A CAPITAL ASSET PRICING APPROACH TO ABANDONMENT DECISIONS IN REAL ESTATE INVESTMENT

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ABSTRACT

Real estate investors, brokers, appraisers, and investment counselors have a need for a practical model to evaluate risk and potential return in real estate investments. The critical elements in such a model are the determination of an appropriate required rate of return, and an indicator of when and if, an investment should be abandoned and the funds reallocated. The capital asset pricing model has been used, but it is not without criticism. The purpose of this paper is to provide a useable model based on the capital asset pricing model, but one that eliminates some of the criticism by integrating the capital budgeting process of abandonment.

The measure of risk and return in real estate investment analysis has been a popular topic in real estate investment, and appraisal journals for years. In addition, it is a daily challenge for real estate investors and managers. As in any capital investment analysis, all serious methods involve some form of discounted cash flow (DCF). The problem with such models is that the analyst must forecast future cash flows, establish the relative volatility of those estimates and adjust for that volatility by requiring an appropriately adjusted rate of return.

Boykin (1990) wrote that appraisers are often confused when confronted with selecting a discount rate because too many definitions exist. In a later article (1991), he suggested that forecasting future cash flows and selecting the appropriate discount rate were so uncertain that more accurate appraisals could be made by evaluating facts based on actual recent property performance. Weinzimmer and Horvath (1990) assumed certainty in forecasting cash flows in real estate investments, and then adjusted those cash flows for volatility by use of the well-known capital asset pricing model (CAPM). They concluded that: (1.) The model recognized all relevant information concerning cash flows; (2.) that it accounted for the time value of money, and (3.) that it measured risk in a manner consistent with intuition. Risk was defined as the chance that other than the expected outcome may take place.

The CAPM has found many uses, from valuing securities to evaluating companies, and according to several texts, capital projects (Copeland and Weston, 1992; Van Horne, 1995). Conversely, at least one popular text teaches that real corporate assets such as plant and equipment cannot be evaluated using the CAPM because of indivisibility, relative large size, limited number of transactions, and the absence of an efficient market for such assets (Gitman, 1994). The use of the model results in an axiomatic and intuitively appealing view that the greater the volatility of actual cash flows the greater the beta coefficient (measure of risk) in the model and, the greater will be the required rate of return. The usual criticisms of application of the CAPM to capital investments are relevant to this study, i.e., CAPM is a one period model, the index or factor used to compute the beta coefficient is critical, individual project risk may not be divisible from company risk, and the future values of the beta coefficient might differ from the present one. Conventional academic wisdom holds that as long as the analyst is aware of the potential pitfalls inherent in the method that it can be used with confidence.

The local versus national (and even international) components of real estate markets are an additional issue in the application of the CAPM. Clearly, return and risk in local markets are, to varying degrees, driven by local economic conditions. This fact however, does not diminish the usefulness of the CAPM for two reasons. First, the CAPM is based on the identification of a so-called macro-factor(s) that drives returns, again to varying degrees on all investible assets, including real estate. Typically, the proxy for the macro factor in the single factor version of the CAPM has been the return on a broad-based security index. The co-movement of the return on an investible asset with the market return proxy, normalized by the variance of the market return, indicates its relative riskiness. That co-movement is measured by the beta coefficient of the investible asset, and hence determines its required rate of return.

The second reason the CAPM in useful in the analysis is that, while land and structures are (nearly) immovable, the resources to finance real estate investment as well as market participants are highly and increasingly mobile and national, if not international, in scope. Efficiency gains associated with the development of secondary mortgage markets, the growing prominence of real estate investment trusts (REITs) and other institutions in the commercial real estate segment, and the widespread secuitization of mortgages have all served to (at least) partially transform what were once decidedly local markets into national ones. Relatedly, the relevant opportunity costs to both institutional and individual investors is based on returns available on an expanding array of investments that cover an increasing variety of locations, industries, sectors, etc. The return on a broad-based market index is an appropriate measure of opportunity cost.

The purpose of this paper is to provide a useable model for evaluating real estate investments. The model is based on the CAPM, but some of the caveats to the use of the model may be eliminated through the use of the capital budgeting procedure of abandonment. The question of when or if, an investment should be abandoned and the funds reallocated has also been of great concern to investors. Such a model will have implications for real estate investors, real estate brokers, professional appraisers, their clients, real estate managers, and investment counselors.[1]

Real estate investment may be viewed as a capital budgeting project. Thus, the net present value (NPV) and internal rate of return (IRR) criteria provide methods to evaluate such investments. Projected cash flows and an appropriate discount rate are needed to implement the model. As in the Weinburger study, cash flows here are assumed with certainty, and the CAPM is used to compute an appropriate discount rate reflecting the riskiness of the investment.

The difference between our analysis and Weinburger's is that by reevaluating the investment at the end of each year of its life some of the one period criticism of the CAPM may be eliminated. In addition, the stability of betas over time is not an issue, since when the reevaluation occurs the discount rate for projected cash inflows may be changed based on recent empirical evidence of changes in the elements of the CAPM. For example, changes in project volatility vis a vis the market, changes in the risk free rate, and the market risk premium will produce a new required rate of return. The change in the discount rate may be small but can have a significant effect on cash flows, depending on the magnitude of the cash flows. Thus, the CAPM becomes a multiperiod tool for evaluating residual cash flows. It is however, still based on a single market index.

Implied in capital budgeting decision is that projects will continue for their estimated lives, since the NPV and IRR are computed over those estimated lives. In practice however, projects are reevaluated on an ongoing basis to determine the remaining value of the project. If and when the NPV of abandoning the project is greater than continuing, the project should be abandoned. Residual cash flows can only be known in the future. Thus, they are uncertain at the time of investment, but as the project life shortens, future cash inflows can be forecasted with greater accuracy. It may be expected that the residual values of machinery and equipment would decrease over time due to obsolescence and other factors. In the case of real estate investments however, residual values may generally be expected to increase over time due to inflation and the growth of property value. Regardless of whether cash flows are expected to increase or decrease, annual reevaluation of every investment should be accomplished.

The NPV and IRR methods use the same discount rate for the entire estimated life of investment projects. In addition to the implication that investment projects continue to the end of their estimated lives, the NPV and IRR methods assume that the marginal cost of capital remains the same throughout the lives of those investments. Investors compute the NPV and IRR on the basis of their marginal cost of capital at the time of investment. It is not reasonable to assume that the elements in the CAPM: the risk-free rate, the market rate of return, and the beta coefficient will remain the same throughout the lives of projects as assumed in the Weinzimmer and Horvath study, and is taught in introductory undergraduate finance courses. The accuracy and usefulness of reevaluations can be improved if the required rate of return is recomputed, using the latest data, at the time of each reevaluation. In this way the CAPM becomes a de facto multiperiod model, but more importantly it provides the investor with a current required rate of return based on that more recent data. Moreover, the remaining cash flows on the project are reforecasted at the time of the reevaluation. Each year the accuracy of those forecasts should improve because of the shorter time horizon remaining, and because of the accumulated information and insights from the prior year(s). Thus, at the beginning of each year, new NPV's are calculated for the remainder of the project using new forecasted cash flows and a new discount rate. The recomputation of the CAPM at the beginning of each period would not be unlike the idea of computing adjusted internal rates of return. It is assumed in the IRR method that all intermediate cash flows are reinvested immediately at the IRR. The adjusted method requires the investor to wait until the reinvestment rate is known, and then compute an adjusted IRR. This is done each time a cash flow occurs, and the real project IRR is not known until the last time period.

An example follows that illustrates the differences in valuation that may occur using the same set of data with a discount rate derived by the conventional (Weinzimmer and Horvath) method, and the discount rates derived by the recomputed CAPM models we recommend. Table 1 presents hypothetical after tax cash flows on a five-year nonbinding lease:

Table 1
After Tax Cash Flows On A Five Year Nonbinding Lease

Year	Cash Flows	Discount Rate	Present Value	Abandonment Value	Residual Present Value
0	-$225,000		-$225,000	-$225,000	
1	62,500	.10	56,818	170,000	180,105
2	62,500	.10	51,653	125,000	128,453
3	62,500	.10	46,957	75,000	81,496
4	62,500	.10	42,688	30,000	38,811
5	62,500	.10	38,808	0	0

Column one depicts the time frame for the project, while column two shows the project's hypothetical cash flows, which are assumed to be known with certainty. An initial expenditure of \$225,000 is required at time period zero, to be followed by annual after tax cash inflows of \$62,500 in years one through five. Column three presents the discount rate for the project's cash flows as derived below from the CAPM. Initially, we assume this discount rate to be ten percent. Column four shows the present value of each annual cash flow. Hypothetical abandonment values at the end of each year are illustrated in column five. In the case of owned property these values can be thought of as representing the net cash flows from the sale of the asset. In contrast, if the project is one with a nonbinding lease, the abandonment value can be considered the exercise or strike price on a put option on the project. That is, at the end of each year the holder of the lease has the option of selling it at the abandonment value, which would be determined by market conditions. Column six depicts the residual present values for the project. Residual present values indicate how much of the total present value of the cash inflows are remaining at the end of each year of the project's life. The sum of the present values of each cash inflow is approximately \$236,924 from column four. At the end of the project's first year \$56,818 of this cash flow in present value terms would have been obtained, leaving \$180,106 of remaining or residual present value. By subtracting the cumulative present value at the end of each year from the total present value of the cash inflows, the residual present value is determined.

The initial discount rate of 10% was derived by use of the CAPM and used for the entire five year period:

$$k = R_f + B(R_m - R_f)$$
$$.06 + 1.00(.10-.06) = .10$$

Where:

k is the required discount rate on lease investments.

R_f is the Risk-Free rate on one year U.S. Treasury Bills, assumed to be 6.00%.

B is the firm's beta coefficient on similar investments, assumed to be 1.00. That is, our

project is assumed to be no more or less risky than the market as a whole.

Rm is the return on an index of the market portfolio.

In the example in Table 1 the abandonment value never exceeds the residual present value. Thus, the investment should be continued for its estimated life.

Consider, however, the outcome if the discount rate is changed each year to reflect the following assumed changes in certain micro and macro variables. Four events, labeled A – D, are considered:

A. At the beginning of the second year greater volatility in projects is observed resulting in an increase in the beta coefficient from 1.00 to 1.25. The appropriate discount rate at that time is:
   $.06 + 1.25\ (.10 - .06) = .11$
B. At the end of the second year the market index increases from .10 to .108 as a result of a strong bull market. The appropriate discount rate at that time is:
   $.06 + 1.25\ (.108 - .06) = .12$
C. At the end of the third year corrections in the market have occurred; the market returns are again .10, and the appropriate discount rate is thus, .11.
D. At the end of the fourth year greater volatility again occurs from the implementation of new projects perceived to have more risk. The new beta coefficient is 1.38, and the new discount rate should be: $.06 + 1.38(.10 - .06) = .115$

The use of re-estimated discount rates results in the following array of discount rates. They are presented in Table 2. The example in Table 1 is the baseline, and the four events noted above are labeled vertically A through D. Reading across the table, one can see the discount rates used in the analysis for each year and scenario.

Table 2
Re-estimated Discount Rates Across The Five Year Investment Horizon

	Year				
Event	1	2	3	4	5
Baseline	.10	.10	.10	.10	.10
A	.10	.11	.11	.11	.11
B	.10	.11	.12	.12	.12
C	.10	.11	.12	.11	.11
D	.10	.11	.12	.11	.115

As our purpose is to focus on the revision of the discount rate for the abandonment decision, the after-tax cash flows are assumed constant. Ideally, adjustments to the discount rate also capture the effects of events on the volatility of the cash flows. This however, is not always possible. Thus, in a more complete setting the cash flows might also be adjusted as we mentioned earlier. While the hypothetical events noted above do not alter the project's cash flows or abandonment values, they do lead to changes in the discount rate, residual net present value, and hence, the abandonment decision. Table 3 illustrates the residual net present values associated with each of the four events A through D, as well as the year, cash flows, and abandonment value.

Table 3
Re-estimated After Tax Cash Flows On A Five Year Nonbinding Lease

Year	Cash Flow	Residual Abandonment Value	Residual Present Value A	Residual Present Value B	Residual Present Value C	PresentValue D
0	-$225,000	$225,000				
1	62,500	185,000	$193,902	$206,421	$219,142	$224,470
2	62,500	145,000	137,596	150,115	162,836	168,164
3	62,500	100,000	91,897	94,311	107,032	112,360
4	62,500	60,000	50,726	44,486	50,726	56,054
5	62,500	0	0	0	0	0

In this illustration the abandonment value exceeds the residual present value for event A at the end of the second year; for event B at the end of the third year, and for events C and D at the end of the fourth year. The importance of the process was first described by Robichek and Van Horne (1969). They proposed that the project be abandoned in the first year that the abandonment value exceeds the NPV of the remaining cash flows of continued operations.

In a comment on the Robichek and Van Horne article, Dyl and Long (1969) suggested that there might be a greater advantage than abandoning the project by considering expected cash flows subsequent to abandonment. However, future cash flows and abandonment values are not known with certainty. The practical procedure suggested by Van Horne and Robichek does not require a forecast of future cash flows, abandonment values, and discount rates. Thus, in the event A case, the project should be abandoned at the end of the second year.

CONCLUSIONS

The purpose of this paper was to provide a usable model for evaluating real estate investments. If real estate investors, brokers, appraisers, and investment counselors are, as Boykin suggested, concerned with determining the proper discount rate for investments, the annually adjusted CAPM, integrated with the abandonment procedure used in capital budgeting is a logical model. It has the advantage of using the current required rate of return, and more accurate residual cash flow forecasts to evaluate the residual present value in a project annually, and compare that value with the abandonment value. The model is offered as a logical extension of existing literature.

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ENDNOTES

1. It is recognized, as pointed out by the manuscript reviewer, that not all brokers, appraisers, and real estate investors possess the mathematical sophistication to use models, such as the one in this study, for abandonment and other financial decisions. We note however that in all levels of management, more sophisticated decisions are being made than once were. In most instances this is done by means of simple computer programs that require few inputs, such as a new discount rate, or cash flow adjustment. More of these programs become available every day, and more are purchased and put to use in all businesses as the needs become clear. Thus, new models have the potential to become useful immediately as technological advances continue.