JAMES A. GRAASKAMP COLLECTION OF TEACHING MATERIALS
II. CLASSES AT THE UNIVERSITY OF WISCONSIN--MADISON
     F.   Business 551: Real Estate Finance
          (Was Income Property and Residential Finance until
          Fall of 1982; Graaskamp divided 551 into two
          separate courses--551 and 552 and renamed 551
          "Income Property Finance and Group Investment")
          5.   Computer Models

INTRODUCTION TO: MR-CAP COMPUTER PROGRAM

The MR-CAP program was designed by Mike Robbins to replace the
MINIMOD program you have used to date in your investment analysis
problems. The basic logic of the two programs is similar, but
the MR-CAP program offers the flexibility of iterative modified
runs; discontinuous variable increases over the life of the fore-
cast period; and, fractional output summaries to enable you to read
partner or joint venture return forcasts directly. The program
uses a free-format input style to simplify data entry. It is essen-
tial that you enter the data to the correct field by the proper
placement of commas. If you wish to repeat a rate of increase over
the balance of the forecast period, merely place an asterisk immedi-
ately after the rate of increase to be repeated (ie. Fixed Income,
46080,.02*). The user manual provides the rest of the instructions.

ASSIGNMENT
The purpose of this assignment is to introduce you to the MR-CAP
program. It will not be graded but will be used as an outline for
discussion sections this week. Please be sure that you have completed
a run of the problem and that you bring it with you to class. Note
that because of the Easter break on Friday, April 16, 1976, the
Friday sections will meet at 6:30 Wednesday, April 14; the room will
be announced in lecture on Wednesday.

The problem to be discussed in class and that you are to analyze
represents a modification to the problem we have been evaluating.
Consider the following:

Structures:**

One bedroom units	$13,500/unit	48 units
Two bedroom units	14,500/unit	24 units

            **(note: costs include builders' profit)

Architects' fees (design & supervision)	5.5%
Taxes & Insurance	$12,700
Title & Recording	3,000
Legal & Organizational	9,600
Land	86,400

Mortgages:
      Construction Loan
            Loan amount = amount of permanent loan
            Interest Rate = 12.5%, 15 month const. period
      Permanent Mortgage:
            Loan amount based on 75% L/V ratio; all costs
                  included in base amount except construction
                  interest and financing fee.
            Terms: 30 year, monthly payments, 10.5%, conventional.
      Financing fee: 2%

Equity Interest:
    Contributed by two partners with the following
    profiles:
        Partner A.
            40% tax bracket; 13% discount rate; 10.5%
            reinvestment rate
        Partner B.
            50% tax bracket; 15% discount rate; 11.5%
            reinvesment rate
    Participation:
        Partners will each contribute 50% of equity
        required; share of spendable cash divided 55/45;
        share of tax losses divided 40/60; share of
        equity reversion equal.

INCOME/EXPENSES

Income:
    Use the frontdoor model from class, given the cost
    and an 8% cash on cash equity return. Increase
    at 2%/year for the first three years and 4% there-
    after.

Claims on net income:
    Expenses; 22% of gross, increase at 5% first two years
        and 3% thereafter.
    Taxes; 18% of gross, increase at 4% per year.
    Vacancy; 7% in the first two years, 5% the second
        two years and 3% thereafter.

OTHER DATA
    Resale cost = 5%
    Rate of growth of project value 2%

MODIFICATIONS
    1 Ceteris paribus; income increases 5% of base and
        follows same pattern thereafter. (ie. 2%-3yrs, 4% balance).
    2. Ceteris paribus; cost over-run of 10%,

NOTE: I WILL NOT BE IN TOWN MONDAY, APRIL 12. IF
YOU HAVE QUESTIONS I WILL BE IN THE OFFICE TUESDAY,
11:30 am to 12:30 to answer them.

                        Jim DeLisle
                        91 Bascom

CRUNCHING NUMBERS FOR FINANCE

I. A number of items from 550 provide a basis for income property analysis
    for a preliminary financial analysis.
    A. Basic MINI-MOD cash-flow formats suggest the basic element and initial
        key financial ratios.
    B. What numbers should be tested on MINI-MOD? First the project must
        make sense on a pre-tax basis, which should remind you of the "front
        door and back door" approach to feasibility:
        1. Front Door approach:
            Total project cost = mortgage balance + equity capital
            Cash dividend on equity + debt service = net income
            Net income + expenses + real estate tax + vacancy = required gross re-
            Required gross receipts/space units = rental price/unit   ceipts

        2. Back door approach:
            Gross rents - vacancy - expenses = net income available for
                debt service + equity dividends
            Gross rents x desired default point = maximum expenses and outlays
            Break even cash - expenses = income available for debt service
            Income available for debt service/ $1,000/year of loan debt service =
                maximum loan
            Maximum loan + equity capital to be committed = total project budget

II. These are reversible equations once one learns how to state key variables
     as ratios to some other basic unit which might be total replacement cost
     or monthly rent from a basic one bedroom unit or whatever.
     A. Front Door Approach where total replacement cost is known.
         1. Definitions of total replacement cost, total construction cost,
             total budget, etc. to be elaborated later
         2. Computation of the mortgage and equity constant to be developed later
     B. Basic revenue unit can be per square foot, per room, per bed, or
         per standard one bedroom apartment.
         1. For example basement space might be 1/2 regular office space but
             first floor retail could be two times regular office space.
         2. Certain items such as parking income or concessions could be added
             into line 20 and thus be used to reduce required monthly gross
             from rental areas (similar to service income as compared to space
             income).

III. Development of a mortgage and equity constant to determine an overall
      capitalization rate on net income.
      A. Simple investment band
      B. Evolution of the Ellwood rate
      C. Evolution of the FHA constant
      D. For Monday compute what is total investment value if expenses are
          35% of gross, cash equity constant is 5% and 1 bedrooms go at
          $220 per month?

COMPONENTS	PCT. DEPR	BEGIN USE	USEFUL LIFE	DEPR METHOD	COST				
LAND	.00	1	.	0	$ 40000.	GROSS RENT	$ 46080.	RATE OF GROWTH OF GROSS RENT	.0200
BUILDING	1.00	1	35.	3	$ 165300.	EXPENSES	$ 8400.	RATE OF GROWTH OF EXPENSES	.0200
PARKING	.50	1	10.	3	$ 7200.	R E TAXES	$ 9000.	RATE OF GROWTH OF R E TAXES	.0500
FURNISHINGS	1.00	1	7.	1	$ 13200.	INCOME TAX RATE	.3000	RATE OF GROWTH OF PROJECT VALUE	.0100
ELEVATOR	.80	1	12.	3	$ 12500.	VACANCY RATE	.0500	WORKING CAPITAL LOAN RATE	.0900
TRANSACTION COST	1.00	1	35.	3	$ 1800.	EQUITY DISCOUNT RATE	.1800	EXTRAORDINARY EXPENSES	$ 7625.
7TH YR REFURBISH	1.00	8	7.	1	$ 10000.	STAGING YR(0),FACTOR	.00	COST OF EQUITY CAPITAL	.1200
TOTAL INITIAL INVESTMENT					$ 240000.				

	1	2	3	4	5	6	7	8	9	10
CASH EQUITY REQUIRED	45000.	45000.	45000.	45000.	45000.	70000.	70000.	70000.	70000.	70000.

FINANCING PLAN

FIRST ASSUMED MORTG. $ 180000.
     MONTHLY PAYMENT $ 1477.   INTEREST RATE .0775   STARTS 1 ENDS 5   BONUS INTEREST .0000 OF GROSS RENT

	1	2	3	4	5	6	7	8	9	10
PRINCIPAL	3919.	4234.	4574.	4942.	5339.	.	.	.	.	.
INTEREST	13812.	13497.	13157.	12790.	12393.	.	.	.	.	.
BALANCE	176080.	171845.	167270.	162328.	156989.	.	.	.	.	.

SELLERS 2ND MORTG. $ 15000.
     MONTHLY PAYMENT $ 185.   INTEREST RATE .0850   STARTS 1 ENDS 5   BONUS INTEREST .0000 OF GROSS RENT

	1	2	3	4	5	6	7	8	9	10
PRINCIPAL	994.	1082.	1178.	1282.	1396.	.	.	.	.	.
INTEREST	1236.	1148.	1053.	948.	835.	.	.	.	.	.
BALANCE	14005.	12922.	11743.	10460.	9064.	.	.	.	.	.

REFINANCED FIRST $ 170000.
     MONTHLY PAYMENT $ 1421.   INTEREST RATE .0800   STARTS 6 ENDS 10   BONUS INTEREST .0400 OF GROSS RENT

	1	2	3	4	5	6	7	8	9	10
PRINCIPAL	.	.	.	.	.	3593.	3891.	4214.	4564.	4943.
INTEREST	.	.	.	.	.	13470.	13171.	12848.	12499.	12120.
BALANCE	.	.	.	.	.	166406.	162515.	158300.	153736.	148792.

REFURBISH CHATTEL $ 10000.
     MONTHLY PAYMENT $ 150.   INTEREST RATE .0900   STARTS 8 ENDS 10   BONUS INTEREST .0000 OF GROSS RENT

	1	2	3	4	5	6	7	8	9	10
PRINCIPAL	.	.	.	.	.	.	.	.	938.	1026.	1122.
INTEREST	.	.	.	.	.	.	.	.	861.	773.	677.
BALANCE	.	.	.	.	.	.	.	.	9061.	8035.	6913.

	1	2	3	4	5	6	7	8	9	10
GROSS RENT	46080.	47001.	47923.	48844.	49766.	50688.	51609.	52531.	53452.	54374.
LESS VACANCY ALLOWANCE	2304.	2350.	2396.	2442.	2488.	2534.	2580.	2626.	2672.	2718.
EFFECTIVE GROSS INCOME	43776.	44651.	45527.	46402.	47278.	48153.	49029.	49904.	50780.	51655.
LESS REAL ESTATE TAXES	9000.	9450.	9900.	10350.	10800.	11250.	11700.	12150.	12600.	13050.
LESS EXPENSES	16025.	8568.	8736.	8904.	9072.	9240.	9408.	9576.	9744.	9912.
NET INCOME	18751.	26633.	26891.	27148.	27406.	27663.	27921.	28178.	28436.	28693.
LESS DEPRECIATION	11469.	10537.	9640.	8775.	7940.	6762.	5942.	7729.	7144.	6571.
LESS INTEREST	15049.	14646.	14210.	13739.	13229.	15497.	15236.	15812.	15411.	14972.
TAXABLE INCOME	-7768.	1449.	3039.	4633.	6236.	5403.	6742.	4637.	5880.	7149.
PLUS DEPRECIATION	11469.	10537.	9640.	8775.	7940.	6762.	5942.	7729.	7144.	6571.
LESS PRINCIPAL PAYMENTS	4914.	5317.	5753.	6224.	6735.	3593.	3891.	5152.	5590.	6065.
CASH THROW-OFF	-1213.	6669.	6926.	7184.	7441.	21582.	8793.	17213.	7434.	7655.
LESS TAXES	.	434.	911.	1390.	1870.	1620.	2022.	1391.	1764.	2144.
CASH FROM OPERATIONS	-1213.	6234.	6014.	5794.	5570.	19961.	6770.	15822.	5670.	5510.
WORKING CAPITAL LOAN(CUM BALANCE)	1213.	.	.	.	.	.	.	.	.	.
SPENDABLE CASH AFTER TAXES	.	4911.	6014.	5794.	5570.	19961.	6770.	5822.	5670.	5510.
TAX SAVINGS ON OTHER INCOME	2330.	.	.	.	.	.	.	.	.	.
* * * * * * * * * *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
MARKET VALUE	240000.	242400.	244800.	247200.	249600.	252000.	254400.	266800.	269200.	271600.
BALANCE OF LOANS	191298.	184767.	179014.	172789.	166054.	166406.	162515.	167362.	161771.	155706.
NET WORTH OF PROPERTY	48701.	57632.	65785.	74410.	83545.	85593.	91884.	99437.	107428.	115893.
CAPITAL GAIN	7853.	18106.	28359.	38613.	48866.	59119.	69373.	81055.	92566.	103922.
CAPITAL GAINS TAX	1177.	2715.	4253.	5791.	7329.	8867.	10405.	12158.	13884.	15588.
INCOME TAX ON EXCESS DEPRECIATION	1084.	1890.	2426.	2702.	2729.	2401.	1828.	1362.	772.	57.
* * * * * * * * * * *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
PERCENT INITIAL EQUITY PAYBACK AFTER TAX	.0517	.1609	.2946	.4233	.5471	.6369	.7336	.8168	.8978	.9765
NET INCOME-MARKET VALUE RATIO	.0781	.1098	.1098	.1098	.1098	.1097	.1097	.1056	.1056	.1056
RETURN ON NET WORTH BEFORE TAXES	.0552	.3203	.2616	.2403	.2227	.2828	.1762	.2695	.1551	.1500
RETURN ON NET WORTH AFTER TAXES	.0837	.2476	.2280	.2132	.1993	.2830	.1627	.1517	.1457	.1400
CASH RETURN ON ORIG CASH EQUITY BEF TAX	-.0269	.1482	.1539	.1596	.1653	.3083	.1256	.2459	.1062	.1093
CASH RETURN ON ORIG CASH EQUITY AFT TAX	.0517	.1091	.1336	.1287	.1237	.2851	.0967	.0831	.0810	.0787
DEFAULT RATIO	.9763	.8339	.8054	.8029	.8004	.7808	.7796	.8126	.8109	.8092
LENDER BONUS INTEREST RATE	.0000	.0000	.0000	.0000	.0000	.0122	.0124	.0129	.0127	.0134
* * * * * * * * * * *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *
PRESENT VALUE OF PROJECT BEFORE TAXES	236272.	241180.	244044.	246091.	247482.	250665.	250564.	252753.	252195.	251580.
PRESENT VALUE OF PROJECT AFTER TAXES	236329.	238585.	240136.	241150.	241708.	244513.	244111.	243513.	242850.	242141.
EQUITY RATE W/ COST OF CAPITAL AT .120	.0837	.1599	.1779	.1821	.1816	.1904	.1838	.1778	.1728	.1684

1) Current period return on Net Worth before taxes =

$$\frac{\text{Cash Throw-off + Change in Net Worth}}{\text{Net Worth at End of Previous Year}}$$

2) Current period return on net worth after taxes =

Spendable cash + tax savings on other income +

$$\frac{\text{(Change in net worth - change in cap. gains tax)}}{\text{Net worth at the end of previous year less capital gains tax of}}$$
previous year

3) Cash return on original cash equity before taxes =

$$\frac{\text{Cash throw-off}}{\text{Total initial investment less initial mortgage debt}}$$
(This is adjusted for staged projects)

4) Cash return on original equity cash after taxes =
(This is adjusted for staged projects)

$$\frac{\text{Spendable Cash after taxes + Tax savings on other income}}{\text{Total initial investment cost less initial mtge. debt}}$$

5) Net income - market value ratio

$$\frac{\text{Net Income}}{\text{Market Value for the same period}}$$

6) After tax cash recovered - cash equity ratio (payback) =

$$\frac{\text{Accumulated spendable cash after taxes + accumulated tax savings other income}}{\text{Cash equity required}}$$

7) Default ratio =

$$\frac{\text{Operating Exp. + R.E. Taxes + Prin. \& Interest on Mtge. + Working Cap. Loan Prin. Repayment}}{\text{Gross Income}}$$

8) **Lender Bonus Interest Rate =**

$$\frac{\% \text{ of effective gross (not to exceed cash throw-off for period)}}{\text{Balance due on loan at beginning of period}}$$

9) **Resale Market Value at End of Year**

Total Initial Investment Cost + Additional Staged Investment X

Index for Year

10) **Net worth of property =**

Market value less balance of loans less working capital loans

11) A. **Sales proceeds subject to capital gains tax =**

Market value - (Total Capital Investment - Straight-line depreciation - Allowed excess depreciation)

B. **Sales proceeds subject to income tax =**

Cumulative depreciation taken - Straight-line depreciation - Allowed excess depreciation

C. **Taxes on sale =** (A X 1/2 Income Tax rate*) + (B X Income Tax Rate)
    * Not to exceed 25%

12) **Present value of project before taxes =**

Original mortgage balance + PV of received stream of cash throw-off
+ PV of net worth if sold at end of year indicated by column number.

13) **Present value of project after taxes =**

Original mortgage balance + present balue of received stream of spendable
cash after taxes + PV of received tax savings on other income + PV of
(net worth less capital gains tax) if sold at end of year indicated
by column number.

14) **Cash Equity Required =** $\sum$ \$ components utilized -

$\sum$ face value of mortgages in force

15) For each year N (net worth - cap gains tax) +

$$X = \sqrt{} \sum^{N} \left[(\text{Spendable Cash Aft Taxes} + \text{Tax Savings}) * (1. + \text{Cost of Equity Cap})^{N-1} \right]$$

Y = (LOG (X) - LOG (Original Investment)/N

Equity Rate = Exp (Y) - 1.

Demonstration of Back-Door, Front-Door Calculations
for an Apartment Building with some Commercial Space

(Developed by James R. DeLisle)

			What is Rent? Front Door 1.4m TRC	What is TIV? Back Door* $220/mo./1 bdr.
1	Total Replacement Cost (TRC)	Sp $%	1400000	
2	Mortgage @ % TRC	Sp % in decimals	.90	
3	Equity @ % TRC	(1 - Ln 2)	.10	
4	Mortgage Constant	Sp in decimals	.0907	
5	Equity Constant	Sp in decimals	.08	.08
6	Net Income Required	(Ln1)[(Ln 2)(Ln4)+ (Ln3)(Ln5)]	125580	115500
7	Mortgage @ % NIR	Sp % in decimals	.90	.90
8	Mortgage NIR	(Ln6)(Ln 7)	113000	103955
9	Mortgage Investment Value	(Ln8) ÷ (Ln4)	1246000	1146135
10	Equity Net Income	(Ln6)-(Ln8)	12580	11545
11	Equity Investment Value	(Ln10)÷(Ln5)	157250	144300
12	Equity Constant-Residual	(Ln1)-(Ln9) Backdoor		
13	Total Investment Value (TIV)		1403250	1290500
14	Expenses,Taxes,Reserves @ %GBR	Sp % in decimals	.40	
15	Expense, Taxes & Reserves	[(Ln6)÷(1-Ln14)]-(Ln6)	83720	77000
16	Required Effective Gross	(Ln6) + (Ln15)	209300	192500
17	Occupancy %	Sp % in decimals	.93	.93
18	Required Annual Gross	(Ln16)÷(Ln17)	225000	206980
19	Required Monthly Gross	(Ln18) ÷ 12	18750	17750
20	Fixed Source Contribution to Gross			
21	Fixed Source #Reserve Units	Sp #		
22	Fixed Source Revenue/Unit/Mo.	Sp $'s		
23	Fixed Source Contribution Gross	(Ln21) x (Ln22)		
24	Allocated Mo. Gross	(Ln19) - (Ln23)	18750	17750
25	Basic Revenue Unit, #(BRU)	Sp #	45	
26	s.f./unit	Sp. s.f.	560	
27	Relation to Basic Rev. Unit			
28	Type R-2 #	Sp #	9	
29	Type R-2 Relation	Sp % in decimals	1.3	
30	Type C-1 # s.f.	Sp. s.f.	8668	
31	Type C-1 Relation	Sp % in decimals	1.4	
32	Factors			
33	BRU	Ln25	45	
34	R-2 (#in BRU)	(Ln28)(Ln29)	11.7	
35	C-1 (#in BRU)	[(Ln30)÷(Ln26)](Ln31)	21.7	
36	Total Factors	(Ln33) + (Ln34)+(Ln35)	78.4	
37	$/BRU Unit/Mo.	(Ln24)÷(Ln36)	$239	$220*
38	$/R-2/Mo.	(Ln37) x (Ln29)	$311	$286
39	$/C-1 s.f./Mo.	(Ln37) x(Ln31)÷(Ln26)	.60	.55

Given the following information, solve for MIRR(With Sale) and hand in the
condensed output and a copy of your data file. Same point structure of the last
exercise applies to this exercise.

50 Non-subsidized apartments;rent=$300/mnth;annual growth rate=3%compound growth
10 year holding period
vacancy = 5%
Real Estate taxes =$35,000 in yr1; 2.5% compound growth
Operating Expenses=$45,000 in yr1; 4% compound growth
After tax equity yield sought = 18%
Individual investor's marginal tax rate = 45%
Reinvestment rate = 11%
Extraordinary Expenses = $3,000 in year 1 only
Net income multiplier = 10
Interest rate on working capital loan, if any, = 8%
Sales Commission = 6%
Charge new capital first to cash throw-off then to cumulative reserves
Annual cash replacement reserve = $12,000
Initial Equity reserve = 0
Maximum reserve = $120,000
Land Value = 15% of Backdoor-Justified investment value
Building Value = 85% of Backdoor-justified investment value
Depreciation on building = $175% declining balance
No salvage value
Useful life of building = 19 years
Permit automatic switching to straight line when appropriate
Interest rate on mortgage loan = 9.5%
Monthly payments
28 year amoritization period
Bonus interest rate = 15% of gross rent over $180,000
Backdoor analysis:
    Default ratio basis = 88%
    Before-tax-equity-yield rate = 7.5%
    Begin year investment value projection = 1
    End year investment value projection = 10

BASIC MRCAP DATA INPUT FORM

1, _____' _____
   Project Title' User Name

10, _____' _____' _____' _____' _____' _____
   Starting Year' Data Sets' Class'n' % Owned Yr.1 Hldg. Pd.' Units/Yr.

40, _____' ___2__' ___3__' ___4__' ___5__
   Fixed Income'

41, ___6__' ___7__' ___8__' ___9__' ___10__

50, _____' ___2__' ___3__' ___4__' ___5__
   Variable Income'

51, ___6__' ___7__' ___8__' ___9__' ___10__

60, _____' ___2__' ___3__' ___4__' ___5__
   Vacancy Rate'

61, ___6__' ___7__' ___8__' ___9__' ___10__

70, _____' ___2__' ___3__' ___4__' ___5__
   Real Estate Tax'

71, ___6__' ___7__' ___8__' ___9__' ___10__

80, _____' ___2__' ___3__' ___4__' ___5__
   Fixed Expenses'

81, ___6__' ___7__' ___8__' ___9__' ___10__

90, _____' ___2__' ___3__' ___4__' ___5__
   Variable Expenses'

91, ___6__' ___7__' ___8__' ___9__' ___10__

100, _____' _____' _____' _____
   Discount Rate' Income Tax Rate' Reinv't Rate' Income Tax Type

101, _____' _____' _____
   Extraordinary Exp.' Project Growth Rate' Project Growth Type

102, _____' _____' _____' _____
   Working Cap. Loan' Ownership Form' Resale Cost Rate' Charge New Cap'l

103, _____' _____' _____' _____
   Reserves Withheld' Initial Eqty. Res.' Eqty. Res. Rate' Res. Maximum

200, ___#__' _____
   Title

201, ___#__' _____' _____' _____
   Original Cost' % Depreciable' Depreciation Method

202, ___#__' _____' _____' _____
   Starting Year' Useful Life' Switching

300, ___#___, Title _____

301, ___#___, Principal Amt. , Annual Interest , Payment/Period , Term in Yrs.

302, ___#___, Payments/Year , Yr. Paym'ts Begin , Yr. Paym'ts End , Ref'd by Mtg

303, ___#___, Bonus Interest % , Base Amount , Base Type # , Mortgage Factor

400, ___1___, ___2___, ___3___, ___4___, ___5___, ___6___, ___7___, ___8___, ___9___, ___10___

403, ___1___, ___2___, ___3___, ___4___, ___5___, ___6___, ___7___, ___8___, ___9___, ___10___

999,99

You are evaluating a possible real estate investment. For this analysis you will use the Mrcap program developed at the University of Wisconsin by Michael Robbins.

The real estate investment that you are looking at is a poorly managed 100 unit apartment complex with a sales price of 1.2 million dollars. For the purposes of this assignment, you are in the 45% marginal tax bracket and you intend to hold the property for eight years.

For this analysis, you feel comfortable with the assumption that you can obtain a first mortgage with a loan to cost ratio of 75%. Present market rates are at 10%, with a 22 year amortization period. Furthermore, your lender has stated that should you have any cash shortfall in any year, he will give you a loan to fund the shortfall at 12% interest.

Furthermore, your accountant has advised you that the IRS will not likely accept an estimated land value of less than 10% of the sales price. Depreciation for the improvements should be calculated on a straight line basis using 19 years.

You assume through better management you will be able to reduce the vacancy rate in the complex from the present 10% to 7% in the second year, and 5% for each year thereafter. You anticipate that the gross income of $150,000 will grow at an annual rate of 5%. With regard to expenses, a review of the owner's books indicates that variable expenses run approximately 9% of gross while fixed expenses run approximately $10,000 per year and real estate taxes run $30,000 per year.

You desire an after-tax equity yield of 18% on the project should you decide to buy the apartment complex. For your safety you decide that you will withhold $10,000 per year to use for replacements of the furniture when it runs out. You don't anticipate replacing the furniture while you are the holder of the property but they will be transferes to the new buyer when you go to sell the investment. These reserves will be invested at the reinvestment rate of 8%. Yet, you feel that the most reserves you will need will be $90,000. Furthermore, you expect to have to make some out-of-the-ordinary expenses in the first year of operations which you estimate to be $5,000.

Given these assumptions, you need to calculate how much the property must appreciate in value over the holding period on a compound growth basis to give you a 18.5% MIRR. Other points you may want to consider are:

1. Whether or not leverage is negative or positive
2. If the required appreciation is reasonable given the net income to market ration in year 1 and in the year of sale and
3. If the loan appears reasonable to the lender's perspective.

Assumptions:

Charge new capital first to cash throw-off and then to reserves.

TO CALCULATE VALUE CHANGE

Many have difficulty understanding the logic of Ellwood's method of calculating value change. The text provides an explanation on pages 12 and 13. To state the obvious, we would agree 'depreciation,' or, 'appreciation,' or 'no change' must occur in the value (i.e., Purchase Price to Selling Price) during any income projection period to realize a selected yield 'Y' rate.

The basic rate 'r' will increase as the equity yield 'Y' increases. When the composite rate 'R' is greater than 'r' a <u>decline</u> in property value must occur to compensate for the difference in the two rates.

Formula

$$\text{Depreciation} = \frac{R - r}{1/S_n}$$

When equity yield 'Y' is <u>high enough</u> to make the basic 'r' <u>greater</u> than composite rate 'R', an <u>increase</u> in property value must occur during the project projection period to realize the difference.

Formula

$$\text{Appreciation} = \frac{r - R}{1/S_n}$$

The yield on equity investment will be significantly influenced by the source of recapture, and this in turn will be determined by the relative magnitudes of periodic income and proceeds of resale or "reversion."

1. If reversion is less than original investment, part of the recapture must be taken from periodic income leaving only the remainder income as yield producing profit.

2. If the reversion is equal to the original investment, all of the recapture will be in the reversion and all of the periodic income will be yield producing profit.

3.   If the reversion is greater than the original investment, all of the recapture will be in the reversion and the balance of the reversion plus all of the periodic income will be yield producing profit.

4.   If the aggregate total of reversion and all periodic income is equal to or less than the original investment, there will be no profit and no yield.

Obviously, one of these sets of conditions will occur. Which one, when and to what extent is never known at time of purchase.

For further study of this point you should consider pages 51, 52, 70, and 81 and 84 of the Ellwood text Volume I.

As is indicated on p. 81 of the Ellwood text and the first drill problem presented by Professor Cooper (Higgins supermarket purchase) it is possible that the ending value is known, yield rate is known, amortization term, contract interest rate, etc., but the purchase price is <u>not</u> known. Through the use of one of Ellwood's formulas we derived the beginning value or purchase price by Higgins. Some felt the explanation was somewhat obscure. Therefore, one of the students, Mr. D. L. Abdul, has prepared the following explanation of that part of the problem solution:

See Higgins' problem solution: where,

$$\text{appreciation or depreciation} = \left(1 - \frac{220,000}{V}\right)$$

$$\frac{16,076}{V} = R = .0874 + \left(1 - \frac{220,000}{V}\right) * .0702$$

$$\frac{16,076}{V} = .0874 + .0702 - \frac{15,444}{V}$$

$$\frac{16,076 \quad 15,444}{V} = .1576$$

$$\frac{31,520}{V} = .1576$$

$$V = \frac{31,520}{.1576}$$

$$V = \$200,000$$

The algebraic expression and explanation for the depreciation (+) which has occurred is set forth below, along with the alternative algebraic expression if appreciation (-) has been assumed.

1. $R = Y - MC + \% \text{ dep } 1/S_{\overline{n}|}$

    where E = ending value and V = beginning value

    $\% \text{ dep } = \dfrac{V - E}{V} = 1 - E/V$

    $R = Y - MC + (1 - E/V)1/S_{\overline{n}|}$

Alternatively,

2. $R = Y - MC - \% \text{ app } 1/S_{\overline{n}|}$

    $\% \text{ app } = \dfrac{E - V}{V} = \dfrac{E}{V} - 1 = - (1 - E/V)$

    $R = Y - MC\ (-)\ - (1 - E/V)1/S_{\overline{n}|}$

    $R = Y - MC + (1 - E/V)1/S_{\overline{n}|}$

REAL ESTATE PLANNING SOFTWARE PACKAGE

Introduction:

The Real Estate Planning Software Package is an integrated software package developed by Bob Gibson, a doctoral candidate in the U.W. Real Estate Department. The package includes three major analytical tools:
- 1. Front Door/Back Door Analysis
- 2. Ellwood Analysis; and
- 3. After Tax Cash Flow Analysis.

The program which is written in Basica is menu driven, using the special function keys F1-F10 to enter appropriate commands. The software package can be considered integrated as each of the more complex analytical programs can be run with data generated by the previous program and saved to a file. This allows for a rapid comparison of returns based on changing assumptions.

Getting Started:

Boot up the computer with DOS.
When the A> prompt appears, type Autoexec and return.
The program will load Basica and run Main.bas
Main.bas produces the Main Menu with 4 options:
- F1   Front Door/Back Door Analysis
- F2   Ellwood Analysis
- F3   After Tax Cash Flow Analysis
- F4   Exit Program

Selecting one of the Special Function keys, F1-F4, will run one of the 3 analytical programs or break and return to the Basica prompt. Each of the three programs has its own main menu which allows for inputting data from the key board or a file, revising the input, saving data to a file, and viewing the output on the screen or printing the output.

Front Door/Back Door Analysis:

Notes:
The front door inputs for annual expenses and real estate taxes may be input as a dollar figure or as a percent of gross income.
Percentages may be entered as a decimal, i.e. .1, or as 10.
The front door calculation requires a loan to value ratio; however calculations using a debt cover ratio and a default ratio will be performed if these two ratios are included in the input.
The back door analysis uses the debt cover ratio.

Ellwood Analysis:

Notes:
    The Ellwood analysis will compute the overall Ellwood capitalization rate and produce an estimate of value base on this cap. rate.
    The analysis will require additional inputs even if the front door/back door file is used for input.
    The length of the holding period, whether or not there is appreciation or depreciation in value, and whether or not there is an increase or decrease in income must all be inputted.

After Tax Cash Flow Analysis:

Notes:
    The ATCF analysis requires inputs on a year by year basis over the holding period for several factors including: tax rate, gross operating income, vacancy loss, and variable and fixed expenses.
    The ATCF analysis then provides the IRR for the project calculated on both a before-tax and an after-tax basis.
    The program allows for two mortgages and for varying methods of depreciation.

MAIN MENU

F1--TO RUN FRONT DOOR/BACK DOOR ANALYSIS
F2--TO RUN ELLWOOD ANALYSIS
F3--TO RUN AFTER TAX CASH FLOW ANALYSIS
F9--TO LEAVE SYSTEM

FRONT DOOR/BACK DOOR ANALYSIS MENU

REAL ESTATE PLANNING

FRONT DOOR/BACK DOOR MAIN MENU

F1--TO ENTER DATA FROM THE KEY BOARD
F2--TO ENTER DATA FROM A FILE
F3--TO CHANGE INPUTED VARIABLES
F4--TO STORE DATA IN A FILE
F5--TO DISPLAY FRONT DOOR ON SCREEN
F6--TO DISPLAY BACK DOOR ON SCREEN
F7--TO PRINT FRONT DOOR
F8--TO PRINT BACK DOOR
F9--TO EXIT FROM FRONT DOOR/BACK DOOR
F10--TO WRITE OUTPUT TO AN ASCI FILE

3.	ANNUAL EXPENSES	30.0000%	10.	LOAN TO VALUE RATIO	0.0000%
4.	ANNUAL R. E. TAXES	15.0000%	11.	DEFAULT RATIO	0.0000%
5.	VACANCY RATE	5.0000%	12.	DEBT COVER RATIO	1.
6.	LOAN INTEREST RATE	11.0000%			
7.	LOAN TERM IN YEARS	30	13.	SPACE TIME UNITS	70
8.	PAYMENTS PER YEAR	12			
9.	EQUITY CASH ON CASH RAT	14.0000%			

FRONT DOOR INPUTS

15.	LAND COST	175,000
17.	SQ. FT. TO BE BUILT	66,315
18.	CONSTRUCTION COST/SQ FT	35.00
19.	SOFT COSTS AS % CONS.	0.0000%
20.	OTHER	0

BACK DOOR INPUTS

14.	MARKET RENTS/SPACE TIME UNIT	550

1. ENTER THE TITLE FOR THIS ANALYSIS Osgood1

2. ENTER THE TYPE PROPERTY n
E=EXISTING INCOME PROPERTY
R=REHABILITATION OF EXISTING PROPERTY
N=NEW CONSTRUCTION

FRONT DOOR ANALYSIS USING LOAN TO VALUE RATIO FOR Osgood1

LAND COST	175,000
CONSTRUCTION COST	2,321,025
SOFT COSTS	0
OTHER	0
TOTAL COST	2,496,025

499,205   1,996,82(
14.0000% EQUITY CASH ON CASH RATE   MORTGAGE CONSTANT 11.4279%
69,889   228,19<

NET OPERATING INCOME	298,083	
R. E. TAXES	89,425	
OPERATING EXPENSES	178,850	
EFF. GROSS INCOME	566,357	
VACANCY LOSS	29,808	
GROSS INCOME	596,166	
SPACE TIME UNITS	840	
REQUIRED RENT PER SPACE TIME UNIT	710	= 129.0402% OF MARKET RENTS

LOAN TO VALUE RATIO	80.0000%	
DEBT COVER RATIO	1.31	STRIKE ANY KE'
DEFAULT RATIO	83.2770%	TO CONTINU(

ELLWOOD ANALYSIS MENU
                    RWAL ESTATE PLANNING

                    ELLWOOD ANALYSIS WITH J FACTOR
                    F1--TO INPUT NEW DATA
                    F2--TO INPUT DATA FROM A FRONT DOOR BACK DOOR FILE
                    F3--TO INPUT DATA FROM AN ELLWOOD FILE
                    F4--TO WRITE DATA TO A FILE
                    F5--TO DISPLAY OUTPUT TO SCREEN
                    F6--TO PRINT OUTPUT ON PRINTER
                    F7--TO CHANGE DATA
                    F8--TO WRITE OUTPUT TO AN ASCI FILE
                    F9--TO EXIT FROM ELLWOOD

ELLWOOD ANALYSIS INPUTS

            ENTER THE NUMBER OF THE VARIABLE TO CHANGE?
     1.   PROJECT NAME   Osgood1
     2.   EQUITY YIELD   14.000 %
 LOAN 1
     3.   LOAN INTEREST RATE   11.000 %
     4.   TERM   30
     5.   PAYMENTS/YEAR   12
     6.   LOAN TO VALUE RATIO   59.000 %
 LOAN 2
     7.   LOAN INTEREST RATE   0.000 %
     8.   TERM   0
     9.   PAYMENTS/YEAR   0
    10.   LOAN TO VALUE RATIO   0.000 %
    11.   PROJECTION PERIOD   10
    12.   NET OPERATING INCOME   150,000
    13.   APPREC./(-)DEPREC. IN VALUE   37.000 %
    14.   INCREASE/(-)DECREASE IN INCOME   0.000 %   15. J-FACTOR ASSUMPTION
                                                             1=STRAIGHT LINE
                                                             2=ELLWOOD J-FACTOR
                                                             3=COMPOUND J-FACTOR

                    ELLWOOD ANALYSIS

NET OPERATING INCOME   =   150,000

THE ELLWOOD OVERALL RATE IS CALCULATED
BY TAKING--
   EQUITY YIELD   = 14.000 %
   LESS EQUITY YIELD X L/V   = 8.260 %   NOTE:
   LESS % LOAN PAID OFF X S/F X L/V   = 0.236 %   DECREASES IN THE RATE
   PLUS MORTGAGE CONSTANT X L/V   = 6.742 %   RESULTS IN HIGHER VALU
   LESS EQUITY YIELD X L/V2   = 0.000 %   INCREASES IN THE RATE
   LESS % LOAN PAID OFF(2) X S/F X L/V = 0.000 %   RESULTS IN LOWER VALUE
   PLUS MORTGAGE CONSTANT(2) X L/V(2)   = 0.000 %
   LESS INCREASE IN VALUE X S/F   = 1.913 %   DECREASES IN VALUE SHO
  ALL DIVIDED BY J FACTOR ADJUSTMENT   =100.000 %   AS NEGATIVES
EQUALS THE OVERALL ELLWOOD RATE   = 10.333 %

ESTIMATE OF VALUE   =1,451,664

AFTER TAX CASH FLOW ANALYSIS MENU

```
ENTER F1--TO INPUT NEW DATA
      F2--TO INPUT DATA FROM A FILE
      F3--TO INPUT DATA FROM A ELLWOOD FILE
      F4--TO STORE DATA IN A FILE
      F5--TO DISPLAY OUTPUT TO THE SCREEN
      F6--TO PRINT DATA ON THE LINE PRINTER
      F7--TO WRITE OUTPUT TO AN ASCI FILE
      F8--TO CHANGE A VARIABLE
      F9--TO LEAVE ATCF
     F10--DISPLAY CURRENT INPUT ASSUMPTIONS
```

AFTER TAX CASH FLOW ANALYSIS INPUTS

INPUT ASSUMPTIONS FOR--Osgood3

BASIC DATA

Project Name	Osgood3
Projection Period	10
Acquisition Cost	2,500,000
Is Property Subsidized Housing ? Y Or N	N
Is Property Residential? Y Or N	Y
Is Owner A Taxable Corporation? Y Or N	N
Effective Ordinary Tax Rate	50.000
Effective Tax Rate In Year Of Sale	50.000
Cap Rate for NOI to Determine Resale Price	10.000
Owner's Reinvestment Rate in %	10.000
Owner's Discount Rate in %	12.000

MORTGAGE DATA

Do You Want To Use Standard Financing? Y Or N	Y
Mortgage Ratio Or Amount	80.000
Interest Rate	11.000
Mortgage Term	30
Payments Per Year	12
Points to be paid	0.000
Prepayment penalty	0.000
Is There Lender Participation? Y Or N	N
Income Cash Throw-Off To Lender In %	0.000
Resale Proceeds To Lender Before Taxes In %	0.000

COMPONENT DATA

Value or Ratio Of Improvement #1/Total Value	80.000
Depreciable Life Of Improvement #1	18
Depreciation Method, Improvement #1	1
Is There a Second Improvement	N
Value or Ratio of Component #2/Total Value	0.000
Depreciable Life of Component #2	0
Depreciation Method, Improvement #2	0
Rehabilitation Tax Credit for Improvement #2	0.000
Is Structure a Historic Landmark	N

INCOME AND EXPENSE SUMMARY

Year	Gr. Inc.	Vac Rate	Var Exp	Fix Exp
1	420,000	0.050	0.100	100,000
2	420,000	0.050	0.100	100,000
3	420,000	0.050	0.100	100,000
4	420,000	0.050	0.100	100,000
5	420,000	0.050	0.100	100,000
6	420,000	0.050	0.100	100,000
7	420,000	0.050	0.100	100,000
8	420,000	0.050	0.100	100,000
9	420,000	0.050	0.100	100,000
10	420,000	0.050	0.100	100,000