SHORT RUN BREAK-EVEN ANALYSIS FOR REAL ESTATE PROJECTS

The cash-on-cash return ratio is used to analyze the short-term question "What if?".

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Cost-volume-profit analysis for real estate projects is a new application of an old but trustworthy accounting analysis technique. This article describes this technique by citing a congressionally-chartered nonprofit service organization which was going to build an apartment complex specifically designed for veterans with a traumatic spinal cord injury. The model is also applied to for-profit organizations, under the assumption that taxes will be paid, to further demonstrate this method for short run analysis.

Facts Of Project And Analysis

A $1,936,400 loan funded by the U.S. Department of Housing and Urban Development (HUD) will be used to construct and maintain a 24-unit apartment facility. A down payment of $194,500 is planned. The loan is expected to be at 9.25% fixed interest for 40 years. The federal government will subsidize 70% of the annual loan amount.[1] The monthly payment, or debt service, is $15,310. Since 70% of the payment will be subsidized, the organization will be responsible for $4,593 (e.g. $15,310 x .30) per month for debt service.

The analyses contained in this study were based on assumptions relevant at the time of this report. When the complex is actually opened, other costs are likely to be incurred. Since the facility will be designed for physically-handicapped citizens, additional costs peculiar to this project will be necessary (e.g.,transportation, aid and attendance, and recreation).

Management must maintain accurate accounting records. Depreciation was not included in the analysis, since as a not-for-profit organization, there will be no taxable income. The question of depreciation in nonprofit organizations is an issue that continues to draw controversy.[2]

It is wise to establish operational-accountability reporting procedures for this fixed expense. Any excess funds should be transferred to a separate account for future expenditures. These excess funds should be utilized for periodic maintenance, improvements and unexpected costs.

All income/expense data implemented in this report were compiled utilizing 1989 statistics obtained

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from the Institute of Real Estate Management. The data selected was strictly for low rise buildings located in the Los Angeles metropolitan area, and it relates specifically to federally-assisted complexes such as the subject project.[3] To describe the data, the sample size for each income/expense item ranges from zero to seven. Anytime the sample size for a specific operating cost is less than five, the value should be used with caution.

The costs are estimated based on the average apartment unit being 675 square feet for a total of 16,200 square feet of rentable space. The common area was 3,800 square feet and the total complex land area is 20,000 square feet. In order to calculate expenses from the income/expense analysis, the cost per square foot values were totaled for each income and expense item which were then computed to a per/apartment unit basis.

To determine the effect of setting an appropriate rental rate to apply, the technique of break-even analysis was used based on two possible competitive rental rates of $400 and $500. In order to fully understand the economic consequences and effects on the project from choice of the rental rate, an income/expense analysis was conducted to provide a comprehensive study of the potential risks involved in the "investment capital" for this project over the life of the investment.

Breakeven Capital Budget Analysis

Rental property normally does not incur variable costs.[4] Whether the complex is fully utilized or not, the cost of operating real estate does not materially change, except for physical depreciation. As a result, the first step of the study will treat all costs as fixed. Income properties determine the break-even point, or default point, only in terms of the occupancy rate. This rate is calculated by dividing monthly gross possible income into the sum of monthly operating expenses and debt service.[5] Here in Equation 1, this is defined as:

$$R = \frac{e + d}{GPI}$$

where:

R = break-even occupancy rate (%)
e = operating expenses
d = debt service
GPI = gross effective income (after vacancy charge).

Assuming the rental rate is $400 per apartment, the gross effective income is $9,600 ($400 x 24 units). The operating expenses total $4,137 and the debt service is $4,593 (see Table I).

By inserting the values in Equation 1, the breakeven occupancy rate was found to be 90.9%.

$$90.9\% = \frac{\$4{,}137 + \$4{,}593}{\$9{,}600}$$

Therefore, in order for the project to break-even (meaning no profit or loss), 22 units must be occupied. If this level is not achieved, then management must "seek" additional tenants.

TABLE I

Low Rise Buildings—Los Angeles, California
Monthly Median Income and Operating Costs

Income Total	Square Feet	
Rents (24 Units @ $400/Month)		$ 9,600
Other Income (7)	.07	1,100
Gross Potential Income		10,700
Vacancies/Rent Loss (7)	.03	500
Total Collections (7)		10,200
Expenses		
Management Fee (7)		300
Other Administrative (7)		500
Subtotal Administrative (7)		800
Supplies (6)	.04	55
Heating Fuel—CA Only*(1)	.09	30
Electricity—CA Only*(2)	.23	70
Water/Sewer—CA Only*(7)	.10	32
Gas—CA Only*(3)	.02	15
Building Services (6)	.09	120
Other Operating Expenses (2)	.10	135
Subtotal Operating Expenses (7)	1.72	457
Security (1)	.08	110
Grounds Maintenance (7)	.15	200
Maintenance-Repairs (7)	.74	1,000
Painting/Decorating (7)	.11	150
Subtotal Maintenance (7)	1.08	1,460
Other Tax/Fee/Permit (6)	.02	325
Insurance (7)	.17	230
Subtotal Tax & Insurance (7)	.19	555
Recreational/Amenities (13)	.10	135
Other Payroll (4)	.54	730
Total Expenses (7)		$ 4,137
Net Operating Income (7)		$ 6,063

*: California Only—indicates common areas only
(): Figure in parentheses indicates sample size

Source: Income/Expense Analysis: Apartments, 1990

Another concern for management is to generate additional funds from the tenants to cover unexpected costs and keep the project financially sound. Therefore, a nominal profit should be generated. This will modify the original equation by including a profit. The revised equation is:

$$R = \frac{e + d + \pi}{GPI}$$

where:

π = profit.

For instance, if the complex wishes to generate a profit of $1,000 per month, then the occupancy rate must be 100.1%, or more than 24 units.

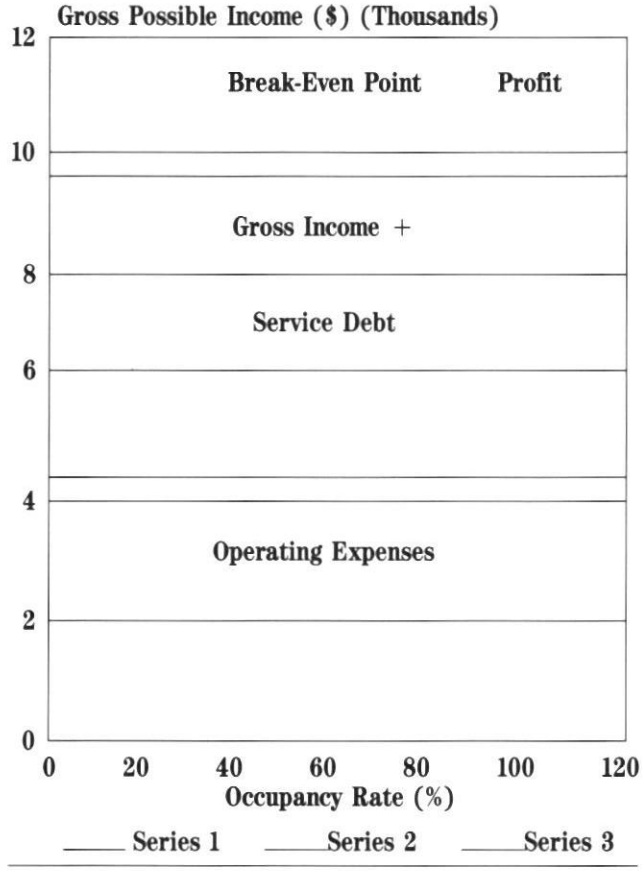
$$100.1\% = \frac{\$4{,}137 + \$4{,}593 + \$1{,}000}{\$9{,}600}$$

This rent price is obviously too low for the project to be profitable. Therefore, a higher price is necessary for the complex to be profitable and survive.

The formula is shown in Table II.

TABLE II

Break-Even Chart



By plotting occupancy rate on the horizontal axis and gross effective income on the vertical, the range of occupancy rates is illustrated to cover operating expenses, debt service and profit.

Variable And Fixed Cost Approach

Discussion so far has treated all costs as fixed. However, while the facility would incur costs in this fashion, another approach is provided here to accommodate the objectives of the apartment complex.

As noted earlier, the purpose of the facility was to help newly-disabled veterans adjust to their injury. One problem is that tenants may not be able to meet their expenses. It may be necessary to establish a policy whereby management pays certain utilities. Considering the occupants, such a policy would enable the veterans to remain focused on recovery and gaining independence.

If this policy was implemented, then a different approach could be taken. While most of the costs remain fixed, some would change to variable costs. According to *Barron's Real Estate Handbook*, some costs can be identified as variable.[6] That is, as the occupancy rate increases, so do certain costs. Fixed costs remain the same regardless of the activity level. The unit rental price will have to be adjusted to cover the additional expenses paid by the organization. The original price will increase by the total unit variable costs not accounted for in the fixed cost method. Here the traditional cost-volume-profit analysis formula can be applied. The basic principle underlying the formula is that the difference between the unit sales price (in this case, the rental rate) and the unit variable costs must cover the total fixed costs.[7] Stated in equation form:

$$R = \frac{a}{p - b}$$

where:

R = occupancy rate (units)
a = fixed costs
p = unit rental price
b = unit variable cost.

Table III separates costs into fixed and variable costs.

TABLE III

Monthly Fixed and Unit Variable Costs

Fixed Costs	Total
Management Fee	$ 300
Other Administrative Expenses	500
Building Services	120
Other Operating Expenses	135
Security	110
Grounds Maintenance	200
Maintenance-Repairs	1,000
Painting/Decorating	150
Other Tax/Fee/Permit	325
Insurance	230
Recreational/Amenities	135
Other Payroll	730
Total	$3,935

Variable Costs	Unit Cost
Electricity	$ 36
Gas	11
Heating	16
Water/Sewer	16
Total	$ 79

Source: Income/Expense Analysis: Apartments, 1990.

By substituting the financial analysis into the third formula, the break-even occupancy rate is 22 units.

$$21.1 \text{ Units} = \frac{\$3{,}935 + \$4{,}953}{\$500 - \$79}$$

The second approach changes the result from a percentage to a unit value. Or, this is the number of units that must be occupied to at least break-even. If more units are rented, then possibly rental rates would be reduced.

A profit can also be incorporated into the formula. Including it with the fixed costs allows the unit contribution margin (unit rent price less unit variable cost) to account for the desired profit. Thus, the following equation is formed:

$$R = \frac{a + \pi}{p - b}$$

where:

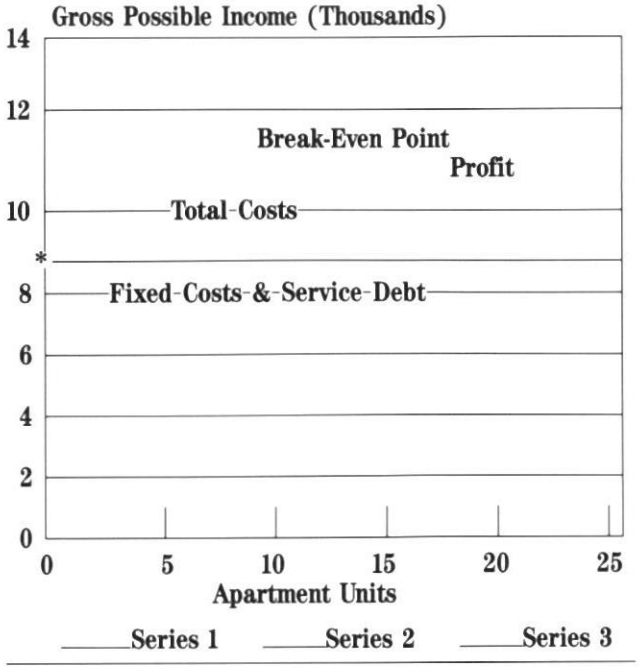
R = occupancy rate
a = fixed costs
π = profit
p = unit rent price
b = unit variable cost.

Again, applying the average costs available from Table III and adding $1,000 per month surplus revenues for contingencies, the desired occupancy from rental activity would be 23 units. A break-even chart, Table IV, is developed from this alternative to visually assess the potential risk of the project.

$$22.6 \text{ Units} = \frac{\$3{,}935 + \$4{,}593 + \$1{,}000}{\$500 - \$79}$$

TABLE IV

Break-Even Chart



While the discussion so far has been limited to assessing the potential risk of the new project, a sensitivity analysis will be applied now which will offer a better judgment on the overall risk factor of the apartment complex.

Cash-On-Cash Return (COC) Analysis

Most owners want to know the rate of return on their equity investment. For-profit organizations return on equity is measured by relating pretax and aftertax cash flows for a particular year to the owner's down payment, commonly known as *initial equity investment*.[8] However, for a nonprofit organization, the aftertax approach is disregarded for the nonprofit organization (e.g. assume a tax rate of 0).

The cash-on-cash return analysis uses the data compiled in the fixed cost approach described earlier. In order to compute the cash-on-cash (COC) return ratio, annual cash flow data and initial equity must be available. The ratio is computed by dividing the initial equity investment into the cash flow value.[9] The equation is:

$$COC = \frac{C}{I}$$

where:

COC = cash-on-cash return
C = cash flow
I = initial equity investment

Table V illustrates the pro forma cash flow statement for this project in Year One.

TABLE V

Pro Forma Cash Flow Statement at 95% Occupancy Rate

	Year One
Gross Possible Income ($400 × 12 × 12)	**$ 115,200**
Vacancies (3%)	**(5,760)**
Total Actual Collections	**109,440**
Operating Expenses	**(49,644)**
Cash Available for Service Debt	**59,796**
Less: Debt Service	**(55,116)**
Cash Flow	**$ 4,680**

The initial equity investment is $194,500. From here, the equation is applied, giving a COC of 2.4%, based on a 95% occupancy rate (23 units).

$$2.4\% = \frac{\$4{,}680}{\$194{,}500}$$

Knowing the cash-on-cash return ratio, sensitivity analysis is applied to determine how far the occupancy rate could drop and still generate a predetermined minimum COC return.[10] The following equation is used to solve for the required occupancy rate to reach the previous specified COC return of 2.4%:

$$COC = \frac{r \times 12 \times u \times R) - e - d}{I}$$

where:

r = monthly rental price
u = totalapartment units
R = occupancy rate (%)
e = operating expenses
d = debt service
I = initial equity investment.

Given the formula to compute the minimum occupancy rate, it could drop to 95% and provide a 2.4% return on the owner's initial equity investment of $194,500. The formula is applied in the following manner:

$$2.4\% = \frac{\$400 \times 12 \times 24 \times R) - \$49{,}644 - \$55{,}116}{\$194{,}500}$$

$$.024 = \frac{\$115{,}200R - \$49{,}644 - \$55{,}116}{\$194{,}500}$$

$$\$4{,}668 = \$115{,}200R - \$104{,}760$$

$$\$109{,}428 = \$115{,}200R$$

$$.95 = R$$

A 2% return on investment is extremely low for this industry, and it could be dangerous, financially speaking.

Let us assume that the approximate real estate industry standard for COC, or the expected COC return, is 9%. The project's cash flow requirement would be $17,505 (.09 × $194,500). If the rent price was increased to $500, the occupancy rate could drop to 85% and still generate a 9% COC return.

$$9\% = \frac{(\$500 \times 12 \times 24 \times R) - \$49{,}644 - \$55{,}116}{\$194{,}500}$$

$$.09 = \frac{(\$144{,}000R) - \$104{,}760}{\$194{,}500}$$

$$\$17{,}505 = (\$144{,}000R) - \$104{,}760$$

$$\$122{,}265 = \$144{,}000R$$

$$.85 = R$$

Table VI illustrates an annual pro forma cash flow statement for a rental price of $500 and an occupancy rate of 85%.

TABLE VI

Pro Forma Cash Flow Statement at 85% Occupancy Rate
Year One

Gross Possible Income at $500/Unit	**$144,000**
Vacancies (15%)	**21,600**
Gross Actual Income	**122,400**
Operating Expenses	**49,644**
Cash Available for Service Debt	**72,756**
Debt Service	**55,116**
Cash Flow	**$ 17,640**

$$\text{Cash-on-Cash Return} = \frac{\$17{,}640}{\$194{,}500}$$

$$COC = .09 = 9\%$$

The end of year cash flow remains at the 9% COC return rate. This indicates that it may be necessary to raise the rental rates (from $400 to $500) to meet the apartment expenses, debt obligations and obtain a desirable rate of return on the investment.

The previous formula for computing occupancy rates for a desired cash-on-cash return ratio can be further improvised to determine how much operating expenses can rise and still deliver a zero or minimum COC return.[11] The equation is revised to:

$$COC = \frac{(r \times 12 \times u \times R) - OE(\text{net } 9\% \text{ Return})9 - d}{I}$$

The symbol OE9 signifies the operating expense level that results in a 9% COC return. Assuming the original vacancy rate of 5% and the rent price of $400, operating expenses would have to decrease to $36,819 to yield a 9% COC.

$$9\% = \frac{(\$400 \times 12 \times 24 \times .95) - OE9 - \$55{,}116}{\$194{,}500}$$

$$.09 = \frac{\$109{,}440 - OE9 - \$55{,}116}{\$194{,}500}$$

$$\$17{,}505 = \$54{,}324 - OE9$$

$$OE9 = \$36{,}819$$

However, if higher rent prices are established, then expenses may be allowed to rise to a higher level before the 9% COC is diminished.

Assume the rent is increased to $500 and the original vacancy rate of 5% is unchanged. Operating expenses could rise to $64,179 and yield a 9% COC. Expenses could also rise to $81,684 before a zero COC would occur. The computations are as follows:

$$9\% = \frac{(\$500 \times 12 \times 24 \times .95) - OE9 - \$55{,}116}{\$194{,}500}$$

$$.09 = \frac{\$136{,}800 - OE9 - \$55{,}116}{\$194{,}500}$$

$$\$17{,}505 = \$81{,}684 - OE9$$

$$OE9 = \$64{,}179$$

Assuming the figures are accurate, it may be necessary to set the rental rate at $500 per unit or higher. That way, the complex has the ability to meet all its expenses and still have surplus revenue for unexpected future expenditures. However, the rental rate must be determined based upon the vacancy rates and the tenant's financial position.

Allowing A Margin Of Safety

The margin of safety measures the amount of cash flow available to cover the debt service.[12] The amount by which the net operating income exceeds debt service gives some indication of how the debt was repaid. The margin of safety formula is:

$$M = ni - d$$

where:

M = margin of safety ($)
ni = net income
d = debt service

The margin of safety for a $400 rental rate is $4,680 ($59,796 − $55,116). For a $500 rental fee and 85% occupancy rate, the margin of safety equals $17,640 ($72,756 − $55,116). The margin of safety is the same as the net cash flow in this example because the organization is a nonprofit entity and will not pay taxes. However, in a for profit organization taxes must be considered as an expense of doing business.

Probability Analysis

In the course of the analysis, we have not considered the uncertainty of the estimates made through the use of probability analysis. However, break-even analysis can easily be modified for the effect of uncertainty and/or risk of the assumptions in the analysis already provided. Assumptions can be made on the probability of occupancy rates at different rent levels either discretely or through the use of a probability distribution. Next, would be to calculate the cash on cash return (COC) as the expected value of the outcome that is most reasonable to occur. Occupancy rates are directly related to rental rates (e.g. the higher the rental rate, the lower the occupancy; the lower the rental rate, the higher the occupancy which, we shall note, can never exceed 100% occupancy). If the property is in an urban market, data can be gathered from neighboring properties or by direct experimentation with incremental changes in the rental rate and associated vacancy rate. Also, it is important to note the relationship of expense ratios to the level of effective gross income which varies with rental rate, occupancy and the tax rate. The relationship is as follows:

Rental Rate	Occupancy	Expenses Ratio
Low	Higher	Depends*
Low	Lower	Higher
Medium	Medium	Medium
High	Higher	Lower
High	Lower	Depends*

* The direction of change depends on the relative incremental changes in occupancy caused by changes in rental rate. If occupancy changes at a greater proportionate rate than the rental rate, then expense ratio would be higher and, conversely, then lower.

The relationship between rental rate, occupancy (e.g. vacancy) and the expense ratio is important and may vary based on economic conditions, changes in demand and supply of renters and uncertain random factors which affect occupancy and which are not attributed to rental rate. The relationship, from a decision theory point of view, would improve the assessment of planning for profitability through analysis of controllable factors such as rental rate.

Conclusion

This simple and short-term risk analysis enabled management to view the project from a managerial accounting perspective. Using the simple break-even analysis, cash-on-cash return ratio and margin of safety formulas that were presented, the illustrated project has a relatively low risk factor based on estimated fair rental rates.

Once the project is operational, the accounting records will provide a better indication of actual cost behavior. Actual costs should also be compared to industry standards. The Income/Expense Analysis published by the Institute of Real Estate Management is one of the most accurate sources for expense analysis. The statistics are expressed in square footage and can be converted to an apartment unit basis. Some costs will remain fixed while others will be variable, and it is the particular property which determines those factors.

For some projects, the use of cost-volume-profit analysis is a meaningful technique in the analysis of the project's feasibility. While decision analysis using simulation techniques, risk analysis and scenario analysis are possible extensions, the analyst must blend the nature of the project to the complexity of the task and then consider the outcomes. Break-even analysis is a useful, yet simple technique to model the relationships of rental rates, vacancies and operating expenses in an easy to understand approach. Understanding these relationships is important because they are the key determinative factors that affect profitability.

REFERENCES

1. Harris, Jack C., Jack P. Friedman, *Barron's Real Estate Handbook*, New York: Barron's, 1988.
2. Henke, Emerson O., *Introduction to Nonprofit Organization Accounting*, Boston: Kent Publishing Company, 1985.
3. Institute of Real Estate Management of the National Association of Realtors, *Income/Expense Analysis: Apartments*, Chicago, 1990.
4. Morse, Wayne J., Harold P. Roth, *Cost Accounting: Processing, Evaluating and Using Cost Data*, Reading, MA: Addison-Wesley Publishing Company, 1986.
5. Santillanes, Edward T., President, California Paralyzed Veterans of America, Long Beach, California. Personal Interview, October 17, 1990.
6. Wiley, Robert J., *Real Estate Accounting and Mathematics Handbook*, New York: Ronald Press, 1986.

NOTES

1. Santillanes, Edward T., President, California Paralyzed Veterans of America. Long Beach, California. Personal Interview. October 17, 1990.
2. Henke, Emerson O., *Introduction to Nonprofit Organization Accounting* (Boston, Kent Publishing Co.), 1985, 536.
3. *Income/Expense Analysis: Apartments*. (Chicago, Institute of Real Estate Management of the National Association of Realtors), 1990, 72.
4. Harris, Jack C., Ph.D., and Jack P. Friedman, Ph.D, *Barron's Real Estate Handbook* (New York: Barron's) 1988, 51.
5. Wiley, Robert J., *Real Estate Accounting and Mathematics Handbook* (New York, Ronald Press) 1986, 70.
6. Harris, 51.
7. Morse, Wayne J., and Harold P. Roth, *Cost Accounting* (Reading, Ma: Addison-Wesley), 291.
8. Wiley, 62.
9. Wiley, 62.
10. Wiley, 70-71.
11. Wiley, 73.
12. Wiley, 65.