

Publication status: This preprint has not been published elsewhere.

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<https://doi.org/10.1590/1808-057x20252221.en>

Submitted on: 2026-03-11

Posted on: 2026-03-12 (version 1)

(YYYY-MM-DD)

DOI: 10.1590/1808-057x20252221.en

e-location: e2221

Capitalization of internally generated intangible assets and its impact on the predictive power of accounting information

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Received on 10/04/2024 – Desk acceptance on 11/21/2024 – 4th version approved on 08/21/2025

Academic Editor-in-Chief: Andson Braga de Aguiar 

Associate Editor: Sirlei Lemes

ABSTRACT

This research aimed to examine the extent to which the capitalization of internally generated intangible assets provides a better prediction of stock returns in the Brazilian market. Accounting for intangible assets as expenses has led to a decline in the relevance of accounting information, demanding research to test the adaptation of accounting metrics for application in risk and return models. International studies have been developed to test the effects of capitalizing these assets, but this verification has not yet been carried out in Brazil. The capitalization of internally generated intangible assets provided an accounting measure more closely related to stock returns and also made it possible to select companies with better fundamentals for value strategy. Thus, the study is relevant because it provides input for discussions on the treatment given to internally generated intangible assets. The research contributes to academia and market participants by providing an alternative measure of book value that constitutes an improvement in the informational content generated by accounting. The findings suggest that the capitalization of internally generated intangible assets improves the predictive power and informational content of accounting. The sample consisted of Brazilian companies listed on the B3 S.A. – Brasil Bolsa Balcão, from 2011 to 2022. Intangible assets reported as expenses were estimated and capitalized. The adjusted book-to-market (B/M) ratio was used in cross-sectional return regressions and in the reconstruction of the value factor in the five-factor model. The B/M adjusted for the capitalization of internally generated intangible assets showed a greater correlation with stock returns than the original indicator. The selection of value and growth stocks, using the adjusted B/M ratio, provided portfolios with higher returns in the high minus low (HML) strategy and a better measure for the five-factor

This is a preprint of an accepted manuscript. This version has been peer-reviewed, accepted for publication. It is currently undergoing final editing, and will be available under the DOI <https://doi.org/10.1590/1808-057x20252221.en>

This article is derived from a doctoral thesis defended by author Julio Henrique Machado, under the supervision of the author Fernando Caio Galdi, in 2024.

Study presented at the 24th USP International Conference on Accounting, São Paulo, SP, Brazil, July 2024.

model. The best results were obtained with a long position in value stocks using the adjusted HML and a short position in growth stocks using the original HML.

Keywords: intangible assets, book-to-market, Fama and French, value investing, *SG&A*.

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1. INTRODUCTION

The current highly competitive business environment makes investments in intangible assets important drivers of corporate value. In 2024, the intangible assets of the world's largest companies reached \$79.4 trillion, while 79% of that value is off the balance sheet (Brand Finance, 2024). This may be because current regulations dictate that a large portion of internally generated intangible assets must be treated as expenses [Comitê de Pronunciamentos Contábeis (CPC, 2010)]. This environment, in which market value may be predominantly based on assets not reported on balance sheets, presents challenges to accounting in terms of correctly signaling them.

The growing importance of uncapitalized intangible assets has generated criticism of accounting standards, arguing that they have not adapted to the new reality, according to Barker et al. (2021), Dichev (2017), and Lev (2019). The authors argue that treating investments in intangible assets as expenses undermines the perception of future value creation by distorting the accrual accounting by mixing current sales results with investments intended to generate future benefits. Disregarding the accrual accounting diminishes the predictive power of profits and their usefulness as a performance indicator, as it interferes with traditional indicators (return on assets and return on equity) and indicators of the level of intangibility (Tobin's Q and market-to-book). They also cite the incompatibility of analyzing companies in the same sector that have different innovation strategies, which may involve the acquisition of intangible assets (recorded on the balance sheet) or their creation (recorded in the income statement). Therefore, these authors advocate for increased information provided by the capitalization of these assets, improving matching through the amortization of these investments, or through greater disclosures that provide a better understanding of the impact on future results.

The existence of intangible assets included in expenses has been demonstrated by Enache and Srivastava (2018), Iqbal et al. (2025), and Lev and Srivastava (2022), who found that they provide future benefits. Given the current importance of these resources, the aforementioned accounting limitation is one of the factors that explains the decline in the statistical relationship between accounting information and stock prices (Dugar & Pozharny, 2022; Kanodia et al., 2004). The omission of these assets in the book value of shares generates a demand to understand the resulting informational loss from this practice and to study alternatives to mitigate it. These verifications can be made through adaptations of the book value, given its popularization as a value anchor in the three-factor model for asset pricing by Fama and French (1992, 1993). In a subsequent study, when proposing the five-factor model, Fama and French (2015) realized that the value factor is losing predictive power, which was corroborated by Eisfeldt et al. (2022), Lev and Srivastava (2022), and Park (2019, 2022). These authors interpret that, as this measure was propagated when tangible assets were more

significant, the shift to focusing on intangible assets has reduced its potential to represent intrinsic value, causing mispricing, especially in intangible-intensive firms.

An investment strategy that can be harmed by this limitation is the value strategy. By maintaining long-term positions in undervalued firms, the investor benefits when the market perceives the mispricing and corrects prices. However, when considering book value as a measure close to intrinsic value, its undervaluation can motivate erroneous classification between value and growth stocks, compromising performance (value trap). Arnott et al. (2021) criticize that this separation may be influenced by accounting treatment and not by the fundamentals of the firms. Eisfeldt et al. (2022) and Lev and Srivastava (2022) demonstrated that value investing returns in the United States of America decreased in line with the rise of intangible assets. In Brazil, there is evidence in favor of this strategy compared to the Bovespa Index (Domingues et al., 2022; Palazzo et al., 2018).

This context of the importance of intangible assets and the decline in the predictive power of accounting information has motivated researches to reconstruct financial measures with the capitalization of these assets included in selling, general, and administrative expenditure (SG&A). Peters and Taylor (2017) found a positive relationship between these assets and Tobin's Q, demonstrating that this index better reflects the value of firms when intangible resources are included. Eisfeldt and Papanikolaou (2014) found that the accumulation of expenses improved the prediction of stock returns. Studies such as Eisfeldt et al. (2022), Iqbal et al. (2025), Lev and Srivastava (2022), and Park (2022) have demonstrated an improvement in the predictive power of book-to-market (B/M) when capitalizing internally generated intangible assets.

Following international studies, this research addresses an alternative for improving the informational content provided by accounting, through the capitalization of internally generated intangible assets. Despite the efficiency of the five-factor model in explaining returns in Brazil (Maciel et al., 2021; Siqueira et al., 2017), the adaptation of the value factor for intangible assets has not yet been carried out in the national market, which is why this study aims to fill this gap. This investigation becomes relevant given the institutional and informational differences between the Brazilian and American markets, which interferes with investments in intangible assets and incentives for disclosure. Brown et al. (2013) cite that capital markets and the legal environment favor these assets and, therefore, they are more valued in developed markets. Furthermore, international literature demonstrates that the informational power of profits is reduced in countries where accounting and tax standards are strongly linked, such as those with a civil law tradition. Watts (2003) states that, in these locations, tax influences promote excessive conservatism by restricting the recognition of assets in balance sheets. This is consistent with the Brazilian market, where conservatism has been observed even after adopting International Financial Reporting Standards (IFRS) and fiscal neutrality (Vale & Nakao, 2017). In this market, tax aspects may influence managers' judgment in accounting for intangible assets as immediate expenses, confusing investors' view that there are value-creating elements in the future included in the expenses.

These considerations prevent the conclusions obtained in the US from being applied in Brazil without due verification, given the differences between the two markets, thus configuring the need for this research. Therefore, this study also contributes to the advancement of international literature by providing an understanding of the pricing of intangible assets in an emerging market, useful evidence given the interconnection between global markets.

In this context, the objective of the research was to examine to what extent the capitalization of internally generated intangible assets provides a better prediction of stock returns. To this end, the book value was adjusted by the capitalization of these assets and subsequently tested to see if it improves the predictive power of the B/M and the value factor.

Previous studies have provided empirical support to conjecture that the impact of this change in the equity value of the stock provides a value measure with greater informational content.

The academic contributions lie in supporting discussions about the status quo of the accounting treatment of internally generated intangible assets and their reflections on the informational power of accounting. Despite considerable debate surrounding these assets, the literature lacks specific measures for their identification, as firms disclose these items in a clustered manner with other expenses. Given this difficulty, the present study engages with contemporary research challenges by estimating them econometrically, as proposed by Enache and Srivastava (2018), contributing to advancing the scientific debate and motivating future research. The evidence obtained supports the arguments of Dichev (2017) and Lev (2019) in favor of disclosing financial reports based on the income approach, as it better aligns with the dynamics of value creation, where the results have greater predictive power the closer the accrual accounting regime is to the amortization of investments.

The practical contributions are aimed at investors, analysts, and regulatory bodies, since, given the omission of these assets from balance sheets, there is a growing demand for more relevant accounting information (Iqbal et al., 2025). Investors can make better decisions by understanding the impact of these assets on their investments and protect themselves from value traps, avoiding choosing stocks with low B/M ratios, whose net asset values do not reflect capital with greater strategic essentiality (Eisfeldt et al., 2022). Finally, it presents contributions that help other participants understand the dynamics of the market with a strong participation of intangible information (Araújo et al., 2019). This is useful both for analysts, in better substantiating their investment recommendations, and for regulatory bodies, in evaluating increases in disclosures that better align with current informational demands.

2. THEORETICAL FRAMEWORK AND FORMULATION OF HYPOTHESES

Researchers have used the multifactorial models of Fama and French (1992, 1993, 2015) in studies on asset pricing. The authors consider five risk factors with high explanatory power for stock returns: market premium, size, value, profitability, and investment, while the last two were later additions. The authors demonstrated that the B/M ratio, used as a proxy for value, is one of the strongest and most persistent predictors of returns. Its high explanatory power is due to the consideration of past information, contained in the disclosed fundamentals, and present information, reflected in investor expectations. This indicator is also used to classify value stocks (for higher B/M) and growth stocks (for lower B/M) (Fama & French, 1992). Through this separation, they were precursors of the high minus low (HML) strategy, which consists of buying low-value stocks and selling high-value stocks, capturing assets with undervalued or overvalued prices relative to fundamentals. The success of the strategy is based on the difference between the returns of the two portfolios.

Fama and French (2015) confirmed the superiority of the five-factor model over the three-factor model, as its variables explain a significant portion of the returns of the investment portfolios. They proposed the five-factor model as follows:

$$R_{it} - R_{ft} = \alpha_i + b_iMKT_t + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + \varepsilon_{it} \quad (1)$$

The equation contains the risk pricing factors for stocks: market (MKT), size (SMB), value (HML), profitability (RMW), and investment (CMA), which were explained in topic 3.3. The usefulness of this model, in value strategies, is defended by Domingues et al. (2022), given its ability to explain returns independently of the value investing approach, as these approaches also explore risk factors. Furthermore, in the Brazilian market, the five-factor model showed

superior performance to the three-factor model, according to Maciel et al. (2021) and Siqueira et al. (2017).

Given the high use of B/M, researchers and professionals have discussed the absence of intangible assets in this indicator. Park (2019) demonstrated that the lack of these assets contributes to the decrease in its predictive power. As a large part of these resources is treated as an expense, they do not make up the equity value of the stock, making it necessary to understand the effects of this signaling. Although only acquired intangible assets are capitalized, a vast body of literature argues that internally generated assets impact long-term value creation. For example, Dal Vesco and Damke (2024) demonstrated that the creation of competitive advantage can be facilitated by human capital and cooperative networks. Given the difficulty in identifying them, researchers have used metrics to estimate them through regressions between revenues and expenses that identify portions of current spending that have a greater relationship with future results. This portion estimated from expenses is used as a proxy for intangible assets, which is related to future value creation (Enache & Srivastava, 2018; Lev & Srivastava, 2022; Machado & Galdi, 2023; Iqbal et al., 2025). Market consensus on this reality is also cited, as analysts incorporate intangible portions included in expenses in their forecasts (Banker et al., 2019).

Another research line investigated whether the informational power of losses is affected by the accounting practice of treating intangible assets as expenses. Gu et al. (2023) and Srivastava (2023) demonstrated that when the loss is due to this practice, the informational effect is different compared to the loss that actually occurs due to better performance. By adjusting losses for investments in intangible assets, we obtained more informative results.

Given the importance of these assets, international studies have found improved performance in the five-factor model when adding intangible assets treated as expenses to the book value. For example, Lev and Srivastava (2022) made significant changes to the classification of stocks, value, and growth by capitalizing these assets, as they improved the identification of companies that are overvalued relative to their fundamentals. The effects of the adjustment were stronger in growth stocks, as they are more related to intangible-intensive sectors. Iqbal et al. (2025) obtained a greater association between future returns and the adjusted value factor, emphasizing that capitalization provided a better measure, especially in these sectors. These authors considered intangible assets in two groups: knowledge capital, reflected in research and development (R&D) activities, and organizational capital, including administrative expenses. This approach was also used by Enache and Srivastava (2018) and Machado and Galdi (2023) and is included in the present research, as described in section 3.2.

Eisfeldt et al. (2022) demonstrated that the value factor with intangible assets prices as well as or better than the traditional method and provided higher returns in the American market. This improvement in performance occurred mainly in more recent decades, when value investing returns declined in the US. Amenc et al. (2020) tested alternative solutions to the book value of shares, with the inclusion of other indicators that relate the share price to financial fundamentals, such as sales, profits, and cash flows. The results showed that none of these alternatives outperformed the value factor with the inclusion of intangible assets in the book value of the share. Authors such as Arnott et al. (2021) and Park (2022) also obtained improvements in the value factor with the capitalization of intangible assets. They demonstrated significant differences for both future returns and the HML strategy. Li's (2021) study, applied to the European and Asian markets, obtained results in line with the previous ones, applied to the American market.

While studies on this topic are lacking in Brazil, there is evidence of the importance of intangible assets, as they affect the quality of accounting information (Machado, 2023) and are relevant to investors (Machado & Galdi, 2023; Pacheco & Rover, 2020). Therefore, the following research hypotheses were formulated:

H1a – The B/M, adjusted for the capitalization of internally generated intangible assets, has greater explanatory power for equity returns than the traditional B/M.

H1b – The B/M, adjusted for the capitalization of internally generated intangible assets, provides improved performance of the value factor.

The results are expected to be consistent with those presented in the international literature. Despite differences in the informational environment and market development, it is expected that internally generated intangible assets will also impact equity returns and value strategies in the Brazilian market, given their potential to generate future benefits for national companies, as noted by Machado and Galdi (2023).

3. METHODOLOGY

3.1 Sample

The study sample consisted of companies listed on B3 S.A. – Brasil Bolsa Balcão throughout the entire period of validity of Technical Pronouncement CPC 04 (R1) (CPC, 2010), a document that guides the accounting treatment of intangible assets, from 2011 to 2022. This was done to analyze the informational effect of the continuous application of this pronouncement. Initially, 402 companies were obtained, from which the following were excluded: financial services, holdings and participations, judicial or extrajudicial recovery, negative net worth, and firms that did not have listed capital during the analysis period.

Given the small number of listed companies, the information was considered at the asset level, that is, firms with preferred and common shares were treated as two different assets. Negative observations for estimates of internally generated intangible assets, namely Maint (Eq. 4) and Invest (Eq. 5), were excluded, as explained in the Organizational Capital Estimation (InvestmentMainSG&A) topic, an exclusion also carried out by the authors who propose the model (Enache & Srivastava, 2018). The capitalization of intangible assets caused some observations with negative net worth to become positive, which were returned to the sample. Observations with missing information in the database were excluded.

As the assembled portfolios were rebalanced in the months of June, as explained in topic 3.3, the study included observations from July 2011 to June 2022, totaling 132 months. Based on these filtering criteria, the sample consisted of 156 companies, 194 assets, and 15,762 observations, as shown in Table 1.

Table 1

Sample selection

Initial sample of companies	402
(-) Financial services	(59)
(-) Holdings	(35)
(-) Judicial and extrajudicial recovery	(19)
(-) Negative Neth Worth	(19)
(-) Companies without listed capital during the period	(114)
= Total number of companies	156
(+) Companies with preferred shares	38
= Total number of assets	194
= Expected observations (194 assets × 132 months)	25.608
(-) Negative Maint and Invest	(9.013)
(-) Missing values	(932)

(+) Change in Net Worth (negative ⇔ positive)	99
= Total observations	15.762

Source: Prepared by the authors.

The information from the Economatica® database was used and processed in STATA® software version 17.0. The methodological sequence proceeded in the following steps: (a) estimation and capitalization of internally generated intangible assets, altering the book value of the shares and the value factor (sub-item 3.2); (b) calculation of indicators for characterizing the shares in the risk factors and forming portfolios in each factor (sub-item 3.3); and (c) cross-sectional return regression and in the five-factor model (sub-item 3.4).

3.2 Adjustments for Capitalization of Internally Generated Intangible Assets

Internally generated intangible assets were capitalized using the perpetual inventory method, as described by Eisfeldt et al. (2022), Iqbal et al. (2025), Li (2021), and Park (2022). This method capitalizes investments in R&D (a proxy for knowledge capital) and the intangible portion of SG&A expenses (a proxy for organizational capital). These investments are significant in the Brazilian market, according to Machado and Galdi (2023). Capitalizing these assets requires an estimate of useful life for amortization. Given the difficulty of precise determination, estimates based on previous studies are used. Li (2021) and Peters and Taylor (2017) defend this approach, stating that it generates results that do not differ significantly from more complex procedures.

Since the equity value of the shares changes quarterly, internally generated intangible assets were estimated considering balance updates on a quarterly basis. To regress the book value with monthly returns, the values of intangible assets to be capitalized in the quarter were equally distributed across the months that comprise it, until they are updated in the next quarter with the next disclosure. The sequence that results in the adjustment of the book value, B/M, and value factor is presented below.

3.2.1 Knowledge Capital (R&D) Estimation

Companies accumulate knowledge capital through investments in science and technology. The innovations and advances achieved improve the quality of products and services, contributing to long-term benefits. Thus, knowledge capital (K) was estimated as follows, based on Iqbal et al. (2025), Li (2021), and Park (2022):

$$K_{i,t} = (1 - \delta_{i,P\&D}) \times K_{i,t-1} + R\&D_{i,t} \quad (2)$$

Using the perpetual inventory method, the knowledge capital (K) of company i , in period t , is determined by the previous balance of this capital ($K_{i,t-1}$), discounted by the amortization given by δ , considering 15%, according to Iqbal et al. (2025) and Li (2021), and subsequently added to the investment in R&D of company i in t . A value of 0 was assigned to the initial balance of the first observation. Using Eq. 2, the capitalized value at the end of the period refers to the sum of the unamortized previous balance and current investments.

3.2.2 Investment Main SG&A

Intangible investment in organizational capital is difficult to measure because it is not reported separately. Studies have attempted to overcome this limitation, either by considering the total SG&A (Banker et al., 2019) or a fraction of general expenses, such as 20% (Ewens et

al., 2021) and 30% (Eisfeldt & Papanikolaou, 2014; Peters & Taylor, 2017). However, some criticisms prevent the use of these approaches in the present study. The separation of expenses, according to Banker et al. (2019), may overestimate investments in intangible assets. And also, the fractions obtained by Eisfeldt and Papanikolaou (2014), Ewens et al. (2021) and Peters and Taylor (2017), in the USA, may be different in Brazil due to conjunctural aspects that impact these investments and the informational environment that influences their recognition in the result.

Given the diversity of metrics, the model proposed by Enache and Srivastava (2018), used by Iqbal et al. (2025) and Lev and Srivastava (2022) in the USA, and Machado and Galdi (2023) in Brazil, was employed. This procedure consists of regressions to estimate the portion of expenses that has the greatest relationship with future revenues. *R&D* expenses were deducted from the total *SG&A*. In the remaining portion, called *MainSG&A*, the amounts corresponding to period expenses (*MaintenanceMainSG&A*) and investments in intangible assets (*InvestmentMainSG&A*) are estimated using three equations:

$$\begin{aligned} MainSG\&A_{i,t} = \alpha_{i,t} + \beta_{1,i,t} \times Revenues_{i,t} + \beta_{2,i,t} \\ \times Dummy_Revenue_Decrease_{i,t} + \beta_{3,i,t} \times Dummy_Loss_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (3)$$

$$\widehat{MaintenanceMainSG\&A}_{i,t} = \hat{\beta}_{1,i,t} \times Revenues_{i,t} \quad (4)$$

$$\widehat{InvestmentMainSG\&A}_{i,t} = MainSG\&A_{i,t} - \widehat{MaintenanceMainSG\&A}_{i,t} \quad (5)$$

Equation 3 regresses *MainSG&A* with current revenues (both scaled by total assets) and dummy variables to control for sales decline (*Dummy_Revenue_Decrease*) and loss (*Dummy_Loss*). The separation between expenses and investments occurs in Eqs. 4 and 5, while, from the perspective of the information user, *MaintenanceMainSG&A* should be treated as an expense because it matches current revenues, but *InvestmentMainSG&A* should be capitalized because it matches future revenues. As it is an estimate, Enache and Srivastava (2018) emphasize that it is not possible to accurately identify these assets. Thus, the main limitation of the model lies in the fact that it does not account for unproductive expenses or those that relate to both the current and future periods.

Using the perpetual inventory, organizational capital (*O*) was estimated as follows, based on Iqbal et al. (2025), Li (2021) and Park (2022):

$$O_{i,t} = (1 - \delta_{i,SG\&A}) \times O_{i,t-1} + InvestmentMainSG\&A_{i,t} \quad (6)$$

This refers to the portion of general expenses related to the investment in organizational capital of company *i* in *t* (*InvestmentMainSG&A_{i,t}*), added to the previous balance of this investment (*O_{i,t-1}*) and discounted by the estimated amortization (δ) of 20%, following Eisfeldt et al. (2022), Park (2022) and Peters and Taylor (2017). A value of 0 was assigned to the initial balance of organizational capital from the first observation. Thus, the organizational capital to be capitalized refers to the unamortized balance from the previous period added to current investments.

3.2.3 Value fator adjustment

The total intangible capital to be capitalized refers to the sum of knowledge capital (*K*) (Eq. 2) and organizational capital (*O*) (Eq. 6), as Equation 7:

$$Intan_Cap_{i,t} = K_{i,t} + O_{i,t} \quad (7)$$

Since *Intan_Cap* is a proxy for internally generated intangible assets to be capitalized, it was considered by dividing it by the number of shares. Subsequently, the book value per share was adjusted for intangible assets (BV^{int}) by adding the intangible capital to the original book value (*BV*):

$$BV_{i,t}^{int} = BV_{i,t} + Intan_Cap_{i,t} \quad (8)$$

Finally, the new *B/M* (*iB/M*) was calculated using the ratio between the adjusted book value and the market value of the shares:

$$iB/M_{i,t} = BV_{i,t}^{int} / M_{i,t} \quad (9)$$

The *B/M* adjusted for the capitalization of internally generated intangible assets was used to reconstruct the value factor of the five-factor model, as Equation 1. This new factor was named *iHML*, presented below along with the others.

3.3 Five-Factor Model

Table 2 presents the construction of the risk factors included in Equation 1:

Table 2*Construction of risk factors*

Panel A – Variables used for portfolio construction		
Variable	Formula	Description
Size	$VM_{i,t} = P_{i,t} \times N_{i,t}$	$VM_{i,t}$ = market value of company i in period t ; $P_{i,t}$ = price of stock i in period t ; $N_{i,t}$ = number of shares i in circulation in period t .
Book-to-market	$B/M_{i,t} = \frac{PL_{i,t}}{VM_{i,t}}$	$B/M_{i,t}$ = book-to-market of company i in period t ; $PL_{i,t}$ = Net Worth of company i in period t ; $VM_{i,t}$ = market value of company i in period t .
Profitability	$Lucr_{i,t} = \frac{Lop_{i,t}}{PL_{i,t}}$	$Lucr_{i,t}$ = profitability of company i in period t ; $Lop_{i,t}$ = operational profit of company i in t ; $PL_{i,t}$ = Net Worth of company i in t .
Investment	$Inv_{i,t} = \frac{(AT_{i,t} - AT_{i,t-1})}{AT_{i,t}}$	$Inv_{i,t}$ = investment of company i in period t ; $AT_{i,t}$ = total asset of company i in t ; $AT_{i,t-1}$ = total asset of company i in period $t-1$.
Panel B – Risk factors		
Variable	Formula	Description
Value (<i>HML</i>)	$HML_t = \bar{R}_{H,t} - \bar{R}_{L,t}$	Difference between the average returns of portfolios with high ($-H$) and low (L) book-to-market in t .
Value adjusted for intangible assets (<i>iHML</i>)	$iHML_t = \bar{R}_{iH,t} - \bar{R}_{iL,t}$	Difference between the average returns of portfolios with high (iH) and low (iL) book-to-market adjusted for intangible assets (iB/M) in period t .
Market (<i>MKT</i>)	$MKT_{i,t} = \bar{R}_{mercado,t} - \bar{R}_{CDI,t}$	Difference between the market value weighted average returns of the sample stocks and the monthly return of the Interbank Deposit Certificate.
Size (<i>SMB</i>)	$SMB_t = \bar{R}_{S,t} - \bar{R}_{B,t}$	Difference between the average returns of small (S) and big (B) equity portfolios in t .
Profitability (<i>RMW</i>)	$RMW_t = \bar{R}_{R,t} - \bar{R}_{W,t}$	Difference between average returns of portfolios of robust (R) and weak (W) performing stocks in t .
Investment (<i>CMA</i>)	$CMA_t = \bar{R}_{C,t} - \bar{R}_{A,t}$	Difference between average returns in portfolios with conservative (C) and aggressive (A) investments in t .

Source: Adapted from Fama and French (1993, 2015) and Maciel et al. (2021).

For portfolio construction, based on stock characteristics, we calculated the indicators in Panel A. According to the results for each stock, they were selected or discarded in the construction of risk factors, as per Panel B. For the value factor, both *HML* based on the original *B/M* and *iHML* based on the adjusted *B/M*, the stocks were separated into three groups according to the percentiles of *B/M* and *iB/M*: 30% with lower values (low), 40% with median values (medium), and 30% with higher values (high). The return factor is calculated by the difference between the high and low portfolios. The market factor (*MKT*) was obtained by the difference between the weighted average monthly returns (weighted by the monthly market value) of all stocks in the sample in each year and the monthly return of the Interbank Deposit Certificate. Regarding the other factors, *RMW* and *CMA* are separated in the same way as *HML*, with observations showing values 30% higher and 30% lower, respectively, for profitability and investment. For size (*SMB*), the separation occurred according to the median market value, resulting in small (*S*) and big (*B*). The returns of the factors are obtained by the differences between the two portfolios formed in each factor.

According to these criteria, portfolios were formed in June of each year, considering their monthly returns from July of year t to June of $t+1$. This portfolio rebalancing procedure provided a total of 120 portfolios. The monthly returns of the portfolios refer to the returns of the assets weighted by their participation in the portfolio in t .

3.4 Statistical and Econometric Procedures

The variables were winsorized at 1% to eliminate the effects of extreme values. To analyze whether *iB/M* is superior to *B/M* in predicting stock returns, we estimated Fama and Macbeth (1973) cross-section regressions, given their wide use and acceptance in the literature. Since returns are considered on a monthly basis, both *iB/M* and *B/M* were calculated on the same basis according to the quarterly changes in book value. The regressions were estimated in three stages, considering lags of 1, 2, and 3 months in the independent variables. As there was no relevant difference in the coefficients, the results with a lag of 1 month were presented. The White procedure was used to ensure that the standard errors are robust to heteroscedasticity.

To analyze the effect of intangible assets in the five-factor model, the value factor adjusted for the capitalization of these assets was tested to verify whether it contributes to the predictive power of the model. This was done through regression with the other factors, a procedure called spanning regression, based on Arnott et al. (2021), Li (2021) and Park (2022). The results pointed in this direction, with the intercept being positive and significant.

Finally, we estimated regressions using *HML* and *iHML*. The *z-test* was used to verify if the difference between the coefficients is significant. This procedure, together with the Fama and Macbeth (1973) regression, provided subsidies that support the research hypotheses. It is important to highlight that the effect of COVID-19 was controlled using a dummy variable, given the impact of this period on both stock returns and published figures, based on Bravo et al. (2023), who demonstrated that, in this crisis, there was a higher incidence of impairment in intangible assets than in fixed assets.

In addition, we performed tests to seek greater robustness. The Fama and MacBeth (1973) regression was estimated, and the returns of the *HML* and *iHML* strategies were calculated, considering the inclusion of financial institutions; for companies that have common and preferred shares, only the most traded share was kept. Regressions were also estimated using the risk factors published by the Center for Research in Finance of the Faculty of Economics, Administration, Accounting and Actuarial Science of the University of São Paulo (FEA/USP-Nefin). The results of both tests pointed to the same findings initially obtained.

4 ANALYSIS AND DISCUSSION

4.1 Descriptive Statistics

Table 3 presents the descriptive statistics of the variables.

Table 3

Descriptive Statistics

	Av	SD	Coef.Var.	Min	Max
<i>B/M</i>	1.0279	0.9331	0.9078	0.0684	4.9708
<i>iB/M</i>	1.4921	1.4620	0.9798	0.1627	8.2874
<i>K</i>	0.0087	0.0262	3.0115	0.0000	0.1508
<i>O</i>	0.1802	0.1747	0.9695	0.0000	0.8015
<i>Intan_Cap</i>	0.1900	0.1828	0.9621	0.0000	0.8564
<i>Vlr Merc</i>	11.2000	3.0050	2.7273	38.0000	2.2800
<i>Lucratividade</i>	0.0518	0.1651	3.1873	-0.9268	0.6048
<i>ret</i>	0.0102	0.1139	11.1667	-0.2875	0.4139
<i>ret-1</i>	0.0113	0.1143	10.1150	-0.2878	0.4256
<i>ret-2-12</i>	0.1305	0.4430	3.3946	-0.6231	1.9539

B/M = book to market; *iB/M* = *B/M* adjusted for intangible asset capitalization; *Intan_Cap* = intangible capital scaled by total assets; *K* = knowledge capital scaled by total assets; *Profitability* = operating profit divided by shareholders' equity; *O* = organizational capital scaled by total assets; *ret* = monthly return on shares; *ret-1* = return from the previous month; *ret-2-12* = return from the 2nd to the 12th previous month; *Vlr Merc* = market value in millions of reais (R\$).

Source: Prepared by the authors.

It is noted that the capitalization of intangible assets provided a higher average *iB/M* compared to *B/M*. As this indicator is one of the fundamentals for value and growth stocks, this denotes that there may be a significant change in the classification of these assets. The proposed adjustment causes *iB/M* to have a higher standard deviation by including intangible assets that reflect heterogeneity and particularities of companies and sectors. This high dispersion is also observed in the other variables related to intangible assets (*K*, *O* and *Intan_Cap*).

The *Intan_Cap* variable, which represents the intangible capital reported in the income statement, has an average of R\$ 0.19 for every R\$ 1.00 of assets. In other words, the volume of investment in internally generated intangible assets that were treated as expenses was 19% of total assets. This volume is low compared to the amount close to 50% found by Enache and Srivastava (2018) in the American market. This reflects characteristics of emerging markets, where investments in innovation and knowledge are incipient compared to developed markets. This can be observed in the Global Innovation Index (World Intellectual Property Organization, 2022), which tracks innovation trends in countries. While the US ranked 2nd in 2022, Brazil was ranked 54th. Intangible capital is predominantly composed of organizational capital, reaching 18% of total assets, higher than innovation capital, which accounts for less than 1%. This is because, while all companies practice the first type of investment, a smaller number invest in innovation and, even in these companies, expenditures on organizational capital are higher. This reflects low investments in science and technology in Brazil.

On average, the assets in the sample yielded a return of 1.02% per month during the study period. This value should be analyzed with caution, given the high fluctuation compared to the other variables. The other returns also showed high dispersion, reflecting market volatility.

4.2 H1a Test: Association with Future Returns

To verify the explanatory power of internally generated intangible assets, the Fama and MacBeth model (1973) was used. Table 4 shows the results considering B/M , iB/M , and the decomposition of the intangible portion between innovation capital and organizational capital.

Table 4

Fama and MacBeth (1973) regressions

<i>ret</i>	Model with B/M		Model with iB/M		Model with decomposition of <i>Intan</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
	coef	t-stat	coef	t-stat	coef	t-stat
<i>logB/M</i>	0.0453***	3.23			0.0289**	2.03
<i>logiB/M</i>			0.0703***	5.86		
<i>logK</i>					0.1882**	1.99
<i>logO</i>					0.0534***	5.06
<i>logSize</i>	-	-5.92	-	-3.93	-0.0392***	-6.97
<i>profit</i>	0.0266***	4.24	0.0287***	4.61	0.0300***	4.77
<i>ret(t-1)</i>	-0.0113	-1.41	-0.0100	-1.24	-0.0133*	-1.66
<i>ret(t-12,t-2)</i>	0.0136***	5.89	0.0141***	6.14	0.0124***	5.35
Intercept	0.2020***	5.41	0.1236***	3.22	0.2382***	6.26
Observations	15,762		15,762		15,762	
R ² Adj	0.0269		0.0339		0.01	
Hausman/effect	0.0000/F		0.0000/F		0.0000/F	
Prob>F	0.0000		0.0000		0.0000	
Wald	0.0000		0.0000		0.0000	
z-stat		-3.3637***				-

$$(1) \quad ret_{i,t} = \alpha_{i,t} + \beta_{1,i,t} \times logB/M_{i,t} + \beta_{2,i,t} \times logSize_{i,t} + \beta_{3,i,t} \times profit_{i,t} + \beta_{4,i,t} \times ret_{i,t-1} + \beta_{5,i,t} \times ret_{i,t-12,t-2} + \varepsilon_{i,t}$$

$$(2) \quad ret_{i,t} = \alpha_{i,t} + \beta_{1,i,t} \times logiB/M_{i,t} + \beta_{2,i,t} \times logSize_{i,t} + \beta_{3,i,t} \times profit_{i,t} + \beta_{4,i,t} \times ret_{i,t-1} + \beta_{5,i,t} \times ret_{i,t-12,t-2} + \varepsilon_{i,t}$$

$$(3) \quad ret_{i,t} = \alpha_{i,t} + \beta_{1,i,t} \times logB/M_{i,t} + \beta_{2,i,t} \times logK_{i,t} + \beta_{3,i,t} \times logO_{i,t} + \beta_{4,i,t} \times logSize_{i,t} + \beta_{5,i,t} \times profit_{i,t} + \beta_{6,i,t} \times ret_{i,t-1} + \beta_{7,i,t} \times ret_{i,t-12,t-2} + \varepsilon_{i,t}$$

Note: Z-test on the null hypothesis: $\beta_1 logiB/M = \beta_1 logB/M$.

B/M = book to market; iB/M = B/M adjusted for intangible asset capitalization; $logB/M$ = natural logarithm of B/M ; $logiB/M$ = natural logarithm of B/M adjusted for intangible asset capitalization; $logK$ = natural logarithm of knowledge capital; $logO$ = natural logarithm of organizational capital; $logSize$ = natural logarithm of market value; $profit$ = operating profit divided by shareholders' equity; ret = monthly return on equity; $ret(t-1)$ = return from the previous month; $ret(t-12, t-2)$ = return from the 2nd to the 12th previous month.

*** = significant at 1%; ** = significant at 5%; * = significant at 10%.

Source: Prepared by the authors.

It is noted that B/M is positive and significant, corroborating evidence about its predictive power for stock returns in the Brazilian market (Maciel et al., 2021). As this index is one of the fundamentals for selecting value stocks, the positive sign denotes that value stocks performed better than growth stocks in the period studied.

The iB/M variable returned high significance and a higher coefficient compared to B/M , as tested by the z -statistic. This demonstrates that the book value adjusted for intangible assets better explains stock returns than the traditional measure, denoting an improvement in the predictive power of accounting information. The capitalization of intangible assets brought relevant informational content to B/M , increasing its association with returns. This result is in agreement with Li (2021) and Park (2022), who also found improvements from this adjustment when using Fama and MacBeth (1973) regressions.

In column 3, innovation capital (K) and organizational capital (O) returned statistical significance of 5% and 1%, respectively, indicating that the latter has a greater contribution to improving the predictive power of B/M . The lower significance for innovation may reflect that, despite lower investments in this area, as demonstrated in the descriptive statistics, its disclosure carries informational content and contributes to predictive power. It is evident that investors attribute importance to this type of capital as an element that provides competitive advantage and continuity of operations. This reinforces the need for $R\&D$ activities to continue to be highlighted separately.

In all regressions, the coefficients obtained for the control variables were significant and returned signals similar to the studies by Li (2021) and Park (2022). The positive signal for profitability and 12-month lagged return demonstrates that operational performance and momentum influence stock returns. Conversely, the 1-month lagged return and market value returned a negative sign, reflecting short-term price reversals, as small caps tend to yield higher returns than large caps.

To test the robustness of the results, the procedures described in Table 4 were conducted with the inclusion of financial institutions, and for companies with more than one type of shares, only the most traded was retained. The results pointed to the same conclusions, as the significances remained.

In further analysis, the same regressions were estimated by level of intangibility. The aim is to verify the effects of capitalization through the volume of intangible investment reported as an expense and the volume already capitalized. Intangibility was used via the income statement ($Intangible_Capital/Total\ Assets$) and via the balance sheet ($Intangible\ Assets/Total\ Assets$). Two groups were formed in each verification by partitioning the observations below and above the median of the indicators. The results are shown in Table 5.

Table 5

Fama and MacBeth (1973) regressions by level of intangibility

Panel A – Intangibility by Income Statement								
<i>ret</i>	Low <i>Intan_Cap</i> (1)		Low <i>Intan_Cap</i> (2)		High <i>Intan_Cap</i> (3)		High <i>Intan_Cap</i> (4)	
	coef	t-stat	coef	t-stat	coef	t-stat	coef	t-stat
<i>logB/M</i>	0.0399*	1.8 2			0.0425**	2.0 9		
<i>logiB/M</i>			0.0481**	2.3 3			0.0800** *	4.4 4
<i>logSize</i>	- 0.0282** *	- 3.3 1	- 0.0242** *	- 2.7 7	- 0.0439** *	- 5.3 5	- 0.0274** *	- 3.0 8
<i>profit</i>	0.0341** *	3.8 0	0.0350** *	3.9 1	0.0199** *	2.3 9	0.0219** *	2.6 5

<i>ret (t-1)</i>	-0.0196*	-	-0.0195*	-	-0.0076	-	-0.0046	-
		1.7 2		1.7 1		0.6 6		0.4 1
<i>ret (t-12. t-2)</i>	0.0112** *	3.2 6	0.0113** *	3.3 0	0.0141** *	4.4 1	0.0152** *	4.7 8
Intercept	0.1809** *	3.0 1	0.1515** *	2.4 4	0.2678** *	4.9 6	0.1467** *	2.4 6
Observations	7,881		7,881		7,881		7,881	
R ² Adj	0.007		0.008		0.0113		0.0134	
Hausman/effec t	0.0000/F		0.0000/F		0.0000/F		0.0000/F	
Prob>F	0.0000		0.0000		0.0000		0.0000	
Wald	0.0000		0.0000		0.0000		0.0000	

Panel B – Intangibility by Balance Sheet

<i>ret</i>	Low AI/AT (1)		Low AI/AT (2)		High AI/AT (3)		High AI/AT (4)	
	coef	t- stat	coef	t- stat	coef	t- stat	Coef	t- stat
<i>logB/M</i>	0.0809** *	3.5 8			0.0306*	1.5 8		
<i>logiB/M</i>			0.0892** *	4.9 1			0.0721** *	4.0 7
<i>logSize</i>	-0.0204**	-	-0.0125	-	0.0413**	-	0.0285**	-
		2.1 8		1.3 5		* 2		* 1
<i>profit</i>	0.0204** *	2.5 4	0.0230** *	2.8 8	0.0298** *	3.7 2	0.0314** *	3.9 5
<i>ret (t-1)</i>	-0.0098	-	-0.0093	-	-0.0165	-	-0.0139	-
		0.8 5		0.8 1		1.4 5		1.2 3
<i>ret (t-12. t-2)</i>	0.0128** *	4.0 4	0.0125** *	3.9 7	0.0131** *	3.7 9	0.0147** *	4.2 6
Intercept	0.1071*	1.7 4	0.0500	0.8 2	0.2765** *	5.5 2	0.1763** *	3.3 0
Observations	7,881		7,881		7,881		7,881	
R ² Adj	0.0091		0.0107		0.0105		0.0123	
Hausman/effec t	0.0000/F		0.0000/F		0.0000/F		0.0000/F	
Prob>F	0.0000		0.0000		0.0000		0.0000	
Wald	0.0000		0.0000		0.0000		0.0000	
z-stat		-0.9308						

$$(1) (3) \text{ret}_{i,t} = \alpha_{i,t} + \beta_{1,i,t} \times \log B/M_{i,t} + \beta_{2,i,t} \times \log \text{Size}_{i,t} + \beta_{3,i,t} \times \text{profit}_{i,t} + \beta_{4,i,t} \times \text{ret}_{i,t-1} + \beta_{5,i,t} \times \text{ret}_{i,t-12;t-2} + \varepsilon_{i,t}$$

$$(2) (4) \text{ret}_{i,t} = \alpha_{i,t} + \beta_{1,i,t} \times \log iB/M_{i,t} + \beta_{2,i,t} \times \log \text{Size}_{i,t} + \beta_{3,i,t} \times \text{profit}_{i,t} + \beta_{4,i,t} \times \text{ret}_{i,t-1} + \beta_{5,i,t} \times \text{ret}_{i,t-12;t-2} + \varepsilon_{i,t}$$

Note: z-test on the null hypothesis: $\beta_{1,i,t} \log iB/M = \beta_{1,i,t} \log B/M$.

AI/AT = ratio between intangible assets and total assets; $\log B/M$ = natural logarithm of book to market (B/M); $\log iB/M$ = natural logarithm of B/M adjusted for the capitalization of

intangible assets; logSize = natural logarithm of market value; profit = operating profit divided by shareholders' equity; ret = monthly return on equity; ret(t-1) = return of the previous month; ret(t-12, t-2) = return from the 2nd to the 12th previous month.

**** = significant at 1%; ** = significant at 5%; * = significant at 10%.*

Source: Prepared by the authors.

Panel A demonstrates greater significance for iB/M compared to B/M , both in companies with low intangibility (columns 1 and 2) and in those with high intangibility (columns 3 and 4), as measured by intangible investments treated as expenses. Thus, the improvement in the predictive power of the indicator occurred in both groups. However, the magnitude of the changes in coefficient and significance allows us to infer about the informational content of intangible capital added to book value. The increase was more pronounced in firms with high intangibility, which brought larger volumes of intangible capital into capitalization. In companies that make smaller investments, the capitalization of smaller volumes of intangible assets provided a smaller increase in B/M . This constitutes evidence that the capitalization of these investments is not about including irrelevant information. The comparison between the iB/M of columns 2 and 4 also points in this direction, considering that the greater addition of intangible capital provided a greater increase in B/M .

Panel B demonstrates that, according to the level of intangibility via the balance sheet, there was little increase from B/M to iB/M in firms that have few intangible assets recognized in the asset section (columns 1 and 2). The difference is not significant, as it is not possible to disagree with the equality hypothesis of the z -statistic. The smaller increase may be linked to the volume of investments in intangible assets made by companies, regardless of whether they are capitalized or treated as expenses. Considering that capitalized assets are more publicly disclosed than those treated as expenses, the disclosure of a small portion in the asset section may reflect that the company does not have a policy of making high investments in these resources. This signal may lead investors to understand that intangible assets accounted for as expenses are also not relevant in these companies. As income statement items are less publicly disclosed and there is little clarification on strategic issues, this may contribute to a lack of understanding on the part of participants.

Columns 3 and 4 of Panel B allow for the analysis of the effects of the proposed capitalization on firms with larger volumes of intangible assets on their balance sheet. As in previous regressions, iB/M showed greater significance compared to B/M . However, in this group, the predictive power of B/M is lower, suggesting that there may be capitalized intangible assets that are not related to strategic potential. Since there are differences in the characteristics of identifiable (capitalized) and non-identifiable (treated as expenses) intangible assets, as strategic essentiality is not reflected in the recognition criteria, these two groups may carry different informational content. This could lead to intangible assets that have less impact on revenue generation being capitalized; consequently, assets that poorly reflect strategic orientation may be more prominently displayed. Studies along these lines include King et al. (2023), who found that the market differentiates the pricing of intangible assets according to their strategic potential, reflecting differences in informational content, and Pacheco and Rover (2020), who demonstrated the vast nature of the items included in the intangible asset subgroup of the balance sheet. According to these authors, in Brazil, this subgroup is dominated by goodwill and concessions, with low participation of other strategic assets such as trademarks and patents. Thus, it can be inferred that intangible assets reported in the income statement may provide greater predictive power than those whose accounting regulations have required capitalization. For example, investments related to innovation, employee training, and advertising, treated as expenses, may have a greater impact on future cash flows than intangible assets capitalized simply because they are identifiable, such as software. The results advocate

in favor of capitalizing internally generated intangible assets, given that the adjusted *B/M* has more significance in relation to stock returns than the original. This indicates that including these assets in the equity value per share improves the predictive power of accounting information. This finding was supported regardless of the level of intangibility, aligning with H1a.

The evidence presented in Tables 4 and 5 is also in line with the studies by Gu et al. (2023) and Srivastava (2023), who adjusted firms' losses by excluding intangible investments reported in expenses. Just as these authors demonstrated that the reported results became more informative after this adjustment, the evidence obtained here also demonstrates that there was an increase in informational value in the book value after the capitalization of these assets. In other words, the results of both studies suggest that treating internally generated intangible assets as expenses impairs both the signaling of the result and the equity value of the share. This constitutes an important challenge to be considered by academia and accounting professionals, as the research results suggest that the current accounting treatment of these assets, essential for competitive advantage and business continuity, is not correctly signaling investment policies in these resources and, therefore, has presented less informative content.

4.3 H1b Test: *HML/iHML* Strategies and Five-Factor Model

Due to changes in asset classifications and portfolio composition, there may be significant differences in the returns of the value strategy. For verification, Table 6 presents the risk, return, and performance results of the *HML* and *iHML* strategies.

Table 6

Comparison between HML and iHML strategies

Panel A – Risk and return						
	<i>HML</i>			<i>iHML</i>		
	<i>Value</i> (30%) <i>H</i>	<i>Growth</i> (30%) <i>L</i>	<i>HML</i>	<i>Value</i> (30%) <i>iH</i>	<i>Growth</i> (30%) <i>iL</i>	<i>iHML</i>
E(R)	0.0230	0.0147	0.0089	0.0246	0.0139	0.0115
σ	0.0976	0.0472	0.0911	0.0879	0.0452	0.0777
Sharpe	0.1642	0.1384	0.0225	0.1845	0.1241	0.0484
Panel B – Performance						
	<i>y = HML</i> (1)		<i>y = iHML</i> (2)			
	Coef.	t-stat	Coef.	t-stat		
<i>HML</i>			0.6828***	171.77		
<i>iHML</i>	0.9546***	171.77				
Intercept	-0.0018***	-4.30	0.0051***	14.09		
R ² Adj	0.6518		0.6518			

$$(1) \quad HML_t = \alpha_i + b_i iHML_t + \varepsilon_{it}$$

$$(2) \quad iHML_t = \alpha_i + b_i HML_t + \varepsilon_{it}$$

*** = significant at 1%; ** = significant at 5%; * = significant at 10%.

Source: Prepared by the authors.

Panel A demonstrates that the return of the *iHML* factor was 1.15% per month, exceeding the return of *HML* (0.89%) and the overall sample described in Table 2 (1.02%). The Sharpe ratio was also higher for this strategy, reflecting a better risk-return relationship, in line with the studies by Arnott et al. (2021), Eisfeldt et al. (2022), and Li (2021). This demonstrates that considering book value with capitalized intangible assets provides better foundations for

investor decisions, providing a better assessment of their investments in order to obtain a higher premium for the risk assumed.

The higher return of the *iHML* strategy is due to the superior return of the high portfolio and the lower return of the low portfolio. The value portfolio, formed by stocks resulting from the adjustment of the book value, generated a return of 2.46% per month, higher than the traditional value portfolio. This result is in accordance with Eisfeldt et al. (2022), who interpret that a value portfolio formed through the capitalization of intangible assets can perform better than a traditional one, by avoiding positions in firms whose book value of shares does not reflect their fundamentals. This portfolio also provided a better risk-return ratio, according to the Sharpe ratio result. This indicator in value stocks was, in both situations, higher than in growth stocks, constituting a positive aspect in favor of the value strategy.

Regarding growth portfolios, the highest return was obtained by the portfolio formed by the traditional *B/M*, with a return of 4.72%, with a better risk-return ratio than the portfolio formed by the adjusted *B/M*. The comparison between the two strategies and the portfolios that compose them demonstrates that better results were obtained with a long position in *iHML* value stocks and a short position in *HML* growth stocks. These results were also obtained by Eisfeldt et al. (2022) and Li (2021). The choices between high and low portfolios provided better returns and association with the risk incurred according to the Sharpe ratio.

The return of the value portfolio adjusted for intangible assets denotes that these assets can also be important for value investing strategies, as the capitalization of these resources made it possible to select assets with better long-term performance. The highest returns in the analyzed sample were obtained with a long position in firms with more intangible assets, which may contain companies with better fundamentals than the long position of the traditional strategy. These results suggest that intangible assets are important even in companies in traditional sectors, commonly referred to as old economy sectors, which typically make up value stock portfolios.

Panel B demonstrates the performance comparison between the two strategies through regression of the two value factors, as proposed by Eisfeldt et al. (2022). The regression of *HML* on *iHML* (column 1) returned a negative and significant alpha, denoting lower performance of the first strategy. In contrast, the alpha coefficient of the regression containing *iHML* as a dependent variable (column 2) is positive and significant, reflecting the superior performance of this strategy, a result similar to that found by these authors when studying the American market. This corroborates the superior performance of the value factor adjusted for intangible assets demonstrated in Panel A. These results demonstrate that the value strategy, based on the capitalization of internally generated intangible assets, performed significantly better. This evidence supports H1b.

Given the better performance of *iHML*, the five-factor model was regressed to test whether this factor has greater pricing potential. The results are presented in Table 7.

Table 7*Fama and French (2015) five-factor model*

$R_{it} - R_{ft}$	Five-factors with <i>HML</i>		Five-factors with <i>iHML</i>		Spanning regression $y = iHML$	
	(1)		(2)		(3)	
	Coef.	t stat	Coef.	t stat	Coef.	t stat
<i>HML</i>	0.0271***	2.83				
<i>iHML</i>			0.0716***	6.07		
<i>MKT</i>	0.8661***	44.71	0.8460***	43.67	0.5251***	42.42
<i>SMB</i>	0.4093***	25.69	0.3843***	23.20	0.4093***	38.27
<i>RMW</i>	0.2980***	2.47	0.2901***	2.41	-0.1238	-1.52
<i>CMA</i>	0.0095	0.94	0.0115	1.13	-0.0448***	-6.55
Intercept	-0.0021***	-2.53	-0.0025***	-3.05	0.0081***	14.41
R ² Adj	0.1712		0.1728		0.1834	
Hausman/effect	0.0000/F		0.0000/F		0.0000/F	
Prob>F	0.0000		0.0000		0.0000	
Wald	0.0000		0.0000		0.0000	
z-stat			-3.1039***			

Note: z-test for the null hypothesis: $\beta_1 HML = \beta_1 iHML$.(1) $R_{it} - R_{ft} = \alpha_i + b_i HML_t + s_i MKT_t + h_i SMB_t + r_i RMW_t + c_i CMA_t + \varepsilon_{it}$ (2) $R_{it} - R_{ft} = \alpha_i + b_i iHML_t + s_i MKT_t + h_i SMB_t + r_i RMW_t + c_i CMA_t + \varepsilon_{it}$ (3) $iHML_{it} = \alpha_i + b_i MKT_t + s_i SMB_t + r_i RMW_t + c_i CMA_t + \varepsilon_{it}$ R_{it} = return of stock i in period t ; R_{ft} = return of the risk-free asset in period t .

*** = significant at 1%; ** = significant at 5%; * = significant at 10%.

Source: Prepared by the authors.

The intercept (α_i) different from 0 means that the return variations are explained by the model. The coefficients of the value factor were 0.02 for *HML* (column 1) and 0.07 for *iHML* (column 2), a relevant difference given the significance of the *z-test*. The higher coefficient for *iHML* demonstrates that the capitalization of intangible assets improved the pricing of this risk factor. The superior return generated by this strategy (Table 6) was maintained when controlling for the other risk factors. The adjusted R^2 showed a small increase, from 17.12% to 17.28%, demonstrating that the value factor adjusted for intangible assets prices as well as the original, but generates higher returns and lower volatility, as shown in Table 6.

When regressing *iHML* with the other factors (spanning regression), a positive and significant intercept was obtained, indicating that its use contributes to improving the five-factor model. These results in favor of *iHML* reinforce H1b, as the use of *B/M* adjusted for intangible assets led to the selection of stocks that provided better performance in the value factor. These results are consistent with studies that served as empirical support for the present research, such as Amenc et al. (2020), Arnott et al. (2021), Eisfeldt et al. (2022), Iqbal et al. (2025), Lev and Srivastava (2022), Li (2021) and Park (2022).

Since value strategy is based on long-term positions in firms with better fundamentals, adding intangible assets to the book value of shares provides better support for selecting value stocks. Because these investments are treated as expenses, generating returns in the long term, the market may take time to perceive and price their potential for generating benefits, leading to mispricing of these assets, as per Banker et al. (2019). These authors demonstrated subsequent positive returns in firms with high levels of intangible assets included in expenses. If SG&A expenses include expense components that reduce current profits and asset components that generate value in the future, then profits of companies with high expense levels tend to be underestimated due to conservative accounting treatment. If investors focus on profits but fail to understand this effect, firms will be undervalued in the current period and will have excessive returns when the market corrects prices. Therefore, capitalizing on intangible assets emphasizes the value investing characteristic based on acquiring undervalued stocks with good fundamentals, since long-term price corrections can be enhanced by these assets. Because valuable companies tend to be undervalued and intangible assets are more sensitive to mispricing, their capitalization improves the value factor by capturing improvements in fundamentals, thus benefiting long-term investors during price corrections.

Overall, the factors value, market, size, and profitability are those that best explain the variations in returns in the Brazilian market. The only variable that did not return significance was *CMA*, indicating the absence of risk premiums associated with the investment factor. When comparing the results of the value factors with the other factors, it is noted that the former returned lower coefficients, which was also observed by Iqbal et al. (2025). A possible explanation lies in the decline in the relevance of accounting information for the market. However, the inclusion of the value factor modified by the capitalization of intangible assets caused a decrease in the coefficients of the other factors and a significant increase in the *iHML* factor. This constitutes further evidence that the capitalization of intangible assets can increase the predictive power of accounting information due to its greater association with returns.

In robustness tests, both the risk, return, and performance analysis, conducted with the inclusion of financial institutions and the exclusion of less-traded stocks for companies with two types of assets, and the regression with the risk factors disclosed by Nefin, pointed to the superiority of *iB/M* and *iHML*.

The evidence presented is relevant to the current discussion on the informational content of internally generated intangible assets. Their relationship with stock returns demonstrates a need for improvement in the accounting treatment of these resources. The non-capitalization of investments in strategic assets that add value in the future can confuse users in

prospects and expectations. Furthermore, even if they are not capitalized, their aggregated disclosure along with other expenses hinders the understanding of their generation of future benefits. Although the regulatory requirements for capitalization are not related to strategic essentiality, improvements in disclosure levels are necessary so that these investments can be more easily identified and, therefore, there is better signaling about the future potential of firms.

Although the focus of regulation is on the balance approach, the income approach is more inherent to valuation because it facilitates projections. Profits are more useful for estimating future performance the greater the matching of the accrual basis, which can be improved by the capitalization and amortization of internally generated intangible assets. In this context, the work had the innovation of bringing this discussion to the Brazilian scenario, using the local market as a source of evidence. Future studies could advance this approach, providing evidence to support or refute capitalization, as well as alternatives for separately disclosing these assets in the income statement.

5. FINAL CONSIDERATIONS

The lack of disclosure about internally generated intangible assets can affect the quality of accounting information. Since the book value of shares is one of the main predictors of stock returns and is widely used for asset selection, its reporting without the inclusion of resources essential to the business presents challenges for valuation. To contribute to this area, this research relied on evidence from previous studies and proposed adjusting the book value by capitalizing internally generated intangible assets, providing a more accurate B/M to explain returns.

The econometric development demonstrated that the adjusted B/M has a greater relationship with stock returns than the original indicator. This improvement occurred mainly through the capitalization of organizational capital. These results demonstrate that the capitalization of internally generated intangible assets provides greater predictive power for accounting information, providing support for H1a. When studying the effects of the proposed capitalization, according to the level of intangibility, it was observed that, in all cases, there was an increase in the relationship between adjusted B/M and return on shares. This improvement was more pronounced when there were larger volumes of intangible investments, both treated as assets and as expenses. Additionally, it was observed that, in companies that already had larger volumes of capitalized intangible assets, the original B/M has less explanatory power, indicating that there may be capitalized intangible assets with low strategic potential. As regulatory requirements do not distinguish strategic characteristics of assets, it is possible that less essential assets are being capitalized, while those that most impact future benefits are being treated as expenses and under less disclosure.

The intangible asset-based value strategy achieved returns that surpassed the traditional strategy and the sample average, even showing a better risk-return ratio. This was due to the better performance of the value portfolio formed by stocks with the book value adjustment. As the traditional book value does not capture intangible assets essential to the business, the adjustment made it possible to select companies with better fundamentals.

Finally, in the five-factor model, it was observed that the adjusted value factor has greater potential to price stocks, corroborating international research and aligning with H1b. This indicates that intangible assets are important value drivers in the Brazilian market, and their capitalization can increase the relevance of accounting information, bringing greater utility in predicting returns. If these assets improve the ability to explain returns, then they should be included in pricing metrics.

The results align with a vast body of literature that criticizes the status quo of intangible asset accounting and advocates for income-based accounting (Barker et al., 2021;

Dichev, 2017; Lev, 2019). Since the matching provided by capitalization contributes to earnings quality, more persistent and predictive earnings are expected. Conversely, reporting intangible investments as expenses can lead to informational losses, particularly in intangible-intensive firms. Thus, this research advances the literature on intangible assets, providing a methodological approach and evidence that can motivate further studies aimed at understanding the informational content of intangible assets, as well as alternatives for recognition and disclosure.

In practical terms, the work helps to understand the relationship between intangible assets and stock returns, constituting an analytical tool for investors focused on value investing, so that they can estimate these assets and consider their impact on long-term investments. It also contributes to analysts by assisting them in identifying them for inclusion in their future prospects and better substantiating their recommendations. In cases of loss or negative equity, the reported evidence can help to understand these disclosures, separating, in the result, losses from operating activities from losses caused by accounting practices. Furthermore, it contributes to accountants and regulatory bodies by providing evidence for discussions on improvements in disclosures. These contributions are relevant in the knowledge era, in which the high quality of accounting information should be an objective of accounting professionals and a requirement of users.

Finally, it is important to consider the limitations of the study. Asset prices can be influenced by macroeconomic and firm-specific events. Since the failure to consider these aspects constitutes a limitation of the five-factor model, the occurrence of these events may not have been captured by the model. Furthermore, the results estimated by the excess sensitivity model for capturing intangible assets should be considered with caution, as they do not account for unproductive investments and expenditures that generate current and future revenues.

In future research, it is recommended to test adaptations to the value stock filters. As the value strategy was developed in the era of tangible assets, the selection criteria can be updated according to the impacts of intangible assets on the fundamentals of firms. It is also possible to research the informational effects of loss disclosures motivated by the accounting treatment of intangible assets or by poor performance.

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AUTHOR CONTRIBUTIONS

Julio Henrique Machado: conceptualization: (lead); data curation: (lead); formal analysis: (lead); investigation: (lead); methodology: (lead); project administration: (lead); resources: (lead); software: (lead); writing – original draft: (lead); writing – review and editing: (lead).

Fernando Galdi: conceptualization: (supporting); formal analysis: (supporting); investigation: (supporting); methodology: (supporting); supervision: (lead); validation: (lead); writing – original draft: (supporting); writing – review and editing: (lead).

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

The entire dataset supporting the results of this study can be made available upon request to the authors.

GENERATIVE AI DISCLOSURE

The authors declare that no generative artificial intelligence was used in any stage of the production of this manuscript (including research, writing, data analysis, formula generation, or the creation of graphic elements).

FUNDING

Fernando Galdi thanks the following institution for funding this research project:

- National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico [CNPq]).

This preprint was submitted under the following conditions:

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