JAMES A. GRAASKAMP COLLECTION OF TEACHING MATERIALS

VI. ACADEMIC ASSOCIATIONS

A. American Real Estate and Urban Economics Association (AREUEA)

1. "A Commercial Computer Service for Financial Analysis of Rental Income Property Decisions", Presented at AREUEA Annual Meeting, Palmer House Hotel, Chicago, IL, December 28-29, 1968

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A COMMERCIAL COMPUTER SERVICE FOR FINANCIAL ANALYSIS OF RENTAL INCOME PROPERTY DECISIONS

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Abstract

A COMMERCIAL COMPUTER SERVICE FOR FINANCIAL ANALYSIS OF RENTAL INCOME PROPERTY DECISIONS

The debut of a commercial computer service for simulating after-tax cash flow profiles of real estate returns and values gives the author an opportunity to discuss the system and critique appraisal theory in regard to the income approach to value of an investment property. The Compraisal Model is represented as an investment model which can be used for appraisal purposes under specific conditions. The article includes reproductions of newly designed input and output formats for the Compraisal Model, which is represented as a dramatic innovation in techniques available to the general public for real estate investment analysis and planning.

A COMMERCIAL COMPUTER SERVICE FOR FINANCIAL ANALYSIS OF RENTAL INCOME PROPERTY DECISIONS

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Introduction

It is widely held that the investment value of any income producing capital asset is the present value of the net income to be generated. This has been generally true since the days of Alfred Marshall and Irving Fisher.[1]

Frederick Babcock went so far as to maintain that there was only one method of valuing real estate, the discounting of building returns extended to perpetuity with capitalization rates determined in the market.[2] The basic concept, Income/Capitalization Rate = Value (I/C = V), has become a truism for income property appraisal, but the appropriate application of this concept is a matter of considerable debate when forecasting sale price.[3]

This article suggests how an available computer service can actually apply the theory of the income approach to value in modern real estate investment counseling and appraisal assignments. Because the system relies on a combination of market rents, historical costs and a present value discounting of returns, it is also possible to comment on the controversial need to use and correlate three approaches to value.

Redirection of Income Theory

Over the years the definition of Income has evolved from a simple average annual net income over the full useful life of the investment, to a mixed return of periodic incomes and singular reversions, and most recently, to a further division of returns between vested mortgage interests and equity interests.[4] Concurrently, Capitalization Rate has evolved from a simple straight line concept to elaborate composite, Hoskold, Inwood or Ellwood configurations. Each refinement has sought to provide a more realistic allocation of proceeds among cash dividends, mortgage payments and capital recapture.[5]

In these refinements, concern with methodology gradually obscured original present

value theory. One school of thought, with its roots in Babcock, seeks an "overall market rate" by analyzing market sales of properties producing known net incomes. However, a cap rate determined by the ratio of income to sale price is nothing more than the reciprocal of a price/earnings ratio such as is used in the stock market.

A "market rate" of .085 means a price/earnings ratio of 12, a more accurate representation of market price comparisons than is possible with its cousin, the gross rent multiplier. Insurance companies and banks frequently determine loan value basis as some multiple of a normalized or average net income expectation. For smaller income properties the market may well operate on net income multipliers.[6] A multiplier is a market comparison approach and not specifically a present value factor, however.

Another approach to cap rate, such as the Ellwood present value annuity method, would construct a factor as a function of loan ratio, interest rate, mortgage term, equity yield and depreciation. A single composite discount rate requires that Income in the present value equation be constant at an average figure. Any leveling, or averaging of income to achieve conformity with the single variable truism I/C = V does violence to the proposition that present dollars are worth more than future dollars and avoids the need to place returns to investor in specific time periods. All of the scholarly concern with the Capitalization Rate misses the point that the income received by the investor is uneven and erratic in amount and of differing investment quality because of the varying degrees of penetration in income taxes on these receipts. Nonetheless, the income schedule, not the capitalization rate, is the root of all value.

Therefore, the basic proposition of this essay is that, if the income approach to value is to be salvaged as an appraisal tool, then attention must be redirected to these problems:

Redefinition of the income returns to the investor.

Placement of returns in specific periods of time.

Accounting for each type of return to reflect exposure to income tax confiscation.

Reliance on simple, compound-interest, reversion discounts only, rather than all-encompassing fictional annuity factors.

Redirection of appraisal methodology to reflect investor logic and motivation.

Redefinition of Income Returns

It must be recognized by now that the productivity of any real estate investment is not only shared between mortgage and equity interests but is also distributed among local governments via real estate taxes and the national government in the form of income taxes. Therefore, if it is acceptable to value returns to equity after debt service, it should be acceptable to value returns to equity after partnership shares have been taken by local and federal governments. The stream of returns, measurable in money terms, received by the beneficiary of certain vested rights in income-producing real estate must therefore be the after-tax spendable cash which he enjoys attributable to the real estate. The investment value of the equity is the present value of after-tax spendable cash from the point in time when the initial commitment of funds is made to the time that the equity commitment is withdrawn through sale, abandonment or reorganization of the legal entity of ownership.

The after-tax cash received in each period is discounted back to the point of initial investment as a simple Inwood reversion, and the series of reversions is then totaled to measure the present value of equity returns. The total investment value of the private vested interests (as contrasted to the public vested interest in real estate and income taxes) is then the present value of the after-tax cash benefits to equity and the present value of payments to the mortgage interests.

After-tax spendable cash in real estate may come to the investor over time from four sources and in varying amounts:

1. Positive cash flows remaining from normal operational revenues over successive periods of time.
2. Positive net worth received as proceeds on sale of the property after debt and capital gain tax claims have been paid at a single point in time.
3. Surplus proceeds not subject to tax derived from refinancing of an existing mortgage balance with a larger loan balance at infrequent points in time.
4. Spendable cash salvaged from other income subject to income taxation unless shielded by tax losses generated from real estate ownership over successive periods of time.

Positive cash flows from operations and spendable cash salvaged from other income each period must be scheduled for the anticipated time sequence. Proceeds from sale or refinancing must be given assumed but specific calendar dates. In addition, cash flow from operations or other income must be permitted to vary in each period of time, because at the very least, interest and depreciation deductions to determine taxable income will vary and over the long-run most revenue and expense factors will shift in amount for a variety of reasons.

Month-by-month determination of after-tax cash flows is a tedious and repetitious task well-suited to electronic data processing machines. Indeed, the accurate and extensive accounting required of this method may be a major factor in explaining the willingness of practicing appraisers to accept normalized income for appraisal purposes while paying their own CPA to calculate after-tax cash flow for the appraisers' own real estate investments.

It is recognized that determination of spendable after-tax cash involves assumptions which can be unique to a single investor or characteristic of a class of investors. If these assumptions must always be unique to one taxpayer, then any valuation of after-tax income is appropriate to investment counsel but not to appraisal. But if certain assumptions can be modified to reflect probable group behavior, then after-tax benefits are not only benefits to the user but are also marketable benefit streams appropriate to appraisal consideration. Consequently, this study will first describe a valuation model for the investor and then suggest the extension of the method to appraisal.

General Structure of an Investment Model

Investment models for the computer can be designed to produce alternative results of given actions with measures of the chance of varying degrees of success and failure,[8] a single result with a stated probable standard error, or a single result which is simply the mechanical and mathematical result of one set of numerical assumptions.[9] The commercial model described in this paper is one of the latter types, a "heuristic model" say the decision theory people, for it runs through a single set of inputs and stops without searching for an optimal solution.

Since the combination of alternative inputs is infinite, it is presumed that the analyst has narrowed his choices to a limited set of practical alternatives based on his own judgment and experience. The product of the model is an extension of decisions already made by the investor or appraiser or modified as a result of previous runs on the computer. It lacks the glamour of optimizing or decision-making models, but it is doubtful that the art of real estate investment can be made conclusively mechanistic or that it would be accepted as such by practitioners if it were. Any model builder must anticipate the resentment any computer system generates among real estate practitioners, and this model deliberately avoids infringing on matters of "judgment."

Reference to the simplified flow chart of inputs and outputs in Fig. 1 will suggest the type of input information which presumes an extensive market and cost study by the investor or appraiser prior to bringing all these factors to bear in the valuation process. The gross annual rent roll, current operating expenses and real estate taxes, and the type and terms of financing all require full knowledge of the market if the data provided are to be realistic and are to justify sophisticated analysis. Depreciation assumptions, income tax decisions and choice of discount rates require explicit choices by the investor or professional analyst. Time index adjustments of each input factor to anticipate changing market, cost and money factors in future years require an understanding of the dynamics of real estate appropriate to the professional ideals of realtor, appraiser or counselor.

Once the analyst has made these assumptions and communicated them to the machine, the computer simply does the tedious arithmetic to produce the annual summaries of operations computed monthly. These are outlined in Fig. 1 in the box designated, "cash flow data printouts." The specific commercial model which follows is one of a family of alternative programs, each of which follows the general format of cash flow analysis but varies the degree of detail in the initial inputs to focus application on the objectives of the architect, the land planner, the tax assessor, the lender or the appraiser.

It is important to distinguish between a model which provides financial profiles with investment valuations and an appraisal model intended to forecast purchase price in the market. At the start, the investment model must presume a purchase price which

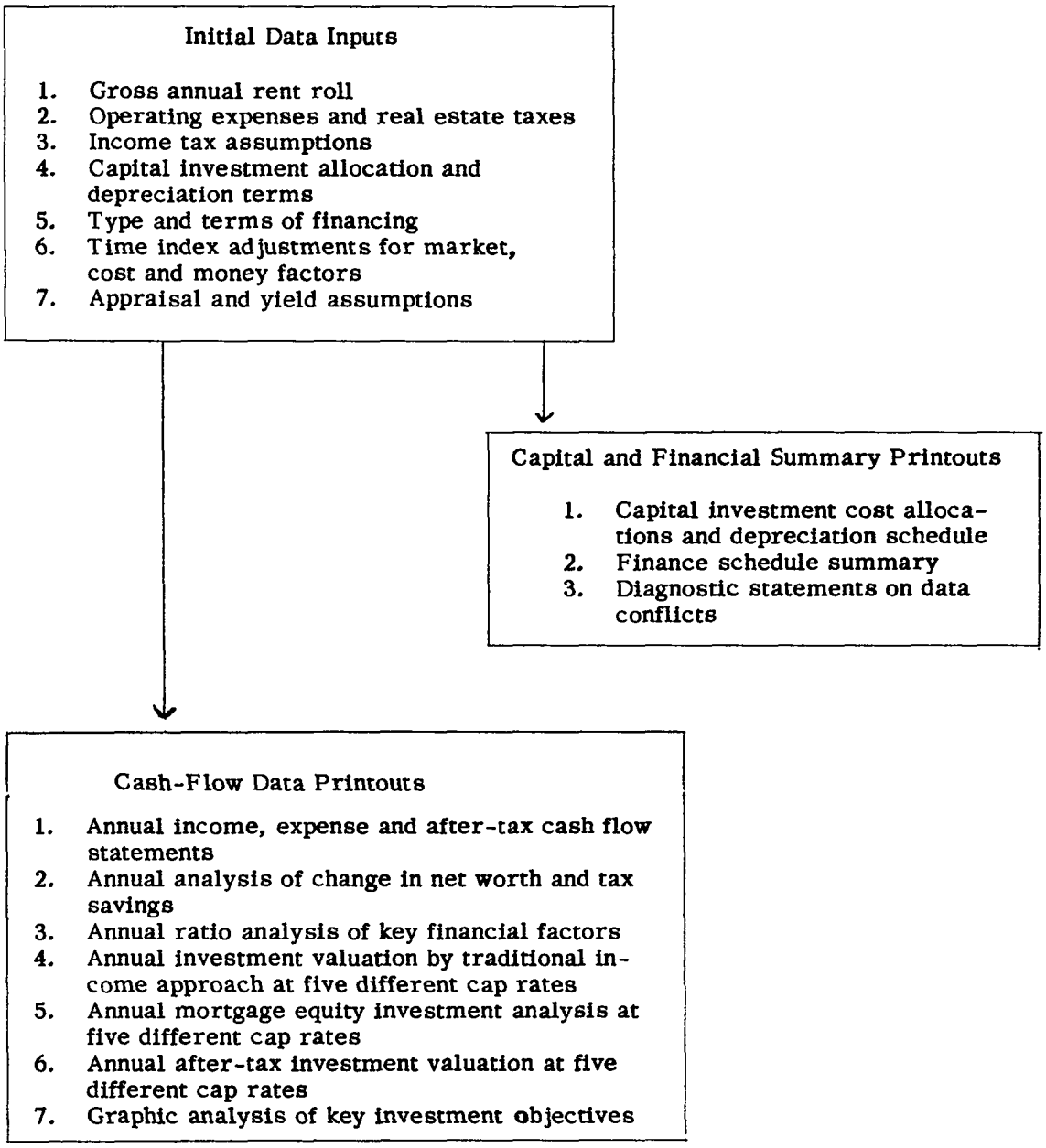

Figure 1. Simplified Flow Chart of Compraisal Investment Simulation Model

is then allocated to different capital classes for depreciation calculations for purposes of measuring taxable income. Cash returns could be valued by an array of capitalization rates to permit equivalent comparisons of mortgage-equity, after-tax and traditional appraisal results. However, the appraisal is attempting to forecast a price, not assuming one from the start. Moreover, the appraisal must presume group behavior patterns if it is to infer a price the subgroup may typically pay. If there is group behavior, there should be only one discount rate or, more realistically, a narrow range of capitalization bracketed by two related discount rates. Therefore, for an appraisal model, there must be further processing of original acquisition cost allocations to bring after-tax cash flows, as discounted by the market expectation of return, into balance with the forecasted purchase price.

An investment model is not an appraisal technique for estimating probable selling price until it can be proven that a certain group of buyers has a certain pattern of analysis of cash flows or that these buyers rely on the results of the specific investment models in question. Thus the presentation which follows must be thought of as an investment model until the modifications necessary to reflect market behavior have been introduced or buyers in the market generally follow the output of an investment model.

A Cash Flow EDP Service for Real Estate Investors

In spring 1968, the Compraisal Corporation[10] licensed a set of cash flow models from the University of Wisconsin School of Business, or more specifically, from the Alumni Foundation which had received gifts of commercial rights to these programs from School of Business staff members who participated in their development.[11]

The Compraisal Corporation was uniquely composed of professional appraisers and nationally known leaders in applied research technology who were specifically concerned with computer applications to real estate appraisal and investment.

Basic to their approach was the assumption that the computer could produce any form of analysis for which the appraiser could communicate the facts and then understand the implications of the outputs. The essential problem was not considered to be software for the computer but the method by which those without special training could

communicate with the machine and then interpret the results to aid appraisal and investment decision-making.

Thus, the University programs were recast to fit the program to the user, to aid the information gathering process and to maintain roots in traditional investment logic. Separate programs and input forms have been prepared and are now available for either the novice or sophisticated investor, for the appraiser and for the land planner. In addition, organizations with computer capabilities will be able to purchase programs to run on their own equipment.

The forms and outputs of the basic investment model are utilized in this essay to illustrate both the nature of the service and the theory of spendable after-tax income as the root of value in the income approach. With this service the investor or real estate analyst can communicate with the computer without any special training in data processing methods by using the information entry forms presented in Figs. 2 - 6. The investor simply answers questions in the blanks provided, and the number and letters of his response are carbon duplicated onto an underlying keypunch form. The input form is not cluttered with administrative instructions to the keypuncher. The five basic forms for entering data are grouped as follows:

(These forms were deleted — copyright owner not found)

Form A - Income, expenses, real estate tax, and income tax data.

Form B - Equity yields, discount rates and miscellaneous tax data.

Form C - Capital investment allocation and depreciation terms.

Form D - One form for each mortgage or term loan of any amortization or bonus interest plan.

Form E - Indexes to modify each factor affecting cash flow to reflect changing conditions over time.

On Form A (Fig. 2) the analyst is asked to provide the annual economic gross rent roll, the current annual real estate taxes and the current annual operating expense budget, excluding real estate taxes. On Form E (Fig. 6) the analyst will have the option of varying occupancy, rents, taxes and expenses over time so that the initial entries need only be a base or normative amount.

Then the analyst is asked to estimate the average annual income tax rate applicable

to a taxable income to be generated or protected by this particular real estate project. The income tax rate may combine the federal and state rate applicable to the investor, may represent the highest marginal rate of the investor, or may be an average of applicable progressive rates as estimated by a CPA. However, this model does not have recourse to the full schedule of federal corporate and individual tax rates. The analyst may choose to carry losses forward to be applied against future taxable income from the project within the limits of the "carry forward" provisions of the Internal Revenue Code, or he may elect to apply tax losses in excess of taxable real estate revenue to other "outside" current income, the resulting tax-saving to be discounted over time as an additional investment value.

Form B (Fig. 3) completes the cost and tax rate charges and provides for investment valuation at five different capitalization rates. The lower half of the form allows the analyst to state the estimated 7 percent investment tax credit generated by the subject property as a dollar amount. In these forms for the novice, all cash flow statements add mortgage payments, are computed on a monthly basis, and then are summarized in an annual printout representing a 12-month fiscal statement. All formulas are abstract, however, and the more sophisticated equations, for example, would permit the analyst to use quarterly period printouts with quarterly payment mortgages, or biannual printouts with 6-month payment mortgages.

The upper half of Form B is related to five selected discount or yield-rate entries and can be better appreciated when the nature of the outputs has been explained. Suffice it here to state that each valuation of the subject property provides for the traditional income approach based on income before debt service and taxes, the mortgage-equity approach based on net income after debt service but before taxes, and the spendable after-tax approach advocated in this essay. Thus, the analyst may value the property by an overall rate bracketed by the rate in lines A and B. The cap rate in lines C and D may bracket the rate appropriate to equity in the mortgage-equity approach to value, while the rates suggested in lines D and E may be most appropriate to valuing after-tax rate of return. As will be shown, this method permits comparisons of value derived by the traditional approach or in the marketplace with after-tax spendable cash values derived

by this analysis. The analyst can then judge equivalent rates of return on real estate relative to municipal bonds or some other security type.

Form C (Fig. 4) is designed to establish the terms of depreciation appropriate to various components of the contemplated capital investment. These outlays may represent estimated costs of land acquisition and construction or may be an allocation of a selling price or offering price to be tested for investment profitability.

For the novice, Fig. 4 prescribes the components in capital costs in nine categories in Column 1, although equipment and the two "other" lines may be further detailed by writing in label information on space provided. Land and basic building structure are self-explanatory. Equipment might be elevators or window air conditioners. Building remodeling costs, site improvement costs and furnishing costs might apply either to setting up space for tenants in a new building or to renovation of an existing building contemplated after purchase. Transaction cost is designed to include all expenditures for legal service, professional fees and other indirect cost items that must be capitalized (or may be at the option of the taxpayer) and then depreciated over some specific term.

The analyst enters the historical cost figure for each pertinent capital component in Column 2. In Column 3 the analyst shall state the percentage of each capital item which can be depreciated, that is, 100 percent minus the percentage of anticipated salvage value at the end of the useful life defined in Column 4. Every form has a complete example to guide the analyst. In the example in Fig. 4, given land is not depreciable, 100 percent of the building is to be depreciated over 480 months and 80% of equipment costs can be depreciated in five years (60 months).

The analyst may then choose any depreciation method appropriate to the capital item and Internal Revenue Service rules by entering one of four numbers to signal the computation method to the computer. As presented in the example, each capital component may follow a different method. The code numbers in Column 5 are "1.0" for straight line accounting method, "1.5" for second owner existing buildings at 150 percent declining balance method, "2.0" for double declining balance method (allowable on first ownership items) and "3.0" for sum-of-the-digits method. Historical cost, providing depreciation reserve charges to income, bears directly on after-tax spendable cash valuation, one of

the few appraisal situations where the relevance of cost can be clearly established.

For each loan in the financial plans of the investor, one copy of entry Form D (Fig. 5) must be completed. The flexibility of this form permits the user to describe the amount, interest rate and repayment terms of virtually any type of loan commonly used in real estate today. In Item 8 (A, B), the mortgage amount may be described as a specific dollar amount or as a percentage of initial required capital investment. Then the annual basic interest rate may be stated in Item 9 of the schedule, with the terms of bonus interest on a participation mortgage and the usury limit which may be applicable. The percentage of net worth to be received by the lender at the time of resale, if any, may be specified in Item 13 (B).

The method of mortgage payment can be stated as a fixed dollar amount, as a level amortized mortgage if the number of months in the term of the mortgage is known or as an annual constant rate expressed as a percentage of the mortgage amount. To permit periodic refinancing, it is possible to start and stop mortgage obligation in any given month. For example, a first mortgage may be acquired at the time of purchase and a second mortgage then defined (on another loan schedule Form D) which begins six months later, with both mortgage balances replaced by a new first mortgage in the sixth year or perhaps a "wrap-around" in the eighth.

With this device it is possible to test the impact of alternative financial loans on investment value and equity yield or to measure the influence on investment value of a loan closed to repayment for 10 years instead of five during an inflationary period. The bonus interest provision allows the investor to measure the true cost of his financing over time relative to mortgage balance, to cash flow and to after-tax investment value. Because the repayment method is not tied directly to the mortgage due date, it is possible to finance with notes such as a 10-year mortgage, amortized on a 25-year basis, and ballooned for the balance at the end of 10 years.

Payment of a mature mortgage balance is made directly from after-tax cash, and proceeds from new loans also go to the same account. Therefore, if the refinancing provides additional cash to the investor, it is recognized as a return, while deficit cash is first covered by operational income and then by an automatic working capital loan, a

feature to be discussed when describing outputs. Since value can be created by the form and pattern of financing available to the investor, and since mortgage credit is becoming so elastic in its terms and costs, complete flexibility is needed for sophisticated investment planning. The computations by the computer both eliminate the need for the investor's using any complex set of tables for a single result, and at the same time reveal to the investor the exact cash flow implications of the finance plan for each year under study.

A Time Schedule for Income Returns

When calculating after-tax spendable cash, it is obvious that taxable income must change each period as tax deductible interest and depreciation items change, even when the net income before tax and debt service is a constant dollar amount. However, it is likely that over the life of any particular investment this net income figure will also tend to shift as the elements which constitute revenue and expenses alter over time.

Therefore, each Compraisal Model permits the analyst to make explicit assumptions in regard to the future in order to test the sensitivity of his yield expectations to changes in the time-line of developments in rents or occupancy, real estate taxes and expenses, or resale price of his investment. One might test three sets of assumptions in regard to the future by holding the elements of net income constant in one case, inflating costs and prices in a second case, or perhaps inflating costs and deflating rents and resale to have a picture of the slope of downside risk as a third alternative.

For the novice the indexes in Form E (Fig. 6) are presumed to be annual modifications, so that the twelve-month span of the index in Column 1 is preprinted. The more sophisticated model permits the analyst to vary the time and rate of adjustment by any configuration of basic time units. There is no necessity that the gross rent, real estate taxes, expenses or resale price actually be the annual base figures provided on the first Data Entry Form A. These simply represent constants with a base of 100 so that the construction period can be recognized as a year of zero index revenue.

1. Construction period expenses might be determined as 20 percent of normal operating expense levels during the construction period and then rise above index 100 for a shakedown period.

2. Rental revenues could begin at zero and build as occupancy improves or on an annual basis be set at an index of 80 for the first year, with a normal occupancy rate achieved in the second year. With occupancy at a normal level of 93 to 100, the gross rent index can then build from 100 to, say, 104 at the end of the fifth year to reflect rising price levels.

3. Real estate taxes can be indexed to increase at a rate reflecting the trend in a particular community (100 + 1 percent annual increase equals an index of 101 in the second year, 104 in the fifth year and so on).

4. Operating expenses could be indexed to reflect increasing maintenance of the older building or rising labor and supply prices.

Indeed, should there be a plan to finance remodeling from annual rents, the remodeling budget could be added to the index for the first several years so that cash flow could be tested for adequacy and alternative financing methods tested for their impact on value. Resale price index provides an opportunity to introduce true depreciation, defined as the difference between original outlays and net recapture on resale. This index should immediately reflect the sales cost or commission that might be paid for selling the property. For example, if a property sold at its original cost, it might still carry an index of 95 to reflect a 5 percent sales commission and more accurately estimate the actual dollars received by the investor after taxes and all other claims on the resale proceeds. By the same token, if resale prices are expected to rise or net at an amount higher than original cost because of a good buy, inflation or a change in market demand, this index might soon be more than 100.

Time indexes are a simple way of probing the investment significance of trends and future events. It is too early to find much acceptance of probability and risk models of real estate investment among those who make the market. Much real estate investment is made in anticipation of inflation, and this index model would provide an opportunity to measure just how inflation should affect purchase price limits currently. Gross rents must rise faster than taxes and expenses if resale price is to rise without a change in market discount factors.

The reasonable expectations of profits due to inflationary price rise when converted to indexes in this section may not justify a contemplated purchase price when yield is actually measured for this set of assumptions. The use of an explicit cash flow model, even though the indexes are only "guesstimates," may underscore the character of

excessive asking prices. It is still true in real estate that most profits are made with a good buy rather than a lucky sale.

The Nature of Cash Flow Computations

It is not possible to reprint a major portion of the manual of definitions and computations to describe the full Compraisal Report in a brief presentation. However, it is valuable to provide a facsimile of the cash flow output form to indicate how each source of spendable dollars for the investor is identified, given a dollar value and scheduled for the appropriate fiscal year in which it would be received. Reference to Figs. 7 and 8 will demonstrate how each of four types of cash receipts can be placed in proper reference to tax claims and priorities:

1. Net Income Before Capital Recapture is the traditional measure of productivity while Cash Generated from Project includes positive cash flows from all sources except for short-term needs to cover cash deficits or balances outstanding from previous periods.

2. Spendable Cash to Investor After Taxes measures the yearly dividend to the investor, the income stream about which so many theorists have generalized.

3. In addition there is an additional annual benefit in the form of cash savings to other income which is measured by dividing the marginal tax rate into annual tax loss and identified by Tax Savings in Cash if Loss Can Be Applied to Other Current Income.

4. Finally, the equity enhancement due to appreciation in the property or repayment of loans in excess of property decline in resale value provides a measure of Change in Net Worth and Capital Gain Exposed to the Gains Tax After Adjustment for Depreciation in Excess of Permissible Allowances.

The program automatically covers operating cash deficits by borrowing on a Working Capital Loan in order to charge following periods with an interest cost until period cash flow is positive in sufficient quantity to repay all previous working capital loans. Only then is there cash available for the investor.

Valuation of Cash Returns to the Investor

All cash receipts to the investor are treated as returns and then discounted by the Inwood reversion factor appropriate to each period in which a benefit is received relative to the valuation point at the outset of the investment. Then the sum of these reversion values represents the maximum price payable at a given discount rate with allowance

LR102
2575 UNIVERSITY AVE. MADISON, WIS. 24-Unit Apartment Building

	-1-	-2-
GROSS INCOME	42854	46080
Less Vacancy and Credit Loss	6428	2304
EFFECTIVE GROSS INCOME	36426	43776
Less Total Expenses Excluding Real Estate Taxes	10500	8400
Less Real Estate Taxes	9000	9180
NET INCOME BEFORE CAPITAL RECAPTURE	16926	26196
Less Interest on Mortgages and Working Cap., Loan	15044	14884
Less Bonus Interest	0	0
Less Principal Payment on Mortgages	5079	5495
Plus New Loans From Refinancing	0	0
CASH GENERATED FROM PROJECT	-3197	5817
Less Working Capital Loan Principal Payment	0	3197
Plus Working Capital Loan Required	3197	0
CASH INCOME BEFORE TAXES	0	2621
Plus Principal Payment on Mortgages	5079	5495
Less Depreciation	13625	11698
Plus Working Capital Loan Principal Payment	0	3197
Less Working Capital Loan Required	3197	0
Less New Loans from Refinancing	0	0
TAXABLE INCOME THIS PERIOD	-11743	-385
Less Tax Loss Carried Forward	0	0
NET TAXABLE INCOME	-11743	-385
Less Income Taxes	0	0
Plus Investment Credit Used to Offset Income Tax	0	0
Plus Tax Loss Carried Forward	0	0
Plus Depreciation	13625	11698
Less Principal Payment on Mortgages	5079	5495
Plus New Loans from Refinancing	0	0
Less Working Capital Loan Principal Payment	0	3197
Plus Working Capital Loan Required	3197	0
SPENDABLE CASH TO INVESTOR AFTER TAXES	0	2621
TAX SAVINGS IN CASH IF LOSS CAN BE APPLIED TO OTHER CURRENT INCOME	3523	116
TAX LOSS BALANCE AVAILABLE TO BE CARRIED FORWARD	0	0
INVESTMENT CREDIT BALANCE TO OFFSET INCOME TAX	0	0

Figure 7. Ten-Year Income Analysis

LR102
2575 UNIVERSITY AVE. MADISON, WIS. 24-Unit Apartment Building

-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-
47462	47462	49306	49306	49306	49306	49306	49306
2373	2373	2465	2465	2465	2465	2465	2465
45089	45089	46840	46840	46840	46840	46840	46840
8568	8736	8904	9072	13440	9072	9240	9408
9540	9900	10260	10620	10980	11340	11700	12060
26981	26453	27676	27148	22420	26428	25900	25372
14178	13691	13164	12594	15055	14722	14361	13970
0	0	0	0	1972	1972	1972	1972
5945	6432	6959	165089	4016	4349	4710	5101
0	0	0	190000	0	0	0	0
6858	6330	7553	39465	1377	5385	4857	4329
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
6858	6330	7553	39465	1377	5385	4857	4329
5945	6432	6959	165089	4016	4349	4710	5101
10202	9028	8092	7335	6714	6195	5755	5377
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	190000	0	0	0	0
2601	3735	6421	7220	-1320	3539	3812	4054
0	0	0	0	0	0	0	0
2601	3735	6421	7220	-1320	3539	3812	4054
780	1120	1926	2166	0	1062	1144	1216
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
10202	9028	8092	7335	6714	6195	5755	5377
5945	6432	6959	165089	4016	4349	4710	5101
0	0	0	190000	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
6078	5210	5627	37299	1377	4323	3714	3113
0	0	0	0	396	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Figure 7. (Continued)

LR102
2575 UNIVERSITY AVE. MADISON, WIS. 24-Unit Apartment Building

	-1-	-2-
CURRENT PERIOD RETURN ON NET WORTH BEFORE TAXES (Cash Income Before Taxes plus Change in Net Worth Divided by Net Worth at Beginning of Year)	5.704	53.071
CURRENT PERIOD RETURN ON NET WORTH AFTER TAXES (Cash Income After Taxes Plus Change in Net Worth Divided by Net Worth at Beginning of Year, Result Includes Adjustments for Capital Gains Tax and Tax Saved on Other Income)	2.615	45.010
NET CASH RETURN ON ORIGINAL CASH EQUITY BEFORE TAXES	0.000	5.824
NET CASH RETURN ON ORIGINAL EQUITY CASH AFTER TAXES	7.829	6.081
OVERALL CAPITALIZATION RATE (Net Income Before Recapture / Resale Price Projection)	7.424	11.138
EXPENSE RATIO (Total Expenses as a Percent of Gross Income)	45.503	38.151
DEFAULT RATIO (Percent of Occupancy Required to Satisfy all Cash Expenditures Including Working Capital Loan)	92.459	89.313
DEBT COVER RATIO (If Less Than 100, Total Debt Service Cannot Be Satisfied by Net Income Before Capital Recapture)	84.114	130.180
LENDER BONUS INTEREST RATE (1.0 # 1 PERCENT)	0.000	0.000
TAX SHELTER RATIO (If More Than 100, Principal Payments Are Tax-Free)	268.261	212.879
N E T W O R T H A N D C A P I T A L G A I N		
RESALE PRICE PROJECTION	228000	235200
Less Principal Balance (All Mortgages)	189921	184426
Less Working Capital Loan Balance	3197	0
NET WORTH	34882	50774
Change in Net Worth	1882	15892
CAPITAL GAIN	1625	20523
Capital Gains Tax	1019	4290

Figure 8. Ten-Year Analysis of Important Rates, Returns and Ratios

LR102
2575 UNIVERSITY AVE. MADISON, WIS. 24-Unit Apartment Building

-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-
	(In Percentages)With a Statement of Net Worth and Capital Gain (Dollars)						
39.397	31.231	27.998	23.721	7.288	12.478	11.616	10.830
35.591	29.023	25.954	21.996	7.651	12.436	11.389	10.406
15.241	14.067	16.785	87.701	3.061	11.967	10.794	9.621
13.507	11.578	12.505	82.888	3.941	9.608	8.253	6.918
11.131	10.598	10.777	10.283	8.493	10.011	9.811	9.611
38.152	39.265	38.868	39.939	49.528	41.399	42.470	43.541
80.550	81.662	79.680	14.958	88.207	80.078	81.149	82.220
134.082	131.458	137.536	122.211	117.563	138.580	135.811	133.043
0.000	0.000	0.000	0.000	1.050	1.074	1.101	1.132
171.609	140.351	116.275	300.000	167.173	142.439	122.190	105.405
242400	249600	256800	264000	264000	264000	264000	264000
178481	172048	165089	190000	185984	181635	176924	171823
0	0	0	0	0	0	0	0
63919	77552	91711	74000	78016	82365	87076	92177
13145	13632	14159	-17711	4016	4349	4710	5101
37926	54153	69445	83980	90694	96889	102644	108021
6969	9282	11350	13263	14010	14722	15443	16203

Figure 8. (Continued)

for recovery of the purchase outlay. A Compraisal Investment Model computes the present value of returns on the Inwood basis for five selected rates, using three different sets of returns, for each of 10 years. These valuations can be used in several ways to guide the decisions of the investor as can be demonstrated by reference to Fig. 9.

The valuation example is based on the cash flows computed and scheduled through time in Figs. 7 and 8. In addition, it is assumed that the investor was considering paying $240,000 at the beginning of the first year and is assuming resale in the tenth year for $242,400, suggesting one percent appreciation, defined as the difference between purchase and resale price. The resale price is net of sales costs. A similar investment valuation is done assuming resale for each year of the 10-year forecast span, with resale prices as indexed in Form E.

The first valuation method is labeled The Inwood Technique and reflects traditional viewpoints. The Net Income Stream which is discounted is net income before recapture, debt service, or income tax while the Total Resale Reversion is the present value of the property sold free and clear. The sum of these two types of returns suggest the Total Investment Value. Since this value at 10 percent discount is $239,429, the runs suggest that the overall rate of return would be slightly less than 10 percent compounded over the 10-year investment period.

The Mortgage Equity Before Tax Technique recognizes the original mortgage debt as the present value of returns to the lender and then computes the present value of the Net Income Less Debt Service and the Net Worth at Resale to determine the three components of the total investment value. In the example the total investment value of $239,960 at the 18 percent discount rate is about equal to the proposed purchase cost of $240,000, suggesting that the return to equity before taxes over the 15-year span would be in the neighborhood of 15 percent compounded annually if the various assumptions hold true. A land value residual difference between total investment value and expected improvement cost is provided for the investor who wishes guidelines on land values for any proposed level of improvements. The land value residual output is more significant on the Compraisal Architectural Model which allows the architect-developer to test various alternative development intensity plans.

LR102
2575 UNIVERSITY AVE. MADISON, WIS. 24-Unit Apartment Building

Three Discounting Techniques are used to calculate the present value of returns to the investor on a compounded basis. The discount rate which gives a total investment value equaling the original total investment cost of $240000 is the yield rate to the investor at that cost.

(The projected resale price provided for this year is $264000 which is 110 percent of the original total investment cost.)

	Percent Yield
The -Inwood- Technique assumes no mortgage (i.e., the traditional viewpoint of free and clear).	11.0
The -Mortgage Equity Before Tax- technique assumes a mortgage position with computations made prior to income tax effects.	19.3
The -Mortgage Equity After Tax- technique assumes a mortgage position and computations are made after income tax effects.	18.1

Present Value Discount Rate	7.00	10.00	15.00	18.00	22.00
-Inwood Technique-					
Net Income Stream	175058	152486	123591	110134	95505
Total Resale Reversion	134204	101783	65257	50441	36141
Total Investment Value	309262	254270	188848	160575	131647
Land Value Residual	109262	54270	-11152	-39425	-68353
-Mortgage Equity Before Tax Technique-					
Orig. Mortgage Debt	195000	195000	195000	195000	195000
Net Income Less Debt Serv.	53235	45558	35657	31030	26003
Net Worth at Resale*	46858	35538	22785	17612	12619
Total Investment Value	295093	276096	253442	243641	233621
Land Value Residual	95093	76096	53442	43641	33621
-Mortgage Equity After Tax Technique-					
Orig. Mortgage Debt	195000	195000	195000	195000	195000
Cash to Investor	47068	40338	31636	27560	23124
Tax Saved on Other Income	3640	3501	3300	3193	3064
Net Worth After Tax*	38621	29291	18780	14516	10401
Total Investment Value	284329	268131	248716	240269	231588
Land Value Residual	84329	68131	48716	40269	31588
*Adj. for Lender Partic.	0	0	0	0	0

Fig. 9. Investment Analysis at End of Year No. 10

The Mortgage Equity After Tax Technique represents the most radical departure from traditional appraisal valuation and demonstrates an application of redefinition of income theory valuation called for at the beginning of this paper. The original mortgage debt remains the present value of the income stream directed to the lenders, but then the receipts in question shift to after-tax returns. Cash to Investor is the present value of spendable after-tax cash items as arrayed in the table of Fig. 7. Tax saved on other income is the present value of these savings, while Net Worth After Tax is the present value of returns to the owner on resale after repayment of loans, after payment of the capital gains tax allowing for readjustment of the basis due to excess depreciation taken in previous years, and after adjustment for participation in the net worth by the lender as part of a bonus interest or joint venture agreement.

The sum of these components to value (remember cash to investor includes refinancing gains) then represents the total investment value of this particular project. In this example, the Total Investment Value of $241,575 appears in the 15 percent discount column and is approximately equal to the investment cost of $240,000, suggesting an after-tax return of above 15 percent compounded per annum (16.4 percent, to be exact). This yield can then be compared to alternatives for the investor such as municipal bonds, life insurance programs, other real estate opportunities, or whatever, on an after-tax basis.

The Compraisal Investment Model has been prepared to compute by means of an iteration process a single investment (yield for each year of the retrospective yield pages. However, in the initial planning stages of an investment it may be helpful to have an array of total investment values in order to visualize negotiation points. For example, through a reduction of Fig. 9 it can be seen that a small difference in the total investment outlay of $3263 makes a difference between 15 and 18 percent yield after taxes to the equity. In short, a difference of 1.5 percent on the purchase price means a difference of 3 percent in yield compounded annually.

Since the risk in such a commitment would be the same at either price, the additional 3 percent is equivalent to having more than $50,000 invested at a secure 6 percent interest on a government bond. Of course, financing terms by the seller can shape

configuration of cash flows from which valuations are derived. The alternative combinations of assumptions and terms which can be tested for any given deal may be limitless. In short, the use of these investment models by buyers and sellers should encourage some sharp and sophisticated purchase agreements!

An Investment Model as an Appraisal Technique

Professor R. U. Ratcliff[12] has strongly stated the case that in the majority of assignments, the task of the appraiser is to forecast the probable sales price of a specific property. This objective is the premise of discussion regarding conversion of investment models to an appraisal method to forecast the central tendency of price negotiations for a specific property. The concept of market action implies the group behavior of knowledgeable buyers and sellers with alternative courses of action open to each, and the striking of a bargain only when their respective self-interests agree to buy and sell.

Professor Ratcliff has stated: "There are only two devices open to the appraiser for predictive purposes--statistical inference and simulation."[13] Market comparison as an approach to value is a rough form of statistical inference and more recently, much has been written on statistical regression analysis of sales prices of residential properties. Simulation is a 25-cent word for describing what an appraiser does to predict value, most specifically when using the income approach. However, present income approach methods are challenged, because they do not accurately simulate how sophisticated investors value income streams. Spendable after-tax cash flow analysis is far more representative of at least real estate investment counseling techniques and is therefore a more precise simulation approach to value.

The Compraisal simulation approach is only an investment valuation model when the inputs for time index dynamics and tax computations characterize a specific investor. However, Professor William Kinnard has underscored[14] the fact that when the appraiser has made a determination on highest and best use, he has also implied the probable group of buyers who would make such use of the property. In that case an appraiser, knowledgeable in regard to the decision-making logic and probable financial and tax

pattern of the group of investors inferred by a statement on highest and best use, can produce an investment value from Compraisal that is the most probable sales price for the investment opportunity in question. Compraisal only relieves the appraiser of clerical and computational responsibility while permitting him to stress his professional understanding of economic and investment research and analysis.

Within the implications of the above proposition, there are four means by which the investment model may become an appraisal model:

1. Widespread use of the Compraisal Model by investors in different parts of the country would mean that the model does simulate and direct investor behavior.

2. Research by Compraisal of the pattern of investor assumptions and expectations in different areas of the country would produce aggregate averages similar in concept to the data provided by nationwide standardized accounting systems for industries like the motel-hotel business. Careful study of sales prices on properties analyzed by Compraisal for the perspective buyer might suggest the statistical dispersion of price around value.

3. In addition, appraisers would have incentive to analyze investor group patterns in their areas to establish parameters for the dynamic assumptions of the Compraisal Model. The investment model has been modified so that preliminary allocations to land and building depreciation accounts can be adjusted by an iteration process until a specific acquisition price is matched to the investment value at a known yield requirement of a given group of investors. In this way the appraiser can bracket a range of possible sales prices and the computer can select that one price that matches required investment value on an after-tax basis.

4. Eventual agreement on a cash flow model format will one day permit widespread use of a risk model in which revenues, expenses, financing and resale estimates can be stated in ranges. The computer would then determine the distribution of alternative results and the probability of given yields being achieved at alternative purchase prices. The price which had the highest probability of achieving a yield acceptable to investors might be defined as the most probable sales price of the property.

By whatever means the Compraisal Models influence investor behavior and appraisal simulation to predict sales price, with time it should be possible to relate the variation in sales price to values simulated in the bargaining process. The range of prices relative to values as a result of better investment simulation today will permit introduction of statistical inference methods tomorrow. The Compraisal Model indirectly advances both the concepts of Babcock in the 1930s and Ratcliff in the 1960s.

A Final Thought

As a final thought on the use of the Compraisal simulation model, one could argue that it may lead to resolution of a basic dilemma in appraisal theory for income properties. If rental income power is a measure of market demand, if historical costs are necessary to measure capital and operating tax deductible budget items, and if financial and yield patterns represent price to income relationships in investor markets, might it be that an after-tax spendable cash income approach represents a synthesis of the three approaches to value? Such a synthesis would eliminate the necessity of the more awkward process of correlation.

In any event the Compraisal Model input and output material permits the appraiser to demonstrate a professional understanding of real estate investment dynamics. The model suggests that the stylized ritual of the present income approach can be modified so that Income (I) and Capitalization Rate (C) can be factual data rather than abstract concepts.

NOTES

1. Arthur M. Weimer, "History of Value Theory for the Appraiser," The Appraisal Journal, October, 1960, pp. 469-83.

2. Frederick M. Babcock, Evaluation of Real Estate (New York: McGraw-Hill, 1932).

3. Richard U. Ratcliff, "Capitalized Income Is Not Market Value," The Appraisal Journal, January, 1968, pp. 33-42.

4. James E. Gibbons, "Mortgage-Equity Capitalization: Ellwood Method," The Appraisal Journal, April, 1966, pp. 196-203.

5. Paul F. Wendt, "Ellwood, Inwood, and the Internal Rate of Return," The Appraisal Journal, October, 1967, pp. 561-601.

6. Ratcliff, op. cit., p. 36.

7. Spendable cash is recognized by investment counselors but not appraisers. Consider James M. McMichael, Real Estate Investment Analysis and Programming (Los Angeles: California Real Estate Association, 1965).

8. The Harvard Group, Inc. "A Risk Model for Real Estate Investment Analysis," (A mimeographed business prospectus traced to the Harvard School of Business. Authors unknown).

9. For other discussions of real estate investment models, see: Richard U. Ratcliff (ed.), Colloquium on Computer Application in Real Estate Investment Analysis, (Faculty of Commerce and Business Administration, University of British Columbia, 1968).

10. Compraisal Corporation, Port Columbus International Airport, Columbus, Ohio, 43219. Final formats of the Compraisal Models were strongly influenced by the contributions of Mr. Jean Poisson, MAI, President; Mr. Gary Seckel, MAI, Vice President; and Mr. Casey Hambleton, Jr., MAI, Vice President.

11. Professor James A. Graaskamp, Robert Knitter, Robert Markwardt, Mrs. Sara Pinkert, Thomas Turk.

12. Richard U. Ratcliff, Modern Real Estate Valuation (Madison, Wis.: Democratic Press, 1965).

13. Ibid., p. 56.

14. William N. Kinnard, Jr., "New Thinking in Appraisal Theory," The Real Estate Appraiser, August, 1968.

APPENDIX

A TYPICAL APARTMENT HOUSE INVESTMENT ANALYSIS

(Landmark Research Incorporated Case Study #1)

1. Assume you wish to analyze the investment value at alternative purchase prices of a 24-unit apartment building, located at 2575 University Avenue, Madison, Wisconsin. The building has twelve two-bedroom apartments that each rent furnished for $140 per month and twelve one-bedroom apartments that rent each for $125 per month. The building is five years old, unfurnished, in need of maintenance and available as is for about $225,000.

2. The building is well located and vacant land in the area is selling for about $1700 per unit. This means that $40,000 of the purchase price could be designated as land value. In addition to the land and building, the purchase price could be allocated to include $12,500 for the elevator and $7,200 to the parking stalls.

3. Market analysis indicates that the building would rent very well if all the units were carpeted and furnished. For this work it is estimated that it would cost $600 per two-bedroom unit and $500 for each one-bedroom unit or a total investment of $13,200 by the prospective buyer.

4. The total capital expenditures could be allocated for depreciation purposes as follows, keeping in mind that the prospect would be a second user and therefore only entitled to a maximum of 150% declining balance except for his new investment in furnishing. The percent depreciable and the number of years of remaining useful life are reasonable estimates given some knowledge of the practices of the Internal Revenue Service and the condition of the building:

$40,000	land	No depreciation allowed		
7,500	parking	50%	10 years	150%
13,200	furnishings	100%	7 years	200%
12,500	elevator	80%	7 years	150%
165,000	building	100%	35 years	150%

5. After completion of repairs and refurbishing it is anticipated that the two-bedroom apartments will rent for $170 a month and the one-bedrooms $150 per month. The gross rent roll of the building would then be:

$$\$170 \times 12 \times 12 = 24{,}480$$

$$\$150 \times 12 \times 12 = \underline{21{,}600}$$

$$\$46{,}080$$

6. During the first year of changeover in ownership, refurbishing and re-leasing you estimate that each unit will be vacant about two months, that is about one-sixth of the time, (i.e., a vacancy of 17%) so that your average occupancy will be 83% of potential for the first year. Thereafter you anticipate a normal vacancy rate of 5%, or an occupancy of 95%.

7. The current real estate and personal property taxes to be paid in the first year following purchase are estimated to be $9,000. The normal current operating expenses, excluding real estate taxes but including management fees, are determined to be $8,400.

8. The property has been poorly maintained and will require additional expenditures of $2100 in the first year to justify the new rent schedule. This deferred maintenance charge will be added to the normal operating expenses of the first year.

9. The buyer is considering this property because his accountant suggested that with his 30% tax bracket, including state and federal taxes, he should look for some tax shelter to offset some of his other current income. Using the accelerated method of depreciation, this real estate project should satisfy this requirement.

10. The investor feels that while the normal appraisal capitalization rates in his community range between 7% and 10%, proper financing should raise the pre-tax yield on his cash equity to something between 15% and 18%. The accountant suggests that if the investor considers the cash saved on deferred income taxes due to depreciation, the investor should seek at least 18% to 22% on his investment annually on an atter-tax basis.

11. The financing available to the investor would initially combine the assumption of a first mortgage with a balance of $180,000 with 235 months to run and a second mortgage taken back by the seller to be repaid in ten years, in monthly payments. The investor would plan to refinance both loans at the end of the sixth year of ownership when the prepayment penalty would lapse on the first mortgage. The seller feels he should receive $1,000 as points on the second mortgage since that is the discount he will take when he sells the note.

1st Mortgage	180,000 20-year 6-year balloon	7 3/4%	
Private loan	15,000 10-year 6-year balloon	8 1/2%	$1000 discount

12. While the seller will pay for title insurance, a survey, and related items the buyer expects to pay about $800 in professional appraisal and legal fees related to this transaction.

13. Temporary cash deficits at the end of any month can be covered with bank notes at a rate of 8.00% per annum and repaid out of positive cash flows when available.

14. The financial plan is to maintain a highly leveraged position and therefore payoff the original loans at the end of the sixth year by obtaining a new mortgage. To discover some measure of influence of such refinancing on yield to equity and cash flows, the investor will assume that in six years the best loan he could obtain would equal $190,000 for 20-year term at 8% interest. The age of the building at that time would require granting a bonus interest feature equal to 4% of gross rent as of the beginning of seventh year when the loan begins.

15 Discussion with his realtor leads the investor to expect some continued inflation on rents, expenses, and resale prices and serious increases in the real estate taxes of the community. In order to sell the property on a conservative forecast, the realtor suggests that the investor make several assumptions in regard to changes in operating results over the years.

16. First the realtor suggests that the full gross rent will not be realized during the first year as refurbishing and re-leasing at the higher rents will not happen over night. Therefore it is assumed that the effective rent roll in the first year will be 93% of the rent roll that will prevail by the beginning of the second year. In the third year and in the fifth year rents will be modestly increased to 103% and 107% respectively of the basic rent roll forecast.

17. In regard to operating expenses, in the first year they will be unusually heavy and the $2100 for deferred maintenance is 25% of the normal operating budget of $8400. Then the current normal expense factor is indexed at 125%. By the beginning of the third year expenses not including real estate taxes are expected to rise about 2% a year. In the seventh year another round of painting and deferred maintenance work is expected to add $4200 to expenses that year, so that the base expense item of $8400 should be indexed at 150%.

18. In regard to resale price the realtor points out that the investor is concerned with cash net to himself after the costs of sale. If sale costs average about 5% of total resale price, then the conservative and correct assumption is to index the resale price for something less than the property might resell for. His advisor suggested that if for some unknown reason the investor or his estate found it necessary to sell at the end of the first year, liquidating value might be 95% of his actual total investment. Even if the property inflated by 3% a year so that it might sell for 103% of what he had paid for it at the end of the second year, nevertheless, he would realize only 98% of his original investment involved in mortgage debt.

19. Moreover as the property aged a conservative view could not anticipate its selling for much more than perhaps $275,000, i.e., 115% of the original value of the property. Thus a reasonable index of liquidating proceeds upon resale would be about 110% of the original investment. While the inflation might seem modest the investment advisor pointed out that in a highly leveraged position the impact on the equity yield could be very good indeed. In any case, most investors tended to overestimate how much inflation could do for them on a building that might be sixteen years old by the time resale became advisable. (Note: If the building is a good investment under conservative assumptions it is a better investment if more capital gain and income are realized than anticipated. It is less risky to make money with sound buys than with dreams of good sales.)

20. Having discussed all these variables with his advisor it was difficult for the prospective buyer to estimate his potential investment yield, to determine a reasonable offering price, or even compare this opportunity with several others which differed in several significant areas such as available financing and depreciation potentials.

208 - Blank

Comments on James Graaskamp's Paper, "A Commercial Computer Service for Financial Analysis of Rental Income Property Decisions"

by
Jerome Dasso

What a wonderful tool for real estate development and investment decision-making Jim Grasskamp has forged. For the most part I can only say good things about his model and his work.

The flexibility in selection and manipulation of variables provided by his model amazes me. Income can be erratic, taxes and operating expenses can vary, and several different financing arrangements can be included, all at the same time. In addition, the information can easily be entered into the computer by way of carbon copies. Besides all this, the analyst is able to exercise his own judgment as to how the variables are likely to change. All of this must certainly lead to more knowledgeable decision-making by the real estate investor and the developer.

Only when the model is proposed for use in appraising for market value do I develop reservations about its applicability. The possibility is there; but it seems to me that considerable empirical analysis--for example, analysis regarding investor groups and subgroups and their relative tax rates, regarding rates at which properties actually depreciate in value, regarding rates of return expected by investors and regarding varying expenses of properties--must be completed before the model can be adapted to appraising.

We really don't know much about the types of investors owning various types of properties. We really don't know much about how fast properties of various types depreciate. We really don't know much about the after-tax rate-of-return expected by investors and how it varies through time. We really don't know much about how expenses of properties vary with age. And until we do know how this type of information varies, and know that the market takes these factors into account, we can't simulate the investor's decision-making process well enough to determine market values of various types of properties. At this time it appears that the market-comparison approach still gives the most accurate indication of value for most properties.

Professor Graaskamp's model is not, by itself, likely to overturn tradition completely, for several reasons. Even after general acceptance of EDP models by investors, the market-comparison approach will probably still not be obsolete. Other people, like Dr. Shenkel of the University of Georgia, are working on similar models. Then, too, even several different people using a single model like Professor Graaskamp's will not generate the same trends and expectations for various parameters and will consequently end up with a range of values for a given property, essentially in the same way as investors now demonstrate differences concerning values of properties. With computers, accuracy may be greater and the range narrower, but some dispersion seems still likely to exist. In turn, this means that the market-comparison approach to value will continue to be applicable.

Comments on James A. Graaskamp's Paper, "A Commercial Computer Service for Financial Analysis of Rental Income Property Decisions"

by
Edward E. Laitila

Professor Graaskamp presents a very interesting marriage of the possibilities of computer analysis and financial analysis. The availability of large-scale computers has made possible much more sophisticated analysis of financial decisions, such as incorporation of a fluctuating income stream into the financial analysis. I am sure that Fred Babcock would feel at home during the present discussion since he initially proposed many of the concepts during the 1930s; however, at that time he did not have access to the present generation of computers, nor were adequate data sources available.

Since the Compraisal Model discussed in the paper was developed with the assistance of personnel at Battelle Memorial Institute, I must forego any comment upon the model itself. However, I would like to caution users or potential users that a great variety and complexity of data are necessary to adequately utilize the model. This latter problem, of course, is present when any more complex systems are introduced. In conclusion, the availability of actual operating experience should aid greatly in developing a synthesis of group decision-making in financial investments, and should greatly enhance the academicians' knowledge of this particular area.

Comments on James A. Graaskamp's Paper, "A Commercial Computer Service for Financial Analysis of Rental Income Property Decisions"

by
Carl J. Tschappat

Professor Graaskamp is to be commended for directing his methodology to reflect the motivation and thought patterns of professional investors. He has a strong project that can be understood by the investors who would utilize the service he discusses.

Professor Graaskamp suggests a number of refinements that utilize a computer effectively in the area of valuation theory. His month-by-month discounting is an obvious advantage in working with annuity situations, and he can inject many alternative investment considerations without increasing the investor's or the appraiser's work. An additional advantage arises from the fact that Professor Graaskamp developed this material so that it minimizes confusion about how to feed the information into the system and how to interpret the output. His computer system is well-balanced and is well within the investor's realm of comprehension.

One peculiar problem that appears to arise is that a system of this type will be relied upon by investors. It will tend to create values rather than reflect them. The investor who would pay more, but who cannot get a high enough appraisal to support his desired loan value, will now be offered a technique for evaluating property that considers all elements of his decision-making process. This technique provides appraisers with greater insight, hopefully leading them to values which accurately reflect actual transaction prices. It would be very interesting for the Compraisal Corporation to secure price data from each project they analyze to compare with their investment analysis results.

Professor Graaskamp is very polite to real estate practitioners in not infringing upon matters of "judgment." I think, however, that his hobby is the development of an optimization model which will remove many of the factors that are now reserved for "judgment." I look forward to seeing his future activities and future considerations.