Applying the CAPM to Derive Property Capitalization Rates

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The capital asset pricing model ("CAPM") is a generally accepted cost of equity capital measurement model. The CAPM is often applied to estimate the present value discount rate (or yield capitalization rate) in an income approach valuation of industrial or commercial property. The CAPM was developed to estimate the required rate of return on an investment in perfectly liquid equity securities. Therefore, it may not be appropriate to rely on the CAPM, without modification, to estimate the discount rate applicable to the appraisal of industrial or commercial property. This discussion focuses on certain conceptual limitations and application considerations in using the CAPM to value property for property tax purposes. This discussion also presents several alternative cost of equity capital measurement models.

Introduction

For property tax purposes, public utility, transportation, communication, energy, and other similar utility-type properties are sometimes assessed by applying the unit principle of property valuation. In such unit principle valuations, the taxing authority often applies an income approach valuation method—either the direct capitalization method or the yield capitalization method—to collectively value the taxpayer's operating property.

In any unit principle valuation that relies on an income approach valuation method, the estimated cost of equity capital is a significant component of the yield capitalization rate calculation.

The CAPM is a cost of equity model. The CAPM was developed for, and is applied by, money managers, investment managers, and fund managers who invest in publicly traded securities as part of a well-diversified portfolio of publicly traded securities. The CAPM is well suited to estimate the required return on investment for that valuation purpose.

For property tax purposes, however, analysts estimate the cost of equity capital for the valuation of (non-publicly-traded and generally illiquid) industrial or commercial property—and not the valuation of equity securities. Accordingly, the CAPM has to be modified to achieve this fundamentally different valuation purpose.

This discussion focuses on certain conceptual limitations and application considerations related to the use of CAPM in the valuation of industrial or commercial property. This discussion also presents a brief discussion of several alternative cost of equity capital measurement models.

Introduction to the CAPM

The CAPM is a generally accepted model for estimating the cost of equity capital. The simplicity of the model and the relative availability of model inputs make the CAPM an attractive tool for estimating the cost of equity capital. Many corporate finance and

business valuation textbooks extensively discuss aspects of the CAPM.[1]

The focus of this discussion is to understand the fundamental concepts and underlying assumptions of the CAPM and its application in the valuation of industrial or commercial property.

The development of the CAPM was a significant theoretical breakthrough in the 1960s. The CAPM is considered a very important univariate model to estimate the cost of equity capital.

The CAPM was introduced by Jack Treynor, William Sharpe, John Lintner, and Jan Mossin, independently, building on the earlier work of Harry Markowitz related to investment diversification and modern portfolio theory. In 1990, Sharpe, Markowitz, and Merton Miller received the Nobel Memorial Prize in Economics for their contribution to the field of financial economics related to the development of the CAPM.

The CAPM was (and still is) considered an important model to estimate the required rate of return on a short-term investment in perfectly liquid equity securities as part of a diversified portfolio of liquid investment securities. The CAPM is one model (and, certainly, it is a widely accepted model) for quantifying the cost of equity capital component of an income capitalization rate.[2]

The CAPM formula is presented as follows:

$$k_e = R_f + B_j(R_m - R_f)$$

where:

k_e = the cost of equity capital

R_f = the risk-free rate of return

R_m = the long-term equity risk premium (the expected rate of return for a broad-based equity market portfolio)

B_j = the beta coefficient of the subject publicly traded equity security "j"

The CAPM formula can be separated into three main components: (1) the risk-free rate, (2) the long-term equity or "market-derived equity" risk premium, and (3) the selected beta coefficient.

The first CAPM formula component, the risk-free rate, reflects the minimum return that an investor can expect to receive from his or her investment. This rate reflects the time value of money. There is general consensus among analysts as to the appropriate risk-free rate of return to apply in the CAPM. Analysts commonly select the market yield on the 20-year U.S. Treasury bond as the risk-free rate of return component.

The second CAPM component, the market-derived equity risk premium, is the market return that an investor can expect over the risk-free rate by investing in the market portfolio. The selected long-term equity risk premium ("ERP") is not as consistently applied—as compared to the risk-free rate—among analysts.

Certain analysts advocate the use of a more normalized equity risk premium, of say 5 percent. Other analysts elect to use historical ERP estimates, of around 6 percent, as published by Duff & Phelps on its Cost of Capital Navigator database website.[3]

The third CAPM component, the beta coefficient, measures the subject security's sensitivity to changes in the market portfolio. Beta, in general terms, is used to incorporate market risk (general equity risk and industry risk) in an equity cost of capital estimate.

The analyst should keep in mind that the selected beta should fairly represent the systematic risk and stock price variability of the subject company as compared to the broad equity market over a relevant time period. The analyst should keep in mind that the beta estimate is the mean of a statistical distribution that results from a regression analysis.

Fundamental Assumptions of the CAPM

It is often necessary to make foundational assumptions in order for any theoretical model to work. However, it is also important to understand these fundamental premises in order to determine if that model is appropriate for the issue at hand.

Basic CAPM theory indicates that the level of nonsystematic risk of a subject security is not relevant to diversified investors in publicly traded equity securities. That is, because the nonsystematic component of investment risk can be diversified away in a well-managed diversified portfolio of liquid investment securities, investors do not incorporate this risk expectation in their expected rate of return decisions.

In the theoretical state of market equilibrium, a liquid equity security will be expected to provide a rate of return commensurate with its level of systematic risk. This component of total investment risk is the risk that cannot be avoided through efficient portfolio diversification. The greater the level of unavoidable systematic risk of a particular investment security, the greater the rate of return that an investor will expect from that investment security.

"If investment-specific risk cannot be diversified away, then certain conceptual and practical implications of the CAPM do not hold up under analytical scrutiny."

The relationship between the expected rate of return and the level of unavoidable systematic risk is the conceptual foundation of the CAPM. The CAPM assumes that, in a perfect market where there are no restrictions on investments (i.e., no income taxes, no transaction costs, etc.), all investors will have the same information, at the same time, and will invest in a similar manner. However, in the real world, this is far from the truth.

The application of the CAPM implicitly encompasses the acceptance of the following assumptions:

1. Capital markets are highly efficient.
2. Investors operate in a perfect market where information is freely and instantly available to all investors.
3. Investors are well informed and risk averse.
4. Investors evaluate portfolios based on the expected return and standard deviation of the portfolios over a one-period horizon.
5. Transaction costs are zero and there are no income taxes or transfer taxes.
6. There are negligible restrictions on investment.
7. No investor is large enough to affect the market price of the subject stock.

The CAPM is also based on the assumption that investors are in general agreement about the likely performance and level of risk of individual equity securities. In addition, the CAPM is based on the assumption that investors' return expectations are based on the same expected investment holding period of, say, one year.

Under this set of hypothetical conditions, investors perceive the opportunity set of risky equity securities in the same way. And, investors will devise similar (and similarly diversified) investment portfolios.

The more the actual property valuation assignment differs from this set of hypothetical assumptions, the more important are the individual property-specific, or nonsystematic, risks of an investment in the valuation subject.

The analyst should remember that the CAPM assumes that investment-specific risk can be diversified away. If investment-specific risk cannot be diversified away, then certain conceptual and practical implications of the CAPM do not hold up under analytical scrutiny.

Limitations of Applying the CAPM in Property Valuations

CAPM was created to estimate returns for publicly traded securities. However, an investment in publicly traded securities is fundamentally different from an investment in industrial or commercial property.

The CAPM was developed to estimate the fair rate of return on a relatively short-term investment in publicly traded equity securities. The CAPM was not developed to estimate the appropriate capitalization rate on a long-term investment in the illiquid operating property of an individual taxpayer.

These different categories of investment are subject to different degrees of risk. Therefore, these different investment categories have different expected rates of investment return.

For example, cash or cash equivalents—such as marketable securities—change hands regularly in well-established capital markets. The public capital markets are generally recognized as being highly efficient. Thus, this investment category has rates of return that are closely followed by investors.

On the other hand, both tangible property (such as real estate and tangible personal property) and intangible personal property are fundamentally different investment categories than marketable securities.

Exhibit 1 illustrates the fundamental structural differences between:

1. the market for publicly traded securities exchange transactions and
2. the market for industrial or commercial property exchange transactions.

These fundamental structural differences in marketplace mechanics—particularly with regard to marketplace efficiency—explain why the CAPM is appropriate for estimating an investor's required rate of return on investment in publicly traded securities—but less suitable for estimating an investor's required rate of return on investment in industrial or commercial property.

Exhibit 1 provides a few of the reasons why efficient and organized publicly traded securities markets are fundamentally different from inefficient and unorganized industrial or commercial property markets.

Exhibit 1
Structural Differences between Public Securities Markets and Industrial or Commercial Property Markets

	Exchange Market Attributes	Publicly Traded Securities Transaction Market	Industrial or Commercial Operating Property Transaction Market
1.	Property types that are competing for investment funds	Homogeneous	Heterogeneous
2.	Number of buyers and sellers	Many	Few buyers and sellers
3.	Transaction prices	Low	Unpredictable and relatively high
4.	Cost of individual transactions (including brokerage, information, title transfer, and other fees)	Low	High
5.	Government restrictions on secondary market participants	Few	Regulations at all levels
6.	Supply of and demand for the subject properties	Fairly balanced	Volatile demand
7.	Type of buyers and sellers	Genuinely informed	Potentially uninformed, lacking transaction experience
8.	Type of disclosure of financial and operational information	Public	Restricted disclosure (if any) or limited financial or operational information
9.	Type of market mechanism to process the transaction	Relatively seamless	Small, fragmented, overlapping processing
10.	Liquidity of the subject properties	Liquid	Illiquid

Beta Measurement Issues

Another fundamental application consideration related to the use of CAPM for unit valuation purposes is due to the measurement of the beta coefficient component of the CAPM. That is, there is no single recommended method for measuring the beta coefficient component of the CAPM.

There are several platform databases that can be used to estimate the beta coefficients of publicly traded equity securities. For example, the Standard & Poor's Capital IQ database or the Bloomberg database can be used to estimate beta coefficients. However, in order to apply a beta coefficient estimate to calculate the cost of equity capital, an analyst should consider the following issues.

First, the analyst may consider whether to use guideline companies or guideline indices to estimate the beta coefficient. Whether a guideline index or a group of selected guideline companies is relied on to estimate a beta, the analyst should consider the following questions.

- How do the selected guideline companies compare to the subject taxpayer and its assets?
- How frequently do the selected guideline companies trade in equity markets?
- Is a selected guideline company a pure play business, or if it is not a pure play business, is it reasonably similar to the subject taxpayer unit?

Second, an analyst may decide which beta estimate lookback period is appropriate. Is a five-year monthly beta estimate an appropriate lookback period. Perhaps a two-year daily beta estimate is a more appropriate lookback period. What types of trading frequency should be considered—daily, weekly, or monthly trading frequency? To make this determination, the analyst may decide to rely on statistical analysis to aid in decision making. Perhaps the analyst may decide to calculate the beta coefficients and then compare the beta estimates of various groups—that is, groups that are separated by (1) lookback periods and (2) trading frequency.[4]

In this case, the analyst may decide that the selection of the lookback period and the trading frequency is best indicated by the group with the lowest coefficient of variation indication.

Third, an analyst may decide the appropriate equity market index to use in the beta-related regression. For example, some analysts may use the total return Standard & Poor's 500 market index as the benchmark market index to estimate beta.

And, other analysts may decide to use the New York Stock Exchange index as the benchmark index.

Finally, the analyst may consider unlevering and relevering the market-derived guideline publicly traded company beta estimate to correspond with the taxpayer's capital structure. The reason for unlevering and then relevering beta is to extract out security-specific financial leverage risk that is an embedded component of guideline company betas.

The guideline company capital structures may be dissimilar to the subject taxpayer's capital structure. Analysts often use the Hamada formula for unlevering and relevering equity beta estimates. However, there are several other unlevering and relevering formulas analysts may consider such as the Harris-Pringle formula and the Fernandez formula.

Consideration of Property Not Yet in Place as of the Valuation Date

There is another application issue related to using the CAPM to estimate the cost of equity capital for unit principle property valuations. That issue involves the consideration of property not yet in place as of the valuation date.

Since the CAPM implicitly incorporates investor's expectations of security appreciation—that is, investment growth—it imparts a value to the expected return from future investments in both future tangible assets and future intangible assets. These future assets represent property not yet in existence as of the valuation date.

Because the empirical data used in the CAPM is market-derived, it indicates a consensus of investor expectations regarding the prospective performance of either (1) the subject investment or (2) the guideline investments. If the subject taxpayer is successful, then these investor expectations will include the present value of future returns for two types of taxpayer assets that may not be the subject of the unit valuation: (1) intangible value in the nature of goodwill and (2) expected future expansionary capital expenditures.

Goodwill is often considered to be the present value of future income from future tangible assets and intangible assets. Goodwill may represent the present value of future new customers. Future customers are unidentified customers that the taxpayer may serve at some point in the future (as opposed to expected recurring income from identifiable repeat customers).

And, while investor expectations of future income from new customers is an important component of a going-concern business enterprise, the associated goodwill represents the intangible value of future customer relationships that do not yet exist (and are not subject to specific identification) as of the valuation date.

In their public security pricing decisions, investors may also impart a value to the positive net present value of the future capital expenditures of the taxpayer. A positive net present value occurs when the taxpayer expects to earn a rate of return on its investment greater than its cost of capital. The investor expectations of future capital expenditures may, themselves, have two components: (1) future merger and acquisition activity of the taxpayer and (2) future investments in plant, property, and equipment at the taxpayer.

It is reasonable for investors to expect that the competent management of the taxpayer company will continue to make new net investments (i.e., expenditures greater than that required to simply replace worn out assets) in order to expand the taxpayer business—for example, in new locations and with new product lines and services.

Investor expectations regarding future investments in capital expenditures are perfectly reasonable. However, unit principle valuations that incorporate these expectations (through the CAPM or other analytical means) will include the value of taxpayer property that does not yet exist as of the valuation date.

Difficulty in Adjusting the CAPM for Income Measures Other Than Net Cash Flow

The economic benefit (or income) measurement associated with the CAPM is net cash flow available to equity investors (i.e., net cash flow available for distribution to stockholders). It is difficult for the analyst to adjust the CAPM in order to estimate the required rates of return commensurate with measures of income other than net cash flow available to equity investors.

For example, the CAPM cannot be easily adjusted to accommodate pretax net income, net operating income, operating cash flow, or measures of income—other than net cash flow available to equity investors.

The Modified Capital Asset Pricing Model

Because the CAPM was not developed to estimate the capitalization rate on a long-term investment in industrial or commercial property, a useful cost of

equity measurement model is the modified capital asset pricing model ("MCAPM").

The MCAPM is a generally accepted method used in the valuation profession to estimate the cost of equity capital.[5] The MCAPM estimates the cost of equity capital based on risk and expected return metrics that are more applicable to operating property.

The MCAPM formula is presented as follows:[6]

$$E(R_i) = Rf + B \times (RP_m) + RP_s \pm RP_c$$

where:

$E(R_i)$ = Expected rate of return on security i

Rf = Rate of return available on a risk-free security as of the valuation date

B = Beta

RP_m = Market ERP

RP_s = Risk premium for small size

RP_c = Risk premium attributable to other company risk factors

The MCAPM cost of equity may be estimated from the CAPM cost of equity by adding or subtracting increments of risk to reflect the risk of an investment in the taxpayer's operating property.

Other Cost of Equity Capital Models

Several alternatives to the CAPM are available for estimating the cost of equity capital applicable for unit principle valuation purposes. These alternative generally accepted cost of equity capital estimation models include the following:

- The build-up model—the risk-free rate of return + a general equity risk premium + an industry risk premium adjustment + a size risk premium + a property-specific risk premium
- The cost of debt plus equity risk premium model—the cost of debt for the subject taxpayer + a market-derived equity risk premium
- The Duff & Phelps LLC Risk Premium Report Model
- The DCF model—the sum of the dividend yield + the capital gain yield for the selected guideline companies
- The arbitrage pricing theory method
- The Fama-French three factor model

All of these alternative cost of equity capital models, however, also have their own analytical strengths and weaknesses. Furthermore, none of these alternative cost of equity capital estimation models "corrects" all the analytical problems related to the use of the CAPM to value industrial or commercial property.

Valuation Methods That Mitigate the CAPM Analytical Issues

The conceptual and practical issues with the use of the CAPM may be increased when the yield capitalization method is used in the valuation of operating property. The conceptual and practical issues with the use of the CAPM are decreased when the following valuation methods are used in the unit principle valuation of operating property:

1. A cost approach valuation method, including the aggregate valuation of all of the industrial or commercial property.
2. A yield capitalization valuation method that assumes no future growth in the unit income. The implicit assumption in the use of this yield valuation method is either:
   a. capital expenditures equal annual depreciation expense (so that the taxpayer's operating property is maintained and replaced but not increased in the valuation model) or
   b. the expected rate of return on the incremental new capital expenditures equals the taxpayer's weighted average cost of capital (and, therefore, these incremental capital expenditures do not increase the unit value).
3. A direct capitalization method that assumes no future growth in the unit income. The implicit assumption in the use of this direct capitalization method is that the annual depreciation expense exactly equals the prospective capital expenditures. Based on this assumption, the valuation model will have a stable asset base.

   The following factors should be considered in the use of any direct capitalization method:

   a. The naïve use of selected guideline publicly traded company price to earnings ("P/E") pricing multiples is typically inappropriate in the estimation of a direct capitalization rate for unit

principle valuation analyses. This is because guideline company P/E pricing multiples consider both current income yield and the yield from expected capital appreciation.

The naïve use of selected guideline company P/E pricing multiples will typically include the value of operating property not yet in existence as of the valuation date.

b. Public security investors demand a return of and a return on their equity investments. Investors sell their equity investments after a defined investment holding period, and they expect to enjoy appreciation in the value of their equity investments. This appreciation typically does not occur with regard to the value of industrial or commercial property.

c. The expected rates of return on operating property should be adjusted if these rates of return are derived from the expected rates of return on publicly traded equity securities.

Summary and Conclusion

In a valuation analysis that relies on an income approach method, the estimated cost of equity capital is a significant component. This significant component has a direct relationship to the capitalization rate.

The CAPM is a commonly used model for estimating the cost of equity capital. Analysts sometimes apply the CAPM to estimate the capitalization rate (or present value discount rate) to use in an income approach valuation of industrial or commercial property.

The CAPM was developed for, and is used by, money managers, investment managers, and fund managers who invest in publicly traded securities as part of a well-diversified portfolio of publicly traded securities. The CAPM is well-suited to estimate the required return on investment for this valuation purpose.

For property tax purposes, however, analysts need to estimate the cost of equity capital for the purpose of valuing illiquid industrial or commercial property.

Accordingly, the CAPM has to be modified to achieve this fundamentally different valuation purpose. Absent this modification, it may not be appropriate to rely on the CAPM to estimate the capitalization rate applicable to the valuation of industrial or commercial property.

Notes:

1. References to the CAPM can be found in the following financial treatises: Harry Markowitz, "Portfolio Selection," *The Journal of Finance* 7, no. 1 (March 1952): 77–91; William F. Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk," *The Journal of Finance* 19, no. 3 (September 1964): 425–442; Jan Mossin, "Equilibrium in a Capital Asset Market," *Econometrica* 34, no. 4 (October 1966): 768–783; John Lintner, "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets," *The Review of Economics and Statistics* 47, no. 1 (February 1965): 13–37; and numerous other financial and investment textbooks.
2. It is important to note that there are other cost of equity models sometimes used in practice, including (a) the build-up model, (b) Duff & Phelps LLC Risk Premium Report Model, (c) dividend yield plus capital gain yield model, (d) arbitrage pricing theory model, and (e) Fama-French three-factor model.
3. The Cost of Capital Navigator website database has replaced the *Valuation Handbook* that was published by Duff & Phelps LLC.
4. The coefficient of variation is a measure of dispersion or variability of data relative to the mean. Thus, the lower the coefficient of variation, the better (or, the relatively less variable) is the estimate of beta. See, David R. Anderson, Dennis J. Sweeney, and Thomas A. Williams, *The Essentials of Statistics for Business and Economics*, 4th ed. (Mason, OH: South-Western, 2006), 91.
5. Shannon P. Pratt and Roger J. Grabowski, *Cost of Capital: Applications and Examples*, 5th edition, (Hoboken, New Jersey: John Wiley & Sons, 2014), 197.
6. Ibid., 197. For further discussion of the MCAPM, see for example, the following valuation texts: (1) *Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets*, 3rd edition (Washington, D.C.: American Society of Appraisers, 2011), 131; (2) Gary R. Trugman, *Understanding Business Valuation*, 5th edition (New York: American Institute of Certified Public Accountants, 2017), 551; (3) James R. Hitchner, *Financial Valuation*, 4th edition (Hoboken, New Jersey: John Wiley & Sons, 2017), 194–195; and (4) Robert F. Reilly, "Quantifying Company-Specific Risk Premium in the Cost of Equity Capital for Property Tax Valuations," *Journal of Multistate Taxation and Incentives* (July 2007): 31–34.

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