Case Study

The Cost of Capital of Walmart, Kroger, Albertsons, Costco, and Publix in 2025

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Abstract
The goal of this case study is to explore the complexities and relevance of accurately estimating the cost of capital, which serves as a reference for key decisions in corporate finance and equity valuation. Despite the simplicity of a company's cost-of-capital formula, in practice, estimating the cost of capital is not simple because it requires substantial judgment, and alternative approaches exist. This prevents a straightforward method for calculating the cost of capital, leading to inaccuracies. This case study features an equity analyst reviewing survey-based studies on best practices for cost-of-capital estimation and gathering data to estimate and analyze the cost of capital for leading US grocery firms. A technical note on the cost of capital is appended to support the development and solution of the case. Broadly, this study highlights the lack of consensus among practitioners on several aspects of cost-of-capital estimation and underscores the importance of making informed judgments based on finance and economics principles.

1 Introduction

In 2025, an equity analyst was asked to estimate and analyze the cost of capital of leading firms in the US grocery sector.[1] The equity analyst worked for a financial advisory firm, which typically collected and analyzed data on investable companies, built models to value stocks, and prepared reports and presentations for investment recommendations to investors (CFA Institute 2025). A company's capital cost, technically known as the weighted average cost of capital or simply WACC, was a key input to the discounted cash flow model the financial advisory company used to estimate a company's "fair" stock price. This estimated stock price was a primary piece of information that the financial advisory company used to issue "buy, sell, or hold" stock recommendations, guiding investors on how to allocate their capital. In such a model, the estimated stock price is highly sensitive to the value of WACC, meaning that slight variations in the WACC can result in significant variations in the estimated company's fair stock price, and consequently, in the firm value. Additionally, since the cost of capital is the opportunity cost, or best alternative rate of return, of the capital that investors commit to a company, the financial advisory firm used the WACC as a benchmark to assess the firm's profitability. Specifically, it compared a company's estimated WACC with its return on investment to determine whether it added economic value.[2] Furthermore, despite the simplicity of a company's cost-of-capital formula, estimating the cost of

[1] All information presented in this case is factual. However, the equity analyst is a fictional character introduced in this case to illustrate activities in the financial advisory industry, which may inform students on career development. This case is written solely to provide teaching materials.
[2] In corporate finance, for capital budgeting decisions, WACC can be used as the discount rate to estimate the present value of forecast cash flows.

capital was not straightforward because it required substantial judgment, as several WACC inputs were not directly observable and had to be estimated (Schill 2018). Therefore, the equity analyst knew that accurately estimating the cost of capital of grocery firms was an essential and challenging task. Late in May 2025, after weeks of diligent work, the equity analyst was ready to meet with their supervisor and discuss their WACC estimations and analysis.[3]

2 Dynamism in the US Grocery Sector

In 2025, leading grocery retailing corporations in the US included Walmart Inc., with a 25.4 percent estimated market share, Costco Wholesale Corporation (7.2 percent market share), The Kroger Company (7.0 percent), Target Corporation (4.9 percent), Albertsons Companies Inc. (3.9 percent), Publix Super Markets Inc. (3.4 percent), Ahold Delhaize NV (3.1 percent), and Aldi Group (3.0 percent) (Euromonitor 2025).[4] Many companies with estimated market shares below 3 percent also participated in grocery retailing, collectively accounting for approximately 42 percent of the market. In 2025, the US grocery sector was highly diverse in terms of store formats, comprising traditional supermarkets, supercenters and warehouses, natural or fresh grocers, limited assortment grocery stores, wholesale clubs, dollar stores, and mass merchandisers (Trejo-Pech and White 2024a). Supercenters and warehouses, such as Walmart and Costco—as well as traditional supermarkets like Kroger, Albertsons, and Publix—dominated this sector in terms of market share. For this reason, the financial advisory company mentioned above decided to focus on these firms, and the equity analyst was asked to estimate and analyze these companies' cost of capital to better understand their current and future value.

The equity analyst noted that in addition to groceries, some grocery stores sold general merchandise as well as health and wellness products and services.[5] Notably, food and beverage revenue accounted for the largest share of total revenue in the grocery stores sector (Diment 2023). Traditional supermarkets generated approximately 80 percent of their total revenue from food and beverages (Lombardo 2025). Some of these grocery companies, such as Kroger, had convenient pharmacies and fuel centers within and around their stores. Grocery revenue was also critical for supercenters and warehouses, accounting for approximately 45 percent of total revenue in 2024, with the remaining 55 percent from home and appliance products, pharmacies, apparel and accessories, and fuel centers (Buchko 2025).

The US grocery sector has traditionally been characterized as low-growth, low-margin, and mature. However, grocery stores experienced abnormally high profitability during the COVID-19 pandemic, allowing firms to accumulate cash and opening the possibility of more innovations than in past decades (Volpe and Boland 2022; Trejo-Pech and White 2024a). In 2025, growth in this sector was anticipated to continue, as market researcher IBISWorld identified high revenue growth from 2025 to 2028 as one of the industry's opportunities and high competition as one of its weaknesses (Buchko 2025; Lombardo 2025).

[3] The learning objectives of this case are: (1) learn how to estimate the cost of capital of a publicly traded grocery firm and agribusiness by using current and actual data; (2) compare the cost of capital of grocery firms to the expected cost of capital of an average or representative agribusiness and a US firm; (3) discuss the key drivers of the cost of capital and the implications for grocery firms and agribusinesses operating in a relatively low-cost of capital industry compared to the overall US market; and (4) learn how to estimate the cost of capital of a private firm by using comparable companies.

[4] Volpe and Boland (2022) documented the economic impact of Walmart, the food retailer leader, particularly through its Supercenter store format, on the food industry over time. They reviewed the extant literature and summarized it into five broad generalizations. Particularly relevant to this case is Walmart's significant negative impact on large competitors, especially supermarkets.

[5] In Walmart, for instance, grocery items included dry grocery, snacks, dairy, meat, produce, deli and bakery, frozen foods, alcoholic and nonalcoholic beverages as well as consumables such as health and beauty aids, pet supplies, household chemicals, paper goods, and baby products. In addition to groceries, Walmart's product line included general merchandise products, health and wellness products, and services (Walmart 2025).

During 2022–2024, particularly in the second half of 2024, the grocery industry and business media closely followed a prospective Kroger-Albertsons merger. In October 2022, Kroger offered $19.9 billion to acquire Albertsons' equity (an estimated equity value after deducting $4.7 billion of Albertsons's net debt) (Kang 2022). If completed, this merger would have been the largest grocery merger in history. However, following months of concerns voiced by competing grocers, food worker unions, and regulators (Kaye 2024), a federal judge blocked the proposed supermarket merger on December 10, 2024, arguing that it would erode competition and raise consumer prices.[6] That day, a *Wall Street Journal* article reported, "U.S. District Judge Adrienne Nelson agreed with the Federal Trade Commission's argument that Kroger would become the dominant player in traditional supermarkets if allowed to add nearly 2,000 stores by taking over Albertsons, its smaller rival" (Lempert 2024). To complicate matters, the two grocery firms engaged in legal battles. Just hours after the proposed merger was blocked, Albertsons sued Kroger, alleging that Kroger had acted in "its own financial self-interest, repeatedly providing insufficient divestiture proposals that ignored regulators' concerns" (Thomas 2024). Late in March 2025, Kroger countersued Albertsons, claiming that "while Kroger was working diligently to seek regulatory approval and close the merger, Albertsons was engaging in a secret and misguided campaign, together with C&S Wholesale Grocers, the divestiture buyer, to pursue its own regulatory strategy, which ultimately undermined Kroger's efforts" (Kroger Company 2025). As the lawsuits unfolded, business analysts predicted that their ramifications in the grocery industry could be profound, changing industry dynamics and opening new merger opportunities (Lee 2024; Lempert 2024; Mendoza and Thomas 2024). This industry dynamism has prompted financial advisors to conduct long-term valuation and diverse analysis of leading grocery firms.

3 The Technicalities of the Cost of Capital

As part of their preparation for this analysis, the equity analyst thoroughly studied the technical aspects of the cost of capital (see the technical note in Appendix A). Broadly, the WACC calculation requires estimates of the firm's capital structure, the cost of debt, the cost of equity, and the tax rate. In particular, the capital structure can be represented by W_D and W_E, which are the weights or proportions of debt and equity used by a firm to fund its operations. The before-tax cost of debt is represented by r_D, the annual rate that debtholders are expected to charge the firm, given the firm's credit risk. Similarly, r_E represents the annual rate that shareholders are expected to charge the firm given the firm's equity risk. Thus, estimating a company's WACC is apparently a simple exercise if the inputs mentioned are known. However, while studying the WACC technical note (Appendix A), the equity analyst remembered from their finance courses in college that the details involved in the estimation of the WACC inputs could be complex and that alternative approaches for estimation existed, all of which preclude a straightforward method for calculating the WACC and introduce sources of inaccuracy.

4 Best Practices on the Cost-of-Capital Estimation

In addition to studying the technical aspects of the cost-of-capital estimation, the equity analyst searched for and compiled results of studies on how practitioners calculate the WACC. Over the last two decades, survey-based research has examined how US financial managers estimate their firms' cost of capital. For instance, Bruner et al. (1998) surveyed 27 senior financial officers from a list of 50 firms considered to be following the best financial management practices. Brotherson et al. (2013) updated the Bruner et al. study by surveying 19 financial managers of firms in the 2012 Fortune's Most Admired Companies list,

[6] The proposed Kroger and Albertsons merger has been documented in detail by Trejo-Pech and White (2024b) and White and Trejo-Pech (2025). The first case study focuses on valuing Albertsons's stock price and compares that price with Kroger's offer. The second case focuses on identifying and valuing potential synergies for the combined firm.

specifically those ranked at the top of their industries for making "wise use of assets."[7] Similarly, the Association for Financial Professionals surveyed more than 300 top financial executives, mainly from the US, regarding their cost-of-capital estimation practices (Jacobs and Shivdasani 2012).

4.1 The Capital Structure

As shown in Figure 1, surveys revealed that, particularly for calculating the W_D and W_E WACC components, financial executives use (1) market values of debt and equity, (2) market value of equity and book value of debt, or (3) book values of debt and equity. The AFP survey showed a predominant use of book values, probably because surveyed executives worked for privately owned firms, for which market values are unavailable. The other two studies only surveyed publicly traded firms.

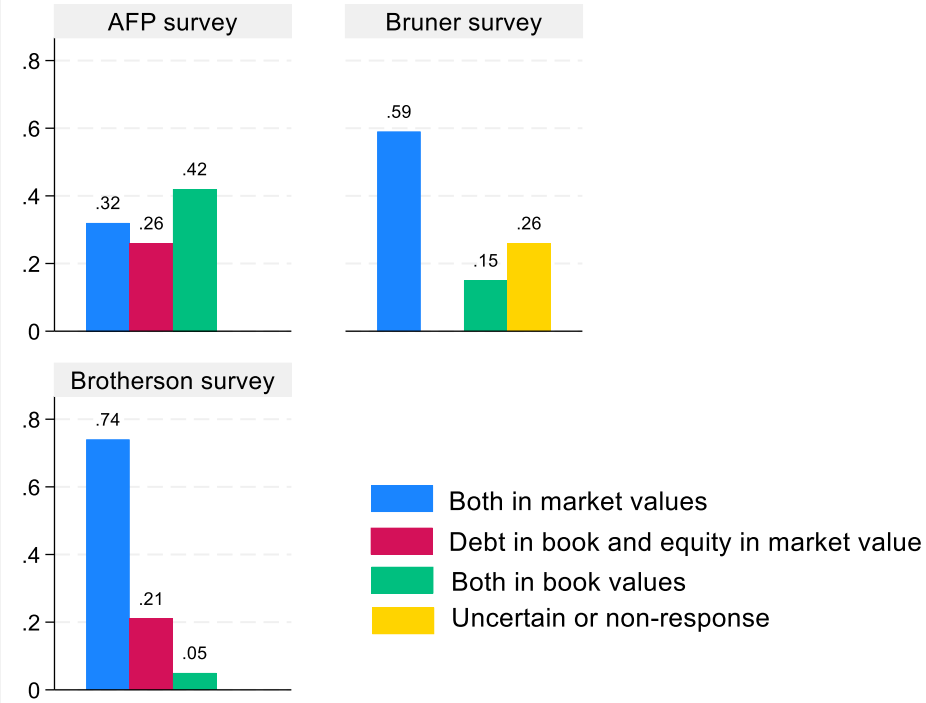

Figure 1. Proportion of managers using alternative types of debt and equity values for estimating the weighted average cost of capital across surveys

Note: Proportions of responses by financial managers to the question "Do you use market or book values for the debt and equity weights?"
Source: Surveys from Brotherson et al. (2013), Bruner et al. (1998), and AFP (Jacobs and Shivdasani 2012).

4.2 The Before-Tax Cost of Debt (r_D)

The surveys showed that financial managers estimated this WACC component using a "yield to maturity" (YTM) or a "risk-free rate plus spread" approach, and that those following the YTM approach estimated a

[7] Bruner et al. (1998) and Brotherson et al. (2013) also surveyed financial executives of financial advisers, such as Credit Suisse and Morgan Stanley, and reviewed WACC estimation recommendations in best-selling financial management books. In this article, we discuss the survey results of nonfinancial companies.

marginal or current YTM. Figure 2 shows the proportion of managers who used alternative methods to estimate the before-tax cost of debt.

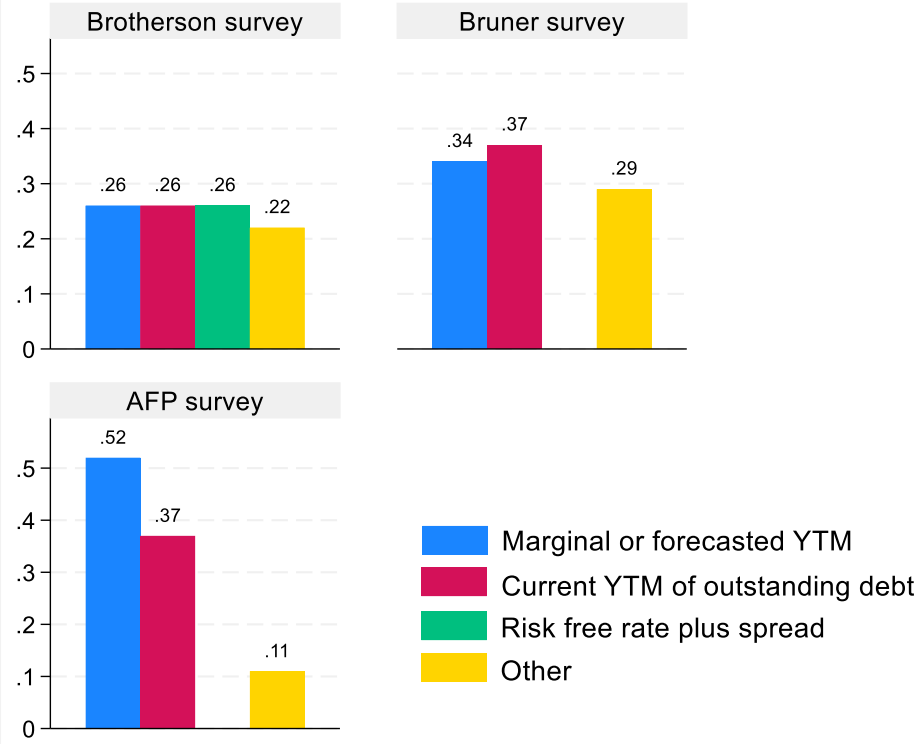

Figure 2. Proportion of managers using alternative methods when estimating the before-tax cost of debt for calculating weighted average cost of capital across surveys

Note: Proportions of responses by financial managers to the question "How do you estimate the before-tax cost of debt?"
Source: Surveys from Brotherson et al. (2013), Bruner et al. (1998), and AFP (Jacobs and Shivdasani 2012).

4.3 The Cost of Equity (r_E)

Surveys consistently reveal that the majority of financial managers employ the Capital Asset Pricing Model (CAPM) to estimate the cost of equity (Bruner et al. 1998; Graham and Harvey 2001; Brotherson et al. 2013). The CAPM is a stylized model for estimating shareholders' expected rate of return based on the risk-free rate, the firm-specific risk level, and the overall market's expected return (see the technical note in the appendix for details).

Regarding the risk-free rate, financial managers reported using US government securities with maturities ranging from 3 months to 30 years. Figure 3 summarizes the responses from the three surveys. Many surveyed financial managers commented that they typically match the maturity of the chosen risk-free rate security with the maturity of the investment they evaluate with their estimated WACC (Bruner et al. 1998). Furthermore, many financial managers reported using historical averages rather than spot rates (Brotherson et al. 2013). The firm-specific risk level was proxied by a firm's beta. About two-thirds of surveyed financial managers reported obtaining their firm's betas from published

sources such as Bloomberg, while one-third calculated them themselves (Bruner et al. 1998; Brotherson et al. 2013). Moreover, among those who calculated betas, 41 percent used a 5-year series of returns for their beta estimation, 29 percent used a 1-year series, 15 percent a 3-year series, 13 percent a 2-year series, and 2 percent were uncertain or did not respond (Jacobs and Shivdasani 2012).[8] Finally, on the equity market risk premium (ERP), 43 percent of nonfinancial firms and 73 percent of financial advisor firms reported using historical data as an approximation of the expected ERP (Brotherson et al. 2013). Specifically, financial executives appeared to rely heavily on averages of *very* long-term data provided by Ibbotson Associates Inc., an investment management company, as a reference when estimating the CAPM and WACC (Graham and Harvey 2018). Their implicit assumption was that the ERP was relatively stable over time and would provide a good approximation of the ERP in the following years.[9] In 2025, Ibbotson reported that over the 99-year period (1926–2024), the US stock market's annual return has averaged 11.1 percent (New York Life Investments 2025).

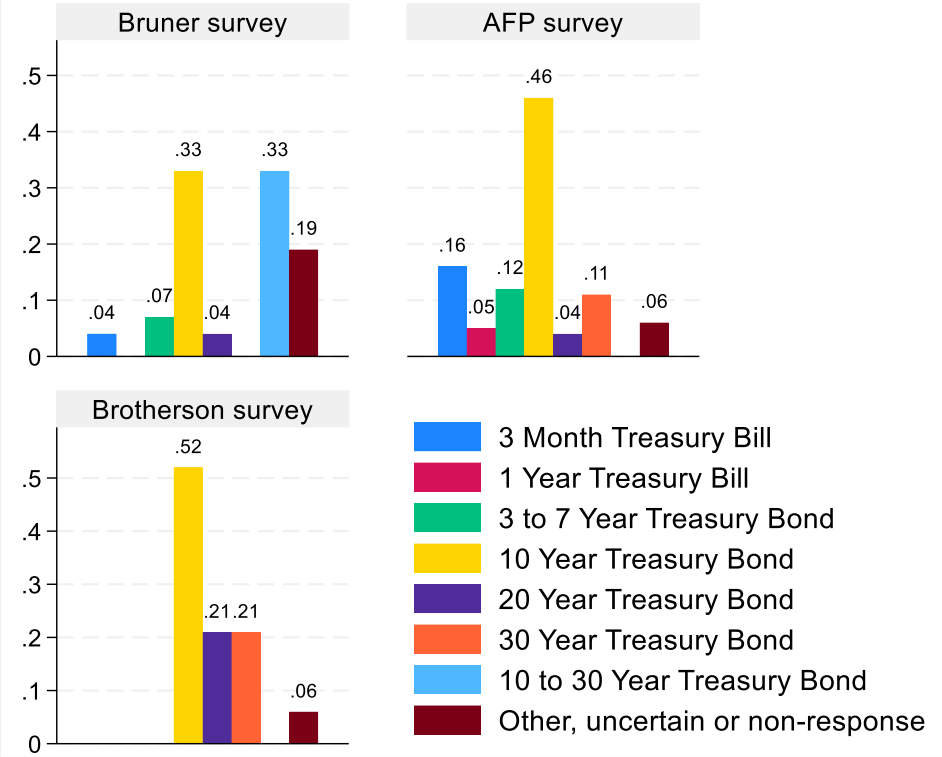

Figure 3. Proportion of managers using alternative risk-free rate proxies when calculating weighted average cost of capital

Note: Proportions of responses by financial managers to the question "What security do you use as the risk-free rate?"
Source: Surveys from Brotherson et al. (2013), Bruner et al. (1998), and AFP (Jacobs and Shivdasani 2012).

[8] It was unclear whether financial managers used daily, weekly, or monthly returns when calculating beta.

[9] Others believed that using historical averages to proxy future ERP was not a good approximation, arguing that forward-looking estimations (i.e., an implied ERP) based on current equity prices and risk premiums in other markets was more appropriate (Damodaran 2025b). In 2025, the implied ERP was estimated at 4.3 percent (Table 4). However, surveys suggest that managers tend to favor a historical approach.

5 Data Collection

To accomplish the task, the equity analyst had been pulling and tabulating data from multiple sources, including financial databases accessed through corporate subscriptions, such as Standard & Poor's Net Advantage and Standard & Poor's COMPUSTAT, as well as freely available databases such as the US Department of the Treasury and Yahoo Finance. The equity analyst noted, based on the surveys analyzed, that there was a lack of consensus on the best practices for estimating several components of the cost of capital. Therefore, the analyst gathered as much available data as possible to provide alternative proxies for analysis and appropriate WACC input selection.

Table 1 reports financial statement data of the grocery firms of interest. As noted in the Table 1 footnotes, some financial data were curated by aggregating items into categories needed for the WACC estimation. For example, long-term debt included long-term loans and leases. In addition to the firm-specific information compiled, the equity analyst found a study with financial statement data intended to portray a representative sample of the agribusiness sector, which is included in Table 1 (refer to column AGB). Table 2 provides debt and equity-related market data that the equity analyst may need for the WACC estimations. Debt market data included firm YTM and credit ratings. Equity data included stock prices, number of shares, and firm betas. While the analyst was collecting these data in May 2025, they decided to collect stock prices, for instance, up to early March 2025 (refer to the Table 1 notes), because this date better aligned with the time when the annual financial reports of the grocery firms were made available through the financial databases.

Table 1. Selected financial statement data of grocery firms and agribusinesses (USD millions unless otherwise noted)

	Kroger	Walmart	Albertsons	Costco	Publix	AGB
Balance sheet data						
Accounts payable	10,124.0	58,666.0	4,092.7	18,610.0	2,949.0	43.9
Short-term debt	871.0	7,965.0	763.1	0.0	412.0	14.2
Other current liabilities	4,945.0	29,953.0	2,395.2	18,389.0	2,056.0	76.4
Long-term debt	24,211.0	54,148.0	13,419.7	8,039.0	3,179.0	230.0
Other noncurrent liabilities	4,184.0	12,399.0	2,699.1	2,609.0	6,107.0	47.5
Total liabilities	44,335.0	163,131.0	23,369.8	47,647.0	14,703.0	412.0
Total equity	8,281.0	97,692.0	3,385.9	25,577.0	22,898.0	546.2
Income statement data						
Revenue	147,123.0	680,985.0	80,390.9	264,086.0	59,736.0	813.6
EBIT or operating income	4,648.0	29,249.0	2,009.8	9,751.0	4,468.0	48.0
Net income	2,665.0	19,436.0	958.6	7,621.0	4,635.0	17.4
Effective income tax rate	21.6%	28.3%	20.6%	24.6%	20.1%	28.2%

Sources and Notes: (1) 2024 fiscal year financial statement data of grocery firms are from the Standard & Poor's Net Advantage database (Standard and Poor's 2025). Selected data assembled by the author following the following criteria: (a) short-term debt includes short-term borrowings, the current portion of long-term debt, and the current portion of leases; (b) other current liabilities includes accrued expenses, current income taxes payable, unearned current liabilities, and others; (c) long-term debt includes long-term loans and long-term leases; (d) other noncurrent liabilities includes pension and other postretirement benefits, deferred tax liability, and others.
(2) The effective income tax rate for grocery firms is the average of the last 5 fiscal years, calculated by the author using data from the Standard & Poor's Net Advantage database.
(3) EBIT stands for earnings before interest and taxes.
(4) Agribusiness (AGB) financial data are the average of fiscal years 2021, 2022, and 2023 from Trejo-Pech (2026). These 3 years' financial statement items were calculated by aggregating fiscal year annual data at the median from over three hundred agribusinesses in COMPUSTAT, available at the Wharton Research Data Services database (WRDS 2025).

Table 2. Debt and equity market data of grocery firms in 2025

	Kroger	Walmart	Albertsons	Costco	Publix
Debt					
Credit rating	BBB	AA	BB+	AA	NA
YTM	5.4%	4.5%	6.0%	4.1%	NA
Equity					
Stock price ($), 03/03/25	62.89	97.59	20.69	1,046.85	19.20
No. of shares (millions), 03/03/25	723.606	8,033.386	579.379	443.899	3,253.000
Stock price ($), average last 3 months	61.85	95.65	19.98	984.93	18.63
Standard deviation, last three months	2.37	4.18	0.69	49.31	0.575
Coefficient of variation, last three months	0.04	0.04	0.03	0.05	0.03
No. of shares (millions), last three months	723.586	8,033.785	579.365	443.797	3,253.00
Stock price ($), average last 12 months	56.45	76.84	19.85	870.95	16.71
Standard deviation, last 12 months	3.95	13.40	0.85	92.63	1.48
Coefficient of variation, last 12 months	0.07	0.17	0.04	0.11	0.09
No. of shares (millions), average last 12 months	723.017	8,043.844	578.485	443.463	3,284.00
Beta	0.61	0.70	0.32	0.99	NA

Sources and Notes: The source for the credit ratings and YTMs is Standard & Poor's (2025), obtained in the Fixed Income modules of S&P's Net Advantage. YTMs are weighted averages calculated by the authors using bond amounts, maturities, and individual debts' YTMs provided in the database for each company. Equity prices and the number of shares of the firms other than Publix were obtained from the Wharton Research Data Services database (WRDS 2025). The last 3 months' average includes daily data from December 1, 2024 through March 3, 2025, and the last 12 months' average includes data from March 1, 2024 through March 3, 2025. Equity prices and the number of shares of Publix were obtained from Publix's website (accessed May 10, 2025) and the company's 10-K form, respectively. Betas were obtained from Yahoo Finance's website.

Table 3 provides descriptive statistics of US Treasury securities data, obtained from the US Department of the Treasury. Table 4 presents statistics from investment management company Ibbotson, which is the reference most financial practitioners use when estimating the equity risk premium. Table 4 shows that the ERP has ranged from 6.1 percent to 7.8 percent, depending on whether practitioners prefer short-term or long-term rates as proxies for the risk-free rate. Some surveys have asked financial managers to indicate the ranges of ERPs they use. In one survey, 11 percent of managers reported an ERP of less than 3 percent, 23 percent reported an ERP between 3 percent and 4 percent, 49 percent reported an ERP between 5 percent and 6 percent, and 17 percent reported an ERP above 7 percent (Jacobs and Shivdasani 2012). In another survey, 11 percent indicated that their ERP was between 3 percent and 4 percent, 37 percent used an ERP between 5 percent and 6 percent, and the rest did not respond to this question (Bruner et al. 1998). Still, 47 percent of financial managers reported in another survey that their ERP ranged from 4.9 percent to 9 percent, with an average of 6.5 percent (Bruner et al. 1998). Moreover, another survey indicated that, in 2018, managers reported an average ERP of 4.4 percent (Graham and Harvey 2018). In short, survey results from practitioners suggested that there was no unique or appropriate number to use as the ERP in CAPM and WACC estimation, which was expected given that forecasting stock returns is complicated by high volatility and statistical noise in stock prices.

Table 3. Descriptive statistics of Treasury securities yields (annual percentage points) by maturity

	3 months	1 year	5 years	10 years	20 years	30 years
Last 3 months up to the end of February 2025:						
Average	4.4	4.2	4.3	4.5	4.8	4.7
Minimum	4.3	4.1	4.0	4.2	4.4	4.3
Maximum	4.5	4.3	4.6	4.8	5.1	5.0
Last 6 months up to the end of February 2025:						
Average	4.6	4.2	4.1	4.3	4.6	4.5
Minimum	4.3	3.9	3.4	3.6	4.0	3.9
Maximum	5.2	4.4	4.6	4.8	5.1	5.0
Last 12 months up to the end of February 2025:						
Average	5.0	4.6	4.2	4.3	4.6	4.5
Minimum	4.3	3.9	3.4	3.6	4.0	3.9
Maximum	5.5	5.3	4.7	4.8	5.1	5.0

Sources and Notes: Calculated by the author using daily yields data from US Department of the Treasury (2025). The columns in the table indicate the security's maturity.

Table 4. The equity market risk premium (annual percent)

	Historical	Implied
Returns on short-term government debt	3.3	n/a
Returns on long-term government debt	5.0	n/a
Market return (average of small and large stocks)	11.1	n/a
ERP based on short-term risk-free rate	7.8	n/a
ERP based on the long-term risk-free rate	6.1	4.3

Note: "n/a" indicates "not applicable."
Source: Historical metrics are statistics generated by Ibbotson Associates Inc. (New York Life Investments 2025). The implied ERP is an estimation by Damodaran (2025b).

Table 5. Selected financial metrics for US agribusiness and the market

Financial metric	Agribusiness	Market
Beta	0.616[a]	1.019[a] and 1.090[b]
WACC	6.9%[a]	9.1%[a] and 10.1%[b]
Debt to Capital	35%[a]	33%[a]
Debt spread over a Baa-rated firm	1.2%[b]	1.2%[b]

Note: Specifically, the market's WACC was estimated from the WACC calculator using a 6.1 percent ERP. The market data represent all industries except financial industries.
Source: [a]Trejo-Pech (2023). [b]Damodaran (2025a).

6 The WACC of Agribusiness and the Market

As a result of the analysts' search, the equity analyst obtained estimated WACCs for the US agribusiness sector and the market. Such data was commonly available for some firms whose publicly traded stock was frequently traded. Relevant metrics are presented in Table 5. While the analyst was aware that these estimates likely used different assumptions, the analyst believed they were relevant benchmarks. The equity analyst believed the agribusiness sector could serve as a benchmark for grocery companies, given

that food and beverage products accounted for the primary sources of income in grocery stores, and grocery stores represented the largest food retail channel for agribusiness manufacturers.

7 In Preparation for the Meeting

Late in May 2025, after weeks of diligent work, the equity analyst had calculated estimated WACCs for the grocery firms and the US market. The analyst was getting ready to meet with their supervisor and mentor. As part of their task, the analyst's supervisor gave them the list of questions below to guide their work, to provide discussion points, and to ensure they understood the concept of cost of capital:

(1) Estimate the WACC of Kroger, Walmart, Costco, and Albertsons. Specify and justify your assumptions for each component of the WACC and CAPM formulas.
(2) Traditional grocery firms (Kroger and Albertsons) and nontraditional grocery firms (Walmart and Costco) differ in their revenue mix. Do you expect significant differences in WACC among these two groups of firms? Why? Did you observe differences in your WACC estimations? What WACC components drive these differences, if any?
(3) Identify from the WACC and CAPM equations which variables are firm-specific and which ones would be the same for all firms.
(4) Estimate the WACC of an average or representative US agribusiness. Specify and justify your assumptions for each component of the WACC. Are grocery stores' WACCs similar, higher, or lower than the WACC of an "average" agribusiness and an "average" US firm? Is this what you expected? Why?
(5) Estimate the WACC of Publix, a private grocery company. Briefly explain the challenges of estimating the cost of capital of a private firm as opposed to a publicly traded firm.

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Appendix A. A Technical Note on the Cost of Capital

A1 How to Estimate a Firm's Cost of Capital

The two primary types of capital that companies use to finance their assets are debt (D) and equity (E). Therefore, given the cost of debt (r_D) and equity capital (r_E), the overall cost of capital is the weighted average of the two. This is why the cost of capital is also known as the weighted average cost of capital or simply WACC.

$$WACC = \frac{D}{D+E} \times r_D \times (1-t) + \frac{E}{D+E} \times r_E = W_D \times r_D \times (1-t) + W_E \times r_E. \quad \text{(A1)}$$

As implied by Equation (A1), W_D and W_E represent the company's capital structure because they are the weights or proportions of the two types of capital. In the context of the WACC estimation, r_D is also referred to as the *before*-tax cost of debt, because, as Equation (A1) shows, the cost that companies pay for their debt (i.e., interest) is reduced by the company's tax rate (t).[10]

Thus, estimating a company's WACC is apparently a simple exercise if the inputs of Equation (A1) are known.[11] However, this is not true in practice. Financial managers are generally unsure which values to use as inputs to the WACC equation. This is because firms do not directly observe some of these inputs and must estimate them, which introduces inaccuracies. In addition, there are ambiguities in the application of the cost-of-capital theory (Bruner et al. 1998), which prevent the development of a straightforward method for calculating the WACC.

A2 The Capital Structure (W_D and W_E)

The weights of debt and equity in the firm's capital structure can be estimated using book values from the balance sheet or market values based on the prices of debt and equity securities. Publicly traded firms have stock prices readily available through public sources; therefore, the market value for a firm's equity can be obtained by multiplying the stock price by the number of shares outstanding. The market value of equity generally differs significantly from its book value. For instance, according to Yahoo Finance,[12] Kroger's market value of equity on May 15, 2025, was approximately $41.45 billion compared to its equity book value of roughly $8.3 billion, meaning that Kroger's equity traded about 5 times or 500 percent relative to its book value. This significant difference is common for grocery stores and, in general, for most publicly traded companies.

In contrast, the market and book values of debt are generally similar. For example, by mid-May 2025, we estimated the market value of debt for selected grocery stores. We compared them to their book values and found that the average market value-to-book value ratio was 94 percent. In addition, unlike equities, the market values of debt securities (bonds) are generally not readily available, and the data needed to estimate them are usually available only for firms with frequently traded bonds through subscription services such as Bloomberg or Standard & Poor's databases. Given the limitations in

[10] The reason for including a "tax shield," 1 – t in Equation (A1), is that interest expenses are tax-deductible. In other words, interest expenses are listed before taxable income in the income statement, meaning that the amount paid for interest decreases taxable income and, consequently, income taxes. For example, if a company pays an average of 6 percent interest on its debt and has a 20 percent tax rate, the debt will actually cost the company 0.05 ×(1 – 0.20) = 0.040, or 4.0 percent; this is the after-tax cost of debt.

[11] For example, assume a firm has 60 percent debt and 40 percent equity. The firm pays banks an average of 10 percent for the various types of loans acquired and promises to pay equity owners an annual rate of 12.5 percent. Given a 20 percent income tax rate, the company's after-tax cost of debt is 0.10 × (1 – 0.20) = 0.080, or 8.0 percent. The company's WACC would be 0.60 × 0.08 + 0.40 × 0.125 = 0.098 or 9.8 percent.

[12] Yahoo! Finance, accessed May 16, 2025.

estimating debt's market value and the general similarity between market and book values, leading finance textbooks recommend using the book value of debt when the market value is unavailable. They further recommend combining the market value of equity and the book value of debt as an appropriate practice when calculating a company's WACC (Brigham and Houston 2019).

A3 The Before-Tax Cost of Debt (r_D)

This section discusses two approaches to estimate the cost of debt.

A3.1 The Yield to Maturity Approach

For privately owned firms, the before-tax cost of debt is the weighted average of recent interest payments, or simply interest paid divided by total debt. Alternatively, private firms may ask their bankers how much *new* debt would cost and thus use the marginal, rather than the current, cost of debt when calculating the WACC. Publicly traded firms can borrow from investors (debt holders) by selling them bonds.[13] Similar to banks, debt holders expect payments in the form of interest, called coupon payments, and the principal amount to be repaid at maturity.[14] As bonds are traded and the firm and market conditions change, the bond's price changes, and consequently, the debtholders' rate of return also changes. This annual rate of return, called the bond's yield to maturity (YTM), is the cost of debt or r_D from Equation (A1) for a company with listed debt securities on an exchange market. The YTM is the internal rate of return of debtholders' expected cash flows, and from the company's side, it represents the most current cost of obtaining debt capital. In practice, companies commonly use the current YTM of their debt as their cost of debt when calculating WACC, as shown in Figure 2.[15]

A3.2 The Risk-Free Rate Plus Spread Approach

Alternatively, some financial managers employ the "risk-free rate plus spread" approach to estimate their cost of debt. In essence, this method is equivalent to the YTM, but the company uses the average YTM of a sample of firms with similar credit risk rather than the YTM of its specific debt. Figure A1 illustrates this approach. The top panel of Figure A1 shows the average YTM per day from May 2023 (when the COVID-19 pandemic ended) through May 2025 for Moody's Baa-rated corporate bonds. A Baa Moody's rating code is equivalent to a BBB Standard & Poor's rating code and represents an "investment grade" debt risk or midlevel/average debt risk.[16] Specifically, if a firm with a Baa debt credit risk estimated its WACC by May 2025, it had the option to use as r_D for Equation (A1) its own debt's YTM (let us assume it was 5.8 percent) or the average YTM of the market (e.g., a diversified portfolio of many firms), which was 6.2 percent, according to Figure A1. Financial analysts may prefer to use the average YTM from their firm's peers (i.e., 6.5 percent) instead of their firm's YTM (i.e., 5.8 percent) for several reasons, including infrequent trading of their company's debt securities or the expectation that their company's YTM will move toward the market average YTM.[17] In short, YTM data provided by credit rating agencies are

[13] For simplicity, this discussion assumes that publicly traded companies use primary bonds to raise debt capital. Firms can also obtain debt from banks.

[14] The amount lent per debt unit or bond is also known as the bond's face value or par value.

[15] Figure 2 shows that some firms use the marginal estimated YTM, or the cost of debt if they had to issue new debt. With this method, firms assume that if they issue new debt, the cost of debt may differ from the current YTM because their capital structure will change, changing the firm's overall risk. Therefore, instead of using the observed current cost of debt, they *estimate* or *forecast* the cost of marginal debt.

[16] The company's debt credit risk is assessed by credit rating agencies such as Standard & Poor's and Moody's, which assign bond rating codes (e.g., AAA is assigned to a firm's debt with the lowest risk, and CCC to the highest risk). A Baa or BBB grade means a firm's debt has medium or "average" risk.

[17] Furthermore, after analyzing the trends of the sample of firms' yields, an analyst may use a YTM above or below the 6.2 percent if they expect the average YTM to increase or decline.

relevant because they capture information from hundreds of firms. Approximately one in four surveyed financial analysts from firms that follow best practices reported using this type of information (Brotherson et al. 2013).

Figure A1. Moody's Baa corporate bond yield to maturity (YTM), risk-free rate (RFR), and spreads (yield relative to a 10-year Treasury bond)

Source: Federal Reserve Bank (2025).

The approach just discussed is referred to as the "risk-free rate plus spread" because it is a common practice to represent the YTM as the risk-free rate (r_F) plus a debt spread (YTM = r_F + debt spread), as illustrated in Figure A1. Equivalently, the debt spread is the corporate bond YTM relative to the risk-free rate (debt spread = YTM – r_F). The debt spread represents the premium corporations pay investors to buy their bonds rather than risk-free bonds. To illustrate this concept, the gap between the YTM and r_F in Figure A1 provides the debt spread of Baa corporate bonds. By May 2025, the debt spread was approximately 1.8 percent, the difference between the 6.2 percent YTM discussed and the 4.4 percent paid by 10-year US Treasury bonds. Conceptually, the separation of r_F from the debt spread highlights that debt security investors have the option to (1) invest in risk-free or safe debt and be compensated with a risk-free rate of return (4.4 percent in this example) or (2) invest in risky corporate debt by buying Baa rated bonds and obtain a spread or premium (1.8 percent) over the risk-free rate. The spread is relatively low because Baa-rated bonds are considered "investment-grade" securities with a low default risk. This insight is crucial when calculating another WACC component—the cost of equity—as discussed below.

A4 The Cost of Equity (r_E)

This section discusses the capital asset pricing model to estimate the cost of equity, and its components.

A4.1 The Capital Asset Pricing Model

The cost of equity is the rate of return that equity holders (shareholders) expect to receive from investing as owners of the company. However, unlike debt investors or banks, shareholders cannot know in advance, nor can they negotiate with the company leadership, the rate of return they will earn. Even if a company regularly pays dividends to its shareholders, dividends do not necessarily reflect the rate of return shareholders expect to earn, given the company's risk, and a firm is not obligated to pay dividends continuously throughout its lifetime. Therefore, the cost of equity is not directly observable by firms or shareholders; instead, it is estimated based on shareholders' *expectations* aligned with the firm's risk. Consequently, the cost of equity is arguably the WACC input that is more difficult to estimate accurately.

Several models have been developed to estimate the cost of equity for publicly traded companies. Surveys consistently reveal that the majority of financial managers employ the Capital Asset Pricing Model (CAPM) to estimate the cost of equity (Brotherson et al. 2013; Bruner et al. 1998; Graham and Harvey 2001). The CAPM is a stylized model for estimating shareholders' expected rate of return given the overall market expected return, the risk-free rate, and the firm-specific risk level (Sharpe 1964). The following equation expresses CAPM:

$$r_E = r_F + (\beta \times ERP), \tag{A2}$$

where β is the firm's equity risk beta, ERP is the equity market risk premium, and the other variables, defined previously, are the cost of equity and the risk-free rate.

A4.2 The Equity Risk Premium

The equity market risk premium is the equity spread equivalent of the debt spread discussed in the previous section. Specifically, the ERP is the rate of return of a sample of equities representing the market, minus the rate of return of government bond securities, which represents the risk-free rate. Thus, the ERP is the additional return enticing investors to invest in a diversified portfolio of risky equities rather than in risk-free securities. While several diversified portfolios are intended to represent the US equity market, the S&P 500 index is typically used to represent the market when calculating the WACC. Thus, the rate of return on equities in the S&P 500 index or another index is equivalent to the average rate of return of bonds, or YTM, as discussed (Figure A1).

A4.3 The Firm's Beta

The firm's beta measures the risk of a company's equity (stock) relative to the overall market, represented by a diversified portfolio of stocks, such as the S&P 500 index. To obtain beta, a company's returns are compared to the market's returns over time. Beta predicts how much a company's stock return is likely to change when the overall equity market return changes. Figure A2, a scatter plot of Kroger and the S&P 500 monthly returns from 2019 to 2023, illustrates the concept of beta. The trendline in Figure A2 captures the linear relationship between Kroger's equity and the equity market's returns. The trendline slope, equal to 0.45 in Figure A2, is Kroger's beta, meaning that a 1 percent change in market return is expected to change 0.45 percent of Kroger's return.[18] In general, a firm's beta represents

[18] Beta is estimated by regressing a firm's (Kroger) stock (monthly) returns on the market (S&P 500 index) returns over a period (2019–2023). The estimated parameter of the independent variable (S&P 500 returns) is the firm beta. This is equivalent to calculating the slope of the trendline in the Kroger and S&P 500 returns series with the Excel SLOPE function.

the company's stock's sensitivity to market movements, with a beta of 1.0 representing the threshold or the market's beta. A firm beta higher (lower) than 1.0 means the company's stock is more (less) volatile than the market.[19]

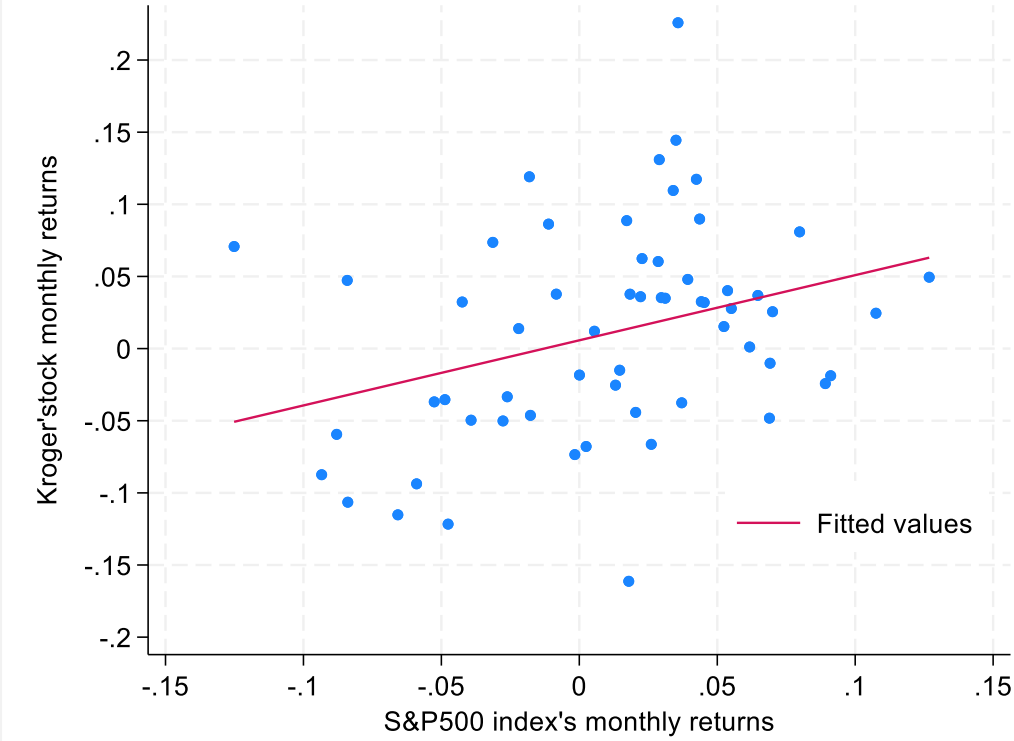

Figure A2. Kroger and the S&P 500 index returns from 2019 to 2023 (slope of trendline = 0.45)

Source: Calculated by the author using monthly returns of Kroger and the S&P 500 index from COMPUSTAT.

[19] In the CAPM framework, beta measures the systematic risk of stocks. A firm's equity total risk is composed of systematic and idiosyncratic risk. Idiosyncratic risk refers to firm-specific risk (such as the risk related to the firm's management capabilities or products). According to the efficient portfolio theory, idiosyncratic risk can be diversified away, and since all investors can diversify their investments, what matters and is compensated by the market is systematic risk, which is the risk related to the overall market. Consequently, the beta measures how a firm's stock reacts to overall market changes.

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