

Determinants of the issuance of hybrid securities by insurers from the perspective of IAS 32

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ABSTRACT

This study aims to evaluate the relationship between the issuance of hybrid financial instruments by insurance firms and various potential determinants. Specifically, it investigates how factors such as asset size, cost of capital, duration gaps, effective tax rates, and liquidity and solvency ratios influence the propensity of insurers to issue hybrid bonds. Empirical research often overlooks financial firms such as insurance companies when examining hybrid securities, making it difficult to assess their motivations and decision-making processes. Our study aims to fill this gap. In November 2023, the International Accounting Standards Board (IASB) published the Exposure Draft Financial Instruments with Characteristics of Equity – Proposed Amendments to IAS 32 Financial Instruments. The board awaited comments and proposals on the text until the end of March 2024. Therefore, an in-depth study of its relationship with hybrid securities is timely. Our study aims to add new elements to the discussion on the capital structure of companies. The proposed amendment to IAS 32 will certainly influence companies' decisions regarding their capital structure. We applied a logit regression model using the panel data methodology to a dataset of 207 active insurers operating in 25 different countries (public companies). We constructed a database of several publicly traded international insurance companies located in different countries to assess their differences in terms of propensity to issue hybrid financial instruments. Our study reveals that the likelihood of issuing hybrid bonds increases for larger insurance firms with higher costs of capital and leverage, particularly in jurisdictions with significant duration gaps. These findings support the financial health/pecking order theory and contribute valuable insights to both the academic literature and industry practice. By examining the determinants of the issuance of hybrid financial instruments, this research provides a nuanced understanding of the decision-making processes within the insurance sector and fills a notable gap in empirical studies.

Keywords: hybrid financial instruments, financial instruments with characteristics of equity, insurance companies, IAS 32, pecking order theory.

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Determinantes da emissão de instrumentos financeiros híbridos por seguradoras sob a perspectiva do IAS 32

RESUMO

Este estudo tem como objetivo avaliar a relação entre a emissão de instrumentos financeiros híbridos por empresas de seguros e vários potenciais determinantes. Especificamente, investigar de que modo fatores como tamanho do ativo, custo de capital, lacunas de duração, taxas de imposto efetivas e índices de liquidez e solvência influenciam a propensão das seguradoras a emitir títulos híbridos. A pesquisa empírica muitas vezes ignora empresas financeiras, como companhias de seguros, ao examinar títulos híbridos, tornando difícil avaliar suas motivações e processos de tomada de decisão. Nossa estudo visa preencher essa lacuna. Em novembro de 2023, o Conselho de Normas Internacionais de Contabilidade (IASB) publicou o Rascunho de Exposição Instrumentos Financeiros com Características de Patrimônio – Emendas Propostas ao IAS 32 Instrumentos Financeiros. O conselho aguardou comentários e propostas sobre o texto até o final de março de 2024. Portanto, um estudo aprofundado de sua relação com instrumentos híbridos é oportuno. Nossa estudo tem como objetivo adicionar novos elementos à discussão sobre a estrutura de capital das empresas. A proposta de emenda à IAS 32 certamente influenciará as decisões das empresas em relação à sua estrutura de capital. Aplicou-se um modelo de regressão logit utilizando a metodologia de dados em painel a um conjunto de dados de 207 seguradoras ativas operando em 25 países diferentes (empresas de capital aberto). Construímos um banco de dados de várias seguradoras internacionais de capital aberto localizadas em diferentes países para avaliar suas diferenças em termos de propensão a emitir instrumentos financeiros híbridos. Nossa estudo revela que a probabilidade de emissão de títulos híbridos aumenta para empresas de seguros maiores com custos de capital e alavancagem mais altos, particularmente em jurisdições com lacunas de duração significativas. Essas descobertas apoiam a teoria da saúde financeira/ordem de precedência e contribuem com valiosas percepções tanto para a literatura acadêmica quanto para a prática da indústria. Ao examinar os determinantes da emissão de instrumentos financeiros híbridos, esta pesquisa fornece uma compreensão sutil dos processos de tomada de decisão dentro do setor de seguros e preenche uma lacuna notável em estudos empíricos.

Palavras-chave: instrumentos financeiros híbridos, instrumentos financeiros com características de patrimônio, companhias de seguros, IAS 32, teoria da hierarquia de financiamento.

1. INTRODUCTION

According to the literature, classification criteria established by accounting standards influence firms' behaviour and their decisions regarding financial instruments (Levi & Segal, 2015). Additionally, as highlighted by Fargher et al. (2019), if firms issue financial instruments with characteristics of (both liabilities and) equity (FICE), and if their recording/classification is driven by the aim to achieve specific outcomes in terms of preferred capital structure, then examining the determinants of hybrid securities issuance can yield valuable insights for standard setters.

Accounting standards are constantly being revised to account for these complex financial instruments in financial statements (Kim et al., 2023). Accountants, investors and analysts have traditionally been required to interpret the relevant accounting standards and exercise the necessary judgement in determining whether a financial instrument should be accounted for as debt, equity or a combination of both (Jian & Koh, 2023).

In June 2018, the International Accounting Standards Board (IASB) published the Discussion Paper Financial Instruments with Characteristics of Equity (IASB,

2018). The aim of this paper was to provide clarity to stakeholders regarding the classification of (complex) financial instruments as liabilities or equity for companies applying or adopting IAS 32.

The topic is relevant and timely. The popularity of hybrid financial instruments (HFIs) has grown significantly since their inception (IASB, 2023a), leading to calls to amend International Accounting Standard (IAS) 32, which governs the classification of financial instruments (Kim et al., 2023). In November 2023, the IASB also issued the Exposure Draft Financial Instruments with Characteristics of Equity – Proposed Amendments to IAS 32 Financial Instruments (IASB, 2023b). The board awaited comments and proposals on the text until the end of March 2024.

Hybrid instruments, also known as compound instruments (Fargher et al., 2019), encompass attributes of both debt and equity (King & Ortegren, 1988), combined in various ways (Johannesen, 2014), and typically have maturities of more than 30 years (or no maturity at all), allow borrowers to skip payments without defaulting, and rank below traditional bonds (junior securities) in a company's capital structure.

In this context, the central objective of this article is to evaluate the determinants of the issuance of HFIs by international insurers over a 15-year period. Specifically, to what extent are insurance firms with larger asset bases, higher costs of capital, greater duration gaps, higher effective tax rates, or lower liquidity and solvency ratios more likely to issue hybrid bonds? The total nominal amount issued by these companies between 2005 and 2019 was approximately US\$ 347.5 billion (see Table 2). In the six-year period between 2009 and 2015, the market capitalization of hybrids listed on the Australian Securities Exchange (ASX) more than doubled, increasing from AU\$ 14.5 billion to AU\$ 30 billion (Basu & Dulleck, 2020).

Several factors motivate our decision to address the issuance of HFIs by insurance companies, as recognized by scholars such as Engel et al. (1999). First, the widespread and increasing use of such instruments in recent decades (Clor-Proell et al., 2016; Fargher et al., 2019; Jian et al., 2023; Kimmel & Warfield, 1995). Second, their “cost-benefit” compared to alternative methods of raising financial resources (Deboden & Wurtz, 2015; Lee & Figlewicz, 1999) through the lens of the pecking order theory (Myers & Majluf, 1984). Lastly, their role in mitigating the cost of capital (Finnerty & Kuan, 2007; Walravens, 2017).

Furthermore, as highlighted by Dutordoir et al. (2014), financial firms – such as insurance companies – are frequently overlooked in empirical research on hybrid securities, making it difficult to assess their motivations and decision-making processes. Consequently, our research endeavours to address this gap and provide insights into this area of inquiry.

2. PREVIOUS LITERATURE AND HYPOTHESIS DEVELOPMENT

2.1 Hybrid Financial Instruments and the Pecking Order Theory

As described by Culp (2009), hybrid instruments encompass perpetual securities with discretionary, non-cumulative payments that are only prioritized above common shares within a company's capital structure, resembling debt (Levi et al., 2015), or highly subordinated bonds with equity-like characteristics. These instruments aim to absorb the risk inherent in the issuer's business while it is still in operation, which is achieved through actions such as the withdrawal or deferral of interest/coupon payments.

A common feature of hybrids, particularly those issued by banks, is their potential to be written off or converted

Indeed, our study expands upon the research conducted by Ryu and Yu (2020) by broadening its scope. While their sample dataset was limited to 26 domestic insurance firms in Korea, covering the period from the third quarter of 2016 to the second quarter of 2019, we employed non-linear panel data models using a dataset of 207 active insurers listed on stock markets. This dataset includes both companies that issue HFIs and those that do not, located across 25 different countries. We collected data from 2005 to 2019 from two primary sources: Bloomberg® provided information on the issuance of HFIs during this period, while Capital IQ® provided data on general financial statements.

Consistent with previous findings, our results indicate that the probability of issuing a hybrid bond increases for larger insurers with a higher cost of capital and leverage. Moreover, this likelihood increases significantly in jurisdictions with larger duration gaps, defined as the duration of liabilities minus the duration of assets.

This study attempts to contribute to the academic literature and industry practice in the field of finance. First, we empirically examine the determinants of hybrid issuance in the insurance (financial firms) sector, which has received little attention from academic researchers. Second, our study is timely given the recent publication and discussion of amendments to an accounting standard, IAS 32. This proposal will certainly influence companies' decisions regarding their capital structure. Third, we manually constructed a database of several publicly traded international insurance companies located in different countries to assess their differences in terms of their propensity to issue HFIs.

into equity in response to specific “trigger events” caused by financial distress (Goes et al., 2016), where the issuing bank's capital drops below a certain threshold (Basu et al., 2020).

Additionally, one of the primary advantages of issuing HFIs is their cost-effectiveness when compared to alternative methods of obtaining financial resources (Deboden & Wurtz, 2015; Lee & Figlewicz, 1999). In the United States, hybrid instruments are primarily issued by banks and insurance companies with the objective of, among other things, reducing the cost of capital (Finnerty & Kuan, 2007; Walravens, 2017).

In this regard, in a recent study investigating the effects of employing HFIs on the performance of insurance companies, Deboden and Wurtz (2015) analysed the

published and audited accounting statements of 39 publicly traded European companies with hybrid instruments on their balance sheets between 2009 and 2014. They note that insurance companies have been issuing these instruments since the turn of the century, particularly large companies in the sector. Additionally, they observe that, on average, HFIs constitute approximately 13% of the financial capital of the companies in their sample.

Briefly, as previously explained, hybrid instruments encompass attributes of both debt and equity (King & Ortegren, 1988), combined in different ways (Johannesen, 2014). Within the theoretical framework of the pecking order theory (Myers & Majluf, 1984), HFIs are considered a preferred source of financing compared to raising funds from third parties in exchange for common shares (equity capital). They can also serve as a substitute for equity (Suchard & Singh, 2006).

In simple terms, the pecking order theory posits that an entity's best and safest sources of project financing are internal resources (financial slack, e.g., large amounts of cash in hand or real estate or accumulated profits, according to Deboren & Wurtz, 2015), which are preferred over external financing options. When external financing is necessary, direct debt (debt capital) is preferred over issuing convertible or common shares (Lee & Gentry, 1995), as a means of circumventing the strict scrutiny and discipline imposed by capital markets (Myers & Majluf, 1984). In essence, companies would typically prioritize more secure sources of financing for their projects, following a hierarchy that begins with internal resources, followed by debt, HFIs and finally equity (Myers, 1984).

In the insurance sector, as emphasized by De Mey (2007), companies have been strengthening their capital through the issuance of hybrid instruments, which have become a significant component of capital market transactions in the industry. Due to the characteristics of hybrid bonds – they are recognized as Tier 1 capital, have perpetual maturities and do not impact the actual quantity or proportion of equity – they have become a viable way for insurance companies to address the capital challenges associated with the implementation of new accounting standards (Ryu & Yu, 2020).

2.2 Determinants of Hybrid Securities Issuance

In a study similar to ours, Ryu and Yu (2020) discovered that between the third quarter of 2016 and the second quarter of 2019, among a sample of twenty-seven South Korean domestic insurers, those with higher net profits or total assets and lower risk-based capital (RBC) indices

were more likely to issue hybrid instruments. The RBC index serves as a measure of solvency in that domestic context.

In short, their findings substantiate the proposition that insurers issue HFIs with the aim of enhancing their financial stability. Despite testing other solvency-related financial indicators such as asset quality (non-performing assets ratio), leverage and liquidity levels, only the coefficients associated with the explanatory variables RBC and net profit (alternatively, the natural logarithm of total assets) showed statistical significance.

In order to elucidate the role played by the issuance of hybrid securities, W. S. Kim et al. (2023) analysed a panel dataset of Korean non-financial companies between 2000 and 2011. They found that younger and larger firms with greater growth prospects, higher debt ratios, lower profitability, weaker credit ratings and lower ownership concentrations tend to issue more hybrid securities compared to pure debt or equity. As also noted by Suchard and Singh (2006), companies with lower leverage, lower risk and higher profitability are expected to be more likely to issue financial liabilities. Conversely, companies with higher leverage, greater growth opportunities and better performance are more likely to issue equity-like securities.

Levi et al. (2015), in a sample including all firms traded on the US stock exchanges (excluding banks), also verified that firms with higher debt-to-asset ratios and higher credit risk (coverage ratios) chose to issue mandatorily redeemable shares – a debt-like hybrid security – instead of “pure” debt, to facilitate the classification of new financing as a non-liability.

Lee and Gentry (1995) found that financial health, as measured by cash flow information, plays a significant role in the security choice decision. They develop a study based on the financial health/pecking order theory. Their general conclusion is that the market perceives the offering of junior securities as a more negative signal than the offering of senior securities. This means that financially healthy companies differentiate themselves from less healthy companies when seeking external capital by choosing senior securities.

Furthermore, in a recent study, Yu and Ryu (2019) report that banks in weaker financial positions are more likely to issue subordinated debt – another form of HFI. Consistent with this line of reasoning, De Cesari et al. (2023) discuss evidence from the literature regarding the use of hybrid securities as a form of last-resort financing by financially distressed firms. They then examine the mediating effect of the issuer's insolvency risk, proxied by a Z-score based on Altman (1968).

Flores et al. (2020) employ a similar methodology to assess the impact of different financial variables, including leverage, cost of capital and effective tax rate, on the likelihood of companies issuing FICE. Regarding the financial instruments under consideration, the authors focus exclusively on perpetual bonds, which allow the issuer to defer coupon payments and include provisions for the bond to be redeemed at the issuer's discretion.

In general, their findings suggest that leverage and the cost of capital play a significant role in determining the issuance of hybrid instruments by the companies analysed. These determinants show both statistical and economic significance, with positive coefficients indicating their impact on the decision-making process of the firms studied.

In short, the author contends that the issuance of these bonds could lower the cost of capital for companies employing this form of external financing, as the guarantees embedded within them could reduce the investment

risk. In terms of leverage, firms may have a higher level of financial leverage prior to issuing HFIs, considering the possibility of registering these bonds as equity. This expectation of debt relief through equity conversion can influence their decision to issue HFIs.

The final proposition pertains to the tax advantages associated with registering hybrids as liabilities, which allows their interest to be deducted for tax purposes. In a similar vein, other authors, such as Johannesen (2014) and Panteghini (2012), have also explored aspects related to corporate tax planning and tax avoidance, examining how multinational firms use hybrid instruments, treated as debt in the host country and equity in the home country, to finance foreign investments.

In conclusion, the arguments presented support the inclusion of the variables described in section 3.2 (methodological approach) as potential determinants of the issuance of HFIs.

3. DATA AND METHODOLOGY

3.1 Sample Selection

The methodology involved gathering data on hybrid bonds issued in major global capital markets over a 15-year period using the Bloomberg® platform. This approach aimed to provide a comprehensive overview of HFIs issued by insurance companies worldwide.

Using the Bloomberg® database, we identified 593 different issues (based on the International Securities Identification Number [ISIN] numbers, according to a search performed on 29 April 2021) within the specified parameters for the period from 1 January 2005 to 31 December 2019. These parameters included filtering by asset class (bonds or preferred shares), the presence of ISIN codes, BICS sector classification (life, property or personal accident insurance) and instrument type (hybrid).

The analysis period was limited to exclude the years 2020 and 2021, as the potential influence of the COVID-19 pandemic on the behaviour of insurance companies, particularly within the life insurance sector, would likely introduce confounding variables that could distort the analysis.

After reviewing the data in the ticker field, which identifies specific companies or financial instruments according to field DS001 extracted from the Bloomberg® database, and making minor manual adjustments as

needed, there were observations for 147 different issuers/tickers based in 28 different countries, including both listed and non-listed companies.

With these criteria in mind, the next step involved selecting insurance companies headquartered in these twenty-eight countries from the S&P Capital IQ® (CIQ) database. The selection criteria were as follows: a. Industry classification (primary): Insurance; b. SIC (Standard Industrial Classification) industry primary code: H (finance and insurance); c. Company type: Public, indicating publicly traded companies; d. Company status: In operation.

We excluded from the database companies that are primarily classified as "insurance brokers", as they only act as intermediaries and do not directly underwrite or manage risks. Additionally, we also excluded insurers with an average total asset value of less than US\$ 100 million over the previous five fiscal years (2015 to 2019) to increase the comparability of the size of the insurance firms in the dataset; however, this criterion resulted in a very limited deletion of a total of 15 firms. Firms with incomplete data for this period were also deleted. Insurers whose first stock exchange listing occurred after 31 December 2019, according to the available data in the CIQ database, were also excluded from the analysis (Flores et al., 2021).

Finally, companies based in tax havens such as Bermuda or the Cayman Islands were also excluded from the sample, following guidelines to mitigate potential biases related to the regulatory and tax environment (Chen et al., 2015).

To avoid double counting, subsidiaries listed in the CIQ database that were under the control of another publicly traded insurer, even if located in different countries, were also omitted from the analysis. We identified seven such cases and excluded them.

Based on the criteria outlined, we narrowed the focus of the study to companies in the countries listed in Table 1 below. This resulted in 207 publicly traded insurance firms in the dataset.

It is also interesting to assess the relative participation of each jurisdiction and the total amount issued in U.S. dollars during the period analysed, as shown in Table 2 in nominal terms.

Issuance from European countries such as France, the United Kingdom and Germany totalled approximately US\$ 129.6 billion, equivalent to roughly 37% of the total.

Additionally, the United States accounted for US\$ 59.6 billion, Japan for US\$ 49.5 billion and Switzerland for US\$ 33.9 billion.

3.2 Methodological approach

Building upon the framework proposed by Ryu and Yu (2020) and Flores et al. (2020), our study employed non-linear (logistic) longitudinal models to identify the financial variables that influenced companies' decisions (or propensity) to issue HFIs over a 15-year period.

We constructed a logit regression model using the panel data methodology (equation 1) to identify the financial factors and other relevant controls identified in the existing literature that influence the propensity of insurance firms to issue HFIs. All of the financial variables of the insurers included in the logit regression analyses were analyzed in US dollars based on the end of the previous fiscal year (Dutordoir & Van de Gucht, 2007; Flores et al., 2021; Ryu & Yu, 2020):

$$\begin{aligned} \text{logit}(\rho_{i,t}) = \ln \left(\frac{\rho_{i,t}}{1 - \rho_{i,t}} \right) = & \beta_0 + \beta_1 \text{COFC}_{i,t-1} + \beta_2 \text{DGAP}_c + \beta_3 \text{SIZE}_{i,t-1} + \\ & \beta_4 \text{RETN}_{i,t-1} + \beta_5 \text{LIQR}_{i,t-1} + \beta_6 \text{ZSCR}_{i,t-1} + \beta_7 \text{ETRA}_{i,t-1} + \beta_8 \text{LEVR}_{i,t-1} + \\ & \beta_9 \text{GAAP}_{i,t-1} + \beta_{10} \text{DMKT}_{i,t-1} + \beta_{11} \text{CGPD}_{i,t-1} + \beta_{12} \text{CNTY}_c + \beta_{13} \text{INDT}_a + \\ & \beta_{14} \text{PERD}_y + u. \end{aligned}$$

where $\rho_{i,t} = P(Y_{i,t} = 1 | \text{COFC}_{i,t-1}, \text{DGAP}_c, \dots, \text{CNTY}_c, \text{INDT}_a, \text{PERD}_y)$ and the dependent variable $Y = \text{HFI}$ is equal to one if the sample company issued at least one hybrid instrument in a given year and zero if it did not. The variables CNTY, INDT and PERD are country, industry and year fixed effects, respectively (see Appendix A for detailed definitions of the variables).

We estimated equation 1 using random effects. As explained by Wooldridge (2012), the advantage of employing models that incorporate random effects (as opposed to fixed effects) becomes apparent in scenarios such as the present case, where the most crucial explanatory variables remain constant over time (e.g., DGAP).

In order to disentangle the effects of potential confounding factors that may influence insurers' propensity to issue HFIs, country-level controls were incorporated into the analysis (Chen et al., 2015). We introduced additional controls to capture the level of capital market development (DMKT), which accounts for differences in the ease of access to external sources of finance, such as the bond market, particularly in countries with more developed capital markets (Cummins & Rubio-Misas, 2021). Moreover, the analysis includes the GDP

growth variable (GDPG), as suggested by Florou and Kosi (2015) and Santos et al. (2016), to account for variations in gross domestic product growth rates across different jurisdictions.

All explanatory variables at the company level are time-varying, including the GAAP variable, which is a dichotomous indicator. As Florou and Kosi (2015), we identified firms that adopted IFRS based on the accounting standard used for each company/year observation. Therefore, our GAAP variable (Generally Accepted Accounting Principles) takes a value of one if the insurer adopts International Financial Reporting Standards (IFRS) and zero otherwise, capturing potential institutional and regulatory changes associated with the adoption of IFRS. The ZSCR variable measures the distance from bankruptcy, often represented by the Z-score (Pasiouras & Gaganis, 2013). The SIZE variable denotes the natural logarithm of total assets, which is commonly used as a proxy for company size (e.g., Chen & Wong, 2004). RETN reflects the average rate of return on assets, also known as ROA (Chen et al., 2015; Florou & Kosi, 2015). LIQR represents the liquidity index, a characteristic associated with companies that issue financial instruments

Table 1*Issuer Companies and Countries (Group of Interest)*

Number	Country code	Country	Number of companies
1	AU	Australia	6
2	AT	Austria	2
3	BE	Belgium	1
4	CA	Canada	8
5	CN	China	7
6	DK	Denmark	3
7	FI	Finland	1
8	FR	France	4
9	DE	Germany	7
10	HK	Hong Kong	5
11	IE	Ireland	1
12	IL	Israel	8
13	IT	Italy	5
14	JP	Japan	8
15	NL	Netherlands	3
16	NO	Norway	4
17	QA	Qatar	5
18	SI	Slovenia	3
19	ZA	South Africa	8
20	KR	South Korea	11
21	ES	Spain	2
22	CH	Switzerland	7
23	TW	Taiwan	12
24	GB	United Kingdom	12
25	US	United States	74
Total			207

Source: Prepared by the authors.**Table 2***Total Amount Issued in US Dollars and the Issuing Countries (Group of Interest)*

Number	Country code	Country	Total in US dollars (M)	% per country
1	AU	Australia	9,932	2.86%
2	AT	Austria	3,746	1.08%
3	BE	Belgium	3,631	1.05%
4	CA	Canada	3,313	0.95%
5	CN	China	1,998	0.58%
6	DK	Denmark	1,564	0.45%
7	FI	Finland	1,373	0.40%
8	FR	France	57,333	16.50%
9	DE	Germany	34,542	9.94%
10	HK	Hong Kong	2,714	0.78%
11	IE	Ireland	780	0.22%
12	IL	Israel	440	0.13%
13	IT	Italy	15,540	4.47%
14	JP	Japan	49,487	14.24%
15	NL	Netherlands	16,920	4.87%

Table 2

Cont.

Number	Country code	Country	Total in US dollars (M)	% per country
16	NO	Norway	2,507	0.72%
17	QA	Qatar	450	0.13%
18	SI	Slovenia	56	0.02%
19	ZA	South Africa	2,295	0.66%
20	KR	South Korea	3,599	1.04%
21	ES	Spain	1,541	0.44%
22	CH	Switzerland	33,886	9.75%
23	TW	Taiwan	2,519	0.73%
24	GB	United Kingdom	37,682	10.85%
25	US	United States	59,575	17.15%
Total			347,424	100.00%

Source: Prepared by the authors.

(Ryu & Yu, 2020; Florou & Kosi, 2015). Additionally, ETRA (effective tax rate) and COFC (cost of capital) are included, as identified by Flores et al. (2020). The cost of capital is calculated using a widely accepted methodology (Bruner et al., 1998) that is commonly used by regulators around the world (Savoia et al., 2019).

The approach to LEVR, similar to that of Luhnen (2009), uses the equity/total assets ratio as a proxy for financial leverage. We divided the sample of insurers into two groups based on this ratio. One group comprises companies with an equity/total assets ratio below the median of the data points, indicating higher indebtedness, and is thus assigned a value of one for LEVR. The other group consists of companies with an equity/total assets ratio above the median, reflecting lower indebtedness, and is assigned a value of zero for LEVR. This approach allows for a categorical representation of financial leverage, facilitating its inclusion as a determinant variable in the analysis.

Furthermore, in an analysis specifically targeting the insurance industry conducted by the European Insurance and Occupational Pensions Authority (EIOPA, 2014), the duration gap (DGAP variable) is defined as the difference between the duration of liabilities and assets. The more this difference is “positive” (a common feature of long-term contracts such as life insurance), as observed in countries such as Austria, Denmark, Finland, Germany and the Netherlands, the higher the frequency of issues related to insufficient regulatory capital (called eligible own funds under the Solvency II Directive) and the more vulnerable insurers become to negative interest rate shocks.

Japan, Norway, South Korea, Switzerland and Taiwan are five other countries with high duration gaps and/or low rates of return or returns close to the minimum guaranteed rates for long-term contracts. According to Moody's (2015), these countries are classified as “high risk in terms of profitability”. Moody's adds that the greater the duration gap, the higher the risks that insurance companies in the individual segment face during prolonged periods of low interest rates.

Given this, we find it interesting and timely to create a dummy variable to identify countries with a high duration gap and to include it in equation 1 above as a potential determinant of HFI issuance. Therefore, our DGAP variable takes a value of one for insurers located in Austria, Denmark, Finland, Germany, the Netherlands, Norway and Taiwan, and zero otherwise.

In summary, the visual representation presented in Figure 1, adapted from Libby et al. (2002), attempts to enhance our understanding of the principal aspects discussed earlier:

Drawing from the previous findings and the theoretical underpinnings outlined in section 2.2, it is hypothesized that a company's propensity to issue HFIs is likely to increase in tandem with the increased cost of its own capital and the increased proportion of long-term contracts in its portfolio.

The binary variable HFII indicates the propensity or likelihood of issuing HFIs, serving as the dependent variable and indicating the issuance of at least one HFI during the period under review. Conversely, the variables of primary interest in this study (the independent

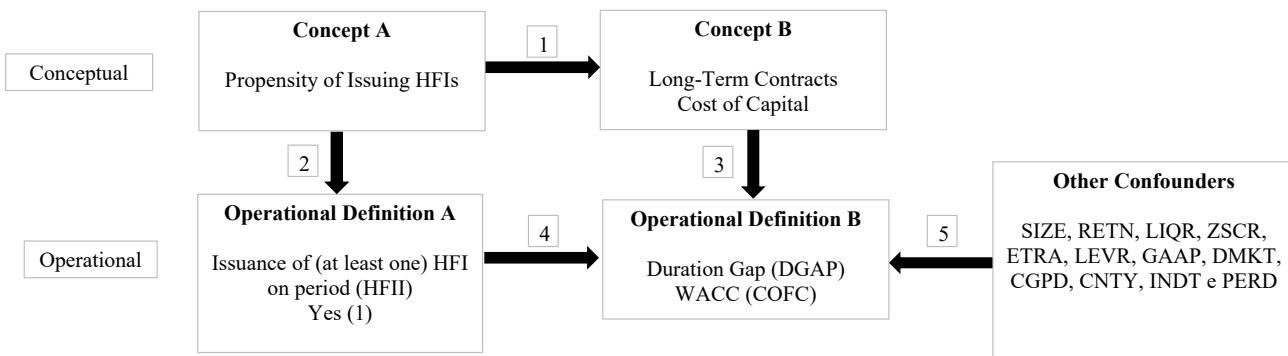


Figure 1 Libby Box Graphical Representation

Source: Prepared by the authors.

variables) – long-term contracts and the cost of capital – were operationalized through the duration gap (DGAP) and weighted average cost of capital (WACC). Additional variables that may influence or determine the issuance of hybrid bonds by insurers (such as company size, leverage, liquidity and solvency, and effective tax rate, among others) were also controlled for.

4. RESULTS

4.1 Descriptive Statistics

Table 3 below presents primary descriptive statistics for all numeric variables in the database, while Table 4 shows the distributions of the dichotomous variables.

Table 5 presents the Pearson correlations between the variables, offering a clearer understanding and visualization of the linear relationships between pairs of variables (bivariate analysis). The variables SIZE, ZSCR, RETN, COFC, and DMKT show some significant correlations with other variables, suggesting possible direct or inverse relationships depending on the pair analysed. In contrast, the variables LIQR and ETRA do not show significant correlations with other variables, indicating possible independence or non-linear relationships. Such findings underscore the importance of controlling for these variables, particularly in all multivariate analyses (Chen et al., 2015).

Therefore, considering all the above discussions and what has been previously addressed in section 2.2, we hypothesized that insurance firms with larger total assets, a higher cost of capital, a larger duration gap, a higher effective tax rate or lower liquidity/solvency ratio are more likely to issue hybrid bonds.

Accordingly, the following sections present a multivariate analysis of the data to assess the robustness of the proposed hypothesis.

4.2 Logistic Regression

We used a non-linear model to identify the financial variables that influence companies' decisions to issue HFIs, as shown in Table 6 below.

The coefficients associated with the variables COFC, LEVR and SIZE are statistically significant, consistent with previous research findings (Flores et al., 2020; Ryu & Yu, 2020). The logistic regression results indicate that the likelihood of issuing an HFI rises when the insurer is large, has a higher cost of capital, and has a greater degree of leverage. Regarding DGAP, our findings suggest a significant increase in the likelihood of issuing an HFI for insurers located in jurisdictions with a high duration gap.

An examination of the results in column 3 of Table 6 is also insightful. The odds ratio for the COFC variable

Table 3*Descriptive Statistics (Numeric Variables)*

Variables	Mean	Standard deviation	Median	Skewness	Kurtosis	Q1	Q3
SIZE	9.295	2.500	9.546	-0.39	3.011	7.337	11.208
ZSCR	2.896	0.794	2.973	-1.229	8.688	2.449	3.407
LIQR	5.279	49.974	1.115	30.175	1,037.829	0.636	2.22
RETN	1.681	3.086	1.181	1.89	59.635	0.511	2.459
ETRA	34.417	245.986	25.673	41.41	1,838.136	18.403	32.077
COFC	8.531	7.486	8.253	25.975	1,157.578	6.649	9.942
GDPG	2.439	2.874	2.25	2.304	18.161	1.551	3.076
DMKT	139.931	163.804	115.258	5.191	32.043	78.777	145.917

Note: $N = 3,105$ (maximum value). Some variables have a lower number of observations. The variables are described in Appendix A.

Source: Prepared by the authors.

Table 4*Distributions of Dichotomous Variables*

Variables	Statistic	#0	#1	Total
HFII	Frequency	2,816	289	3,105
	%	90.7%	9.3%	100%
DGAP	Frequency	2,625	480	3,105
	%	84.5%	15.5%	100%
LEVR	Frequency	1,545	1,560	3,105
	%	49.8%	50.2%	100%
GAAP	Frequency	1,683	1,422	3,105
	%	54.20%	45.80%	100%

Note: All dichotomous variables take the values zero (#0) or one (#1). The variables are described in Appendix A.

Source: Prepared by the authors.

Table 5*Pearson Correlation Matrix*

Variable	1	2	3	4	5	6	7	8
1. SIZE	-							
2. ZSCR	0.24***	-						
3. LIQR	0.01	0.001	-					
4. RETN	-0.15***	0.07***	0.00	-				
5. ETRA	0.00	-0.01	-0.001	-0.02	-			
6. COFC	0.00	0.05**	0.001	0.04*	0.002	-		
7. GDPG	-0.09***	0.022	0.004	0.11***	-0.03	0.03	-	
8. DMKT	-0.10***	-0.07***	0.01	0.00	-0.02	0.05**	0.04*	-

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The variables are described in Appendix A.

Source: Prepared by the authors.

Table 6
Logistic Regression Results

Variables	(1)	(2)	(3)
	Coefficient	Pr > z	Odds Ratio
COFC	0.030**	0.047	1.031**
DGAP	2.191***	0.007	8.946***
LEVR	0.710*	0.057	2.035*
SIZE	0.738***	0.000	2.092***
RETN	0.087	0.243	1.092
LIQR	-0.005	0.448	0.994
ZSCR	0.169	0.419	1.185
ETRA	0.000	0.688	1.000
GAAP	-0.467	0.433	0.627
Constant	-11.790***	0.000	7.58e-06***
N (Obs.)	1,632		1,632
N (id)	168		168
County Fixed Effects	Yes		Yes
Periods Fixed Effects	Yes		Yes
Industry Fixed Effects	Yes		Yes

Note: ***, **, * indicate statistical significance at the levels of 0.01, 0.05 and 0.10, respectively. The variables are described in Appendix A.

Source: Prepared by the authors.

is 1.03. This indicates that a 1% increase in an insurer's cost of capital raises the probability of issuing an HFI by approximately 3% on average.

Given the categorical nature of the LEVR and DGAP variables, the interpretation of their coefficients differs. The odds ratio for LEVR is 2.04, indicating that transitioning from a high equity-to-total assets ratio (low leverage) to a low ratio (high leverage) doubles the average odds of issuing an HFI (approximately a 104% increase).

Following the same reasoning, based on the odds ratio of 8.95 for DGAP, it can be said that the probability of issuing an HFI for an insurer operating in countries with a high duration gap ("more negative") is, on average, approximately 795% higher (or, equivalently, multiplied by 8.95) compared to insurers in other countries in the sample.

Finally, given the notably high odds ratio of 8.95, we considered it appropriate to conduct additional analyses (robustness tests) using the same logistic model. However, these analyses will only focus on observations pertaining to jurisdictions where the duration gap is high according to EIOPA (2014) or Moody's (2015). The aim of this

investigation is to assess whether insurers issue HFIs because of the high duration gap characteristic of their location or due to the lack of satisfactory long-term allocation or investment alternatives.

Therefore, we retained only the data for the following countries: Austria, Denmark, Finland, Germany, the Netherlands, Norway and Taiwan. Additionally, we replaced the dichotomous variable DGAP from equation 1 with the SGAP variable, which remains constant over time and will contain the estimated value of the duration gap. Information for Taiwan (with an estimated duration gap of 5 to 8 years, we used the average of 6.5 years as the reference) and Norway (with a duration gap exceeding 14 years, we conservatively used 14 years as the reference) was sourced from Moody's (2015), while for the other countries it was obtained from EIOPA (2014), as shown in Table 7.

With a dataset of 3,105 "company-year" observations and a DGAP equal to one in approximately 15.5% of cases, the odds ratio of 1.37 for the SGAP variable suggests that a 1% increase in the estimated duration gap value for a given jurisdiction increases the odds of issuing an HFI by

Table 7*Logistic Regression Results (Only Observations where DGAP = 1)*

Variables	(1)	(2)	(3)
	Coefficient	Pr > z	Odds Ratio
COFC	0.445***	0.000	1.560***
SGAP	0.313***	0.005	1.367***
LEVR	3.424**	0.029	30.68**
SIZE	0.505**	0.014	1.658**
RETN	0.519	0.259	1.680
LIQR	1.165***	0.002	3.207***
ZSCR	0.313	0.368	1.367
ETRA	0.009	0.573	1.010
GAAP	-0.363	0.624	0.696
Constant	-20.16***	0.000	1.76e-09***
N (Obs.)	158		158
N (id)	15		15
Country Fixed Effects	No		No
Period Fixed Effects	Yes		Yes
Industry Fixed Effects	Yes		Yes

Note: ***, **, * indicate statistical significance at the levels of 0.01, 0.05 and 0.10, respectively. The variables are described in Appendix A.

Source: Prepared by the authors.

around 37% on average. In other words, based on these findings, it is clear that the likelihood of issuing an HFI

increases significantly when the insurer operates in a jurisdiction where the duration gap is deemed to be high.

5. CONCLUSION

As highlighted by Clor-Proell et al. (2016), determining classification criteria for hybrid instruments that can achieve consensus among experienced financial professionals is a formidable task, even for standard setters. In this context, elucidating the motivating factors behind the issuance of HFIs is of significant informational value.

The aim of this study was to assess the correlation between the issuance of HFIs by insurance firms on a global scale, considering potential determining factors for the issuance of such bonds, notably the cost of capital, leverage, size, duration gap and others. Overall, the findings suggest that the likelihood of issuing an HFI rises with the insurer's size, higher cost of capital, and higher leverage, consistent with previous research. This propensity increases significantly if the insurance company operates in a jurisdiction characterized by a notably greater duration gap, particularly for firms issuing long-term contracts. Furthermore, our findings align with the financial health/pecking order theory of Lee and

Gentry (1995) as mentioned in section 2.2, indicating that insurance companies issuing HFIs tend to be in worse financial condition, characterized by a higher cost of capital, leverage and duration gap.

In this context and in light of these results, the proposed amendment to IAS 32 (IASB, 2023b) is welcomed. It essentially advocates for improved quality of presentation and disclosure of information about the accounting for HFIs in financial statements so that users can better understand the characteristics of these instruments (EFRAG, 2024). A potential mandatory accounting change imposed by the standard setter, such as the previously proposed (or envisioned) reclassification of HFIs by the IASB, could have a serious impact on financial statements, particularly during the "contract" life of the financial instrument, and likely lead to breaches of covenants (Hanlon, 2019). This impact would be even more pronounced for insurers in worse financial condition (higher cost of capital, leverage and duration gap). According to EFRAG (2018), the

reclassification of hybrid bonds from equity to debt is likely to affect financial institutions. There was also evidence that the impact on solvency and leverage ratios could have been quite significant at the level of individual reporting entities, with possible short-term market disruptions.

To be sure, our study has limitations that offer opportunities for future research and replication. First, the wide variety of HFIs, characterized by different details and characteristics, implies the need for a precise definition of what constitutes the issuance of such instruments by insurance companies. Moreover, while our study focuses

specifically on the insurance industry, it is important to acknowledge that the findings may not be directly applicable to other financial institutions. Looking ahead, future research could explore a number of avenues. For instance, investigating how insurance companies responded in terms of issuing HFIs only during the COVID-19 pandemic could be a valuable extension. Alternatively, by extending the analysis period to include data from 2020 onwards, researchers could explore the resilience of our findings in the face of unprecedented global challenges.

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APPENDIX A

Definition of variables

Variable	Symbol	Source	Definition
Propensity to issue HFIs (dependent variable)	HFII	Bloomberg database, field DY107 (hybrid indicator).	Binary variable created by the authors based on field DY107 ("Yes/No"), indicating hybrid financial instruments with liability and equity characteristics.
Cost of Capital	COFC (Bruner et al., 1998)	Bloomberg database, field VM011 (weighted average cost of capital).	WACC = [KD * (TD/V)] + [KP * (P/V)] + [KE * (E/V)], where: KD = Cost of Debt; TD = Total Debt; V = Total Capital; KP = Cost of Preferred; P = Preferred Equity; KE = Cost of Equity; E = Equity Capital.
Leverage	LEVR (Luhnen, 2009)	Capital IQ database, IQ_TOTAL_EQUITY and IQ_TOTAL_ASSETS fields.	Binary variable created by the authors based on the median ratio of IQ_TOTAL_EQUITY/ IQ_TOTAL_ASSETS, equal to 1 if less than or equal to 0.1567 and 0 otherwise.
Size	SIZE (R. Chen & Wong, 2004)	Capital IQ database, IQ_TOTAL_ASSETS field (in US\$ millions).	Natural logarithm of IQ_TOTAL_ASSETS.
Profitability	RETN (Chen et al., 2015)	Capital IQ database, IQ_RETURN_ASSETS field.	EBIT*(1 - 0.375) / average total assets.
Liquidity	LIQR (Ryu & Yu, 2020)	Capital IQ database, IQ_CURRENT_RATIO field.	Total current assets / total current liabilities.
Solvency	ZSCR (Pasiouras & Gaganis, 2013)	Capital IQ database, based on the IQ_RETURN_ASSETS, IQ_TOTAL_ASSETS and IQ_TOTAL_EQUITY fields.	Z-score, calculated as follows: $Z_{i,t} = \frac{EAR_{i,t} + ROA_{i,t}}{s(ROA_i)}$ EAR _{i,t} = Equity-to-assets ratio of firm i at time t; ROA _{i,t} = Return on assets of firm i at time t; s(ROA _i) = Sample standard deviation of the ROA of firm i.
Effective Tax Rate	ETRA (Flores et al., 2020)	Capital IQ database, IQ_EFFECT_TAX_RATE field.	Income tax expense / EBT incl. unusual items.
Accounting Standard	GAAP	Capital IQ database, as in the IQ_GAAP_BS field.	Binary variable created by the authors based on the IQ_GAAP_BS field, indicating the accounting standard applied by the insurer in a given year.
Duration Gap	DGAP	(EIOPA, 2014; Möhlmann, 2020; Moody's, 2015).	Binary variable created by the authors, equal to 1 if the insurer's headquarters are located in Austria, Germany, Denmark, Finland, the Netherlands, Taiwan or Norway, and 0 otherwise.
Country Indicators	CNTY	Capital IQ database, IQ_COUNTRY_NAME field.	N/A
Period Indicators	PERD	Capital IQ database, based on the fiscal year (IQ_FY) for all variables.	N/A
Industry Indicators	INDT	Capital IQ database, IQ_PRIMARY_INDUSTRY field.	1. Life and health insurance; 2. Multi-line insurance; 3. Property and casualty insurance; 4. Reinsurance.
GDP Growth	CGPD (Santos et al., 2016)	World Bank database, file WDIEXCEL.xlsx, indicator/field NY.GDP.MKTP.KD.ZG.	GDP growth (annual %).
Capital Market Development	DMKT (Cummins & Rubio-Misas, 2021)	World Bank database, file WDIEXCEL.xlsx, indicator/field CM.MKT.LCAP.GD.ZS.	Market capitalization of domestic listed companies (% of GDP).

Source: Prepared by the authors.

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