

Problem Set 3 **Real Estate Investment Trusts (REITs)**

Objective: The objective of this assignment is to introduce students to how to analyze real estate investment trusts aka REITs (pronounced R-E-E-T-s). In particular, we will look at analyzing REIT trends and how these trends are related to trends in the market for space and the capital market. As such this builds on the earlier work that was done in problem set #1. We will also deal with performing an attribution analysis on a real estate mutual fund. Finally, students will learn some of the paradigms associated with REIT valuation.

Assignment: Download the real estate data from my website (REIT2002.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. Issuance of REIT IPOs: Are the issuance of REIT initial public offerings (IPOs) related to conditions in the market for space and also capital markets? Using the worksheet labeled "REIT IPO Aggregate" together with your constructed indices from problem set #1, chart the number of IPO offerings against the Investment/Loan ratio. Construct another chart showing the relationship between the number of IPO offerings and the Space Market Index. Use the Line-Column on 2 Axes graph option located in Custom Type graphs in constructing both graphs. Discuss the relationship between the number of REIT IPOs and the capital markets. Is the market for space also related to the number of REIT IPOs? The moral of the story is for you to explain when REITs are most likely to have an IPO.

2. The Hybrid Nature of REITs: Is It Real Estate or is it a Stock? There has been much discussion in the real estate literature on whether REITs behave more like real estate or resemble other mid-cap/small cap stocks. To get a sense of how REITs "behave", calculate a rolling 12-month correlation of REIT returns with returns on the Russell 2000¹ using the return data located in the "Returns (REIT & Russell2000)" worksheet. One way that you can do this is with the `correl(array1,array2)` function in Excel. Construct a graph showing the relationship between the rolling 12-month correlation and the Space Market Index using a Lines on 2 Axes graph option located in Custom Type graphs. Please discuss the graph. Are there times when REITs behave more like real estate? Next, graph the relationship between the rolling 12-month correlation and the spread between the returns on *equity* REITs and the returns on the Russell 2000. What, if any, are the implications of this graph in terms of the investment performance of REITs relative to other mid-cap stocks?

¹REITs comprise between 10%-15% of the Russell 2000.

3. Funds of Funds: Attribution Analysis of a Real Estate Mutual Fund. A real estate mutual fund is a specialized mutual fund that invests exclusively in real estate related securities with a primary emphasis on equity REITs and to a more limited extent real estate operating companies (REOCs). One of the oldest real estate mutual funds is Cohen and Steers Realty Shares (ticker symbol: CSRSX). Perform an attribution analysis of CSRSX using the data provided in the "CSRSX" and "NAREIT Ppty Returns" worksheets. Appendix A provides the details of how to use the Solver subroutine in Excel to implement attribution analysis. To obtain the initial set of weights, use the data from January 1994 through December 1998. To calculate the next set of weights, use data from February 1994 through January 1999 e.g., drop one month at the beginning and add one month at the end of the data series. Provide a graph and discuss how CSRSX has changed their portfolio over time. For example, has their exposure to each property sector remained constant over time? What have they increased or decreased their exposure in? Have they avoided any property sectors? How does the performance on CSRSX compare to the NAREIT's equity reit portfolio?

Note: I have included the data in the Appendix in the worksheet labeled "Data from Attribution Appendix". If you are unsure of how to do attribution analysis, I would strongly suggest that you first replicate the example given in this Appendix prior to performing an attribution analysis on CSRSX.

4. Valuation of REITs. Value the industrial REIT known as Cabot Industrial Trust (Ticker: CTR) using the following methods:

a. Relative Valuation using TEV and Equity Multiples: Given the data provided in the "Info on Indus REITs" worksheet, value CTR using the "Valuation Template" worksheet by filling in the sections highlighted in yellow. Is CTR overvalued, undervalued or correctly priced? Are the justified values based on multiples of total enterprise value (TEV) consistent with the equity multiples? Why or why not? Please provide some economic intuition.

b. Net Asset Value (NAV): Value CTR using the "Net Asset Value Template" worksheet by filling in the sections highlighted in yellow. Is CTR overvalued, undervalued or correctly priced relative to the value of their underlying properties? Do any of the REITs trade above their NAV? If so, which REIT(s)? Do any of the REITs trade below their NAV? If so, which REIT(s)? What seems to be the general trend based on your NAV analysis?

c. Market Capitalization per Square Foot: Value CTR using the "Market Cap Per SQFT Template" worksheet by filling in the sections highlighted in yellow. Is CTR overvalued, undervalued or correctly priced relative to its peer group?

Please turn in a hard copy of your work.

Appendix A: Performance Attribution Analysis²

Objective of analysis: make inferences about a fund's exposures to variations in the returns of the asset classes.. the estimated style of the fund. To examine the behavior of a manager's average exposures to asset classes over time, one can perform a series of style analyses, using a fixed number of months for each analysis to determine if the fund's style is constant over time.

Measurement of Performance: For each month t

1. The fund's style is estimated, using returns from months t-60 through t-1
2. The return on the resulting style is calculated for month t
3. The difference between the fund's return in month t and that of the style benchmark determined in 1. and 2. is computed. This difference is the fund's *Selection Return* for month t.

Example: Using Excel to Calculate Sharpe Quadratic Programming Asset Class Exposures

Vanguard U.S. Growth Portfolio is an open-end mutual fund that seeks long-term capital appreciation through investing in stocks of established U.S. companies with above-average growth prospects.

We wish to determine the extent to which this mutual fund's actual performance is consistent with its primary objective using the Solver subroutine in Microsoft's Excel software in conjunction with the following return data:

<u>Date</u>	<u>Vanguard US Grwth</u>	<u>Wilshire Large Growth</u>	<u>Wilshire Large Value</u>	<u>Wilshire Small Growth</u>	<u>Wilshire Small Value</u>	<u>Wilshire Midcap Growth</u>	<u>Wilshire Midcap Value</u>
9209	.0150	0.0169	0.0099	0.0277	0.0076	0.0175	0.008
9210	-.0007	0.02	-0.0017	0.0489	0.0088	0.0408	0.0107
9211	.0476	0.0442	0.0203	0.0885	0.0463	0.0766	0.0416
9212	-.0006	0.006	0.0377	0.0382	0.0488	0.0306	0.0512
9301	-.0052	-0.0106	0.017	0.024	0.0337	0.0226	0.0311
9302	-.0366	-0.0149	0.0471	-0.0482	0.0228	-0.0337	0.0256
9303	.0122	0.0128	0.0252	0.0351	0.0341	0.0307	0.0451
9304	-.0443	-0.0559	-0.0195	-0.0327	-0.027	-0.0418	-0.026
9305	.0176	0.0366	0.0044	0.0592	0.007	0.057	0.0045
9306	.0048	-0.0129	0.0359	0.0112	0.013	0.0066	0.0229
9307	-.0103	-0.0274	0.014	0.0021	0.0202	-0.0089	0.0144
9308	.0208	0.0364	0.0334	0.0513	0.0256	0.0507	0.0218
9309	-.0041	-0.0065	0.0051	0.0422	0.0214	0.0251	0.0092
9310	.0225	0.0275	-0.0177	0.0032	-0.0023	0.0053	-0.01
9311	-.0007	0.0033	-0.0346	-0.0232	-0.0342	-0.0156	-0.039
9312	.0114	0.0103	0.0199	0.0491	0.0212	0.0553	0.0249

²From Craig Wainscott, "Attribution Analysis for Equities" in AIMR, *Performance Evaluation, Benchmarks, and Attribution Analysis*, 1995, no. 2

9401	.0308	0.02	0.0169	0.0284	0.009	0.0353	0.0167
9402	-.0123	-0.0104	-0.0358	0.0118	-0.0166	0.0053	-0.025
9403	-.0454	-0.0472	-0.0299	-0.07	-0.0317	-0.0595	-0.017
9404	.0152	0.0077	0.0283	0.005	0.013	0.004	0.0172
9405	.0197	0.0127	0.002	-0.0278	-0.0059	-0.0153	-0.011
9406	-.0293	-0.0322	-0.0313	-0.0583	0.0003	-0.0504	-0.009
9407	.0226	0.0289	0.0364	0.0316	0.0287	0.0244	0.0359
9408	.0409	0.0559	0.0164	0.0862	0.0237	0.0856	0.0237
9409	-.0174	-0.0179	-0.0392	-0.0005	-0.02	-0.0079	-0.028
9410	.0249	0.0282	0.0292	0.0263	-0.0167	0.0244	-0.009
9411	-.0211	-0.0246	-0.0333	-0.0474	-0.0269	-0.0443	-0.034
9412	.0137	0.0131	0.0006	0.0313	0.0258	0.0166	0.0134
9501	.0280	0.0284	0.0427	-0.0185	0.0205	0.0001	0.0371
9502	.0381	0.0363	0.0447	0.06	0.035	0.06	0.0417
9503	.0238	0.0292	0.013	0.0395	-0.0053	0.0369	-0.001
9504	.0370	0.0225	0.0272	0.015	0.028	0.0149	0.0259
9505	.0351	0.0387	0.0576	0.0242	0.0229	0.0164	0.0379
9506	.0295	0.0393	0.0033	0.0706	0.0268	0.0629	0.0267
9507	.0211	0.0307	0.0323	0.0856	0.0343	0.084	0.0413
9508	-.0037	0.0024	0.0243	0.0053	0.024	0.0153	0.0296
9509	.0563	0.0554	0.0521	0.0246	0.0316	0.0279	0.0286
9510	.0236	0.0065	-0.001	-0.0531	-0.0057	-0.0352	-8E-04
9511	.0393	0.0386	0.042	0.0476	0.0366	0.0525	0.0457
9512	.0024	-0.0009	0.0301	0.0125	0.0157	0.0036	0.0089
9601	.0403	0.0382	0.0318	-0.0165	0.0079	0.0173	0.0101
9602	.0312	0.0165	0.0065	0.0503	0.0082	0.0374	0.0119
9603	-.0037	0.0033	0.0095	0.0247	0.0157	0.0121	0.0131
9604	.0184	0.0238	0.001	0.0753	-0.0031	0.0593	-0.017

Sources: Bloomberg and Ibbotson and Associates, IDEAs database.

Step1: Open the Excel Spreadsheet and using the information given above, perform the following operations (an example of what your spreadsheet should resemble follows)

- Enter your returns in columns as shown above with Vanguard Returns in Column B
- Put the initial weights above each growth or value return column. Set each weight equal to 1/n where n = 6 asset classes or 1/6
- In column I, subtract the sum of the weights multiplied by the returns on each factor/asset class from the Vanguard returns in Column B. Square this difference.

	A	B	C	D	E	F	G	H	I
1									
2		Weights	.1667	.1667	.1667	.1667	.1667	.1667	
3	Date	Vanguard	LgGwth	LgVal	SmGwth	SmVal	MidGwth	MidVal	SqResiduals
4									
5	9209	.0150	.0169	.0099	.0277	.0076	.0175	.0080	.00000013
6	9210	-.0007	.0200	-.0017	.0489	.0088	.0408	.0107	.00048048
.....
46	9602	.0312	.0165	.0065	.0503	.0082	.0374	.0119	.00008791
47	9603	-.0037	.0033	.0095	.0247	.0157	.0121	.0131	.00027994
48	9604	.0184	.0238	.0010	.0753	-.0031	.0593	-.0171	.00002313
49								SumWts	SumSq Resid
50								1.0000	.01269055

where

Col I, Row 5 = (B5-(\$C\$2*C5+\$D\$2*D5+\$E\$2*E5+\$F\$2*F5+\$G\$2*G5+\$H\$2*H5))^2

..... (Use the copy command and paste this formula in rest of rows in Column I)

Col I, Row 48 = (B48-(\$C\$2*C48+\$D\$2*D48+\$E\$2*E48+\$F\$2*F48+\$G\$2*G48+\$H\$2*H48))^2

- In column I, row 50, sum column I from row 5 through row 48. This represents the sum of squared residuals

$$\sum \bar{e}_i^2 = \sum \left[\bar{R}_i - (\beta_{i1} \bar{F}_1^* + \beta_{i2} \bar{F}_2^* + \dots + \beta_{in} \bar{F}_n^*) \right]^2 = \text{sum}(I5 : I48)$$

- Sum the initial weights in columns C2 through H2 and put the result in H50 e.g. H50 = sum(C2:H2)

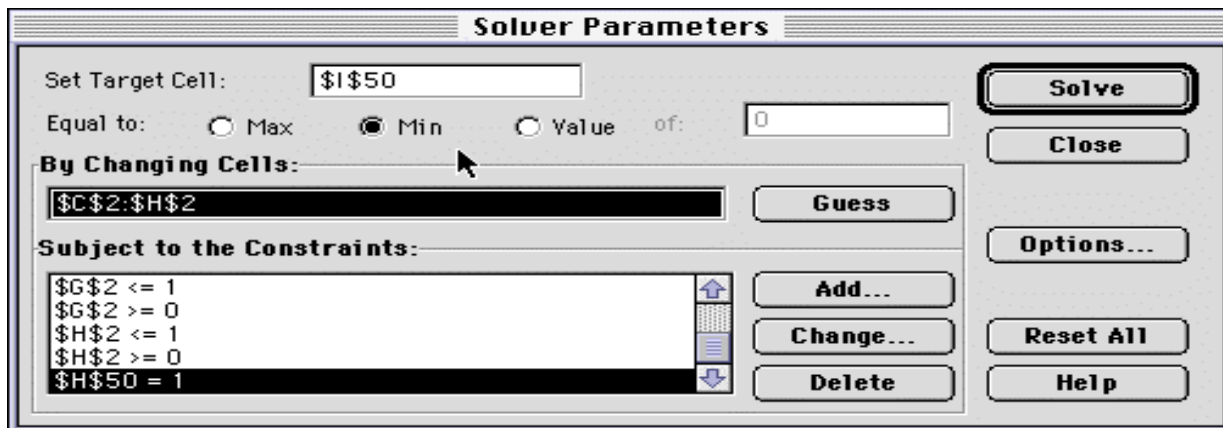
Intuition: Recall that the sum of the % invested in each stock must equal 100% e.g. $b_1 + b_2 + b_3 + b_4 + b_5 + b_6 = 1$. Thus, this is one of our **constraint cells**.

Step 2: Pull Down the **Tools** submenu and chose the **Solver** subroutine. Fill in the boxes as follows:

Set Target Cell: \$I\$50 The target cell is the cell you're minimizing
 Equal to: Min (You're minimizing the sum of the squared residuals)
 By Changing Cells: \$C\$2:\$H\$2
 Subject to the Constraints: \$H\$50 = 1

Note: you need to click on the **Add** button to add this constraint. The cell reference is \$H\$50, pull down the arrow and choose =, then type 1 in the constraint: box. Click on the **OK** button.

\$C\$2 >= 0	The % invested in Large Growth is \geq 0
\$D\$2 >= 0	The % invested in Large Value is \geq 0
\$E\$2 >= 0	The % invested in Small Growth is \geq 0
\$F\$2 >= 0	The % invested in Small Value is \geq 0
\$G\$2 >= 0	The % invested in Midcap Growth is \geq 0
\$H\$2 >= 0	The % invested in Midcap Value is \geq 0
\$C\$2 <= 1	The % invested in Large Growth is \leq 1
\$D\$2 <= 1	The % invested in Large Value is \leq 1
\$E\$2 <= 1	The % invested in Small Growth is \leq 1
\$F\$2 <= 1	The % invested in Small Value is \leq 1
\$G\$2 <= 1	The % invested in Midcap Growth is \leq 1
\$H\$2 <= 1	The % invested in Midcap Value is \leq 1



Step 3: Click on the **Solve** button. Your optimal weights should be as follows

Actual Exposure	.8735	.0747	.0000	.0517	.0000	.0000
Asset Class/ Factor	LgGwth	LgVal	SmGwth	SmVal	MidGwth	MidVal

Note that the actual exposure sums to 100%. Based on this actual exposure, it appears that the fund's major exposure *is* in large cap growth stocks although there appears to be a small exposure in both large cap and small cap value stocks.