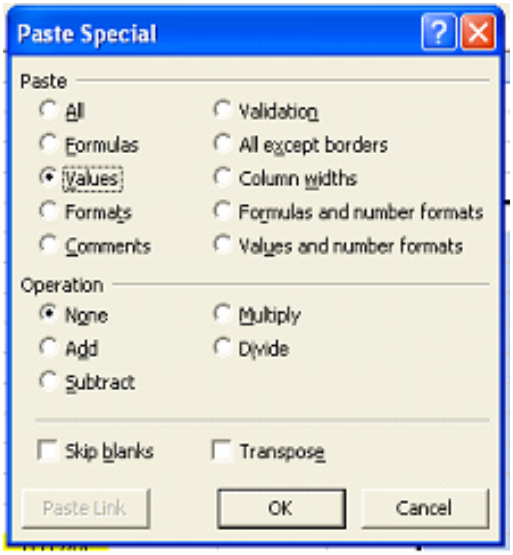
You will now notice a pull down button in the first row of the column that you highlighted. Click on the pull down button and select (Nonblanks) as illustrated below which results in a column of quarterly returns:



	A	B	C	D	E	F	G
1							
2		Equity REITs[1]					
3		Total					
4	Period	Return	Index	Period	Qtrly Rtn		
9	Mar-72	-0.32	101.42	Mar-72		0.0142	0.997
12	Jun-72	9.98	104.96	Jun-72		0.0350	1.100
15	Sep-72	3.86	113.78	Sep-72		0.0840	1.039
18	Dec-72	-1.54	108.01	Dec-72		-0.0507	0.985
21	Mar-73	2.38	106.05	Mar-73		-0.0182	1.024
24	Jun-73	2.12	100.30	Jun-73		-0.0542	1.021
27	Sep-73	6.48	105.39	Sep-73		0.0508	1.065
30	Dec-73	-0.23	91.25	Dec-73		-0.1342	0.998
33	Mar-74	-2.18	97.36	Mar-74		0.0670	0.978
36	Jun-74	1.56	86.89	Jun-74		-0.1075	1.016
39	Sep-74	-0.48	73.84	Sep-74		-0.1502	0.995
42	Dec-74	-1.61	71.72	Dec-74		-0.0287	0.984
45	Mar-75	2.82	86.17	Mar-75		0.2015	1.028
48	Jun-75	6.25	92.78	Jun-75		0.0767	1.062
51	Sep-75	-6.31	84.30	Sep-75		-0.0915	0.937
54	Dec-75	2.32	85.56	Dec-75		0.0150	1.023

You will have to copy this column to the **2a. MvgAvg** worksheet template by

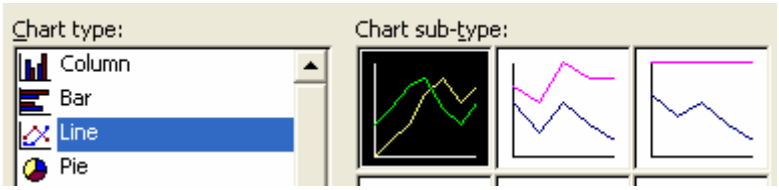
- highlighting the column in the **Calc (REIT Qtrly Rtns)** worksheet with your mouse,
- selecting **Edit** → **Copy** from the Excel toobar,
- clicking on the **2a. MvgAvg** tab,
- highlighting the EREIT Quarterly Return column starting with cell B5 through cell B137, and
- selecting **Edit** → **Paste Special …** from the Excel toobar. In the Paste Special box that appear, click on **Values** then click the **OK** button.



In the next column, labeled MA(4Q) for 4 quarter moving average or one year moving average in the **2a. MvgAvg** worksheet, calculate the 4 quarter moving average by using the average command for four quarters. The formula for cell C8 is thus =AVERAGE(B5:B8) . Copy and paste this formula in cells C9 through C137. Using a similar logic process, calculate the 8 quarter (2 years), 12 quarter (3 years), 16 quarter (4 years), and 20 quarter (5 years) moving average of equity REIT returns. Next, link the quarterly NCREIF returns to the **2a. MvgAvg** worksheet. To link one worksheet to another worksheet, input an = sign into cell H29 in the **2a. MvgAvg** worksheet, click on the **NCREIF Returns** tab and then click on cell D3 in the **NCREIF Returns** worksheet. Your sheets are now linked. Copy and paste cell H29 in the **2a. MvgAvg** worksheet into cell H30 through cell H137 of the **2a. MvgAvg** worksheet.

b. Graph the co-movement of returns between the contemporaneous equity REIT returns and the NCREIF returns. In addition to this, calculate the correlation coefficient using the = CORREL function in Excel and put it as a comment in your graph. To generate this graph using the data in the **2a. MvgAvg** worksheet,

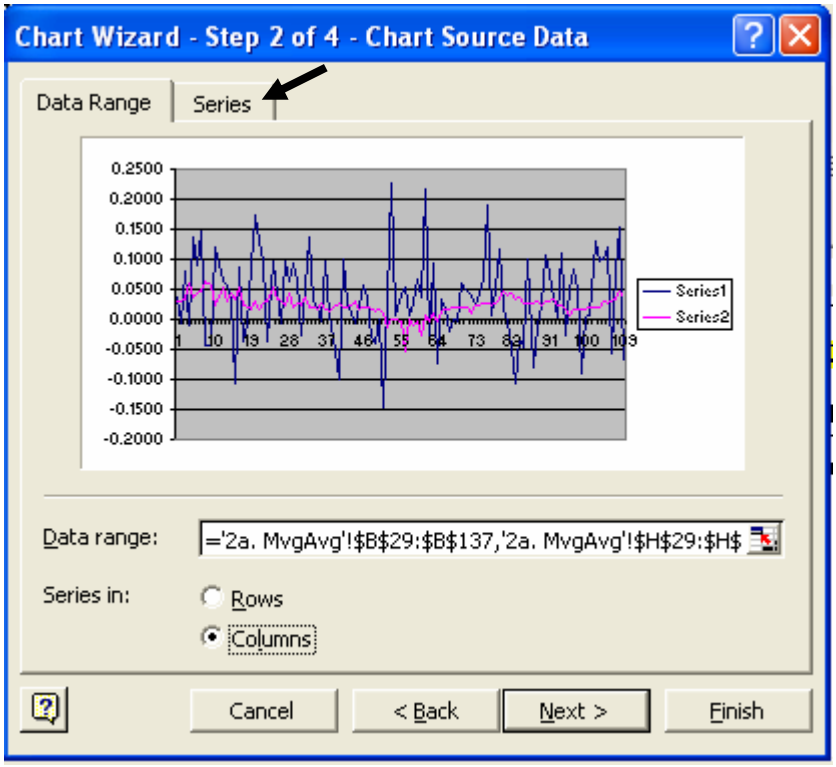
- click on the Chart Wizard icon 
- Select **Line** as the Chart Type and the first chart in the upper left hand corner as the Chart Sub-type



- In **Data range:** box, select the columns that you wish to graph together. For our first graph, we will use column B (cell B29 through cell B137) and column H (cell H29 through cell H137). Click on cell B29. Notice that ='2a. MvgAvg'!$B$29 appears in the **Data range:** box. Highlight the rest of the cells in column B through cell B137. ='2a. MvgAvg'!$B$29:$B$137 now appears in the **Data range:** box. Type a comma (,) then click on cell H29 and highlight the rest of the cells in column H through cell H137. The following is now appears in the **Data range:** box

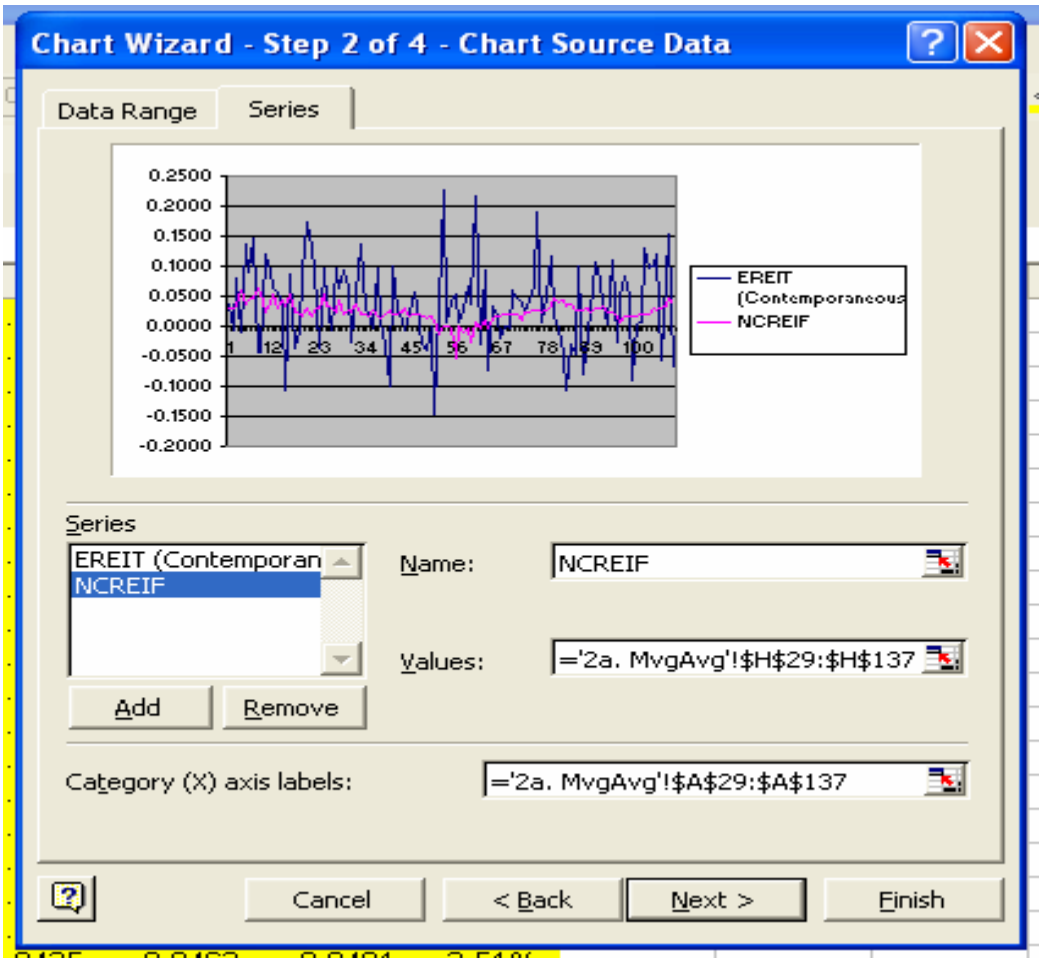
  ='2a. MvgAvg'!$B$29:$B$137,'2a. MvgAvg'!$H$29:$H$137

  Choose the **Columns** option for Series in: and then click on the Series tab located at the top of the Chart Wizard screen.

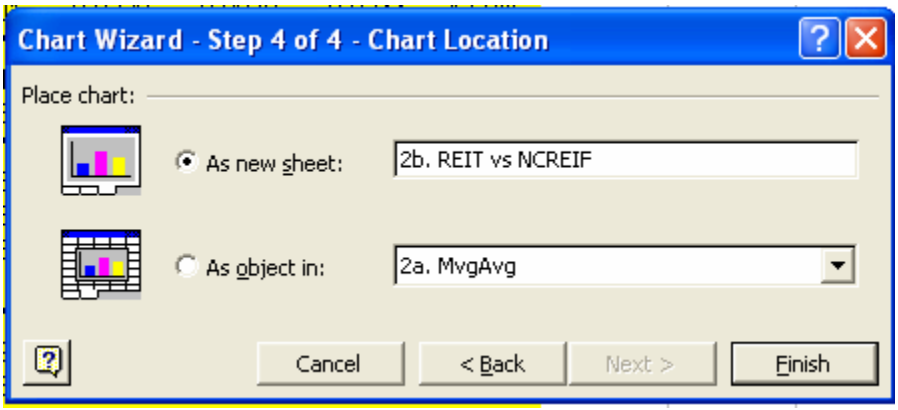


For the first series (Series1: '2a. MvgAvg'!$B$29:$B$137), highlight Series1 in the **Series:** box and in the **Name:** box type in EREIT (Contemporaneous) as the label. Next, highlight Series2 in the **Series:** box[3] and in the **Name:** box type in NCREIF as the label. Finally, click on the **Category (X) axis labels:** box, click on cell A29 and then holding down the left button on your mouse, highlight the remaining cells in column A through cell A137. Then click on the **Next>** button. Your Chart Wizard screen should resemble the following illustration:

[3]Series2: '2a. MvgAvg'!$H$29:$H$137



You can now finish up your graph. When you reach Chart Wizard Step 4 of 4 – Chart Location, select the **As new sheet:** option for **Place chart:**, then click on the adjacent box and type 2b. REIT vs NCREIF as the tab for your graph. Your Chart Wizard screen should resemble the following illustration:



c. Graph the co-movement of returns between the one year (four quarters) moving average (MA(4Q)) of equity REIT returns and the NCREIF returns. In addition to this, calculate the correlation coefficient using the = CORREL function in Excel and put it as a comment in your graph.

d. Graph the co-movement of returns between the two year (eight quarters) moving average (MA(8Q)) of equity REIT returns and the NCREIF returns. In addition to this, calculate the correlation coefficient using the = CORREL function in Excel and put it as a comment in your graph.

e. Graph the co-movement of returns between the three year (twelve quarters) moving average (MA(12Q)) of equity REIT returns and the NCREIF returns. In addition to this, calculate the correlation coefficient using the = CORREL function in Excel and put it as a comment in your graph.

f. Graph the co-movement of returns between the four year (sixteen quarters) moving average (MA(16Q)) of equity REIT returns and the NCREIF returns. In addition to this, calculate the correlation coefficient using the = CORREL function in Excel and put it as a comment in your graph.

g. Graph the co-movement of returns between the five year (twenty quarters) moving average (MA(20Q)) of equity REIT returns and the NCREIF returns. In addition to this, calculate the correlation coefficient using the = CORREL function in Excel and put it as a comment in your graph.

h. For more than a decade, financial academics and market professionals have debated whether the return behavior of equity REITs is more like that of direct ownership in real estate or more like stocks. The debate stemmed largely from the apparently much stronger correlations between REITs and the stock market (and particularly small cap stocks) than between REITs and actual commercial real estate properties. Using the graphs that you have constructed in the preceding questions (2a - 2g), discuss whether the return behavior of equity REITs is linked to the direct ownership in real estate as proxied by NCREIF returns. Do you feel that analysts should look at the contemporaneous relationship between returns on REITs and CREFs which is the source of this debate or is it better to look at a moving average of REIT returns relative to CREFs. Why or why not? What is the relationship between REITs and CREFs e.g., does one return series lead or lag the other? In other words, is one return series a leading indicator of the other return series? What is the economic intuition for why this is the case?

3. Illiquidity of Real Estate and the Swapping of CREF Cash Flows: (55 points) One strategy that some investment banks such as Morgan Stanley have proposed to CREF investors who wish to lessen their exposure in real estate but do not want to pay large transaction costs and do not want to turn a "paper" loss into a real loss through a sale of CREF units is to swap CREF returns for risk-free returns on either LIBOR or Treasury bills. Suppose that your firm, who holds units in a CREF, executes a real estate swap for a 3 month (90 day) Treasury bill. The swap is initiated in the second quarter of 2000; the real estate swap will last for 20 quarters ending in the first quarter of 2005.[4] The terms associated with the swap agreement are as follows:

Initial Appraised Value: $250,000,000
Discount (of Appraised Value): 15%
Length of Swap (in quarters): 20 quarters (from 2000 Quarter 2 until 2005 Quarter 1)
Spread over 3-month Treasury bill: .125%

where

Initial Notional Amount = Initial App Value * (100% - Discount of Appraised Value)

Discount Accretion Amount (per period) = (Initial Appraised Value * Discount of Appraised value)/Length of Swap

Discounted Initial Russell-NCREIF Capital Index Value =(Capital Index Val *(100%-Discount of Appraised value))

Number of Index Units = Notional Amount ÷ Discounted Capital Index Value

Discount Accretion (Percent %) = Discount ÷ Length of the Swap

Fill in the yellow highlighted areas in the Receiver[5] Template (the **3a. Swap05 (Recv Ppty CF** worksheet) and the Payer[6] Template (the **3b. Swap05 (Pays Ppty CF)** worksheet)". The highlighted areas: 1) Show the net cash flows to Party A including all intermediate calculations on a spreadsheet, 2) Show the net cash flows to Party B including all intermediate calculations on a spreadsheet, and 3) Show the cash flows to the financial intermediary who set up the swap agreement including all intermediate calculations on a spreadsheet. Is the swap a good deal for your firm? Was the swap, in hindsight, a good deal for the other party? Why or why not? If it is not a good deal, explain why it isn't. Plot out the NCREIF returns vs. 3-month Treasury bill.

[4]The question to consider here is how would the party who wants to participate in real estate (receiver of real estate cash flows) have fared over this time period.
[5]Receives Property Cash Flows
[6]Pays Property Cash Flows

4. Buy and Hold Strategy: Investing in CREFs relative to Equity REITs: (15 points) In general, institutional investors typically will not engage in real estate swaps. The choice therefore frequently involves choosing between CREFs and REITs. Suppose that an institutional investor purchased 1 unit of NCREIF for $100,000 in the first quarter of 1991. Assume that:

- The NCREIF unit appreciates or declines each quarter at the capital return portion of the NCREIF index. The income (dividend) paid on the NCREIF unit each quarter is equal to the income return on the NCREIF index.

- The income that the investor receives from his/her one unit is put in a bank account. Interest paid on that account is equal to the 90 day Treasury bill yield and is paid quarterly. Interest is compounded on a quarterly basis. Assume that income is paid at the end of each quarter on the value of the CREF unit at the beginning of each quarter.

- The investor can only sell his/her unit when the total quarterly NCREIF return (capital appreciation + income) is greater than the quarterly return on the 90 day Treasury bill

- A new institutional buyer of the investor's unit will only purchase a unit of NCREIF if the total quarterly NCREIF return (capital appreciation + income) is greater than the quarterly return on the 90 day Treasury bill ***and*** the total quarterly NCREIF return (capital appreciation + income) is greater than the quarterly return on the NAREIT index.

Based on the preceding assumptions,

a. Using the **4a. When Buy CREF** worksheet, what percentage of the time since the first quarter of 1991 through the first quarter of 2005 did Commingled Real Estate Funds outperform both REITs and Treasury Bills? Please discuss which investment vehicle you would have preferred to hold over this period given perfect hindsight if you wanted to maximize returns? Hint: You will need to use a series of IF and AND statements in column E. For example, in column E4 you should have a statement that resembles the following

=IF(AND(B4>D4,B4>C4),"Buy XXX",IF(AND(C4>D4,B4<C4),"Buy YYY","Buy ZZZ"))

b. Using the **4b. MIRR (NCREIF)** and **4b. MIRR (NAREIT)** worksheets, what is the modified IRR for the NCREIF unit. If the investor had in lieu of purchasing a NCREIF unit, bought $100,000 worth of the NAREIT's equity REIT composite index what would his/her Modified IRR be assuming the same holding period as the NCREIF investment and assuming quarterly payouts? In hindsight, would the investor have been better off buying NCREIF or NAREIT based solely on the MIRR?

How to Calculate the Modified Internal Rate of Return (MIRR):

To calculate the MIRR, the future value of a lump sum formula is used as follows:

$$FV = PV\ (1 + MIRR)^T$$

where FV = future value of all cash flows. All cash flows are compounded forward at the rate on passbook savings or some safe rate (we use the 90-day return).

PV = present value of cash outlays. If the investment is staged in, say, investing $1,000 in Period 0 and another $1,000 in Period 1, these cash outlays are discounted back to present at the opportunity cost of funds. The opportunity cost of funds is defined as the rate of return on the next best opportunity.

T = Holding period; time to sale of your investment

Example: Suppose that an investor invests $2000 in the current period (t_0) and another $2000 at the beginning of the next period (t_1). Cash flows on the 5 year project are $700 ($t_1$), $750 ($t_2$), $775 ($t_3$), $800 ($t_4$) and $850 ($t_5$). The terminal value of the project is $2500 ($t_5$). If the investor did not invest in this project, the rate of return associated with his next best opportunity is 9%. Assume that the risk free rate is 3% and the risk free rate remains stationary over the five year period. Cash outlays (investments in the project) are assumed to be made at the *beginning* of each period. Cash inflows are assumed to be received at the *end* of each period. What is the modified IRR?

r_F	0.03							
OppCost	0.09							
	Cash			Discounted	Cash			Compounded
Time	Outlay	1+OpCost	PV Factor	Outflows	Inflows	$1 + r_F$	FV Factor	Inflows
0	2000			2000				
1	2000	1.09	0.917431	1834.86	700			940.74
2					750	1.03	1.03000	978.58
3					775	1.03	1.06090	953.15
4					800	1.03	1.092727	900.41
5					3350	1.03	1.1255088	3350
5	T	Totals	PV	$3,834.86			FV	$7,122.88
			MIRR	0.131829936				

Please turn in a hard copy of your answers. Remember that this is an ***individual*** assignment.