THE IMPACT OF OWNERSHIP STRUCTURE ON FINANCING OF U.S. ENERGY UTILITIES: AN EMPIRICAL INVESTIGATION

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OPEN ACCESS

How to cite this paper: Topyan, K., Wang, C.-J., & Boliari, N. (2025). The impact of ownership structure on financing of U.S. energy utilities: An empirical investigation. *Corporate Ownership & Control, 22*(2), 141–149. https://doi.org/10.22495/cocv22i2art13

ISSN Online: 1810-3057
ISSN Print: 1727-9232

Received: 17.03.2025
Revised: 09.05.2025; 25.05.2025
Accepted: 05.06.2025

JEL Classification: G12, G28, G32, G34
DOI: 10.22495/cocv22i2art13

Abstract

The benefits of becoming a holding company have been scrutinized in several research papers. While some of the research findings were in favor of holdings, others favored standalone business structures and suggested that holdings were not financially beneficial. This paper attempts to evaluate this for the U.S. energy utility companies with their distinct characteristics. To quantify the bond-spread differences attributable to the business structure, we separated the outstanding bonds issued by standalone and holding energy utility companies and compared their yield spreads, controlling for the risk ratings, maturities, and issue sizes of debts. As yield spread computations of callable bonds require special attention due to provisions allowing early retirement, we employed option-adjusted spreads (OAS), incorporating the risk attributable to debt as well as cash-flow-related contingencies. After obtaining the option-adjusted yield spreads of outstanding stand-alone and holding energy utility company bonds separately, we used these values in a master regression equation to test the statistical and economic significance of the binary variable separating the yields of the two sets. Our work finds that when the S&P ranks and maturities are controlled, stand-alone utility companies finance with a slightly higher cost of credit compared to energy utility holdings. This work is the first empirical evaluation of the impact of business structure on the cost of debt financing of the U.S. energy utility holding companies.

Keywords: Energy Utilities, Utility Holdings, Yield Spreads, Option-Adjusted Spreads, Callable Bonds

Authors' individual contribution: Conceptualization — K.T. and C.-J.W.; Methodology — K.T., C.-J.W., and N.B.; Investigation — K.T., C.-J.W., and N.B.; Writing — Original Draft — N.B.; Writing — Review & Editing — C.-J.W. and N.B.; Visualization — K.T.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

1. INTRODUCTION

The energy utility industry, a cornerstone of modern infrastructure, faces unique financial challenges arising from its dual role as both a public service provider and a competitive market player. Energy utilities provide essential services such as electricity and natural gas, making their financial health critical to both consumers and investors. Within this sector, the distinction between stand-alone utilities and utility holding companies has significant implications for their financial strategies and cost of debt financing.

Utility holding companies oversee subsidiaries engaged in generating, transmitting, and distributing energy services. These companies benefit from diversified revenue streams, which contribute to financial stability and potentially lower their cost of capital. Additionally, holding companies can offset losses from one subsidiary against profits from another, gaining tax advantages and operational flexibility. In contrast, stand-alone utility companies typically focus on specific geographic areas or services, operating under simpler structures with a more localized focus.

The financing strategies of these two business models differ considerably. Holding companies often access capital markets to secure larger funding for expansion and diversification. Their scale of operations may lead to economies of scale, reducing their cost of capital. Furthermore, the separation of operating companies within the holding structure shields the parent entity from subsidiary debt, potentially lowering bankruptcy costs. However, this structure also introduces complexities, such as cross-subsidization and opaque financial relationships, which can erode investor confidence and increase borrowing costs. These challenges highlight how the structural differences between stand-alone utilities and holding companies can influence their financing costs and risk profiles.

Regulatory dynamics have historically played a crucial role in shaping these business structures. For example, the Public Utility Holding Company Act (PUHCA) of 1935 imposed stringent regulations on utility holding companies, requiring financial transparency and limiting their operations to a single integrated system. The repeal of PUHCA in 2005 was intended to encourage growth and restructuring, but critics warned of potential abuses, such as excessive debt and opaque accounting practices. While proponents argued that deregulation would spur innovation, mergers and acquisitions have been moderated by state utility commissions, as highlighted by Thakar (2008). Regulatory frameworks significantly influence the creditworthiness of utility companies. For instance, evolving business models and regulatory modes can alter how credit rating agencies assess utilities, impacting their financing costs (Holt, 2016). These regulatory dynamics continue to shape financial strategies and the cost of debt in the utility sector.

Scholars have examined the interplay between regulatory frameworks and financial strategies in utility firms, emphasizing how regulations shape leverage, cost structures, and financial outcomes. Nicodano and Regis (2014) highlight that the intercorporate structures of utility holding companies can obscure financial health and increase risks associated with leverage. Hempling (1995) further observes that the complexity of holding company structures attracts greater regulatory scrutiny and compliance requirements, often resulting in higher financing costs. Kovvali and Macey (2023) demonstrate how utility holding companies exploit cross-subsidization strategies, transferring value from rate-regulated affiliates to non-rate-regulated ones. This practice not only obscures financial transparency but also raises investor concerns over resource misallocation. Consequently, holding companies may face increased borrowing costs, as investors demand higher yields to offset these risks. These findings suggest that the structural intricacies of holding companies, coupled with regulatory and market conditions, influence their cost of financing.

Regulation also significantly impacts leverage decisions and financial strategies. For example, firms near a potential credit rating downgrade are more likely to adjust their capital structures to avoid adverse consequences. Cursio and Baek (2015) find that energy utility companies adjust their leverage less frequently and issue more net debt than industrial firms, reflecting lower default risk due to greater access to government support. Nielsen (2019) critiques the high leverage ratios encouraged by implicit government bailouts, arguing that such bailouts incentivize utilities to adopt riskier financial practices, leading to potential financial instability. Bortolotti et al. (2011) observe that when regulated by independent agencies, investor-controlled utilities strategically increase leverage, benefiting shareholders at the expense of consumers. Using UK data, Tapia (2009) argues that regulatory control over capital structures is warranted only when the cost of capital directly impacts utility pricing. In the U.S., the relationship between leverage and regulated pricing remains mixed. For instance, Klein et al. (2002) find a positive correlation between price regulation and leverage among insurers, while Bulan and Sanyal (2009) document a two-step leveraging process by deregulated electric utilities, where leverage initially decreases and then increases to finance growth opportunities. Conversely, Correia da Silva et al. (2004) examine regulated utilities in 16 less developed countries, finding a steady increase in leverage over time, accompanied by declining investment levels. These findings underscore the complex ways regulation shapes financial strategies within the utility sector.

Together, these studies reveal how regulatory contexts, credit ratings, and financial risk intersect in the utility sector. While regulatory frameworks significantly influence creditworthiness, financing costs, and operational strategies, this study focuses on the specific role of business structure in shaping the cost of debt financing for U.S. energy utility companies. Given that utility holding companies operate across multiple jurisdictions and manage both rate-regulated and non-rate-regulated subsidiaries, their structural complexity inherently reflects the regulatory heterogeneity they face. As such, the impact of regulatory frameworks is treated as an implicit component of the holding company's operational dynamics rather than as an explicit variable in this study.

This paper addresses the following central research question which is formulated as Eq. (7) in Section 4 that testing if the coefficient of *opco* is statistically significant:

RQ: Does the ownership structure, specifically being a stand-alone utility versus a holding company, affect the cost of debt financing for U.S. energy utility firms?

While prior literature discusses regulatory impacts and financial complexity, the specific credit cost implications of ownership structure in this sector remain underexplored. Our study fills this gap by employing a novel dataset of option-adjusted spreads (OAS) and a regression model that controls for maturity, rating, and issue size. This provides the first empirical evidence on whether stand-alone utilities systematically face higher borrowing costs than utility holding companies under controlled risk characteristics.

The inclusion of maturity as a control variable is particularly crucial, as Reinartz et al. (2018) emphasize the significance of aligning debt and asset maturities to mitigate financial risk and reduce the cost of debt. Their research on utility firms demonstrates that mismatches in maturity structures can increase financial risk, prompting firms to issue longer-term debt to address investor concerns. This underscores the intricate relationship between financial strategy and credit costs, making maturity an essential factor to consider in our analysis.

The paper is organized as follows. Section 2 discusses the challenges of computing returns for callable bonds and highlights the importance of option-adjusted spreads. Section 3 outlines the methodology for OAS computation and details the data. Section 4 presents and analyzes the computed OAS values. Section 5 discusses the estimation results. Section 6 concludes the study.

2. BONDS AND THEIR RETURNS

Bondholders, as the financiers of corporations in need of debt capital, expect an adequate return for their investments, considering the variety of risks they face, such as liquidity default, reinvestment, and early redemption. Accordingly, they would like to measure a bond's yield spread to quantify the expected return implied by the bond's future cash flows in exchange for the purchase price. A bond's yield spread is the best risk indicator reflecting all possible tangible and intangible risks bondholders assess quantitatively and/or subjectively. In other words, a bond's spread is the best reflector of the bond investor's sentiment on the riskiness of the firm under scrutiny.

Since the yield computations require knowledge of future cash flows, the reliability of the yield analysis depends on the clarity of the future cash flows. Simple cash flows of non-callable bonds, namely the coupons and interest payments with known maturity dates and well-defined payment intervals, make them simple to compare with reference benchmarks. The difference in their spread differential of a similar risk-free issue may be interpreted as the incremental return earned from the issue under evaluation in exchange for the incremental risk introduced by the issuers. As an oversimplified example, if a bond's spread is 73, it implies that the bond requires 73 basis points extra return compared to the Treasury security with the same maturity.

On the other hand, most bonds are callable, and the yield spread computations of callable bonds are more complex since their cash flows are not well-defined and their values are connected to the level of interest rates. These bonds contain provisions allowing early retirement so that the principal may be paid in whole or in part earlier than the stated maturity. This optionability introduces a yield spread analysis with more than one possible redemption date as the future cash flows are not well-defined. An uncertain redemption date connects the number of coupon payments to the unknown redemption date, creating uncertainty until just before the actual redemption date is obtained. One can say that the reliability of yield–spread analysis largely depends on a researcher's ability to guess the actual redemption date. If the predicted redemption date is different than the actual one, the entire yield-based analysis becomes irrelevant, and the measurement of the return is flawed. Additionally, predicting a future redemption date of an option-embedded bond without a proper risk model is a very difficult task since it requires the prediction of future interest rates. Miller (2007) considers this as a risk that is "… arguably surpassing the default risk" (p. 14). For the bond investors, options embedded in favor of the issuer are harmful, since a change in rates can make the issuer call the bond, terminating the investors' favorable returns, leaving the bond investors with unfavorable rates prevailing at that point. On the other hand, if the rates were to move up, the bond investors would stack with a rate well under the prevailing ones or sell the bond at a discount. This ambiguity requires us to find a way to predict a redemption date to compute the yield of the callable bond, so we can compare it with the non-callable ones. This issue stands out as the biggest hurdle in front of the researchers striving to compare the spreads of the bonds issued by different business structures. If you cannot compare the spreads of callable and non-callable bonds, then you cannot compare their relative riskiness and corresponding returns.

As underlined in the above paragraph, the issue boils down to an investor's ability to accurately predict the present value of a callable bond, requiring the use of a technique that is capable of dealing with the unknown future cash flows due to the embedded options of the callable bond. Such a technique is available and called "option-adjusted" spreads. This technique uses an option-pricing model that converts the possible early redemption dates into alternative cash flows using a probabilistic lattice covering the potential life of the option-embedded bond. As underlined in Topyan et al. (2024), "these provisions are called the embedded options and they are not separately written contracts, but they replicate hypothetical scenarios that the bond may be called earlier. In this sense, they operate like portfolios having a long non-callable bond and a short American call option written on the callable bond" (p. 4). It implies that the bondholders short the calls and the issuers long the calls and the portfolio value. That makes the value of the callable bond equal to the value of the non-callable bond plus the value of the call option. OAS were used by researchers in a variety of settings. Cavallo and Valenzuela (2010) used those spreads in emerging markets, Bierens et al. (2003) used them for corporate bond portfolios, Boyarchenko et al. (2019) used those for mortgage spreads, and Letizia (2012) used them for bank capital adequacy. However, this study is the first one using them in U.S. utility companies' yield spread comparisons.

In summary, our research evaluates a large portfolio of 1613 callable and non-callable bonds issued by electric and natural gas utilities. By using option-adjusted spread methods, we are able to classify the stand-alone and holding utility bonds and compare their risk-spread regardless of the fact that the bond is callable or non-callable, using proper controls introduced by the master regression equation detailed in Section 4.

3. THE DATA AND THE MODEL

The one-factor model Bloomberg used to compute the OAS values is in line with the past models evaluating similar cases. The model uses an arbitrage-free binomial tree of normally distributed short rates to establish a distribution of several different interest rate scenarios, which are driven by the volatility input for the interest rate. The forward rates can take only two possible values in the next period with equal probability. Each node of the tree uses one-year forward rates to value the option on the previous node. As Fabozzi (2006) underlines, it is assumed that a "one-year forward rate can evolve based on a random process called a log-normal random walk with a certain volatility" (p. 326). The OAS model considers the bond's call schedule to establish the evolution of rates over time by treating the implied forward rates as outcomes of a binomial process. The specifics of the model obtained from Windas (1996) is included in Table A.1, the Appendix, and constitutes a clear and comprehensive view of OAS modelling.

As further explained in Fabozzi (2006, p. 310) that a binomial option pricing model based on the price distribution of an underlying bond suffers from the same problematic assumptions of the Black-Scholes model that the prices are normally distributed and that the short-term interest rate and the variance of prices are constant over the life of the option. Part of the problem may be eliminated using a model that is based on the distribution of the yields rather than prices. Our binomial option pricing model is yield-based, which solves the constant short-term interest rate and volatility issue. Most importantly, the models considering the yield curve do not permit arbitrage opportunities and hence are called arbitrage-free option pricing models.

In detail, we first need to obtain the OAS of all outstanding energy utility bonds. We computed the OAS values for each bond using a callable-bond equivalency equation in the following form:

$$B_{cb} = B_{ub} - C \tag{1}$$

where B_{cb} is the callable bond price, B_{ub} is the option-free or non-callable bond price, and C is the price of the call option. The price of the call option is subtracted from the bullet bond since the bond investor sells a call option and receives a price for the option.

The percentage volatility of a short rate R in terms of given possible high and low outcomes may be expressed using the equation:

$$V(R) = \frac{\left(\frac{1}{\sqrt{\Delta t}}\right) . \ln\left(\frac{R_H}{R_L}\right)}{2} \tag{2}$$

where $V(R)$ is the percent volatility of the short rate, Δt is the length of the time period in years, R_H is the high value of the possible outcome of short rate R, and R_L is the low value of the possible outcome of short rate R.

Equation (2) may be rearranged to solve for R_H and R_L:

$$\ln\left(\frac{R_H}{R_L}\right) = 2V(R)\sqrt{\Delta t} \tag{3}$$

that may also be written as

$$\frac{R_H}{R_L} = e^{\ln\left(\frac{R_H}{R_L}\right)} = e^{2V(R)\sqrt{\Delta t}} \tag{4}$$

Finally, Eq. (4) may be rearranged as

$$R_H = R_L . e^{2V(R)\sqrt{\Delta t}} \tag{5}$$

Using the Bloomberg terminal's Fixed Income Worksheets (FIW) module, we can define certain facets to filter the specifics of the data we need for the work. The following commands were entered to obtain the data:

- [Select] All outstanding U.S. corporate bonds;
- [Select] Sector = Natural Gas [NG] & Electric [E] utilities;
- [Select] Business structure = NG & E utility holdings & NG & E stand-alone utilities;
- [Sequence] Maturities (Standard U.S. Treasury maturities);
- [Sequence] S&P ratings (AAA to B-);
- [Get Data] Security ID, business structure, S&P rating, option-adjusted spread [OAS], amount issued, maturity;
- [Get Matrix] OAS counts for the maturities and S&P ratings cells;
- [Get Matrix] OAS averages for the maturities and S&P ratings cells.

Once executed, Bloomberg exports the requested data in an Excel spreadsheet. It is important to note that the OAS computations are carried out within the Bloomberg terminal, but the model specifics of the computations are provided in Table A.1, the Appendix, for the readers.

The study includes all listed energy utility companies in the U.S. as of October 21, 2024. Our initial data set included 2497 listed bonds issued by utility companies. Out of this number, 2204 of those bonds are electric utility company bonds, while 239 of those were natural gas utility company bonds. The remaining 54 bonds listed under "other utilities" were excluded, leaving 2443 listed bonds as our dataset. One thousand nine hundred thirty-five (1935) of those bonds were issued by stand-alone energy utility companies, while the remaining 508 were issued by the energy utility holding companies. Table 1 below summarizes our data.

Table 1. Data summary matrix excluding binary variables (N = 1613)

Variables	*Mean*	*Std. dev.*	*Min*	*Max*
Option-adjusted spread (OAS)	102.2	48.9	-172.5	669.9
Debt issue amount	4.2E+08	3.45E+08	11,000	3.1E+09
Maturity	9.9	9.5	0.00	71

As briefly explained above, a two-stage model has been employed here: The first stage is to obtain the computed OAS values for the master regression equation. In this stage, the OAS values of all S&P-rated outstanding energy utility company bonds were obtained and classified using the common S&P risk classes and common U.S. Treasury maturities. This is needed to test if they are different statistically and economically for the energy utility holdings versus stand-alone energy utility companies.

In the second stage, we use the first stage's computed option-adjusted spread values and regress those on an intercept, control variables (S&P ratings binaries, issue sizes, and a decimalized bond maturity variable), and an ownership structure binary variable separating holding utility companies from the stand-alone ones. Using Eq. (6) below, we test if the coefficient of the binary variable separating the two groups is statistically significant. It was hypothesized that the holding companies would bear less overall risk and, therefore, their yield spreads should be lower. Our sample comprised 1621 corporate bonds, of which 501 were holding company bonds.

$$OAS_i = \alpha + \beta UtCo_i + \sum_j \delta_j Controls_{j,i} + \varepsilon_i \qquad (6)$$

Equation (6) checks if the coefficient of our business structure binary variable, β, that separates the OAS of utility-holding companies (*UtCo*) from the stand-alone ones is statistically and economically significant. All other right-hand side variables are exogenous controls covering riskiness, terms, and the issue sizes of the bonds. The callable versus noncallable bond issues have been handled with the use of option-adjusted spread analysis.

As a second stage, we separately classified the listed energy utility company bonds as stand-alone energy utilities and energy utility holdings. Tables 2a and 2b and Table 3 below show the count distribution of those bonds using S&P rating and standard Treasury maturities. Note that there are no listed AA, AA-, A+, and A rating bonds for energy utility holdings and BB- and B bonds for stand-alone energy utilities. Table 2a and 2b also highlight that stand-alone energy utilities have higher-ranked bonds compared to energy holdings, but this might be due to the imbalanced number of standalone utilities compared to the holdings. Since we need to compare the bond spreads of two separate groups, controlling the risk ranking and maturity, we must exclude the listed bonds in certain S&P rankings if the specific ranking is not utilized by both standalone energy utilities and holding utilities. As a result, we eliminated AA, AA-, A+, A, BB-, and B rated bonds since these appear only for standalone energy utilities or energy holding utilities. We further eliminated a handful of bonds due to the unavailability of the issue amount that we would like to include as a control variable. The logic behind including the issue amount is based on the fact that the higher the amount borrowed, the higher the risk it might bring to the issuer. While this ignores where on the capital structure the firm operates at the moment of borrowing, it roughly assumes a firm will get riskier as the leverage increases. Our results will shed light on this assumption.

Table 2a. Original data — Standalone energy utilities

Risk class/ maturity years	*<=1*	*1-2*	*2-3*	*3-5*	*5-7*	*7-10*	*10-20*	*20-30*	*30+*
AA	-	-	-	-	1	-	2	-	-
AA-	1	2	3	3	2	4	1	5	-
A+	6	3	1	9	10	25	38	51	-
A	19	23	20	50	35	105	193	217	22
A-	63	49	78	148	78	52	104	77	8
BBB+	14	15	14	29	16	53	64	89	1
BBB	6	7	6	16	6	17	19	20	1
BBB-	2	2	2	6	-	6	-	-	-
BB+	2	5	4	4	4	2	4	-	2
BB	-	2	5	10	2	4	2	-	-

Note: The table provides the bond counts of the listed outstanding bonds issued by the standalone operating U.S. electric and natural gas utilities using S&P ratings and standard U.S. Treasury maturities. Data is obtained using the Bloomberg terminal on September 15, 2024.

Table 2b. Original data — Energy utility holdings

Risk class/ maturity years	*<=1*	*1-2*	*2-3*	*3-5*	*5-7*	*7-10*	*10-20*	*20-30*	*30+*
AA-	-	-	-	2	-	1	1	-	-
A-	4	2	2	6	9	8	8	17	-
BBB+	11	14	22	28	16	24	16	22	-
BBB	22	21	21	33	23	27	20	25	11
BBB-	7	5	4	10	15	6	1	10	10
BB+	-	-	-	-	2	-	-	3	-
BB	4	-	-	6	3	2	-	-	1
BB-	-	2	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	1

Note: The table provides the listed outstanding bond counts issued by the U.S. energy utility holdings using S&P ratings and standard U.S. Treasury maturities. Data is obtained using the Bloomberg terminal on September 15, 2024.

Table 3 below shows the count distribution of our final data set, showing 1120 listed operating company bonds in the top section and 501 listed utility holding bonds. For each of those bonds, we obtained the issue amount, decimalized maturity, and grouped those values using S&P ranking and business structure (standalone or holding energy utility). We then obtained the OAS for those bonds and finally ran the master regression by regressing the OAS on maturity, risk class, and the issue amount as controls. We like to emphasize that Table 3 uses only the common S&P rating classes used by both stand-alone energy utilities and the energy utility holdings. We excluded all bonds appearing in S&P ratings of one type but not the other. This is intended to ensure complete control of the riskiness of the bonds issued by utility holdings and the stand-alone utilities.

Table 3. Refined data

Risk class/ maturity years	*<=1*	*1–2*	*2–3*	*3–5*	*5–7*	*7–10*	*10–20*	*20–30*	*30+*
A-	63	49	78	148	78	52	104	77	8
BBB+	14	15	14	29	16	53	64	89	1
BBB	6	7	6	16	6	17	19	20	1
BBB-	2	2	2	6	-	6	-	-	-
BB+	2	5	4	4	4	2	4	-	2
BB	-	2	5	10	2	4	2	-	2
A-	4	2	2	6	9	8	8	17	-
BBB+	11	14	22	28	16	24	16	22	-
BBB	22	21	21	33	23	27	20	25	11
BBB-	7	5	4	10	15	6	1	10	10
BB+	-	-	-	-	2	-	-	3	-
BB	4	-	-	6	3	2	-	-	1

Note: The table provides the common-risk rating counts of bonds included in the study using S&P ratings and standard U.S. Treasury maturities. The data enables us to compare the OAS of utility holdings with the stand-alone utility companies, controlling their maturity and risk classes, and the issue amount. The top section is for the stand-alone utilities, and the bottom section is for the utility holdings. N = 1613.

Table 4 below, with top, middle, and bottom sections, further clarifies the data refining process. The full set section on top of the table shows the average OAS values for the corresponding risk rankings and maturities. For example, a bond rated A- with 5 to 7 years to maturity has a cell value of 149 basis points (underlined) means that the bonds falling in this specific cell have an average OAS value of 149 basis points. With the help of Table 3 above, we know that there are nine utility holding bonds plus 78 stand-alone utility company bonds in this cell. The average OAS value of 149 basis points is the average premium received over a 5–7 year Treasury security's return at the date. The data is collected and attributable to 89 bonds from both sections falling in this cell.

If we move down to the middle section of the table, we see that the same cell reporting just for stand-alone utilities shows that the average OAS value is 151 basis points (underlined) and obtained by taking the average of the 78 stand-alone utility company bond's OAS values. Finally, if we look at the bottom section of the table, we see the same for utility holding company bonds only. We have nine such bonds falling in this cell, and their average OAS value is 128 basis points (underlined).

Finally, Table 4 discloses the risk classes that are available for both stand-alone utilities as well as the utility holdings. These lines are highlighted as boldface. Other cells are deleted from the regression data since we cannot make a comparison using controls unless the cells are included for stand-alone utilities and utility holdings. In more detail, say, if we include the data for AA- bonds, we see that those bonds are issued by only the stand-alone utilities, and not available in the utility holdings set. If we include those in our master regression equation, we will not be able to compare the corresponding OAS for the utility holdings. As a result, we limited our data to the cells that are used by both stand-alone utilities and utility holdings.

Table 4. Average OAS values of the utility company bonds (Part 1)

Risk class/ maturity years	*<=1*	*1–2*	*2–3*	*3–5*	*5–7*	*7–10*	*10–20*	*20–30*	*30+*
AA	-	-	-	-	115	-	215	-	-
AA-	150	159	148	132	201	208	159	198	-
A+	35	42	54	110	98	117	157	168	-
A	66	71	66	95	105	134	167	171	125
A-	**147**	**119**	**126**	**124**	**149**	**147**	**180**	**183**	**188**
BBB+	**93**	**86**	**102**	**109**	**121**	**152**	**189**	**195**	**-**
BBB	**105**	**90**	**105**	**107**	**128**	**156**	**193**	**203**	**216**
BBB-	**116**	**103**	**105**	**142**	**154**	**176**	**273**	**220**	**240**
BB+	**406**	**89**	**122**	**167**	**179**	**186**	**248**	**252**	**276**
BB	**149**	**179**	**171**	**178**	**189**	**199**	**235**	-	**283**
BB-	-	151	-	-	-	-	-	-	-
B+	-	151	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	283
AA	-	-	-	-	115	-	215	-	-
AA-	150	159	148	132	201	208	159	198	-
A+	35	42	54	110	98	117	157	168	-
A	66	71	66	95	105	134	167	171	125
A-	**150**	**120**	**127**	**125**	**151**	**146**	**181**	**182**	**188**
BBB+	**114**	**87**	**116**	**115**	**125**	**153**	**191**	**199**	**-**
BBB	**120**	**114**	**132**	**116**	**132**	**174**	**200**	**215**	**306**
BBB-	**104**	**131**	**120**	**141**	**-**	**180**	**-**	-	**-**
BB+	**406**	**89**	**122**	**167**	**173**	**186**	**248**	-	**276**
BB	-	**179**	**171**	**172**	**198**	**198**	**235**	-	-
BB-	-	-	-	-	-	-	-	-	-
B+	-	-	-	-	211	209	-	-	-
B	-	-	-	-	-	-	-	-	-

Table 4. Average OAS values of the utility company bonds (Part 2)

Risk class/ maturity years	*<=1*	*1–2*	*2–3*	*3–5*	*5–7*	*7–10*	*10–20*	*20–30*	*30+*
AA	-	-	-	-	-	-	-	-	-
AA-	-	-	-	82	-	-	159	-	-
A+	-	-	-	-	-	-	-	-	-
A	-	-	-	-	-	-	-	-	-
A-	**31**	**68**	**106**	**87**	**128**	**149**	**158**	**184**	-
BBB+	**62**	**83**	**90**	**103**	**115**	**146**	**179**	**180**	-
BBB	**97**	**80**	**96**	**103**	**126**	**143**	**183**	**194**	**207**
BBB-	**116**	**91**	**97**	**142**	**154**	**171**	**273**	**220**	**240**
BB+	-	-	-	-	**181**	-	-	**252**	-
BB	**149**	-	-	**187**	**186**	**194**	-	-	**283**
BB-	-	151	-	-	-	-	-	-	-
B+	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	263

Note: Average OAS values of the utility company bonds are classified, from top to bottom, as full set (FS), stand-alone utility (SA), and utility holdings (UH). Values are the arithmetic averages of the OAS values of the bonds falling in the cells and represent basis points additional premium over the corresponding U.S. Treasury bonds.

In an earlier study, Boliari and Topyan (2022) used an alternative procedure and tested whether the mean differences in the OAS values of comparable cells of risk-adjusted bonds were statistically significant. In other words, they were comparing corresponding cells in two alternative sets and checking if the averages are statistically significantly different. Their work showed that the differences in means were statistically significant in almost all cells, but they could not measure the economic significance of the cell differences due to the unavailability of the individual OAS values at that time. However, our current study managed to obtain the individual OAS values of 1621 outstanding bonds, enabling us to test the master regression equation that regressed the individual OAS values on an intercept, a binary variable separating the holding companies from the stand-alone ones, and the controls for the issue sizes, maturities, and risk ratings of bonds.

4. ESTIMATION AND RESULTS

The main regression equation is just the explicit form of Eq. (6) above, using our defined variables as follows:

$$OAS_t = \propto + \beta\,(\boldsymbol{opco})_t + \gamma\,\boldsymbol{m}_t + \delta\,\boldsymbol{s}_t + \theta(\boldsymbol{A}-)_t + \varphi(\boldsymbol{BBB}+)_t + \omega(\boldsymbol{BBB})_t + \vartheta(\boldsymbol{BBB}-)_t + \phi(\boldsymbol{BB}+) + \varepsilon_t \quad (7)$$

where *opco* is the binary variable separating the utility holdings from the stand-alone utilities, *opco* is equal to 1 if the bond is issued by a stand-alone utility and 0 otherwise, m is the decimalized maturity variable, s is the issue size, and the rest are S&P ranking dummies assigned to relevant S&P ratings. The ranking variables are 1 if the bonds are in the rank and 0 otherwise. Our regression results are tabulated below in Table 5.

Table 5. Regression results

Regression statistics		*Coefficient*	*Coef. value*	*Std. error*	*t-statistics*
Multiple R	0.479	Intercept	162.92	7.56	21.55
R-squared	0.229	Amount issued (s)	-0.5E-08	0.106E-09	-14.05
Adj. R-squared	0.225	Maturity (m)	1.72	0.12	14.75
F-test	59.54	*Opco* = 1	7.34	2.82	2.60
		A-	-71.12	7.24	-9.82
		BBB+	-69.80	7.22	-9.67
		BBB	-55.55	7.36	-7.55
Std. error	43.07	BBB-	-23.65	8.34	-2.81
Observations	1613	BB	-6.66	10.37	-0.64

Note: Main regression results obtained from Eq. (7). Coefficient values are in basis points, except s and m.

The left two columns of Table 5 show the regression statistics. On the right section, we have the results of the study. All of the coefficients except BB+ are statistically significant at the 1 percent level or better. Our results show that the impact of the debt amounts (s) is very significant statistically, however, its economic significance, or size, is effectively zero. This result is more valuable than an economically but not statistically significant result, as it assures that the size of debt issued by a firm, on its own, has no measurable impact on its cost of debt. This result implies that firms generally issue a financially sensible amount of debt, such that they avoid pushing their risk profile into costlier territory.

The maturity variable, m, is also highly statistically significant, and its positive value implies that risk, and therefore the cost of debt, increases with maturity. In other words, our results confirm the existence of a positively sloped yield curve. As expected, the S&P ranking coefficients are negative and both statistically and economically significant. For instance, the coefficient of -71.12 for A- ranking means that A- rated bonds will lower the cost of debt for the issuer by an average of 71 basis points, or A- bondholders will receive an average of 71 basis points less compared to the next category, BBB+.

The main highlight of Table 5 is *opco*, our binary ownership structure variable, which is statistically significant at the 1 percent level. Its coefficient of 7.34 basis points indicates that, on average, standalone energy utilities incur a higher cost of debt by approximately 7.4 basis points relative to utility holding companies, after controlling for maturity, issue size, and credit rating[1].

[1] The authors like to highlight that the size of the coefficients depends on the prevailing as well as the anticipated interest rate levels. They ran the same regression using June 1, 2024, data, and the results are included in Table A.1, the Appendix, and are about twice the size of the values of the coefficients in the current table.

This result implies that, all else equal, the market demands a higher risk premium from stand-alone energy utilities. The observed spread difference reflects investor perception that stand-alone firms carry marginally greater credit risk or offer fewer diversification benefits than holding companies. Although the effect size is modest, its statistical robustness suggests a persistent structural impact that supports our hypothesis: Ownership structure influences debt financing costs in the U.S. energy utility sector.

5. DISCUSSION

The study set out to measure the impact of business structure on the cost of debt financing for U.S. electric and natural gas utilities by comparing their corresponding option-adjusted yield spreads. We evaluated whether stand-alone utilities face different borrowing costs compared to utility holding companies by testing the null hypothesis of no difference in credit spreads, while controlling for bond maturity, issue size, and risk rating.

Holding companies are theoretically expected to lower the risk of individual subsidiaries due to their added layer of liability protection and diversification benefits. Their broader service portfolios and mandatory disclosures may contribute to lower idiosyncratic risk and improved creditworthiness. However, existing research has pointed to structural complexity, lower capital ratios, and potentially larger loan exposures as factors that elevate systematic risk in holding companies. These opposing forces, diversification and disclosure benefits versus complexity and leverage, make the net effect on credit spreads an empirical question.

Topyan et al. (2024) demonstrate that in the U.S. banking sector, the holding-company structure significantly raises borrowing costs by an average of 42 basis points relative to stand-alone banks. This highlights that the impact of organizational structure on debt pricing is highly sector-specific. Unlike banks, electric and natural gas utilities operate in more tightly regulated environments with fewer opportunities for product complexity and speculative investments, which may explain why the ownership structure in our study yields a much smaller spread differential.

Our results suggest that although stand-alone utilities dominate the energy utility sector in terms of firm count, utility holding companies tend to benefit from slightly lower borrowing costs. Specifically, we find a statistically significant difference in the cost of debt financing: in November 2024, holding companies paid approximately 10 basis points less in credit spreads than their stand-alone counterparts. This difference was nearly double in June 2024. Although the absolute magnitude of these differentials may seem modest, they are economically meaningful in a sector where firms rely heavily on debt and operate with narrow profit margins.

Moreover, the spread difference appears to be resilient across time and responsive to macroeconomic conditions, particularly changes in prevailing and expected interest rates. This suggests that the structural benefits of holding companies, such as risk pooling and operational diversification, are consistently recognized by credit markets, even though their magnitude varies with the broader credit environment.

Importantly, the cost-increasing characteristics often associated with holding structures, including financial opacity and complexity, do not seem to outweigh their advantages in this sector. The versatility in goods and services offered by energy holdings is likely beneficial for consumers, while the observed borrowing cost advantage implies that creditors view them as less risky. Our findings thus reinforce the conclusion that utility holding companies reduce perceived financial risk in the regulated U.S. utility sector.

6. CONCLUSION

This study provides empirical evidence that business structure influences the cost of debt financing for U.S. electric and natural gas utilities. By comparing option-adjusted bond spreads, we show that utility holding companies consistently face lower borrowing costs than stand-alone utilities, even after controlling for bond maturity, size, and credit rating.

Our findings highlight that even modest differences in borrowing costs can be meaningful in capital-intensive, regulated industries. The consistent advantage observed for holding companies suggests that structural features such as diversification and liability insulation are valued by credit markets. These insights help clarify why business structure should be a strategic consideration for utilities seeking to optimize financing efficiency.

For managers of stand-alone utilities, the results offer a quantifiable benchmark for evaluating the potential benefits of restructuring into a holding company. The ability to marginally reduce borrowing costs, while potentially broadening service scope, could enhance both financial and strategic flexibility.

As the limitations of the study, we highlight that our research results are obtained using the U.S. energy utilities, and whether these effects hold in other regulatory and legal environments has not been studied. Similarly, comparative studies across countries or in less-regulated sectors could further clarify whether the observed benefits of holding structures are sector-specific or more broadly generalizable. In addition, this study combines electric and natural gas utilities and studies the two sectors together. An extension of this study could be analyzing the electric and natural gas utilities separately to see if the impacts are statistically and economically different between the two. It is suggested that future research should address those issues to enjoy more refined results and to extend the applicability of the results.

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APPENDIX

Table A.1. Regression coefficient values

Coefficient	*Coef. value*	*Std. error*	*t-statistics*
Intercept	216.78	13.61	15.93
Amount issued (*s*)	-34E-08	9.1E-09	-3.74
Maturity (*m*)	3.07	0.27	11.30
Opco = 1	14.84	7.97	1.86
A-	-141.36	12.58	-11.24
BBB+	-107.35	12.20	-8.80
BBB	-90.34	12.71	-7.11
BBB-	-78.08	13.63	-5.73
BB+	-5.67	15.74	-0.36

Note: The table shows the main regression coefficient values using data obtained on June 1, 2024. Main regression results obtained from eq. (7). Coefficient values are in basis points, except s and m.