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Effects of the Fair Value of Biological Assets on the Cost of Debt: An International Study

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Abstract

This study aims to investigate the effects of fair value valuation of biological assets and bearer plants measured at historical cost on the cost of third-party capital. The study contributes to the agricultural sector and the International Accounting Standard - IAS 41, which has been modified to remove the requirement to apply fair value for bearer plants, one of the primary biological assets with no active market. For this, 182 companies from 39 countries were studied in the years 2020 and 2021, with information taken from the Thomson Reuters Eikon platform. The methodology involves regression by the ordinary least squares method based on the model of Daly and Skaife (2016). The results show that the biological asset at fair value does not influence the cost of debt and that the measurement of bearer plants at historical cost has no effect on the cost of debt. Fair value did not change the perceived cost of debt of the analyzed companies in the studied period, contrary to Daly and Skaife (2016). Finally, the cost of third-party capital can be influenced by other aspects related to profit quality, which were not examined in this paper, such as profit management.

Keywords: Biological Assets, Cost of Debt, Fair Value

JEL Classification Code: C18, G32, M41, O32, Q12

1. Introduction

After the adoption of IFRS (International Financial Reporting Standards) in India, it was possible to observe an increasing use of fair value in accounting statements. The increased use of this form of measurement has brought about a discussion about the advantages and disadvantages of its application in the national (Gupta, 2014; Chandrasekar & Kumar, 2017; Bhattacharya, 2018; Vijayakumar & Vatsala, 2018; Chakravorty & Bhattacharya, 2021) and international fields (Ball, 2006; Barth, 2018; Siciliano, 2019).

According to Ball (2006), fair value is more informative than historical cost when there are observable market prices, which contribute to more accurate estimates. However, when there is low liquidity in the market of the asset under evaluation, the spreads can be large enough to cause uncertainty about the fair value. In the same vein, Johnson and Petrone (1995), members of the FASB (Financial Accounting Standard Board) team, stated in 2015, that the use of fair value is more relevant to the investor, since it better reflects the financial situation of the asset, helping to measure its appreciation or devaluation and predict future results. However, the increased use of fair value by IFRS can contribute to increasing the volatility of financial statements because, in regimes of low disclosure quality, managers are willing to smooth results to achieve a variety of objectives (Ball, 2006). According to this line, there is a possibility of increasing results management practices, especially, when

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there is little or no source of validation for the assumptions used in the valuation at fair value (Alaryan et al., 2014). In this same line, Fukui and Saito (2022) understand that "the fair value measurement involves, in some situations, a high degree of subjectivity and professional judgment, which can compromise the reliability of the information." The authors conclude that subjectivity is a crucial element in determining the quality of the fair value measurement.

Some research has investigated the informational quality provided by the fair value of biological assets and has not observed this informational gain (Kurniawan et al., 2014; Jana & Marta, 2014; Bohušová & Svoboda, 2016; Gonçalves et al., 2017; Ovcharov & Terekhov, 2020; Xie et al., 2020; Węgrzyńska & Nowotarska, 2021; Khushvakhtzoda & Nazarov, 2021), mainly due to the difficulty in estimating fair value in the absence of an active market, and due to the use of unobservable data. In response to this difficulty, a movement to amend the IAS 41 biological assets standard has emerged with accounting regulators in Asian and Oceanian countries, focusing on the measurement of bearer plants. One of the criticisms of the treatment of bearer plants lies in their similarity to property, plant, and equipment, as both are use-oriented, resulting in the measurement basis being changed from fair value to historical cost. The result was a change in the accounting treatment of bearer plants, which started to be measured at historical cost, equating the accounting treatment of bearer plants to fixed assets (IFRS, 2013).

The purpose of this change is to generate more useful information for decision making, consistent with the purpose of accounting, and, consequently, to reduce the adverse selection problem. To reduce asymmetric information between deficit and surplus agents, accounting statements must be relevant, understandable, and useful for investment decision purposes. With higher quality and error-free information, investors are expected to change their perception as to the risk of investing, for example, via the granting of credit for companies to finance their investment projects. Babu et al. (2015) investigated the agricultural credit market in India and China and identified that information is one of the factors considered to select borrowers. In this context, Daly and Skaife (2016) investigated whether accounting information represented by the fair value of biological assets influences the cost of debt. The authors conducted a study in 28 countries that have biological assets. According to the authors, the cost of debt has a positive relationship with fair value measurement, that is, the more fair value is used, the more creditors tend to believe that the value information is not reliable; this fact generates a higher cost of debt, unfavorable for the business. However, this result is influenced by companies that have bearer plants, which were measured at fair value in the period analyzed by Daly and Skaife (2016). Given this, the relationship between the fair value of biological assets and the cost of debt after the amendment of IAS 41, which occurred in January 2016, has not yet been investigated, revealing a gap in the literature. Historical cost measurement of bearer plants may imply more reliable and objective information for assets with no active or liquid market, resulting in greater relevance for decision-making purposes.

Therefore, the general objective of this work is to analyze whether the measurement of biological assets at fair value changes the perception of risk by the creditor and, therefore, changes the cost of debt of companies that have investments in biological assets measured at fair value. If the market does not trust one of the methods applied to measure the existing biological assets, it causes a higher risk perception by the capital holder concerning the company that owns such biological assets and needs loans and, therefore, the higher the rate that will be used in the agreement, resulting in unfair values in the negotiation between the parties. In addition, the cost of debt for companies with bearer plants measured at historical cost is investigated, with the expectation of different results compared to Daly and Skaife (2016). This research can contribute to evaluating possible informational gains and losses of IAS 41 after its amendment, observed by the financial cost of companies with biological assets. It is expected to bring empirical evidence regarding the changes in IAS 41 for countries that adopt IFRS. It is expected that these changes in IAS 41 can best serve the external user by increasing the relevance of the accounting information disclosed, which may have some effect on the creditor's perception of risk. Finally, the justification for the work lies in need to evaluate the relationship between the measurement of biological assets and the cost of debt for an international set of companies that adopt IFRS, especially for the subgroup of bearer plants that have undergone a recent change in the measurement basis: from fair value to cost. Thus, the results may be relevant for the discussion of improvements in the disclosure of biological assets, especially from the point of view of creditors.

2. Theoretical Framework

2.1. Standardization of Biological Assets and Cost of Debt

The International Accounting Standard - IAS 41 was issued by IASB in 2002, applying to financial statements from 2003. India, which has fully adopted international accounting standards since 2011, translated IAS 41, which gave rise to Indian Accounting Standard (Ind AS) 41, which focused on biological assets and agricultural products.

According to Indian Accounting Standard (Ind AS) 41, "a biological asset is a living animal and/or plant". While the definition of agricultural products is "the harvested product of the entity's biological asset". The objective of

IAS 41 is to establish the accounting treatment for biological assets during their growth, degeneration, production, and procreation. To this end, this standard presents concepts related to agriculture and identifies the recognition criteria for biological assets and agricultural produce. Concerning the measurement basis, IAS 41 determines that biological assets should be measured at fair value, except when their measurement does not occur reliably. For these cases, the standard recommends measurement at historical cost, which corresponds to the accumulation of costs associated with the formation of the biological asset or agricultural produce.

On the other hand, the fair value corresponds to the "price that would be received for the sale of an asset or that would be paid for the transfer of a liability in an unforced transaction between market participants at the measurement date" (Indian Accounting Standard 41). According to Ind AS 113, Fair Value Measurement, fair value is divided into three levels, which depend on the information available and techniques to assess. The first occurs when there are quoted prices in active markets for the traded asset, while the third level requires unobservable data and valuation techniques such as discounted cash flow. In this case, the subjectivity used in the calculation of discounted cash flows can decrease the acceptability and credibility of the asset in question.

This is an argument that convinced the international regulator to change the measurement basis for bearer plants, resulting in the amendment of IAS 41. This proposal came from the Asian-Oceanian Standard-Setters Group (AOSSG) - a body formed by the accounting regulatory bodies of the Asia-Oceania region, which defend that bearer plants are not grown for sale since they become a means for the production of agricultural products. Therefore, the AOSSG advocated the application of IAS 16 - Property, Plant, and Equipment for bearer plants, due to the similar characteristics to fixed assets. Therefore, in January 2016, bearer plants moved out of the scope of IAS 41, and into the accounting treatment of IAS 16, implying significant changes to the financial statements of companies with high investments in biological assets. In this context, given the presence of subjectivity elements in the fair value measurement of biological assets, especially without an active market, the authors Daly and Skaife (2016) dedicated themselves to studying in greater depth the economic consequences in the view of creditors, who use this information for decision making. In this sense, motivated by the risk of adverse selection present in granting credit to companies with biological assets, the authors evaluated how biological assets measured at fair value without an active market influence the risk perceived by creditors in debt contracts. In doing so, they observed that the cost of debt has a positive relationship with fair value measurement.

Daly and Skaife's (2016) result is in line with the lender's perceived risk since information can influence the formation of interest rates. An investment with higher perceived risk increases the return required by the holder of capital or the interest rate charged on financing, increasing the cost of debt for the firm. It is known that financing is essential for companies to expand their activities because the resources generated internally may not be sufficient for entities to finance their investment projects.

In India, the largest source of financing is through banks, especially the State Bank of India (SBI), which can be explained by the presence of subsidized interest rates. Considering that the preponderant financing of Indian companies occurs through banks, financial expenses assume a significant weight in income statements, which may justify studies on the cost of debt, also titled cost of financing. The disadvantages of this method are the risks.

2.2. Empirical Evidence on Biological Assets

This discussion on the valuation of biological assets is not recent. Regarding fair value, Gonçalves, Lopes, and Craig (2017) do not reject that the biggest problem with fair value is the lack of an active market for biological assets. There is evidence that fair value has led to more reliable predictions for decision-making in the agricultural sector, but it does not diminish the fact that this method relies on a subjective valuation model (Argilés Bosch et al., 2012).

Huffman (2018) analyzed 35 countries and concluded that the fair value of biological assets provides more useful information for decision-making. However, she found that accounting information is significantly less relevant when companies measure biological assets in use at fair value, which reinforces the recent change in the basis of measurement for bearer plants.

According to Daly and Skaife (2016), the way biological assets are measured influences the cost of debt, and to test this relationship, the authors used a sample of 295 companies between the years 2001–2013. After performing tests, the authors concluded that measuring at fair value results in a higher cost of debt. To explain the results, the authors argue that cost is seen as a more reliable method, although it does not correspond to the expected cash flow value of the asset, which may make the method less informative. On the other hand, fair value purports to measure a company's future cash flows. The challenge in using this measurement method is the changes that occur in the growth, degeneration, and production of the biological asset, which makes it difficult to estimate the expected cash flow.

There is no consensus in the discussion between cost and fair value for biological assets, as both have limitations. While fair value may be irrelevant due to a lack of verifiability, the historical cost may require too precise cost control (Cristea, 2017). Jana and Marta (2014) also present several advantages and disadvantages regarding the use of fair value; for

example, it is a more reliable measurement basis when there is an active market. In India, Rajeev and Sindhuja (2021) investigated whether the contribution of biological assets to the cash flow of companies can influence the relevance of accounting information for the Indian market. The authors observed that biological assets that directly contribute to corporate cash flows are more relevant to explaining stock prices than those that indirectly contribute.

Furthermore, considering that there are no studies on the cost of third-party capital and the fair value assessment of biological assets after the change in IAS 41, the following research hypothesis is presented:

H1: *Biological assets at fair value have a positive relationship with the cost of debt.*

The first hypothesis is based on the work of Daly and Skaife (2016). It is noteworthy that in the period studied (2016–2017) the companies did not apply fair value for bearer plants, which may imply different results for this subgroup due to the change in the measurement basis. In this new scenario, a second research hypothesis was developed:

H2: *Measuring bearer plants at historical cost improves the lender's perception of risk, which means a smaller effect on the cost of debt relative to other biological assets.*

This hypothesis is based on the possibility of the historical cost being more relevant than fair value. One explanation is due to the possibility of misleading information and reduced relevance of accounting information when companies use fair value for biological assets without active markets (Kurniawan et al., 2014; Huffman, 2018).

3. Methodology

The research is quantitative because the data collected can be measured and quantified (Dźwigoł & Dźwigoł-Barosz, 2018). In this sense, a positivist paradigm is adopted since the measurement is an essential element of this research (Collis & Hussey, 2014). The collection technique is conventional and based on secondary data, which can be explained by the research object investigated and also by the quantitative nature of this study (Dźwigoł & Dźwigoł-Barosz, 2018). Furthermore, quantitative data are based on the frequency of occurrence of variables (Collis & Hussey, 2014). The analysis technique is confirmatory data or inference statistics because it uses quantitative data from a sample to reach conclusions. It can still be said to be a parametric and multivariate analysis (Collis & Hussey, 2014), as regression models are used to explore the relationship between the cost of debt and biological assets.

The presentation of the data and variables based on the literature are set out below.

The data were obtained from Thomson Reuters Eikon. In a universe of 2,495 companies from sectors that potentially hold biological assets, a set of 182 companies from 39 countries was selected based on a previous analysis of information available at Thomson. From this number, the presence or not of biological assets was observed through an analysis of the explanatory notes. Therefore, the companies were selected through a non-random sampling method since the selection was guided by sectors. In addition, the sample consists of companies from different countries for the period 2018–2021. However, for the regression analysis, the years 2020 and 2021 were used due to the unavailability of data for the other years. A part of the data collection occurred manually in the financial statements.

The model used for analysis is based on Daly and Skaife (2016) and requires the application of the multiple linear regression techniques, whose dependent variable is the cost of debt:

$$\begin{aligned}\text{Cost of debt} = {} & \alpha + \beta_1 * \text{FairValue AB} + \beta_2 * \text{VAR}_{FV} \\ & + \beta_3 * \text{BPV}_{PORT} + \beta_4 * \text{VL} + \beta_5 * \text{FS} \\ & + \beta_6 * \text{CG} + \beta_7 * \text{CF} + \beta_8 * \text{RE} + \beta_9 * \text{CL} \\ & + \beta_{10} * \text{LPY} + \beta_{11} * \text{DV}\end{aligned}$$

The cost of debt (COD) is the ratio between financial expenses and the onerous liabilities of the company, which is composed of obligations arising from short and long-term financing (Mitra & Naik, 2021). Fair value AB (FV) is a dummy variable that assumes 1 when the company measures biological assets at fair value and 0 when the measurement is made by the cost method. The variable change in fair value (VAR_{FV}) corresponds to the change in the fair value of biological assets in the financial statements. The bearer plants variable (BPV_{PORT}) is a dummy that assumes 1 if the company has bearer plants in relevant amounts, remembering that the changes in bearer plants are required as of January 2020.

The variable leverage (VL), corresponds to the ratio between total debt and the sum of total debt and the market value of the shares. Firm size (FS) is calculated according to the natural logarithm of market capitalization. The company's growth (CG) is measured by the change in annual sales rates, i.e., the percentage change in revenue over the years.

Cash Flow (CF) is calculated by dividing operating cash flow by sales, both in t; this variable allows us to evaluate the probability that debts will be paid off, reducing defaults, for this reason, a negative coefficient is expected. Return (RE) is estimated from the valuation or devaluation of the company, calculated by the market value of the company in *t* and *t*–1; so it is: [(market value in *t* / market value in *t*–1) –1]. Current loss (CL) is a dummy variable that indicates the result in year *t*, if there is a loss it is assigned 1; otherwise, 0. The same occurs for the loss in the previous year (LPY), that is, in *t*–1. It is expected that default will increase if a loss

occurs, so the predicted coefficient for CL is positive; the same interpretation applies for losses in *t*–1 (LPY).

The last variable was used to define whether a company is in a developed market or not, using the human development index (HDI). According to Bova (2016), the level of development of the country influences the relationship between the measurement of biological assets and the cost of debt. The HDI values were gathered based on a United Nations Development Program report (United Nations, 2022) for the years 2020 and 2021. From this data, the development variable (DV) was created which is based on the United Nations human development index (HDI). A company located in a developed market may have a differentiated fair value measurement due to superior institutional and informational aspects (Bova, 2016).

Based on the article by Daly and Skaife (2016) the expected signs for these variables are shown in Table 1:

The data collected in the Thomson Reuters database is in dollars. They are cash flow, net income, revenue, and total liabilities. While the biological assets, the variation in the fair value of biological assets, and onerous liabilities were collected manually and converted from the disclosure currency to the dollar, according to the currency exchange rate available at the Ministry of Finance, India.

Initially, it was decided to analyze the number of companies per country that use fair value or historical cost as the measurement method in their IFRS financial statements, as can be seen in Table 2. In the same table, it is also possible to observe that most companies use fair value as a measurement method. Malaysia has 20.88% of the companies analyzed, and most of the companies adopt the historical cost, while in the other countries, the fair value is predominant. Of the 182 companies studied, approximately 68% use fair value to measure their biological assets.

Table 1: Expectation of the Variables Used

Independent Variables	Expected Signal
FV	+
VAR_FV	?
BPV_PORT	–
VL	?
FS	–
CG	+
CF	–
RE	–
CL	+
LPY	+
DV	–

Source: Adapted from Daly and Skaife (2016).

Table 2 also identifies whether the companies studied have bearer plants or not, according to their respective countries. Some companies have bearer plants and other biological assets. In these cases, the most relevant value within the company's assets was used to define bearer plant or not.

Overall, most companies have bearer plants, and once again, Malaysia stands out with 30 occurrences. However, there are 21 cases of historical cost, which suggests the need to investigate in future research the compliance of financial statements with IAS 41. Furthermore, Malaysia is one of the largest producers of palm oil and natural rubber, which justifies the more significant presence of bearer plants.

4. Analysis and Results

4.1. Analysis of Data Behavior

The variables of the study are analyzed, which come mostly from quantitative data. For this, some tables are used to observe the behavior of the variables over the studied period. First, the operating cash flow is studied (Table 3):

Table 3 allows us to observe that the average of the companies' cash flow values is kept stable in 2019 and 2020, but from the first to the last year there is an increase of, approximately, 14.92%, or USD 17,234,327. In turn, the net income has the following behavior (Table 4):

Regarding the average net income, it can be seen that there was a growth from 2019 to 2021, although the variation was not so high. To understand what may have occurred in this period, the Gross Domestic Product (GDP) at a global level was used, obtained from the World Bank website (Table 5):

There is a 5.66% drop in global GDP from 2018 to 2019, which can be explained by weak investment growth in some economies, as well as lower productivity (United Nations, 2019). This reduction at the global level of Gross Domestic Product (GDP) may elucidate the worse performance in some companies from 2018 to 2019, for example, the reduction in net income and sales revenue.

The companies' sales revenue fell in 2019 and 2020, rising again in 2021. This year saw a pickup in investments globally, which could explain this increase in revenue. According to United Nations data, gross fixed capital formation accounted for about 60 percent of the acceleration in global economic activity in 2021 (United Nations, 2022).

Regarding liabilities, there was a gradual increase in the years from 2019 to 2021 but a sharp drop from 2018 to 2019. In 2018 there was a strengthening of the dollar against other currencies (United Nations, 2019), which could lead to an increase in debt. However, a debt reduction was observed from 2018 to 2019, which could be explained by an increase in liabilities in other currencies or even in local currencies of the countries studied. Further studies could investigate this issue, which is beyond the scope of this paper. Concerning

Table 2: Measurement and Bearer Plants According to Countries

Country	Fair Value	Historical Cost	No Bearer Plants	With Bearer Plants	Total Companies
Malaysia	17	21	8	30	38
United States	27	5	10	22	32
China	3	8	6	5	11
Sri Lanka	8	1	1	8	9
India	2	5	3	4	7
Australia	6	1	3	4	7
Argentina	6	0	2	4	6
New Zealand	4	1	1	4	5
India	5	0	1	4	5
United Kingdom	4	1	4	1	5
Spain	4	1	1	4	5
South Africa	4	0	2	2	4
Canada	4	0	2	2	4
Indonesia	2	2	0	3	3
Latvia	3	0	2	1	3
Peru	1	2	2	1	3
Chile	1	2	1	2	3
Jamaica	3	0	1	2	3
Greece	3	0	1	2	3
Germany	1	1	2	0	2
Denmark	2	0	1	1	2
Saudi Arabia	2	0	0	2	2
Singapore	1	1	0	2	2
Nigeria	1	1	1	1	2
Luxembourg	0	1	0	1	1
Vietnam	1	0	0	1	1
Colombia	0	1	0	1	1
Nigeria	1	0	1	0	1
Finland	1	0	0	1	1
Russia	1	0	0	1	1
Croatia	1	0	0	1	1
Italy	1	0	1	0	1
France	0	1	0	1	1
Sweden	1	0	0	1	1
Ireland	1	0	0	1	1
Ghana	0	1	0	1	1
Thailand	0	1	0	1	1
Lithuania	1	0	0	1	1
Kazakhstan	1	0	0	1	1
Kenya	1	1	0	1	1
Total	**126**	**59**	**57**	**126**	**182**

Table 3: Average Operating Cash Flow of the Companies (in thousand dollars)

2018	115,510,984.46
2019	122,595,756.95
2020	121,437,959.37
2021	132,745,311.87

Table 4: Average Net Income of Companies (in thousand dollars)

2018	61,054,705.05
2019	55,751,178.11
2020	61,218,753.70
2021	72,010,889.48

Table 5: Average Gross Domestic Product (GDP) of Countries Worldwide from 2013 to 2021

2013	1,900,000,000,000.00
2014	2,150,000,000,000.00
2015	2,400,000,000,000.00
2016	2,450,000,000,000.00
2017	2,550,000,000,000.00
2018	2,650,000,000,000.00
2019	2,500,000,000,000.00
2020	2,550,000,000,000.00
2021	2,800,000,000,000.00

Source: Prepared by the authors with data from the World Bank website.

Table 6: Average Biological Assets of the Companies (in thousand dollars)

2018	171,884,128.87
2019	150,276,175.10
2020	365,424,417.07
2021	648,979,561.66

biological assets, an increase in investments is observed (Table 6):

As can be seen, the average of biological assets has been growing, which makes the research even more relevant due to the possible relationships between biological assets and the cost of debt (Bova, 2016; Daly & Skaife, 2016).

4.2. Regression Model Results

This section presents the results of the model based on Daly and Skaife (2016), presented in the methodology section. To make the results more adequate, before performing the tests, two procedures were applied. The first is called winsorization, which corrects extreme value problems. The second aimed to correct the multicollinearity problem, which occurs when the explanatory variables have a high correlation among themselves, which can generate problems in the estimation of the coefficients. The tests, carried out in the Stata program, are based on the Variance Inflation Factor - VIF. After the exclusion of the variables: old loss (LPY), development (DV), and fair value variation (VAR_FV) in the Fiscal Year Income Statement (FYIS) and Cash Flow Statement (CFS) for the year 2021, the data were free of the multicollinearity problem.

After checking the assumptions of the regression model (Guo et al., 2013), the ordinary least squares (OLS) method was applied, allowing the following coefficients to be estimated for 2021 (Table 7) and 2020 (Table 8):

Analyzing these two results (Tables 7 and 8), one can infer that the model is not statistically significant, because when there is a strong relationship between the explanatory variables and the dependent variable, the *p*-value is less than 5%. In addition, the coefficients of the variables for the year 2020 were not statistically significant, except for the variables "size" and "leverage", which were significant at

Table 7: Estimated Model for 2021

Dependent Variable: Cost of Debt	**Estimated Coefficients**	**Expected Signal**
Explanatory Variables		
FV	–0.072/(–1.42)	+
BPV_PORT	–0.016/(–0.32)	–
VL	–0.011/(–0.9)	?
FS	–0.001/(–0.36)	–
CG	0.023/(0.27)	+
CF	–0.069(–1.00)	–
RE	–0.038/(–0.53)	–
CL	–0.986/(–1.86)***	+
α	0.501/(3.86)*	
n	113	
F-statistic	1.37	
R^2	0.04	

Obs.: *0.01; **0.05; ***0.10.

Table 8: Estimated Model for 2020

Dependent Variable: Cost of Debt	Estimated Coefficients	Expected Signal
Explanatory Variables		
FV	0.005/ (0.08)	+
BPV_PORT	–0.010/(–0.18)	–
VL	0.223/(1.64)***	?
FS	0.08/(1.81)***	–
CG	0.066(0.62)	+
CF	–0.120/(–1.32)	–
RE	–0.039/(–0.51)	–
CL	–0.106/(–1.28)	+
LPY	–0.120/(–1.52)	+
DV	0.053/(0.12)	–
α	0.203/(0.50)*	
n	85	
F-statistic	1.56	
R^2	0.13	

Obs.: *0.01; **0.05; ***0.10.

10%, revealing a weak relationship with the cost of debt. For 2021, the only significant variable was "current loss," also showing a weak relationship with the cost of debt. The different result for the two years requires an expansion in the database for further investigation, with more periods and companies holding biological assets, which could be done in future studies.

The variables of interest "fair value" - FV and "bearer plant" - BPV_PORT were not statistically significant, showing that the fair value measurement method and the presence of bearer plants are not related to the cost of debt. These results are contrary evidence to the research hypotheses presented, allowing us to conclude that, the biological asset at fair value has no relationship with the cost of debt, and that, the measurement of bearer plants at historical cost has no effect on the perception of risk by the creditor, and consequently, no effect on the cost of debt.

Particularly, the result of the first hypothesis on the fair value of biological assets is not in line with Daly and Skaife (2016), which can be explained by the different sample and analysis periods. While the authors studied 127 firms from 28 countries from 2001–2013, this paper investigated 182 firms from 39 countries, but for 2020 and 2021. Furthermore, Daly and Skaife (2016) observed that most firms that applied fair value belong to developed countries, while firms that are measured at historical cost are from developing countries. Differently, our paper investigates the measurement of biological assets after the change in IAS 41, which requires historical cost for all firms that have bearer plants, regardless of their origin.

Another way to explain our results can be found in Exposure Draft ED/2013/8. According to this document, many investors and analysts do not use the fair value of biological assets, as they look for other information of a non-financial nature, for example, production data, cultivated area, age of the bearer plants, etc. This information is usually obtained through presentations made to analysts, in management comments inserted in annual reports, or received directly from companies (IFRS, 2013).

Complementarily, there is evidence that the cost of capital can be influenced by profit smoothing decisions (Handoo & Sharma, 2014; Thirumalaisamy, 2015), and the practice of profit smoothing occurs in the Indian market (Ashjaei & Nagaraja, 2018; Munjal et al., 2021; Marvadi & Pandya, 2022). Rajeev and Sindhuja (2021) observed evidence of earnings management for companies that use discounted cash flow to measure biological assets. In this sense, fair value measurement can be used to meet analysts' expectations of accounting profit, especially for assets with no active market, which could lead financial agents to simply not use fair value information in their decision models. This could explain the lack of relationship between the cost of debt and the fair value of biological assets. However, our research did not observe outcome smoothing practices in the context of fair value measurement of biological assets, which we leave as a suggestion for future research. Other suggestions for further research involve studying different variables, which could be used to explain the cost of debt and its relationship with the measurement of biological assets, as well as extending the period of analysis.

5. Conclusion

With the adoption of IFRS (2013) (International Financial Reporting Standards), the fair value measurement for biological assets has gained greater popularity and brought discussions about the advantages and disadvantages of its application. Measurement difficulties, reliability, and relevance of information are some points discussed when the subject is the measurement of assets at fair value. The absence of an active market for bearer plants motivated a change in IAS 41, resulting in the application of the historical cost for this subgroup. With this, it is expected to generate higher quality information for the external user.

In this context, the general objective of this study was to investigate the relationship between the fair value of biological assets and the cost of third-party capital after the change in IAS 41, which includes bearer plants measured at historical cost. The hypotheses pointed out in this study

were: H1: biological assets at fair value have a positive relationship with the cost of debt, and H2: the measurement of bearer plants at historical cost improves the creditor's perception of risk, which means a lower effect on the cost of debt concerning other biological assets. The sample consists of 182 companies from different countries for the period 2018–2021, with data from Thomson Reuters Eikon. The model used for analysis is based on Daly and Skaife (2016).

The analysis of the behavior of the investment in biological assets showed an increase for the studied period, while Malaysia corresponds to the country with the largest number of cases with the measurement at historical cost. After analyzing the regression model results, it can be inferred that the variation in the cost of debt of the companies with biological assets cannot be explained by the variables calculated in this study, since the values found are not significant. Therefore, the hypothesis that the measurement of biological assets is related to the companies' cost of debt is not acceptable. Furthermore, the second hypothesis tested is also not admissible since measuring the bearer plants at historical cost does not improve the creditor's perception of risk and does not mean a lower effect on the cost of debt concerning the other biological assets.

The results differ from Daly and Skaife (2016) in terms of the study period, sample, and the effects of IAS 41. In addition, Exposure Draft ED/2013/8 warns of the importance of non-financial information in analyst and investor decision-making. Finally, earnings smoothing practices may influence our findings, which may be taken into consideration in future research.

In summary, the expectation of contributing to the agricultural sector and the journal's area of knowledge was met because the results obtained showed that the measurement of biological assets is not related to the cost of debt and that the change in IAS 41 did not affect the lender's perception of risk. Thus, in the international scope of biological assets, the changes in the standard did not significantly influence the cost of third-party capital, which can be useful for companies that depend on loans to finance their activities. This shows that there were no significant variations in the transaction cost when restricting the analysis to the measurement method of biological assets.

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