Expected return, stock valuation, and the capital structure: comparing the Gordon model and the capital asset pricing model

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Keywords
Capital asset pricing model, capital structure, expected return, Gordon Model, stock valuation, weighted average cost of capital

Abstract

Expected returns, stock valuation methods, and capital structure management have a major influence on the effectiveness of the company's financial strategy. This study analyzes a sample portfolio to consider how the expected rate of return is assigned, how common stock is valued, and how equity and debt are targeted in the firm's capital structure. The validity of an algorithm that values common stock depends on accurate assessment of the expected return. Company policy for acquiring capital and paying dividends could alter the expected return. The capital asset pricing model (CAPM) helps judge the role of certain factors in determining expected return and stock value. In the sample portfolio, we shall work with one valuation method, the Gordon Model of constant growth, and compare its expected returns with the CAPM. The CAPM considers the risk-free rate, the market risk premium, and a systematic risk index, while the Gordon Model assigns value of stocks based on dividend growth. We examine dividend payout policy to find that it influences differences between the Gordon Model and the CAPM's expected returns. Both methods help determine how the cost of equity may be applied to the firm's capital structure, usually in the weighted average cost of capital (WACC). Tax factors in the WACC influence the proportions of debt and equity in the capital structure. The tax benefit of debt makes debt the least expensive source of capital funding, but its use should be limited due to the higher risk of debt. Manipulations within the WACC have an influence on the mix of funding sources in the capital structure, the cost of both debt and equity, and the stock price. Therefore, the discussion will further consider the topic of capital structure optimization. This previously unpublished paper is the original work of the author.

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First submission received: 26th November 2022
Revised submission received: 4th January 2023
Accepted: 15th March 2023

I. Introduction

Discounted cash flow (DCF) establishes a strong methodology for valuation of financial projects, financial instruments such as stocks and bonds, and even the valuation of a business entity such as a corporation. In this case study, we may assume common-stock value to be the present value of expected future cash flows. The DCF computations assume value from a discount rate, the expected return, which is derived from historical data. Other methods exist but will not be discussed here, except for acknowledgement that they forecast ex ante, not from history.

Although the stock's market price may constantly change, the analyst or investor assumes the present value as its worth, such that investors may even attempt to gauge whether the stock is undervalued or overvalued at the market price. The Gordon Model uses the DCF approach to compute the value of the stock and focuses on future cash flows from dividends. Dividend relevance theory states that a direct relationship exists between the firm's dividend policy and its stock price (Lintner, 1962, pp. 252-254).

In contrast, the capital asset pricing model (CAPM) focuses on expected return from the perspective of risk. In particular, CAPM solves an equation for the expected return based on the risk-free rate, the risk index of the asset or the portfolio, and the market-risk premium. The expected return expresses a percentage as the rate by which the stock or portfolio appreciates in value, usually per annum. Company managers use the weighted average cost of capital (WACC) to determine the overall discount rate for acquiring capital to fund long-term projects. The WACC will be further discussed in this paper as the output for the targeted proportions of equity and debt. The mix of funding sources is called the capital structure of the firm.

The core problem addressed in this study, assignment of expected return, must weigh anticipated returns against the risk of the investment. Risk may be classified as two basic types:

- systematic risk (also called market or non-diversifiable risk).
- unsystematic risk (also called company-specific or diversifiable risk).

To a large extent, nothing can be done about systematic risk except perhaps to weight the portfolio with investments that dampen market risk. Even doing this could mean the risk of too much weight assigned to a vulnerable sector of the portfolio. For example, weighting the portfolio with securities with risk indices less than market (less volatile than market) could result in holding assets in an industry that may suffer more than the rest of the market in the event of a downturn in that industry. In effect, the best risk-reducing method is diversification of the portfolio of investments that reduces diversifiable, or unsystematic, risk. Risk relates to expected returns of an investment or portfolio of investments, and since risk and returns go together, the emphasis of this study shall be on the CAPM, with comparison to the Gordon Model.

The Gordon model, also known as the constant-growth model (Gitman and Zutter, 2015 p. 270), is described by the equation:

$$P_s = \frac{D_1}{(r_s - g)}, \text{ in which}$$

- P_s is the price of common stock.
- D_1 is the dividend to be paid in the next year and is assumed to be annual.
- The r_s is the expected return on the stock.
- The g is the growth rate of the firm, which may be assumed as growth in dividends over an indefinite number of years.
- In further computations, next year's annualized dividend, D_1, is derived from the current year's dividend, D_0:

$$D_1 = D_0 \times (1 + g).$$

The first equation regarding price has these limiting factors:

- Growth may vary over time.
- The denominator cannot equal zero; otherwise, the price would be undefined.
- In the denominator, as r_s and g become close in value, the price of stock would become unrealistically high.
- The r_s must be greater than g, or $r_s > g$; otherwise, the price would be negative.

Note that dividends throughout the paper are annualized rates of return; however, the NASDAQ website lists the dividends by quarter (nasdaq.com, no date). The annualized dividends are used in the computation of the dividend growth rate.

The Gordon Model may consider either the current market price or the price for a new issue of the stock. Usually, the new issue is offered with an underpricing of a few percentage points below market, as well as flotation cost. In reviewing the above equation, note that lowering the price of the stock will increase the expected return, also called the cost of equity. Therefore, the percentage cost of new common stock, r_n, will consistently be higher than the cost of retained earnings. New common equity is usually the costliest source of capital in the firm's capital structure.

The capital asset pricing model, or CAPM, uses the equation (Gitman and Zutter 2019, p. 318):

$$r = R_f + [\beta \times (r_m - R_f)].$$

The CAPM factors include:

- r, the required or expected rate of return on the security.
- R_F, the risk-free rate of return, commonly taken as the rate of a term-relevant U.S. Treasury bill or bond (see further discussion below).
- Beta (also written β or b), the systematic (non-diversifiable) risk index for security.
- r_m, the expected return on the market as a whole (the market portfolio, commonly taken in the U.S. as r of the S&P500 stock index).
- The market-risk premium, which is the difference between expected return of the market and the risk-free rate, or (r_m – R_F).

We may further classify beta as either levered or unlevered. Public quotations of beta are generally levered, which means that the holding period returns used to compute beta are not adjusted to remove the effects of debt. However, removing the factor of leverage to determine unlevered beta should suggest the influence of long-term debt and the relationship between debt and the WACC. Such information might determine any impact on the cost of debt and would affect the weight of equity.

The Hamada equation (Brigham, et. al., 2017, p. 379) determines unlevered beta as follows:

$$b = bu[1 + (1 - T)(\frac{D}{S})]$$

We observe first that b is an alternate notation for levered beta, or β, provided by most financial data services and brokerage houses. As most corporations on stock exchanges are levered, b is standard. If needed, the unlevered beta, bu, may be derived.

We may now make observations from the Hamada equation:

- bu < b, which logically fits with the premise that debt increases the systematic risk index, while lowering or removing debt decreases such risk.
- Increased debt will add to levered beta.
- The tax break (1 – T) affects the levered risk index in inverse proportion to the size of T, i.e., the greater the effective tax rate (T), the less the levered beta (b).
- The increase in common equity, S, lowers the debt-to-equity ratio, D/S, and reduces levered beta.
- The presence of D/S and (1 – T) in the formulation of systematic risk indicates that capital structure plays a key role in the firm's risk control, and means that debt, equity, and tax factors will affect the firm's financial performance.

Costs and risks occur with too much debt. Taxes and sources of capital may affect the beta in the CAPM, as well as other factors in valuation that suggest optimizing the funding sources in the capital structure. We shall examine these ideas further.

II. Literature Review

The specifics of stock valuation, risk assessment, and the capital asset pricing model (CAPM) cited in this paper will refer to several authors (Brigham, et. al., 2017; Gitman and Zutter, 2015; and Keown, Martin and Petty, 2017). Their textbooks present major developments in capital management theory over the last 65 years. All the authors from the three textbooks appear to be in agreement about the CAPM equation and the significance of its development. CAPM is the classic formula that links systematic risk to expected returns and explains the risk-return trade-off (Gitman and Zutter, 2015, p. 313).

The Introduction summarizes Hamada's equation (Brigham, et. al., 2017, p. 379) in order to distinguish levered beta from unlevered beta. The equation, particularly the tax rate and debt and equity in D/S, influences the weight of debt and equity in the capital structure. Gitman and Zutter and Keown, Martin and Petty give the graphical description of the characteristic line of an asset's holding period returns compared with the stock market's returns. Gitman and Zutter specify the types of long-term capital in the capital structure. Keown, Martin and Petty are further cited for historical data used to suggest a market-risk premium to use in the CAPM. They also give the equation for statistical variance, which helps to compare the CAPM with the Gordon Model.

Stock valuation in this paper refers to the Gordon Model based on dividend relevance theory proposed by Myron Gordon and John Lintner (Gitman and Zutter, 2015, p. 529). Time-value computations in this paper refer to Gitman and Zutter. For example, a present-value formula computes the growth rate of dividends in the Gordon Model.

In my concluding remarks, I refer to Miller, Morris and Scanlon's paper (1984) testing Modigliani and Miller's tax incentive hypothesis. Their paper supports the hypothesis that the tax advantage of debt encourages more debt in the capital structure. Lintner's article (1962) cites the influence on the stock price from manipulating funding sources. Gitman and Zutter provide similar insight with regard to signaling theory. These observations suggest future research into optimizing the capital structure.

III. Research Methodology

The case study analyzes a portfolio that is my own and was invested well in advance of this paper. The data derived from the portfolio, which is labeled Portfolio XYZ, may be referenced to some extent as public information from Marketwatch.com (no date, b).

The tables in this paper lay out the research methodology. Each table establishes key items of data needed to verify and compare expected return derived by two methods: the Gordon Model of stock valuation, and the CAPM. The study computes data for both the stock market and Portfolio XYZ. The testing timeframe may be considered both continuous over many years in the case of stock market expected return, and discrete with regard to specific stock values and the risk-free rate. In this case, the risk-free rate applies the rate of the 10-year Treasury bond. 8 September 2022 is the key date for stock values and the risk-free rate.

Table 1 begins with the purchase cost of stocks in Portfolio XYZ to determine the proportion of each of ten stocks in the portfolio. The sum of the weights equals 1.0, just as it would in a statistical analysis to assign probabilities of a limited population. Each stock's beta is multiplied by its weight, and then the weighted betas are added together to derive Portfolio XYZ's beta. Beta is the systematic risk index of the portfolio. Meanwhile, two results are derived for Portfolio XYZ's expected return using CAPM, but only one is chosen for the study. Either would have sufficed. Table 2 extends Table 1 by computing expected returns for the Gordon Model and CAPM. The two methods' respective expected returns are placed side by side for each stock.

Table 3 computes the standard deviation for the Portfolio's expected returns, comparing the Gordon results with CAPM. From there forward the analysis considers the results against general theory to verify both Gordon and CAPM. In general, two theories are verified: the dividend relevance of stock value, and the risk-based determination of expected return. Variance and standard deviation appear to validate the two methods, but some discrepancies occur between the expected returns of CAPM and the Gordon Model. The largest difference is explained. The results launch further discussion of the capital structure and implications for its optimization.

IV. Findings

IV.I. Gathering Facts and Comparing CAPM with the Gordon Model

CAPM considers systematic risk by comparing the beta of the security to the market returns over time. To continue further discussion of levered beta, consider the holding period, which means a period of time to hold an investment as its value changes. For example, an annualized rate of return of 10% of monthly holding periods would show 10% appreciation in the investment's value in one year. To compare the holding period returns for a stock portfolio to the market, a returns graph would measure the portfolio's returns on the vertical axis, and the market portfolio on the horizontal axis. Both axes of such a Cartesian graph would use the same scale in percentage returns (Gitman and Zutter, 2019, p. 315). Now the market represents the basket of all stocks; however, it is often regarded as the S&P500 (Keown, Martin and Petty, 2017, p. 306). If the investor were to consider the market compared to itself, the graph would show a straight line passing through the origin, upward-sloping at a 45-degree angle. Its beta would be the slope, and the slope of 45 degrees is 1.0. All other investments would be placed on the vertical axis, and their value changes at any point in time would compare with S&P500's value changes. Hypothetically, suppose S&P500 returns 8.0% in Year 0, while OXY returns 14.9% in Year 0. The point (x,y) on the graph could be (0.08,0.149). If the points on the graph average the same proportion as our sample point, the slope of the characteristic line would be 0.149/0.08 = 1.86, which is the actual slope of OXY's characteristic line. According to Marketwatch.com (no date, b), OXY's beta in September 2022 was 1.86. Therefore, the slope of common stock holding period values compared to the stock market represents the beta. Portfolio XYZ is compared to market in Table 1.

The stock's standard beta, equivalent to its systematic risk index, can be easily accessed from public sources that track holding period returns and log the results frequently, while comparing them to the S&P500 index. For example, the September 2022, 5-year beta of Occidental Petroleum Company (OXY) was 1.86. This means that the expected volatility of OXY goes up 86% faster than the S&P500 and goes down 86% faster than the S&P500. Some stocks have betas close to zero, showing no relationship or predictability of their changes in price to the stock market's advances and declines. For example, Merck & Company's 5-year beta in September 2022 was 0.34, showing a very low positive correlation of beta with the market's beta of 1.0; see Marketwatch.com (no date, b). There are also betas that measure in the negative, suggesting that as the market increases in value, the corresponding stocks are expected to decline in value.

Public sources for beta include Marketwatch.com and Dunn & Bradstreet. Although beta may be easily tracked for an individual firm's common stock, a portfolio's beta must be calculated as a weighted average of all stocks in the portfolio. This is programmable rather quickly from this formula:

$$\text{Portfolio's beta} = \Sigma[(\beta_1 \times w_1) + (\beta_2 \times w_2) + \ldots + (\beta_n \times w_n)],$$

in which β_1, etc. are the betas of all individual stocks in the portfolio, and w_1, etc. are the weights based on the monetary amount invested in each stock of the portfolio. In the equation, the subscript n represents the number of companies in the portfolio.

In a volatile market, or in the case of inconsistent or no dividend payments, CAPM allows for the factors related to increased risk and instability. The CAPM factors in the changes in beta, interest rates, market expected returns, and the market-risk premium. For example, as inflation increases, the Federal Reserve may increase interest rates, thereby raising Treasury rates. The Treasury rates are equivalent to the risk-free rate of interest (R_F) for the investment time horizon. Suppose the time horizon is ten years; then R_F would likely match the return rate of the 10-year Treasury bond. From Marketwatch.com (no date, b), as of 8 September 2022 the 10-year Treasury bond rate was 3.29%. The R_F affects the CAPM, and consequently, the expected return.

The rate of return of S&P500 is the factor r_m in the CAPM equation, is easily available, and is derived from monthly holding period returns over the long term. Data provided by Standard and Poor and others can be accessed quickly to find the current arithmetic average annual market rate of return for all U.S. stocks since 1900. Furthermore, the average difference between annual rate of all stocks and the rate of return on long-term U.S. government bonds, known as the market-risk premium in the CAPM formula, is about 5.5% (Keown, Martin, and Petty, 2017, p. 306). In the CAPM, the (r_m – R_F) for a ten-year investment horizon could be the 5.5%**.** Using the CAPM and the estimate of the (r_m – R_F) at 5.5% for the market-risk premium, one would not need to derive r_m, and the calculation of the expected return of Portfolio XYZ would be:

$$\text{Result 1: } r_{xyz} = Rf + \beta(0.055) = 0.0329 + 0.5737(0.055) = 6.45\%$$

One could put the 5.5% market-risk premium to the test by checking quickly available annual prices of the S&P500 index on Marketwatch.com over the timeframe from 1 July 1978 through 1 July 2022. Although not including the entire historical range, forty-four years encompasses a lengthy timeframe. Consulting Marketwatch.com (no date, a), the annual returns in that 44-year timeframe resulted in an average annual return of 9.87%. The new market-risk premium would now be computed as 9.87% minus 3.29%, or 6.58%, and the updated figure for expected return on our portfolio would now be:

$$\text{Result 2: } r_{xyz} = R_f + \beta(0.0658) = 0.0329 + 0.5737(0.0658) = 7.07\%$$

Company Name	**Tick-er**	**Beta (5-Year)**	**Cost Basis in $**	**Weight = Cost Basis/Total**	**Stock Beta's Weight = Beta x Weight**
Archer-Daniels MDLN	ADM	0.77	169.81	0.0561	0.0432
CVS Health Corp	CVS	0.72	277.79	0.0918	0.0661
Johnson & Johnson	JNJ	0.61	857.42	0.2835	0.1729
Keurig Dr Pepper Inc	KDP	0.65	77.75	0.0257	0.0167
Merck & Co. Inc.	MRK	0.34	591.02	0.1954	0.0664
Occidental Petrol Co	OXY	1.86	63.45	0.0210	0.0391

Pepsico Inc	PEP	0.56	167.29	0.0553	0.0310
Proctor & Gamble	PG	0.34	311.43	0.1030	0.0350
The Coca-Cola Co	KO	0.54	272.77	0.0902	0.0487
Tyson Foods Inc Class A	TSN	0.70	235.85	0.0780	0.0546
Totals:			3,024.58	1.0	
Portfolio's Beta:					0.5737

Table 1: Cost Basis for Evaluating Beta of Portfolio XYZ, Sept 2022, with Beta from Marketwatch.com (no date, b).

Result 2 of r_{xyz} uses the 44-year average of market returns to derive r_m in the CAPM. This r_{xyz} differs from Result 1 by only 0.62%. Reviewing the expected returns, one may ask, why is the expected annual rate of return of the sample portfolio so low, while historical, long-term market expected returns are generally about 10%? The answer lies in the individual stocks in Portfolio XYZ, which is not fully diversified and includes stocks with relatively low beta coefficients and a portfolio's beta of 0.5737. As the portfolio's beta approaches the market beta of 1.0, the investment will be riskier, and the expected return will consequently rise (Keown, Martin and Petty, 2017, pp. 196-198). Portfolio XYZ is a defensive portfolio overall and therefore less volatile than the stock market in 2022, a year representative of strong market declines, including recessionary declines in successive quarters (Marketwatch.com, no date, a).

Therefore, the prudent investor should consider the incidence of bear markets. For the years 1978 to 2022 from July-to-July year over year, per Marketwatch.com (no date, a), historical downturns number nine times against 35 positive years. Consecutive downturn years number only two times, with two being the maximum number of years for a consecutive decline in returns. The average annual rate of return for the period, as mentioned for Result 2 of CAPM, is 9.87%. The most severe downturn years had recovery times of four years and five years. Even in these cases, recovery times did not exceed the investment horizon of ten years. Therefore, a longer investment horizon, such as 20 to 30 years, would tend to trivialize concerns over bear markets.

Table 2 compares the Gordon Model with CAPM. In a comparison of Gordon Model results of Portfolio XYZ's stocks, only one company's stock did not display a history of constant growth: Occidental Petroleum (OXY). Its resulting expected return using Gordon is therefore ignored. Looking at the other stocks in Table 2, some had a close difference of expected returns compared to the CAPM's results, the closest being Coca-Cola (KO), showing Gordon and CAPM separated by 0.38%. The widest difference was Tyson Foods (TSN) at 10.35%.

Table 2 calculates growth rate, g, from dividends increasing over time. With the exception of OXY, which is omitted and noted in Table 3, the duration of growth in the computation is mostly five years, from 2017 to 2022. Year 2017 was counted as Year 0. The time-value formula for the latest Dividend, or D for 2022 (Gitman and Zutter, 2015, p. 271), computes as

$$D_{2022} = D_{2017} \times (1+g)^5, \text{ solving for } g = (\frac{D_{2022}}{D_{2017}})^{1/5} - 1.$$

An exception for KDP (noted in Table 2) would change the formula to cover three years and would change D_{2017} in the above equation to D_{2019}. The exponent for KDP changes from 5 to 3. The Predicted Next

Dividend, D1, in Table 2 derives from D_{2022} and its future value factor using g, as shown in Table 2. For example, D1 of ADM is 1.0456 times $1.60, which is $1.67.

In Table 2, the CAPM's Result 2 expected return is $R_F + \beta(0.0658)$. R_F was previously given as 3.29%. Each β is given from Table 1, and market-risk premium (0.0658) comes from the previous computation of CAPM's Result 2. The Gordon Model derivations of growth rate, g, and next dividend, D1, are shown in Table 2. Therefore, Table 2 compares the Gordon expected returns with the expected returns of CAPM's Result 2.

Table 3 presents the expected returns, comparing Gordon returns to CAPM. Here I evaluate the weighted mean of expected returns, the variance of the returns, and their standard deviation. The weighted mean represents the probability of each company's stock showing the given expected return, with all weights (probabilities) summing as 1.0.

Company Name	**Tick-er**	**$ Price Close 8 Sept 2022**	**2022 An-nual Div. D0 in $**	**2017 $ An-nual Div. Note 1**	**g from Div. His-tory**	**Predict- ed Next Ann. Div. D1 as D0 x (1+g) in $**	**Gor-don Mod-el Exp'd Re-turn**	**Re-sult 2 CA PM Exp'd Re-turn**
Archer-Daniels Midland	ADM	90.29	1.60	1.28	4.56%	1.67	6.42%	8.36%
CVS Health	CVS	102.15	2.20	2.00	1.92%	2.24	4.12%	8.03%
Johnson & Johnson	JNJ	165.71	4.52	3.32	6.37%	4.81	9.27%	7.30%
Keurig Dr Pepper	KDP	38.46	0.80	0.60	9.96%	0.88	12.25%	7.57%
Merck & Co	MRK	87.42	2.76	1.89	7.87%	2.98	11.27%	5.53%
Occidental Petrol	OXY	64.56	0.52	0.77	-7.55%	-	**Note 2**	15.53%
Pepsico Inc	PEP	172.67	4.60	3.17	7.73%	4.96	10.60%	6.98%
Procter & Gamble	PG	137.86	3.65	2.74	5.90%	3.87	8.71%	5.53%
Coca-Cola Co	KO	62.12	1.76	1.48	3.53%	1.82	6.46%	6.84%
Tyson Foods Class A	TSN	73.94	1.84	0.90	15.38%	2.12	18.25%	7.90%

Note 1: KDP data covers years 2019-2022, after the merger, so the dividend for KDP is Dividend 2019, and the exponent is 3.

Note 2: OXY's dividends are irregular and not conducive to the Gordon Model. Ignore and delete OXY from Table 3.

Note 3: Dividend data was gathered from Dividend History in NASDAQ.com.

Table 2: Gordon Model vs. CAPM (Result 2) - Portfolio XYZ, Sept 2022, with Dividends and Closing Prices per Marketwatch.com (no date, b).

The equation for statistical variance (Keown, Martin, and Petty, 2017, p. 203) of the expected returns with r_i as the variable and w_i as the probability, would be sigma squared, or

$$\sigma^2 = \sum \{(r_1 - \mu)^2 \times w_1\} + \{(r_2 - \mu)^2 \times w_2\} + \ldots + \{(r_9 - \mu)^2 \times w_9\}, \text{ in which}$$

- σ^2 is sigma^2, the variance of returns in the portfolio.
- r_1 through r_9 represent the expected returns of stocks 1 through 9.
- μ is mu, the weighted mean of expected returns, i.e., the portfolio's expected return.
- w_1 through w_9 represent the weights of stocks 1 through 9. Weight adds to 1.0.

From the statistical variance, σ^2, the standard deviation is derived as sigma, equal to the square root of σ^2.

A	B	C	D	E	F	G	H
Stock Ticker	**Weight = (Cost Basis)/ Total Note 1**	**Gordon Model Exp'd Ret**	**Result 2 CAPM Exp'd Ret**	**Gordon Model B X C**	**Result 2 CAPM B x D**	**Gordon Variance (C – μ)² x B**	**Result 2 CAPM Variance (D – μ)² x B**
ADM	0.0574	6.42%	8.36%	0.00369	0.00480	0.00006	0.00001
CVS	0.0938	4.12%	8.03%	0.00386	0.00753	0.00028	0.00001
JNJ	0.2896	9.27%	7.30%	0.02685	0.02114	0.00000	0.00000
KDP	0.0263	12.25%	7.57%	0.00322	0.00199	0.00002	0.00000
MRK	0.1996	11.27%	5.53%	0.02249	0.01104	0.00006	0.00004
PEP	0.0565	10.60%	6.97%	0.00599	0.00394	0.00001	0.00000
PG	0.1052	8.71%	5.53%	0.00916	0.00582	0.00001	0.00002
KO	0.0921	6.46%	6.84%	0.00595	0.00630	0.00009	0.00000
TSN	0.0796	18.25%	7.90%	0.01453	0.00629	0.00060	0.00001
Total Wt.	1.0						
Mean, or μ				0.09574	0.06885		
Variance, or σ²						0.00113	0.00009
Standard Deviation as SQRT σ²						3.36%	0.95%

Note 1: Weight allows for omitting one company (OXY) for comparing Gordon to CAPM, as OXY's dividends are irregular, not conducive to Gordon. Total Cost Basis changes to \$2961.13. E.g., for ADM, Weight = \$169.81/\$2961.13. This adjusts total weight (sum) of the 9 remaining stocks to 1.0.

Table 3: Comparison of Gordon Model and CAPM's Result 2 Standard Deviations on Annual Returns of Portfolio XYZ. Weights and Returns derived per Marketwatch.com (no date, b).

With regard to the deletion of OXY, an explanation should suffice for not adjusting the Portfolio's beta from the CAPM in Table 3. The Portfolio's beta of 0.5737 calculated from the CAPM includes all ten stocks of Portfolio XYZ. However, CAPM figures are compared with Gordon-Model figures using nine stocks in Table 3. The nine-stock beta of the portfolio is ignored in this study and does not affect the CAPM's expected returns of the individual stocks.

Gordon has limitations, such as ignoring companies that have irregular dividends. Effective analysis would likely favor using applicable valuation models, such as Gordon, variable growth, or others, but comparing them with CAPM. Table 3 derives the comparison of standard deviation of the expected returns from Gordon and CAPM, showing Gordon's sigma as 3.36%, and CAPM's sigma as 0.95%. We may surmise from the anecdotal case of Portfolio XYZ that the CAPM derives a less risky result. This may suggest a narrow difference of standard deviation as a good outcome. A large difference in returns for the two methods could be interpreted as a suggestion for further evaluation of expected returns. The management of some firms may average the expected returns between CAPM and Gordon, because the two methods are measuring from different criteria.

The Gordon model's emphasis on discounted cash flow from future dividends may show the reason for a different expected return from the CAPM. Consider the highest discrepancy in Table 2, Tyson Foods. The firm's Gordon expected return of 18.25% dwarfs CAPM's return of 7.90%. The dividend growth rate, g, was computed as 15.38%. See Tyson's Dividend History annualized from 2017 through 2022 (NASDAQ.com, no date). Solving the Gordon equation, the 15.38% is added to the dividend-to-price ratio to derive expected return:

$$P_s = \frac{D_1}{(r_s - g)}.\ \text{Then } r_s = \frac{D_1}{P_s} + g = \frac{2.12}{73.94} + 0.1538 = 18.25\%.$$

The combination of g and dividend-to-price ratio will determine the magnitude of the Gordon expected return. Therefore, it appears that the firm's dividend payout policy determines expected return in the Gordon model; the higher the dividend growth rate combined with dividend-to-price ratio, the higher the expected return. In contrast, the CAPM is concerned with risk. The low risk-free rate and Tyson's low beta of 0.70 keeps CAPM's expected return low compared to the Gordon calculation.

One can see the discrepancy, but which method is more effective? CAPM appears to anchor expected return to the historical market expected return. This is adjusted by the risk-free rate and the risk index (beta). Therefore, a risk-averse investor would tend to favor the CAPM, and even compare CAPM to the Gordon Model's expected return to see whether a widespread would signal a concern. An aggressive dividend payout policy may result from management's desire to maintain high stock value. Different factors could potentially contribute to the ability for high dividend growth, such as very high demand for the product, strong market share, and economies of scale. These factors seem apparent with Tyson.

An examination of Coca-Cola's (KO's) capital structure indicates very high but very inexpensive debt. This supports the WACC formula, with weighted debt and equity determining the cost of capital (Gitman and Zutter, 2015, p. 352). A third of the long-term debt ($13.2 billion) had an interest rate of only 0.4%. Also, Coca-Cola had some very long-term debt. Some notes mature as late as 2098 at 6% interest. However, in 2021, KO's weighted cost of long-term debt was only 1.7%. The CAPM equation for Coca-Cola indicated a moderate risk from dividends, while high debt was offset by good rates. In 2021, the $38.1 billion in long-term debt contrasted with $728 million in interest, a ratio of 52-to-1. The firm's overall times-interest-earned ratio was 7.80 (SEC.gov, no date, a).

IV.II. Capital Structure and the Weighted Average Cost of Capital (WACC)

The review of Tyson and Coca-Cola's financial data hinted at capital structure as a key to sourcing capital and maintaining the financial health of the firm. The firm's capital structure accounts for the mix of sources of capital for investment in long-term projects that are crucial to operating income (Gitman and Zutter, 2015, p. 480). The WACC is the cost of various forms of long-term debt (e.g., bonds and notes) and equity (e.g., common stocks, retained earnings, and preferred stock). Consider a hypothetical firm, ABC Company, with an annual weighted average cost of debt at 8% and an annual weighted average cost of equity at 14%. Suppose that the capital structure of the firm is targeted at 40% long-term debt and 60% equity. The tax on debt interest is deductible, which means that the relevant cost of debt is debt times (1 – T). Suppose T is the effective tax rate at 30%. Thus, at this targeted capital structure, the WACC is

$$WACC = [40\% \times 8\%(1-T)] + (60\% \times 14\%) = 2.24\% + 8.4\% = 10.6\%.$$

In this simple equation alone, we can see the potential impact of the effective tax rate. Lowering the effective tax rate, T, would raise the cost of debt, thereby raising the WACC. In order to keep the total cost of capital the same, management would reduce either debt or equity. Management might attempt to rebalance the WACC in response to changes in the effective tax rate and may possibly try to optimize the changes.

V. Discussion and Conclusions

The CAPM provides a simple, elegant method to assess expected return of a portfolio. The method may be used to judge methods of stock valuation and gauge the effectiveness of a company's acquisition of capital. In the CAPM process, holding period returns should span a sufficient timeframe to overcome any temporary bias from bear markets. All the factors in the CAPM equation are easily available. These include levered beta, the market-risk premium, and the risk-free rate of return. The risk-free rate should be pegged to a Treasury security that matches the investment horizon, whether ten, twenty, or thirty years.

The use of CAPM to evaluate expected returns demonstrates the above principles. A method like the Gordon Model may identify discrepancies. For example, a wide difference between expected returns calculated by the CAPM and the Gordon model would require explanation, such as Tyson's optimistic dividend payout policy. Overall, the findings support the theory of CAPM, and the Gordon Model presented by Gitman and Zutter, Brigham, et. al., and Keown, Martin and Petty.

Consider the Tyson example further according to historical prices (Marketwatch.com, no date, b). A ten-year investment window for Tyson has prices quoted on 1 September 2012 (year 0) at \$16.20 and on 1 September 2022 at \$70.86. Then the present-value formula of the annual price growth would be shown as

$$\$16.20 = \$70.86(1+g_P)^{-10}\text{, so that price-growth resolves to } g_P = 15.90\%.$$

Although Tyson's payout policy appears quite optimistic, over ten years the price growth appears to match dividend growth. However, the price growth falls below the Gordon Model's calculated expected return. The firm may continue dividend growth at the present rate but may reduce dividend payouts if circumstances create a problem. Difficulty maintaining the current dividend growth rate may not appear likely at present due to cash on hand, as seen in the firm's 10K report (SEC.gov, no date, b).

For the conservative example in the portfolio, consider again the smallest difference between Gordon and CAPM in Table 2. Coca-Cola's (KO's) expected returns with Gordon and CAPM are nearly the same.

The low interest rate and modest dividends, as mentioned above, support the WACC formula that demonstrates how weighted debt and equity affect the cost of capital (Gitman and Zutter, 2015, p. 352).

With established firms, the tax-incentive hypothesis of Modigliani and Miller is complicated, not only by a history of decision making and commitments (the anchoring bias), but also by alternative ways to lower taxes. To filter the anchoring bias and the alternative tax breaks, Miller, Morris, and Scanlon compared IPOs, which have no such history, with seasoned firms. They found a positive relationship of the tax incentive with debt in the capital structure (Miller, Morris and Scanlon, 1984, p. 198-199, 209). However, one may question whether the tax benefit of debt is more favorable than lowering income taxes. Furthermore, there are as many variables to optimization as available sources of capital. Therefore, the optimization of the capital structure may be elusive. Generally, the lower the firm's WACC, the more efficient the funding process.

Expected dividends have a direct impact on present value, because dividends are relevant (Gitman and Zutter, 2019, p. 268). However, the effect of dividends on value may be more complicated than the Gordon Model alone. Specifically, when factors in the WACC are manipulated, the stock price may change. This includes the drop in price when the corporation shifts from using retained earnings to issuing new common stock (Lintner, 1962, pp. 252-254). Other changes such as self-tender offers and issuing bonds would signal stock price changes. According to signaling theory, new stock issues signal management's view that the stock price is overvalued, while new debt signals management's view that the stock is undervalued (Gitman and Zutter, 2015, p. 490).

VI. Limitations and Potential Further Research

Empirical evidence of the corporation's optimization of the capital structure could be further analyzed. The variables of capital sources, dividend growth, the costs of debt and equity, and tax rates may reveal the effectiveness of the company's capital-structure management. Examination of a sample portfolio of stocks over a range of years could potentially find changes in these variables that might assist in the analysis.

This study did not consider further methods of stock valuation or alternatives to CAPM, nor were ex ante forecasting methods considered. The Gordon Model's one unvalued exception in Portfolio XYZ (OXY) would suggest the application of other valuation methods that were not considered in this study.

As the Federal Reserve increases interest rates, management may shift to a two-tiered capital structure that includes shorter-term debt. This could justify further research related to the company management's strategic response to external economic changes.

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