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Risk Structure of Banks in Spain: Do BHCs Have Greater Cost of Debt?

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Abstract: Holding companies legally separate the assets and owners of a company creating a layer of liability protection. Theoretically, this feature lowers the risk attributable to holding companies, enabling them to offer lower-cost debts compared to stand-alone alternatives. However, no study has ever tested this hypothesis due to its technical and practical difficulties. Testing this hypothesis requires a separate classification of holding and stand-alone companies' outstanding debts to compare their risk spreads, controlling the bonds' risk ranking, maturities, and issue sizes. Further, a model is needed to make the callable bond spreads with unknown maturity dates comparable to non-callable bonds. This work is the first attempt to evaluate the risk spreads of stand-alone banks and bank holding companies in Spain by including all outstanding rated bonds offered by Spanish banks. In order to make callable bond spreads comparable with noncallable bond spreads, we obtained the option-adjusted spreads for the bonds using a lattice option-pricing model that treats the callable bonds as a bond with embedded options. We then regressed to option-adjusted spreads on control variables and ownership structure dummy to see if there exists a statistically and economically significant coefficient for the introduced dummy variable. We found that bank-holding company bonds have higher risk spreads compared to the stand-alone alternatives in Spain. This may be attributable to the characteristics of holding companies that introduce other risks that offset the gains obtained from the added layer of liability protection.

Keywords: yield spread; holding company; operating company; option-adjusted spread; cost of debt

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1. Introduction

In most countries, banks are chartered and highly regulated financial institutions that are authorized to accept deposits, make loans, and provide a permissible range of financial services. The scope of activities permitted to banks and the cost of regulatory compliance in different jurisdictions largely determines their operating environment and motivate the banking industry to seek the optimal organizational structure in different markets. In Europe, the universal banking model is a well-established feature of most banking systems. Universal banks have been operating in Germany and Switzerland for a very long time. In France, universal banking has become a dominant model after the Banking Act of 1984 abolished a strict separation between deposit banks and business banks. In this model, banks can provide an entire range of financial services, including commercial banking, securities trading, underwriting, general insurance, asset management, and private banking.

A bank holding company ("BHC") is not a bank itself in the US definition that banks are authorized financial institutions to receive deposits, make loans, and provide checking and savings account services, and have access to the Federal Reserve System (central bank). A BHC is a company that owns, directly or indirectly, a controlling interest in one or more banks and thereby exercises a controlling influence over the management or policies of the bank or banks.

The existence of a holding company legally separates the assets and the owners resulting in a structure offering an added layer of liability protection. This separation protects BHCs from losses accrued by subsidiaries by further limiting the financial and legal liability exposure. In general, this added layer of protection should result in lower risk and, hence, is expected to lower the cost of debt financing for the holding companies compared to stand-alone ones.

While the formation of a holding company theoretically may help a better separation of a troubled subsidiary from the holding company and potentially allow the holding company to enjoy a lower cost of debt, in the case of bank holding companies, the reverse might be true in the post-financial crisis regulatory environment. There are EU-wide rules and strategies for bank recovery and resolution framework. Under the resolution plan, in the event of bank distress, the losses of a failing subsidiary bank will be transferred to the holding company, and the holding company is then recapitalized by converting subordinated debt and total loss-absorbing capacity-eligible debt into equity. Similarly, in the US, the Dodd–Frank Act also provides that the appropriate Federal banking agency shall require the bank holding company to serve as a "source of strength" for any subsidiary of the bank holding company that is a depository institution. In addition, as Brahmbhatt (2008) notes, there could be visible differences in defining a holding and subsidiary company since different countries take different stands on the issue mostly from a legal perspective. The cross-selling ability helps a BHC leverage its existing and potential customer base to increase its revenues and market share by offering additional financial products and services. A BHC framework provides opportunities to facilitate growth, achieve greater operating efficiencies, and manage risk in ways that are not possible for stand-alone banks. Subsidiaries of the same BHC can collaborate to offer a full range of financial services, including consumer savings, loans, insurance, personal investing, and commercial and investment banking. In the post-crisis regulatory environment, BHCs are subject to stricter capital and liquidity requirements, and therefore, their bank subsidiaries are expected to enjoy a lower cost of debt. The risk structure of a BHC depends, in part, on the risk of each of the subsidiaries, and, therefore, it is related to the specific risk of each subsidiary. This implies that, at the outset, the risk of a BHC could be greater or lower than that of a stand-alone bank. This work tries to deliberate the market-induced risk spread differential controlling the risk ranking and maturity of the included outstanding bonds.

The empirical evidence on BHCs' impact on risk structure and, therefore, on the cost of debt is mixed. While BHCs benefit from managing interest rate risk through their trading desks and generating higher capital and profitability from issuing loans, they also introduce additional risks to their lending operations. As the complexity of the bank structure increases, the potential benefits of forming a BHC may diminish. Potentially, holding companies may exploit their subsidiaries; a holding-company structure makes it fairly difficult for the investors and creditors to keep track of all the subsidiaries in order to see an accurate picture of the financial health due to their formational complexity. Moreover, not having to own 100% of the shares might sometimes be considered a disadvantage as it may require the holding company to deal with minority owners. As a result, the net effect of combining an added layer of liability protection and serving as a source of strength for bank subsidiaries on the cost of debt is uncertain suggesting a largely unexplored empirical question of whether the perceived economic benefits of the BHC framework translate into lower cost of debt financing. However, no study has ever tested this hypothesis due to its technical and practical difficulties.

This paper[1], therefore, is an attempt to evaluate the risk structure of BHCs in comparison to stand-alone banks to understand the market-perceived risk reflection on the complexities mentioned above. Our contribution to the existing literature lies in two key areas. Firstly, by specifically examining the Spanish banking industry and incorporating control variables for bond characteristics in our estimation model, our study effectively filters out other bond risk factors such as industry-specific effects, macroeconomic conditions, and country-specific risk. This enables a clearer understanding of the impact of bank

holding company structure on bond yields or the cost of debt financing. Secondly, we are among the first, to our knowledge, to employ option-adjusted spread analysis to explore a bank's bond spread attributed to holding company structure. By adopting this approach, we can offer valuable insights into the implications of BHCs on financial risk within the Spanish banking sector.

In this paper, we empirically examine the Spanish banks' cost of debts attributable to the ownership structure. Specifically, we evaluate the cost of debt of BHCs in comparison to stand-alone banks to understand the market-perceived risk reflection on the complexities mentioned above. As such, this work uses a state-of-the-art option-adjusted spread analysis to obtain the values of comparable spreads of callable and non-callable bonds to facilitate the main regression testing the hypothesis that BHCs have higher cost of debt.

Our analysis has two stages: The first stage uses an embedded option pricing model to obtain comparable spreads for all kinds of outstanding bonds that define callable bond price as the option-free or noncallable bond price minus the American call option price. This step enables us to obtain the yield spreads of option-embedded callable bonds and option-free noncallable bonds providing us with option-adjusted yield spreads of all ranked outstanding bonds. In the second stage, we regress the obtained spread values on an intercept and a binary variable that separates the ownership structure (i.e., holding companies versus the stand-alone ones) plus controls for the S&P rating class and maturity of those bonds. Using ordinary least square estimation we check the statistical and economic significance of the coefficient of the ownership or legal structure to evaluate the impact of it on bank holding companies cost of debt.

The rest of the paper is organized as follows. Section 2 describes the hypothesis development. Section 3 discusses the materials and methods applied in our empirical analysis. Section 4 presents the data. Section 5 shows the empirical analysis. Section 6 discusses and concludes.

2. Literature Review

The literature is visibly divided into supporters and critics of BHCs. Consistent with Anenberg et al. (2018), supporters underline that BHCs are likely to spread fixed costs over a larger volume of output, achieve greater cost efficiencies, and pass some of the efficiencies through to competitive prices. They found that customers value the ability to use the same bank to underwrite and lend and that simultaneous lending and underwriting are associated with lower prices. Comizio et al. (2017) highlight that the formation of a holding company facilitates better separation of a troublesome subsidiary and effectively insulates the bank subsidiary from potential liability. Hirtle (2016) examines the disclosure of bank holding companies and finds that more disclosure is associated with lower idiosyncratic risk. Presumably, banks that are owned by BHCs are subject to more disclosure requirements and supervision by banking regulators. As a result, they should be less risky. In a sense, bank regulations work similarly to debt covenants. They constrain banks' actions and thereby reduce the costs of conflicts between shareholders and creditors. Galiay and Maurin (2015) argue that higher prudential standards for bank capital and liquidity should be rewarded by markets, and thus lower the cost of borrowing. By creating indices of capital, leverage, and liquidity regulations, they provide evidence that changes in bank regulations significantly reduce the transmission of shocks to banks' funding spreads. Similarly, Ignatowski and Korte (2014) also find that banks that are more affected by introducing the Orderly Liquidity Authority significantly reduce their overall risk-taking.

Demsetz and Strahan (1997) find that while larger BHCs have better diversification with lower idiosyncratic risk, their systematic risk is high due to a lower capital ratio and larger loan portfolio. Gong et al. (2018) report that lower capitalization ratios are associated with higher riskiness at the BHC level. Stiroh and Rumble (2006) and Yang and Brei (2019) suggest that the benefits of diversification may be offset by an increase in exposure to nontraditional banking activities, which are riskier but do not generate higher returns. Chami et al. (2022) highlight the advantages of maintaining both lines of business,

provided that overleveraging and aggressive behavior by the trading desk are effectively managed. Cuong (2021) investigates subsidiaries of BHCs and finds that the insolvency risk of BHC subsidiaries is not that high and attributes this to the complexity and risk associated with adopting more subsidiaries and lines of business within the structure, as implied by the complexity theory discussed by Lee and Sabourian (2007) and Cetorelli and Goldberg (2014). The structural complexity of BHCs is covered in several research papers (see, for example, Correa and Goldberg (2022); Buch and Goldberg (2022); Goldberg and Meehl (2020) and Flood et al. (2020)) as a risk-enhancing factor. Chernobai et al. (2021) demonstrate that U.S. banks experience increased operational risk with greater business complexity, especially for banks previously constrained by regulations. Luciano and Wihlborg (2018, 2023) analyzed the value and risk effect of a banking group's organizational choice between branch and subsidiary structure with endogenous leverage and interest rates and a capital requirement constraint. They explain that BHCs should have a higher cost of debt due to their higher leverage compared to operating bonks. As underlined by Boliari and Topyan (2022), there are serious drawbacks with holding companies that may be overseeing and making major policy decisions for businesses or industries that they are not particularly familiar with. Additionally, as reported by Brandao-Marques et al. (2020), restricting banks' range of activities ameliorates the link between government support and bank risk taking as this affects the banks' willingness to take risk and has an impact on the cost of capital of BHCs.

3. Hypothesis Development

As underlined in the final section of the introduction, the literature is more focused on the issues of bank-holding companies rather than the risk-reducing separation of ownership of assets and the owners. Building upon these findings, we anticipate that BHCs will exhibit higher financial risk compared to operating banks, given their exposure to increased complexity and the additional risk borne as a source of strength for their bank subsidiaries, as specified in the EU's Bank Recovery and Resolution Directive. In an attempt to measure the implied riskiness, considering that corporate bond yields reflect a firm's riskiness and its reflection on the cost of debt financing, we test the hypothesis of whether the BHCs have higher cost of debt compared to operating banks.

4. Material and Methodology

To estimate the cost of debt financing, we employed an option-adjusted spread (OAS) instead of standard yield-to-maturity spreads. OAS accounts for the presence of embedded options in bonds, such as call provisions, which affect cash flows dependent on future interest rate levels and can impact yields differently from ordinary bonds. OAS analysis incorporates credit risk and contingent cash flow risk, providing insight into the determinants of corporate bond spreads. Previous research has utilized OAS to study various aspects, including corporate bond spreads in emerging markets (Cavallo and Valenzuela 2010), dynamic behavior of credit spreads on corporate bond portfolios (Bierens et al. 2003), mortgage spreads (Boyarchenko et al. 2019), and assessment of bank capital adequacy considering market yield fluctuations and credit spread widening risk (Letizia 2012).

4.1. Bank Holding Companies

Bank holding companies dominate the holding company counts in almost all countries where holding companies are allowed to operate. The most significant example is the US with BHC constituting 24 percent of all holding companies. This study is limited to the banks in Spain since Spain has a balanced number of bank holding and operating company bonds outstanding. As Table 1 shows, holding and operating companies are not uniformly distributed among the countries and a meaningful comparison suggests using a country with a balanced number of operating company (opco) and holding company (holdco) bonds outstanding.

Table 1. Outstanding Holdco and Opco bond count comparison by countries.

	Holdco	Opco
USA	4149	293
France	480	1084
UK	381	898
The Netherlands	334	113
Italy	208	96
Spain	187	115
Japan	158	84
Switzerland	124	213
Norway	74	0
Australia	55	765
Germany	50	1514
Ireland	33	4
Belgium	26	19
Republic of Korea	4	79
Chile	3	58
Peru	2	20
Canada	0	1055

Table values are obtained by the authors from the Bloomberg terminal. (24 February 2023).

4.2. Banking System in Spain

Similar to the universal banking system in other European countries, a bank in Spain (also called a credit institution) can be authorized to conduct both commercial banking and investment banking activities. Therefore, Spanish banks are distinguished not based on their legal form but by the different services and activities they perform. The three types of banks in Spain are commercial banks (bancos), saving banks (cajas), which usually invest in local nonprofit projects and have dwindled after the restructuring and consolidations post-financial crisis of 2008, and credit union banks (*cooperativas*). Under Spanish law, the latter two types of credit institutions exist apart from banks though they can render banking services.

According to the European Banking Federation's data, Spanish banking has ten banking groups representing more than 90% of the industry. In detail, there exist 48 private banks, 2 saving banks (*cajas*), and 61 credit unions (*cooperativas*). According to the Financial Stability Board's list of Global Systematically Important Banks, currently, Banco Santander is the only Global Systematically Important Bank (G-SIB) in Spain and is required to hold the higher capital buffers by national authorities to meet the loss-absorbing capacity standard in addition to the regulatory capital requirements set out in the Basel III. Another other large bank holding company is BBVA, which also owns overseas subsidiaries. Other Spanish banks do not have significant global operations.

4.3. Yield Spreads and the Risk Structure

A bond's yield spread reflects the risk taken by the lender and shows the investors' assessments of those composite risk components. However, a bond's yield spread is a composite indicator reflecting economy-specific issues such as the anticipated inflation rate, instrument-specific issues such as maturity and liquidity, and firm-specific issues such as the leverage and possibility of default. Accordingly, one can compare the holding and operating companies of a selected industry by classifying them using risk ratings, and maturities to investigate the yield spread differences to understand their riskiness. This process will help us obtain valuable insights into how the market actually reacts to the ownership structure differences. As such, this study is an attempt to investigate the market-determined option-adjusted yield spreads of bank-holding companies versus stand-alone operating banks in Spain, potentially reflecting bank-holding companies' cost of debt in comparison to that of the operating banks.

4.4. Fixed Incomes

Fixed-income issuers are borrowers of capital who agree to pay interest and principal to lenders with the terms set in the bond's prospectuses. Bondholders are the investors in such securities as creditors are typically exposed to numerous risks such as default, liquidity, sector, interest rate, reinvestment, and early redemption, among others. They are willing to accept these risks only if they believe that they are adequately compensated. Accordingly, the amount of incremental return demanded by potential investors also increases as the perceived level of risk and uncertainty associated with a given issue increases.

A bond's return is usually expressed in terms of yield which measures the rate of return a purchaser would receive if the bond were held to a specific redemption date. The yield rate describes both the discount factor used in present-value computation using the bond's cash flows and the assumed reinvestment rate for all the coupon payments received.

A bullet bond's cash flows are independent of the level of interest rates. However, a majority of callable fixed-coupon bonds have interest-level-dependent payment streams making the actual payments connected to the interest rates prevailing at a particular point in time. The yield-spread analysis is a reliable method of measuring incremental return for bullet bonds with their simple cash flow structures that provide coupons, or interest payments at regular intervals and repay the full principal amount at maturity. Conventional bond valuation compares the yield of a bond with that available from a benchmark issue such as a risk-free government bond carrying a similar coupon and duration. The spread or the yield differential between a bond and a similar risk-free issue can therefore be viewed as the incremental return of the non-benchmark issue.

4.5. Option-Adjusted Spread and the Estimation Model

The option-adjusted spread is a measurement of the spread above risk-free rates, but it does not attempt to predict a bond's likely redemption date. Instead, it treats a bond's early redemption provisions built into the cash-flow structure as embedded options on its cash flows. The interpretation and calculation of OAS values are also significantly different compared to the traditional yield spread. The OAS computation for callable bonds considers the interest rate volatility since the cash flows of those bonds are sensitive to interest rate levels. We use a lattice model based on a consistent framework for valuing bonds with embedded options as well as noncallable, or bullet, bonds. Since a yield-based model would not use a single rate to discount all the cash flows of a bond with embedded options, the correct spot rate to discount each cash flow will be obtained using the forward rates produced by the lattice model. The OAS values are shown in basis points and interpreted as the spread connected to all possible potential redemption dates of the bond in question. For a noncallable bond, the spread is computed using the redemption at a specific point in time. Since the OAS values can be negative or positive, investors should be careful in interpreting the OAS values. When the OAS value is negative, it implies that the bond's expected return is lower than that of the risk-free option after taking the redemption option into account. In more detail, although it is unlikely, an option-embedded bond's return may be lower than that of a risk-free return of the same maturity due to the specifics of the embedded option, making the OAS negative.

The implications of an unknown redemption point are significant since the number of coupon payments and the payment date depend on the redemption date. It should be noted that the traditional price sensitivity measures such as duration and convexity are also connected to the redemption date. Not knowing the actual redemption date is a serious hurdle in evaluating noncallable bonds. Some researchers suggest predicting the future redemption date for the noncallable bonds to be able to value them, but this is as difficult as predicting the future interest rates. Miller (2007) defines this as "the most significant risk associated with a callable bond, arguably surpassing the default risk". On the other hand, even if a predicted redemption date turns out to be accurate, it is virtually impossible to eliminate the uncertainty until shortly before the redemption.

Unlike standard yield-spread analysis, OAS analysis obviates the need to know or predict the redemption date of a callable bond. A bond's early redemption provisions are treated as options embedded into a bond's cash flows. Notably, while those provisions are hypothetical options they replicate the early redemption features of a bond. Investors routinely gauge the relative value of a particular bond by weighing its yield spread, or incremental return, against all incremental risks contained in the bond. For a given degree of incremental risk, the greater the yield spread, the more attractive the bond to a potential investor. In more detail, the OAS analysis assumes that the investor of a callable bond has two separate contracts. The first contract is an option-free bond purchased from the issuer that our investor pays and the second is the call option our investor sells to the issuer. In summary, our bond investor pays the market price of the bond and receives the market price of the option.

Once the spreads of operating banks and BHCs are obtained using the process explained above[2], we are ready to test the hypothesis that BHCs have greater cost of debt. The next step is to have a regression equation that has the obtained spread values as the dependent variable and regressing them on a binary ownership structure variable that takes the value of "1" if issued by a stand-alone operating bank and "0" if it is issued by a BHC. Since the bonds' spread also depends on the riskiness of the bond as well as the maturity of the bond, we included a decimalized control for the maturity of the bond that takes values from 30 days (0.83) to 30 years (30).

In rating corporate bonds, rating agencies in general, and S&P Global Ratings in particular, typically begin with an evaluation of the creditworthiness of the issuer and then move to the credit quality of a specific debt issue. In individual debt issues, S&P Global Ratings evaluates the terms and conditions of the debt security, its legal structure, seniority of the issue, and priority of repayment in the event of default. Rating agencies also consider the existence of credit enhancements such as guarantees, insurance, and collateral.

Since all of our bonds are ranked as either A− or BBB+, we finally added a binary variable that takes the value of 1 if the bond is rated A− and zero otherwise. In summary, we employed a multiple regression equation in which the spread is regressed on the ownership dummy, S&P ranking dummy, and a decimalized maturity variable to test if the spread is economically and statistically significant. Equation (1) below is the main regression equation that tests the hypothesis that the ownership structure has any impact on the cost of debt.

$$S_t = \propto + \beta\ (OpCo)_t + \Phi\ Maturity_t + \theta\ (A - minus)_t + \varepsilon \quad (1)$$

Equation (1) regresses S_i, the option-adjusted spread, for bond i on an intercept, α, the ownership structure dummy β so that $Opco_i$ = 1 (0) if the company that issued bond i is an operating (holding) company, the maturity coefficient Φ, and the risk-ranking dummy θ and a stochastic disturbance term ε_i.

Equation (1) checks the value and statistical significance of the coefficient of our ownership structure binary variable, β that separates the bank-holding companies from the stand-alone banks. All other right-hand side variables are exogenous controls covering riskiness and terms of the bonds. The callable versus noncallable bond issues have been handled with the use of option-adjusted spread analysis.

5. Data

The data were collected from Bloomberg, on 15 February 2023, and separately grouped using their S&P rating and maturity. Our bonds data set consists of 172 BHC bonds, of which 141 are bonds with embedded options (callable) and 31 are bonds without embedded options (noncallable). For the stand-alone banks, we have a total of 112 bonds of which 91 of them are bonds with embedded options (callable) and 21 without embedded options (noncallable). Those bonds are evaluated by computing and comparing their option-adjusted spreads with maturity and ratings are controlled.

Table 2, below, shows the count distribution of Spain's outstanding banking sector bonds classified using maturities and risk ratings. The table highlights that 3 to 5 years bonds are the most dominating in terms of popularity. The number of outstanding bonds rated below BBB is low and there are no banking sector bonds rated below BB in Spain.

Table 2. Number of outstanding BHC and stand-alone bank bonds in Spain as of February 2023. Organized using S&P rating and standard maturities.

Combined Holdco and Opco Outstanding Bond Counts								
S&P Rating	**Total**	**≤1 years**	**1 to 2 years**	**2 to 3 years**	**3 to 5 years**	**5 to 7 years**	**7 to 10 years**	**10 to 20 years**
Total	284	30	42	33	86	38	46	28
A+	84	5	17	11	19	6	17	9
A	26	5	6	6	6	2	--	1
A−	82	10	11	6	19	11	12	13
BBB+	31	2	2	4	14	5	4	--
BBB	40	3	4	2	16	6	5	4
BBB−	9	--	1	1	1	2	3	1
BB+	5	--	1	1	2	1	--	--
BB	7	--	--	--	2	2	3	--

Table values are obtained by the authors from the Bloomberg terminal. (24 February 2023).

6. Empirical Results

Until very recently, due to technical and practical difficulties, there was no study that had attempted to test the hypothesis of whether BHCs have a greater cost of debt, regardless of the reason. With the help of recently available data that separate the bank holding companies from the stand-alone banks and using the option-pricing models that enable researchers to compare the callable bond returns with noncallable ones, we were encouraged to test the long-standing hypothesis by checking if the yield spreads of bank holding companies are statistically and economically different from the stand-alone banks. Using a binomial arbitrage-free yield-based model to obtain the option-adjusted spreads of all outstanding bonds, we tested our hypothesis that the option-adjusted yield spread of the BHC bonds is higher due to the critical issues inherent to the bank-holding companies.

6.1. Count Distribution of Bonds Issued by Holdco and Opco

Table 3 provides us with our target ratings for direct comparison. While we tabulate the counts of all risk groups, we only use A− and BBB+ bonds for direct comparison of the impact of ownership structure on the cost of debt. As Table 3 shows, all A+ bonds are bank-holding company bonds, and all A, BBB, BBB−, BB+, and BB bonds are stand-alone operating bank bonds. On the other hand, the shaded area of Table 3 highlights bonds with S&P ranks of A− and BBB+ issued by both Holdco and Opcos.

Table 3. Common risk ranking for Holdco and Opco. The table shows the bond counts in each S&P risk class. The shaded section lists bonds issued by BHCs and stand-alone banks with maturity and risk ranking controlled.

S&P Risk Rank	Count	Holdco	Opco
A+	84	84	0
A	26	0	26
A−	82	70	12
BBB+	31	18	13
BBB	40	0	40
BBB−	9	0	9
BB+	5	0	5
BB	7	0	7

Table values are obtained by the authors using the Bloomberg terminal (24 February 2023).

Tables 4 and 5 below separate the OAS for Holdco and Opco. Table 4 shows that BHC bonds are limited to A+, A−, and BBB+ only and the highest quality (A+) outstanding BHC bonds yield an average OAS value of 121.5 basis points. For A− and BBB+ bonds, the average OAS value increases to 131.7 and 168.9 basis points, respectively. Table 4 also implies an upsloping yield curve.

Table 4. Average option-adjusted spreads in basis points for BHC bonds classified by S&P rank and standard maturity. OAS values are obtained by the authors using the Bloomberg terminal. (24 February 2023).

Mean BHC OAS Values for Maturity and Risk Classes								
S&P Rating	**Avg**	**≤1 years**	**1 to 2 years**	**2 to 3 years**	**3 to 5 years**	**5 to 7 years**	**7 to 10 years**	**10 to 20 years**
A−	131.7	57.9	98.2	100.8	147.8	171.9	166.3	150.9
BBB+	168.9	–	–	88.7	157.1	139	266	–

As observed from the table, each matrix cell in the table contains the average option-adjusted spread value of bonds for the corresponding maturity and bond rating as assigned by S&P. Graded increases in bond maturity are observed as we progress across the columns of each row.

Table 5 shows that the two overlapping rows corresponding to S&P ranks of A− and BBB+ disclose lower rates for operating bank bonds.

Table 5. Average option-adjusted spreads in basis points for stand-alone operating bank bonds classified by S&P rank and standard maturity. OAS values are obtained by the authors using the Bloomberg terminal. (24 February 2023).

Mean Stand-Alone Bank OAS Values for Maturity and Risk Classes								
S&P Rating	**Avg**	**≤1 years**	**1 to 2 years**	**2 to 3 years**	**3 to 5 years**	**5 to 7 years**	**7 to 10 years**	**10 to 20 years**
A−	69.2	22.6	31.6	50.7	97.5	95.4	0	109.2
BBB+	86.3	32	19.8	30.4	101.7	164.7	–	–

In the next section, we will perform a formal analysis to see the statistical and economic significance of the difference in option-adjusted spreads.

6.2. Regression Analysis Results

The hypothesis testing whether the BHCs have greater cost of debt would be supported with a statistically significant negative coefficient attached to $Opco_i$. If the Opco's coefficient is not statistically significant, we would conclude that the ownership structure will not make any difference in terms of the cost of debt financing. Similarly, a statistically significant positive coefficient of Opco will suggest that BHCs reduce the cost of debt financing.

We estimate Equation (1), using Ordinary Least Squares[3] where α, β, and δ_j are regression parameters, ε_i is a stochastic disturbance term, and S_i is the option-adjusted spread, for bond i. As a binary variable, $Opco_i$ = 1 (0) if bond i is an operating (holding) company bond. Our controls may be defined as Controls, i = Value of the controlling covariate j for bond i. We have the maturities and the S&P bond rating as the controlling covariates. Table 6 below provides the summary statistics of the regression data.

Table 6. Summary statistics for the date used in Equation (2).

	OAS (S)	**Maturity (M)**	**D (Opco)**	**D (A−)**
Min	−0.5	0.01	0	0
Max	419	16.24	1	1
Average	135	4.99	0.39	0.29
Median	125.4	4.01	0	0

In an explicit form, we run the Equation (1) and obtained:

$$S_t = 1439 - 73.6\ (Opco)_t + 7.2\ M_t - 40.5\ (A - minus)_t + \varepsilon_t \quad (2)$$

As the regressions disclose, BHCs in Spain produce higher yield spreads when the ratings and maturities are controlled. Regression results show that all coefficients are statistically significant at 1 percent level or better. The positive maturity coefficient *M* shows that as the time to maturity increases, the cost of debt increases, implying a positively sloped yield curve. Also as expected, S&P rankings, namely, A−, have negative signs and are economically and statistically significant. The coefficient's value of −40.50 means A− rated bonds provide the investors with about 41 basis point lower cost of debt/spread, on average, compared to BBB+. The most important finding, however, is the statistically and economically significant coefficient of the operating company dummy *Opco*. Its value is −73.6 basis points and is the difference between the average OAS value of bank holding companies and stand-alone banks. The minus sign shows that stand-alone banks provide investors with about 74 basis points lower cost of debt. As expected, and as suggested by Luciano and Wihlborg (2018, 2023), Spanish bank-holding companies have higher cost of capital. The result is statistically and economically very significant. Our analysis concludes that on average, Spanish NHCS' cost of debt is about 73 basis points higher than the stand-alone operating banks.

7. Conclusions

Historically, there were a number of studies favoring the ownership structure of bank holding companies citing their risk-reducing characteristics while a number of other studies suggest the opposite due to the risk-raising features of holding companies as well as their generally higher leverage. The net effect of combining an added layer of liability protection with other weaknesses of bank holding companies on the cost of debt stayed uncertain, suggesting a largely unexplored empirical question of whether the perceived economic benefits of the BHC framework translate into lower cost of debt financing. In an attempt to understand the impact of ownership or legal structure on the cost of debt, this study uses a two-step model to measure the cost of debt differentials between bank-holding company-issued bonds and stand-alone bank-issued bonds.

After controlling bonds' risk classes using S&P ranking and terms to maturity, our work finds that bank-holding companies in Spain, on average, have 74 basis points higher cost of debt compared to stand-alone banks greater cost of debt. The coefficient of the binary variable that separates the BHCs from the stand-alone ones is very significant, statistically (t = 5.58) and economically (74 basis points).

Our result is important since it suggests that bond investors consider BHCs riskier compared to stand-alone banks in Spain. This also implies that BHCs in Spain are not able to obtain lower-cost debt since the risk-enhancing issues in the bank-holding company structure offset the risk-reducing ones.

Our results support the theoretical foresight of Luciano and Wihlborg (2018, 2023) as they highlight that BHCs should have higher cost of debt because they are much more levered than the operating banks. They also note that several worldwide regulations such as the Volcker rule in the US, the Vickers proposal in the UK, and the Liikanen report in the EU "prohibits banks entering into transactions with the institutions they advise, and also from rescuing them." (Luciano and Wihlborg 2023, p. 9).

While Spanish regulation does not have the "source of strength" provision in the exact sense of the Dodd–Frank Act in the US that a BHC shall serve as a source of financial and managerial strength to its subsidiaries, the European Banking Authority has several rules and regulations in creating and monitoring the financial safety in BHC formations. Additionally, IMF's January 2023 report on Spain (IMF Country Report No. 23/33, p. 20) highlights that since the Global Financial Crisis is a source of strength, there is a significant deleveraging in the Spanish private sector.

We suggest that future studies should deal with the potential reasons behind the results. We also suggest that future research should focus on studying the impact of the ownership structure of several different types of holding companies in different countries to see the impact of country-specific risks and legal issues that are potentially different around the world.

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Appendix A. Obtaining the Option-Adjusted Spread Values

As detailed by Miller (2007), we may call the following equation a callable-bond equivalency equation:

$$B_{cb} = B_{ub} - C \tag{A1}$$

where B_{cb} is the callable bond price, B_{ub} is the option-free or noncallable 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.

As explained in Fabozzi (2006, p. 310) it is well known 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 based on the yield that solves the constant short-term interest rate and volatility issue. Most importantly, the models taking the yield curve into consideration do not permit arbitrage opportunities. They are, therefore, properly called arbitrage-free option pricing models.

Our model is an arbitrage-free binomial tree in that 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." (Fabozzi 2006, p. 326).

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

$$V(R) = \frac{\left(\frac{1}{\sqrt{\Delta t}}\right) \cdot \ln\left(\frac{R_H}{R_L}\right)}{2} \tag{A2}$$

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 (A2) may be rearranged to solve for R_H and R_L.

$$\ln\left(\frac{R_H}{R_L}\right) = 2V(R)\sqrt{\Delta t} \tag{A3}$$

that may also be written as

$$\frac{R_H}{R_L} = e^{\ln\left(\frac{R_H}{R_L}\right)} = e^{2V(R)\sqrt{\Delta t}} \tag{A4}$$

Finally, Equation (A4) may be rearranged as

$$R_H = R_L.e^{2V(R)\sqrt{\Delta t}} \quad \text{(A5)}$$

For instance, using Equation (A5), the OAS model may use 6-month divides using $\Delta t = 0.5$ years. If we assume a volatility level of 10 percent, or $V(R) = 0.10$, the equation yields $R_H = R_L \times 1.15191$. Once the individual OAS values for all outstanding bonds are computed using our one-factor, arbitrage-free binomial model explained in the previous section, we run Equation (1) to test the hypothesis if bank holding companies reduce the total risk attributable to a bank.

Notes

[1] Capital markets research in financial accounting tends to focus on the equity market, rather than the debt market. Two notable exceptions are Dichev and Skinner (2002) which focused on public debt and Bharath et al. (2008) which focused on common corporate debt.

[2] Please see the Appendix A for the detailed steps in obtaining the option-adjusted spread values.

[3] All assumtions of OLS are satisfied. Multiple R is 0.64, F-Stat is 32.80, H(BP) is 0.122. Also note that in cross-sectional regressions, heteroscedasticity has no bearing on the unbiasedness or consistency of the OLS estimators.

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