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STICKY COSTS AND ANTI-STICKY COSTS: AN ANALYSIS FROM THE MACRO ACCOUNTING PERSPECTIVE OF ECONOMIC CYCLES

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ABSTRACT

This study analyzed the asymmetric behavior of costs in Brazilian publicly traded companies during different phases of the economic cycle. The methodology is characterized as descriptive, documentary, and quantitative research. The sample comprised 184 companies from 2010 to 2023. To analyze the asymmetric behavior of costs, the model proposed by Anderson et al. (2003) was applied, while the phases of the economic cycle (contraction, recovery, recession, and expansion) were identified based on Schumpeter's (1939) methodology. The distinction between economic cycle phases was made using the real GDP growth rate. In each phase, cost asymmetry was separately analyzed for Cost of Goods Sold (COGS), Selling, General and Administrative Expenses (SG&A), and Total Cost (TC). During the contraction phase, asymmetry in the sticky direction was observed for TC. The recovery phase showed statistically significant anti-sticky behavior for both COGS and TC. In the recession phase, sticky behavior was identified in SG&A and TC. Finally, in the expansion phase, TC also exhibited sticky behavior. These results reveal that cost behavior varies according to the phase of the economic cycle, with identifiable sticky and anti-sticky patterns in different macroeconomic contexts. Therefore, it is concluded that economic cycles significantly influence managerial decisions related to the cost structure of Brazilian publicly traded companies.

Keywords: Asymmetric cost behavior. Sticky costs. Anti-sticky costs. Economic cycles.

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1 INTRODUCTION

Many techniques used in managerial accounting and financial analysis depend on cost behavior, such as the ABC costing system and cost-volume-profit analysis (Ibrahim, 2015). These techniques are based on the assumption that costs behave linearly in relation to organizational activities. However, the literature on cost behavior provides evidence that costs do not always behave in a linear manner (Anderson et al., 2003; Balakrishnan et al., 2004; Weiss, 2010; Chen et al., 2012; Dierynck et al., 2012; Degenhart et al., 2021; Richartz & Borgert, 2021; Bubeck & Hein, 2024).

The study by Anderson et al. (2003) was one of the first to provide evidence that costs behave asymmetrically. Their research showed that costs increase more when sales rise than they decrease when sales fall. This asymmetry was termed **sticky costs** by the authors. Balakrishnan et al. (2004) identified a cost behavior pattern contrary to sticky costs, later named **anti-sticky costs** by Weiss (2010), in which costs increase to a lesser extent when revenues rise than they decrease when revenues decline by the same proportion.

Cost behavior needs to be controlled and managed to maintain organizational competitiveness during both economic crises and periods of prosperity (Zonatto et al., 2018). The economic environment influences managerial optimism or pessimism, which in turn impacts companies' cost structures (Anderson et al., 2003; Banker et al., 2014; Richartz & Borgert, 2021). While economic growth tends to lead managers to believe that increases in sales are permanent and declines are temporary, periods of crisis may cause them to adopt the opposite perspective (Balakrishnan et al., 2004; Pamplona et al., 2018).

During phases of expansion or recession with GDP above the average, there is a greater tendency toward managerial optimism, leading managers to expect continued growth or to treat revenue declines as temporary (Anderson et al., 2003; Banker et al., 2014). This perception influences the maintenance or even expansion of available resources, even in the face of temporary revenue drops, resulting in sticky cost behavior (Ibrahim, 2015). On the other hand, during contraction and recovery phases with GDP below the average, pessimism tends to prevail. Managers may view revenue increases with caution and reduce costs more aggressively in response to falling sales, characterizing anti-sticky cost behavior (Balakrishnan et al., 2004; Pamplona et al., 2018). Thus, the economic cycle influences managerial decision-making, affecting resource management within organizations.

In this context, the complexity of understanding cost behavior as influenced by economic growth becomes evident. Therefore, it is necessary to investigate this topic due to its importance for business activity management and for the advancement of research on cost behavior. The analysis of cost behavior throughout the phases of the economic cycle can be enriched by the macro accounting perspective. This approach involves the compilation of economic data for an entire nation rather than for a single company or sector, thus providing a macroeconomic view of a country's situation by incorporating accounting information (Lande, 2000).

Economic growth was initially introduced in the literature on asymmetric cost behavior by Anderson et al. (2003), being used as a control variable. Subsequently, Ibrahim (2015), Zonatto et al. (2018) and Pamplona et al. (2018) analyzed economic growth as the main objective of the study, analyzing the publicly-held companies of Egypt, BRICS countries (Brazil, Russia, India, China and South Africa) and PIIGS countries (Portugal, Italy, Ireland, Greece and Spain), respectively. However, these studies analyzed the asymmetric cost behavior in a way divided by phases of the economic cycle, however, restricting themselves to only two phases: prosperity and recession. Schumpeter (1939) defined the economic cycle in four phases: contraction, recovery, recession and expansion.

Given the above, this study addresses the following research question: **How do the costs of Brazilian publicly traded companies behave during the phases of the economic cycle?** To answer this question, the objective is to analyze the cost behavior of publicly traded companies during the phases of the economic cycle, as proposed by Schumpeter (1939), over the period from 2010 to 2023. The use of Brazilian companies listed on B3 is relevant for this type of research, as they play a significant role in the country's economic development and provide publicly available information, which is of great interest to both investors and researchers.

This study differs from previous research (Ibrahim, 2015; Zonatto et al., 2018; Pamplona et al., 2018; Richartz and Borgert, 2021) by analyzing the asymmetric behavior of **sticky costs** and **anti-sticky costs** across all phases of the economic cycle, following Schumpeter's (1939) methodology. Furthermore, compared to earlier studies, this research focuses on a more recent period that includes major global events, such as the Covid-19 pandemic, which had widespread and differentiated economic impacts. As such, this study may provide new evidence on the phenomena under investigation.

The study contributes to managers of large corporations and cost researchers by offering a distinct approach to cost management in the face of changes in the economic environment. It does so by providing broader information through the lens of the four phases of the economic cycle, as outlined in Schumpeter's (1939) model. Additionally, it serves to alert users of accounting information, regulatory bodies, and other stakeholders that depending on the phase of the economic cycle, companies may engage in cost-related managerial practices that result in asymmetric reporting. In this way, firms may take advantage of the prevailing economic context to implement or justify asymmetric cost behaviors. The study also has implications for auditors and financial analysts, as their analytical procedures for evaluating cost behavior can be enhanced by a better understanding of how costs vary with economic conditions.

The justification for the period analyzed in this study lies in the availability of the financial statements of Brazilian publicly traded companies, which were essential for conducting the research. The year 2010 marks the beginning of mandatory financial reporting by Brazilian companies under International Financial Reporting Standards (IFRS). The cut-off at 2023 is due to it being the most recent fiscal year for which complete annual financial statements of publicly traded companies were available at the time of this study's development. It is worth noting that fourteen years were analyzed, which constitutes a sufficient period for examining the phenomena in question, as seen in related studies such as Ibrahim (2015) and Zonatto et al. (2018), both of which used shorter timeframes than this research.

2 THEORETICAL FRAMEWORK AND RESEARCH HYPOTHESES

2.1 Asymmetric Cost Behavior

The traditional cost allocation model assumes that costs are classified as either fixed or variable in relation to changes in activity volume (Anderson et al., 2003; Richartz and Borgert, 2021; Ibrahim et al., 2022). The study by Anderson et al. (2003) was the first to provide robust statistical evidence that costs behave asymmetrically, based on an empirical model developed by the authors. Following the confirmation of asymmetric cost behavior by Anderson et al. (2003), numerous studies on the topic began to emerg (Malik, 2012; Reis & Borgert, 2018; Ibrahim et al., 2022).

The cost asymmetry approach considers that managerial intervention affects firms' cost behavior (Anderson et al., 2003; Ibrahim et al., 2022). In this sense, when sales decline, managers must decide whether to maintain or reduce idle resources, which may lead to asymmetric cost behavior in organizations (Chen et al., 2012; Richartz and Borgert, 2021).

The results of the study by Anderson et al. (2003) showed that costs increase by 0.55% in response to a 1% increase in sales, but decrease by only 0.35% in response to a reduction of the same magnitude. This asymmetric behavior, in which costs rise more with increases in sales than they fall with equivalent decreases, was termed **sticky costs** by the authors. Balakrishnan et al.

(2004) extended the analysis of cost asymmetry presented in Anderson et al. (2003) by identifying a cost behavior in the opposite direction to sticky costs, later termed anti-sticky by Weiss (2010). Anti-sticky cost behavior occurs when costs decrease more in response to sales reductions than they increase with equivalent sales growth (Balakrishnan et al., 2004; Weiss, 2010; Ibrahim et al., 2022).

Asymmetric cost behavior has important implications for managers, accountants, market analysts, and other professionals who assess cost variations in relation to revenue changes, as understanding cost impact is essential for evaluating the economic and financial performance of organizations. Cost asymmetry can be influenced by both internal and external factors, such as the economic environment in which companies operate (Ibrahim, 2015).

Empirical studies have revealed different results regarding cost behavior in distinct contexts. For example, Zonatto et al. (2018) identified anti-sticky cost behavior in Brazilian firms during periods of economic crisis. However, Ibrahim (2015), analyzing companies in Egypt, observed both sticky and anti-sticky behaviors in different cost components during both prosperous and crisis periods.

Pamplona et al. (2018) examined cost behavior during times of prosperity and crisis in the PIIGS countries and found evidence that organizations adjust their cost structures according to the economic environment. The study also identified that certain factors, such as free cash flow and fixed asset intensity, intensify cost asymmetry, especially during periods of economic instability.

These findings suggest that cost behavior may vary depending on the component analyzed and the economic context. However, these studies adopt binary classifications of the economic environment (prosperity versus crisis), without considering the nuances of intermediate phases of the cycle, such as recovery and contraction. In this regard, the present research advances the literature by applying the four-phase classification proposed by Schumpeter (1939), allowing for a more refined analysis of managerial decisions in different macroeconomic contexts.

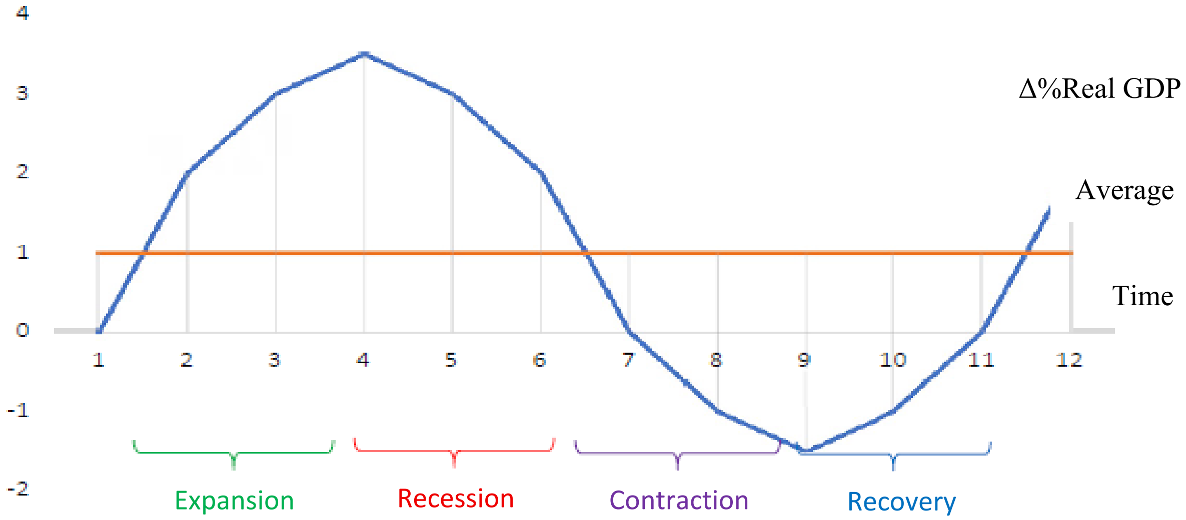
2.2 Economic Cycles

Economic cycles originate from fluctuations in a country's level of economic activity and are generally measured by Gross Domestic Product (GDP) (Paulo and Mota, 2019). The National Bureau of Economic Research (NBER), the U.S. agency responsible for identifying economic cycles, considers two phases: recession and expansion. Schumpeter (1939), on the other hand, defined the chronology of economic cycles in four phases: expansion, recession, contraction, and recovery. In this framework, economic growth can be identified in the expansion and recovery phases, while a decline in economic growth is associated with the recession and contraction phases (Schumpeter, 1939).

According to Schumpeter (1939), fluctuations in a country's economy depend on innovations implemented by entrepreneurs. Thus, companies play an important role in capitalism and may exhibit different behaviors depending on the phase of the economic cycle. Supporting this view, Burns and Mitchell (1946) also classified economic cycles into four distinct phases: expansion, recession, contraction, and recovery.

This four-phase classification by Schumpeter (1939) has been applied in accounting research, such as the study by Paulo and Mota (2019), which evaluated all the phases of this model; however, their focus was on the quality of accounting information, not on cost asymmetry, highlighting a gap to be explored in the field of cost behavior. Schumpeter's (1939) four-phase economic cycle model is widely cited in the literature, having been referenced in over 16.000 works across various fields, according to Google Scholar (2024). The classification of the four phases of the economic cycle is illustrated in Figure 1.

Figure 1
Phases of the Economic Cycle According to Schumpeter (1939)



Source: Adapted from Paulo and Mota (2019).

The segregation of the four phases of the economic cycle, according to Schumpeter (1939), is based on the average of real GDP variations. In the case of expansion, GDP grows at a positive rate above the average. During recession, GDP remains above the average but exhibits negative variations. In the contraction phase, GDP variations are negative and fall below the average. Finally, in the recovery phase, the economy resumes growth with positive GDP variations, although still below the average.

2.3 Research Hypotheses

The economic environment influences managerial optimism or pessimism, which can directly affect decisions related to companies' cost structures (Anderson et al., 2003; Banker et al., 2014; Zonatto et al., 2018; Richartz and Borgert, 2021). Depending on the phase of the economic cycle, managers may adopt different strategies regarding the maintenance or reduction of resources, which may result in varying cost behaviors within organizations (Ibrahim, 2015; Zonatto et al., 2018; Pamplona et al., 2018).

During periods of crisis, the economic environment tends to make managers more pessimistic about sales growth; in other words, they are more likely to view sales declines as permanent and sales increases as temporary (Balakrishnan et al., 2004; Ibrahim, 2015; Pamplona et al., 2018). As a result, managers may choose to postpone hiring new resources when sales rise and to more aggressively reduce idle resources when sales fall (Dierynck et al., 2012; Banker et al., 2014; Ibrahim, 2015). In this context, cost behavior is expected to follow an anti-sticky pattern.

In the studies by Ibrahim (2015) and Zonatto et al. (2018), it was found that during periods of economic prosperity, costs tend to behave in a sticky manner. That is, cost increases are greater in response to rising sales than cost reductions are in response to declining sales. However, during periods of economic instability, costs behave in an anti-sticky manner, meaning that cost reductions in response to falling sales are greater than cost increases in response to rising sales. On the other hand, Pamplona et al. (2018) observed sticky cost behavior in both prosperous and crisis periods.

During the contraction phase, when GDP exhibits negative variations below the average, an environment of heightened pessimism is expected. In the **recovery** phase, GDP begins to grow again, although still below the average. Thus, the economic scenario remains uncertain, potentially leading managers to adopt a more cautious stance. In this context of economic pessimism, managers tend to view revenue declines as permanent and may implement more aggressive cost-cutting measures (Banker et al., 2014).

Based on the above, it is expected that managerial decisions during phases of the economic cycle in which GDP is below the average (contraction and recovery) will lead to **anti-sticky** cost behavior. Within this context, the following research hypotheses are proposed:

H1: During the contraction phase, costs exhibit asymmetric anti-sticky behavior.

H2: During the recovery phase, costs exhibit asymmetric anti-sticky behavior.

On the other hand, economic growth trends and favorable macroeconomic indicators for investment may lead managers to adopt an optimistic outlook that is, to believe that increases in sales are permanent and that declines in sales are temporary (Banker et al., 2014; Ibrahim, 2015; Pamplona et al., 2018). In this case, managers are expected to accelerate decisions to increase resources in response to rising sales.

Additionally, when sales decline, managers are more likely to delay decisions regarding resource reduction (Anderson et al., 2003; Banker et al., 2014). As a result, such managerial decisions may cause cost increases to be greater than cost reductions in response to sales variations of the same magnitude, leading to **sticky** cost behavior in organizations (Anderson et al., 2003; Ibrahim, 2015; Richartz and Borgert, 2021).

During the **recession** phase, despite a slowdown in economic growth, GDP still remains above average. This context may lead managers to interpret sales declines as temporary, thereby maintaining company resources (Ibrahim, 2015). In the expansion phase, when GDP growth is strong and above average, managers tend to adopt a more optimistic stance, believing in the continued growth of sales. This can lead them to quickly expand resources in response to increased revenues, but also to maintain high cost levels even in the face of temporary sales declines (Anderson et al., 2003).

Based on the above, it is expected that companies will exhibit sticky asymmetric cost behavior during phases of the economic cycle in which GDP is above average (recession and expansion). Thus, the following research hypotheses are proposed:

H3: During the recession phase, costs exhibit asymmetric sticky behavior.

H4: During the expansion phase, costs exhibit asymmetric sticky behavior.

3 METHODOLOGICAL PROCEDURES

3.1 Population and Sample

The study population comprises all Brazilian publicly traded companies listed on B3. except for financial institutions, due to their specific characteristics, which hinder the comparability of results. Table 1 presents the composition of the sample companies in Panel A, with the aim of providing a more detailed view of the excluded firms. Panel B presents the composition of the sample companies by sector, according to data from the Refinitiv database.

Table 1
Companies in the Study Sample

Panel A – Composition of the Sample Companies		
Companies	**AF**	**RF**
(+) Companies listed on B3	350	100.0%
(-) Companies from the financial sector	40	11.4%
(=) Subtotal	310	88.6%
(-) Companies with at least one period without data for:	116	33.1%
(-) NSR	113	32.3%
(-) COGS	2	0.6%
(-) SG&A	1	0.3%
(-) Companies with at least one period with negative values for:	10	2.9%
(-) NSR	4	1.1%
(-) SG&A	6	1.7%
(=) Total	**184**	**52.6%**
Panel B – Composition of Companies by Sector		
Companies	**AF**	**RF**
Health Care	6	3.3%
Consumer Staples	18	9.8%
Real Estate	12	6.5%
Consumer Discretionary	49	26.6%
Energy	5	2.7%
Industrials	35	19.0%
Materials	22	12.0%
Communication Services	5	2.7%
Utilities	30	16.3%
Information Technology	2	1.1%
(=) Total	**184**	**100.0%**

Legend: FA: Absolute Frequency; FR: Relative Frequency; B3: Brazil, Stock Exchange, Over-the-Counter Market; NSR: Net Sales Revenue; COGS: Cost of Goods Sold; SG&A: Selling, General and Administrative Expenses.
Source: Research data.

The data for analysis were extracted from the Refinitiv database, based on the following required information: Net Sales Revenue (NSR), Cost of Goods Sold (COGS), and Selling, General and Administrative Expenses (SG&A). The analysis period covered the fiscal years from 2010 to 2023. However, the selected period comprises 15 years, as the 2009 fiscal year is used as the baseline for the variations occurring from 2010 onward (i.e., the variation in 2010 relative to 2009). Thus, variations in the NSR, COGS, and SG&A accounts were obtained for 14 consecutive years, resulting in 2,576 observations (184 companies over 14 years). The annual information refers to the financial statements as of December 31 of each year.

To be included in the research sample, companies were required to provide data for the NSR, COGS, and SG&A accounts throughout the entire period analyzed (2010 to 2023), since the absence of any of these items makes it impossible to calculate cost asymmetry using the model by Anderson et al. (2003). In addition, companies that reported negative values for any of these three accounts in at least one fiscal year during the analysis period were excluded from the sample. The exclusion of companies with negative values is justified by the fact that it is not possible to compute logarithms of negative numbers. As a result, the final sample consisted of 184 companies, which contained the necessary information for the analysis period.

Panel B of Table 1 shows that the companies are classified into 10 different sectors, according to the classification provided by the Refinitiv database. The sector with the highest number of companies in the sample is discretionary consumption, with 49 companies, representing

26.6% of the total sample. Next is the industrial sector, with 35 companies, accounting for 19.0% of the total.

3.2 Classification of Economic Cycles

The methodology used to date economic cycles followed Schumpeter (1939), who defines these fluctuations in four phases: (i) expansion, (ii) recession, (iii) contraction, and (iv) recovery. To classify the economic cycles, the real GDP growth rate was used, since it does not account for inflation effects (Paulo & Mota, 2019). The variation in real GDP is calculated by dividing the real GDP of the current quarter by the real GDP of the same period in the previous year, as shown in Equation 1.

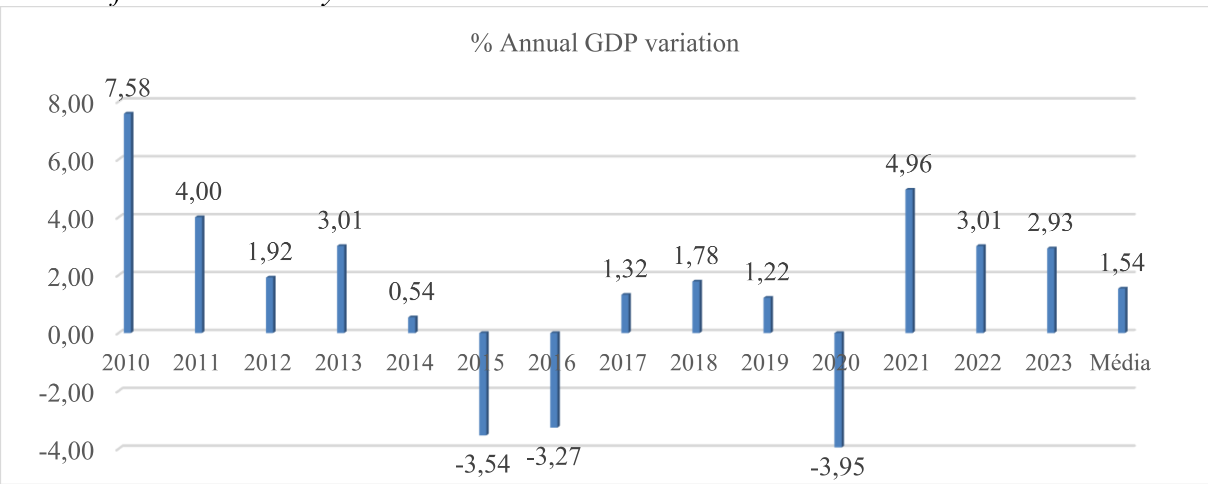
Equation 1

$$\Delta\ \%\ \text{Real GDP}_{\,t} = \left(\frac{\%\ Real\ GDP\ t}{\%\ Real\ GDP\ t-4}\right) - 1$$

The quarterly variations of real GDP were obtained from the Ipeadata website (Ipeadata, 2024). Based on these variations, the average real GDP growth for the analysis period was calculated and treated as a trend toward equilibrium, from which the phases of expansion, recession, contraction, and recovery were distinguished. Thus, the phases of the economic cycle, according to Schumpeter's (1939) model, were determined as follows, as shown in Figure 2:

(i) Expansion: phases with GDP growth above average and higher than in previous periods (corresponding to the years 2010, 2013, 2018, and 2021);
(ii) Recession: GDP growth remains above average, but at a slower pace than during the expansion (years 2011, 2012, 2022, and 2023);
(iii) Contraction: in this phase, GDP continues to decline compared to previous periods and falls below the average (years 2014, 2015, 2019, and 2020); and
(iv) Recovery: phases with GDP growth rates below the average. In recovery, the economy resumes growth with positive changes in real GDP, but still below the equilibrium trend (years 2016 and 2017).

Figure 2
Phases of the economic cycle



Source: Research data.

It is worth noting that although the GDP data collected are quarterly, the economic cycles were measured on an annual basis, given that the data from Brazilian publicly traded companies were based on annual financial statements. As shown in Figure 2, the average GDP variation for the analyzed period was 1.54, which was used as the threshold to distinguish the different phases of the economic cycle.

The expansion, recession, and contraction phases were each observed in four periods, while the recovery phase was identified in only two. Within the analyzed period, the year 2020 recorded the lowest GDP variation, which can be explained by the economic crisis caused by the COVID-19 pandemic.

3.3 Calculation of Asymmetric Cost Behavior

The asymmetric cost behavior was analyzed in three separate ways, using the same methodology for each: (i) Cost of Goods Sold (COGS), (ii) Selling, General and Administrative Expenses (SG&A), and (iii) Total Cost (TC), which refers to the sum of COGS and SG&A. Financial expenses were not included in this analysis because, according to Richartz and Borgert (2021), they are not directly related to production volume, which could compromise the analysis of cost asymmetry.

To identify cost asymmetry, the panel data analysis technique used by Anderson et al. (2003) was applied, capturing the cost variations for each 1% change in Net Sales Revenue (NSR). As noted by Richartz and Borgert (2021), NSR is used as a proxy for the companies' production volume, since this approach is well-established in the literature on asymmetric cost behavior. Below are the formulas used to calculate cost asymmetry for Costs (1), Expenses (2), and Total Costs/Expenses (3):

Equation 2 presents the model proposed by Anderson et al. (2003) for identifying the asymmetric behavior of costs. It should be noted that this same equation applies to COGS, SG&A, and TC, but not simultaneously.

Equation 2

$$\log\left\{\frac{Costs_{\,i,t}}{Costs_{\,i,t-1}}\right\} = \beta_0 + \beta_1 \log\left\{\frac{NSR_{\,i,t}}{NSR_{\,i,t-1}}\right\} + \beta_2 dNSR * \log\left\{\frac{NSR_{\,i,t}}{NSR_{\,i,t-1}}\right\} + \sum Sectorfixedeffect_{i,t} + \sum Yearfixedeffect_{i,t} + \varepsilon_{i,t}$$

Where:
Costs = refers to the different dependent variables in the study (COGS, SG&A, and TC), meaning that Equation 2 was run three times by changing the dependent cost variable, while keeping the independent variables in the model unchanged;
COGS = Cost of goods sold
SG&A = Selling, general, and administrative expenses
TC = Total cost
NSR = Net sales revenue
dNSR = Dummy variable for NSR decrease
ε = Regression error.

In the model proposed by Anderson et al. (2003), the dummy variable takes the value of 1 when the NSR of company i in period t is lower than the NSR in period t-1, and 0 (zero) otherwise. When the dummy variable is 0 due to increases in NSR, the coefficient β_1 measures the percentage increase in costs in response to a 1% increase in NSR. When the dummy variable is 1 due to decreases in NSR, the sum of coefficients β_1 and β_2 represents the percentage reduction in costs in response to a 1% decrease in NSR.

For costs to exhibit sticky asymmetric behavior, the increase in costs in response to a 1% increase in NSR must be greater than the reduction in costs in response to a 1% decrease in NSR. In other words, coefficient β_1 must be greater than the sum of coefficients β_1 and β_2. Costs will be considered to exhibit anti-sticky asymmetric behavior when the reduction in costs in response to a 1% decrease in NSR is greater than the increase in costs in response to a 1% increase in NSR. In this case, the sum of coefficients β_1 and β_2 must be greater than coefficient β_1.

The analysis was conducted by estimating separate models for each phase of the economic cycle (contraction, recovery, recession, and expansion). This approach aims to identify whether the intensity of the asymmetric cost behavior (sticky or anti-sticky) varies according to the phase of the economic cycle, meeting the objective of assessing the influence of the macroeconomic environment on managerial cost-related decisions. This strategy is also supported by previous studies that opted for contextual segmentation for comparative purposes, such as Ibrahim (2015) and Zonatto et al. (2018).

3.4 Data Analysis Procedures

Descriptive statistics and OLS (Ordinary Least Squares) regressions were performed using the Stata software. The "winsorization" technique was applied to treat outliers in the variables. This technique involves identifying extreme values above or below defined minimum and maximum percentiles, which are then replaced with the next closest values within the distribution (Fortunato et al., 2012). The following regression model validation tests were conducted: normality, multicollinearity, and residual autocorrelation.

To test for normality, the Shapiro–Francia test was performed, which indicated that the sample data were not normally distributed. However, when residuals are not normally distributed but the sample size is sufficiently large, it is possible to assume that the coefficients follow an asymptotically normal distribution based on the Central Limit Theorem (Baltagi, 2015). Therefore, despite the lack of normality in the data, this OLS regression assumption was relaxed considering the Central Limit Theorem, due to the number of observations in this study.

To assess the multicollinearity issue, the Variance Inflation Factor (VIF) test was applied. VIF values greater than 10 indicate that the independent variables are highly collinear (Hair et al., 2009; Gujarati, 2011). In preliminary tests, sector control showed multicollinearity issues; therefore, sector control was not included in the final dataset used in this study, but year control was applied instead. According to Fávero and Belfiore (2017), multicollinearity occurs when there are very high correlations among explanatory variables, and in extreme cases, these correlations can be perfect, indicating a linear relationship between the variables.

The Durbin–Watson test was conducted to assess the presence of residual autocorrelation. This test aims to verify whether there is correlation among the errors, identifying whether the residuals from the OLS regression method are autocorrelated.

4 PRESENTATION AND DISCUSSION OF RESULTS

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics for the variables related to the relationships investigated in this study. The following measures are reported: mean, standard deviation, minimum, and maximum.

Table 2
Descriptive statistics of the variables used in the study

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
logCOGS	2.576	0.0330	0.1188	-0.48	0.44
logSG&A	2.576	0.0300	0.0927	-0.28	0.34
logTC	2.576	0.0333	0.0983	-0.34	0.36
logNSR	2.576	0.0322	0.1111	-0.40	0.38

Legend: logCOGS, logSG&A, logTC, and logNSR refer to the log variation (t/t–1) of Cost of Goods Sold (COGS), Selling, General and Administrative Expenses (SG&A), Total Cost (TC), and Net Sales Revenue (NSR), respectively.
Source: Research data.

The research sample comprises 2,576 observations for the period from 2010 to 2023. All variables showed a high standard deviation relative to the mean. It is noteworthy that the sample included all companies that met the criteria required for this study. The sample is heterogeneous, which explains the standard deviation being higher than the mean for the variables analyzed in this study. For the regression analysis, the variables were winsorized.

4.2 General Calculation of Asymmetric Cost Behavior

Table 3 presents the calculation of the asymmetric cost behavior of the companies, covering the entire analysis period of this study (2010 to 2023).

Table 3
General calculation of asymmetric cost behavior

Dependent Variables	Independent Variables	Prob>F	R²	Coefficient	P>t	VIF
logCOGS	logNSR (β_1)	0.0000	0.7177	0.9288	0.000	2.94
	d-logNSR (β_2)			-0.0504	0.116	2.82
logSG&A	logNSR (β_1)	0.0000	0.2592	0.4071	0.000	2.94
	d-logNSR (β_2)			-0.0433	0.285	2.82
logTC	logNSR (β_1)	0.0000	0.7389	0.8044	0.000	2.94
	d-logNSR (β_2)			-0.1161	0.000	2.82
Observations: 2.576						

Legend: logCOGS, logSG&A, logTC, and logNSR refer to the logarithm of the variation (t/t-1) of Cost of Goods Sold (COGS), Selling, General and Administrative Expenses (SG&A), Total Cost (TC), and Net Sales Revenue (NSR), respectively; d-logNSR: dummy variable for a decrease in NSR multiplied by the log of the variation (t/t-1) of NSR; VIF: Variance Inflation Factor.
Source: Research data.

It is noteworthy that, in order to identify cost asymmetry using the model proposed by Anderson et al. (2003), both β1 (logNSR variable) and β2 (d-logNSR variable) must be statistically significant. As shown in Table 3, COGS did not exhibit statistical significance for asymmetric cost behavior. In contrast, other national studies, such as Zonatto et al. (2018) and Richartz and Borgert (2021), found significant results for the asymmetric behavior of COGS, identifying a sticky behavior in both cases.

Similarly to COGS, SG&A also did not show statistical significance for asymmetric cost behavior based on the full analysis period. Medeiros et al. (2005) and Zonatto et al. (2018) reported significant sticky cost behavior for SG&A. Richartz and Borgert (2021) also found significance for SG&A asymmetry, although the identified behavior was anti-sticky.

TC, on the other hand, showed significance for asymmetric behavior. In this case, when NSR increases by 1%, TC increases by 0.8044% (coefficient of the logNSR variable). However, when NSR decreases by 1%, TC decreases by 0.6883% (sum of the coefficients of the logNSR and d-logNSR variables). This result demonstrates that the companies in the sample increased TC more in response to a 1% increase in NSR than they decreased TC in response to a 1% decrease in NSR. Therefore, the overall asymmetric cost behavior identified in the sample is sticky, according to the logic proposed by Anderson et al. (2003). Other national studies, such as Zonatto et al. (2018) and Richartz and Borgert, also identified sticky cost behavior for TC (2021).

4.3 Asymmetric cost behavior calculation by phases of the business cycles

In this section, the results of the regressions of the calculation of the asymmetric cost behavior are presented, separately between the four phases of the economic cycle (contraction, recovery, recession and expansion), as proposed by Schumpeter (1939). Table 4 shows the results of the regressions of the asymmetric cost behavior by the contraction phase.

Table 4

Asymmetric Cost Behavior Calculation – Contraction Phase

Dependent Variables	Independent Variables	Prob>F	R²	Coefficient	P>t	VIF
logCOGS	logNSR (β_1)	0.0000	0.7866	0.9821	0.000	2.65
	d-logNSR (β_2)			-0.0434	0.397	2.46
logSG&A	logNSR (β_1)	0.0000	0.1832	0.2922	0.000	2.65
	d-logNSR (β_2)			0.1105	0.158	2.46
logTC	logNSR (β_1)	0.0000	0.7805	0.8136	0.000	2.65
	d-logNSR (β_2)			-0.0906	0.031	2.46
Observations: 736						

Legend: logCOGS, logSG&A, logTC, and logNSR refer to the logarithm of the variation (t/t-1) of Cost of Goods Sold (COGS), Selling, General and Administrative Expenses (SG&A), Total Cost (TC), and Net Sales Revenue (NSR), respectively; d-logNSR: dummy variable for a decrease in NSR multiplied by the log of the variation (t/t-1) of NSR; VIF: Variance Inflation Factor.
Source: Research data

The periods considered as the contraction phase corresponded to the years 2014, 2015, 2019, and 2020, since during these years the GDP showed results lower than in the previous periods and remained below the average for the analyzed period. Based on Table 4, it was found that during the contraction phase, TC exhibited statistically significant asymmetric behavior. In this context, for every 1% increase in NSR, TC increased by 0.8136%. However, for every 1% decrease in NSR, TC decreased by 0.723%. Therefore, the direction of the asymmetric behavior of TC identified in the contraction phase was sticky, meaning that costs increased more in response to increases in NSR than they decreased in response to reductions in NSR.

Table 5 presents the regression results for the asymmetric cost behavior during the recovery phase.

Only the years 2016 and 2017 fell within the recovery phase, during which the economy resumed growth with positive variations in Real GDP, although still below the average. According to Table 5, COGS showed statistically significant asymmetric behavior. In this case, for every 1% increase in NSR, COGS increased by 0.4930%, and for every 1% decrease in NSR, COGS decreased by 0.6648%. Therefore, COGS exhibited anti-sticky asymmetric behavior, as it decreased more than it increased in response to NSR variations of the same magnitude.

Table 5
Asymmetric Cost Behavior Calculation – Recovery Phase

Dependent Variables	Independent Variables	Prob>F	R^2	Coefficient	P>t	VIF
logCOGS	logNSR (β_1)	0.0000	0.5232	0.4930	0.000	2.65
	d-logNSR (β_2)			0.1718	0.077	2.46
logSG&A	logNSR (β_1)	0.0000	0.1844	0.1995	0.018	2.65
	d-logNSR (β_2)			0.1113	0.331	2.46
logTC	logNSR (β_1)	0.0000	0.5347	0.4324	0.000	2.65
	d-logNSR (β_2)			0.1544	0.068	2.46
Observations: 368						

Legend: logCOGS, logSG&A, logTC, and logNSR refer to the logarithm of the variation (t/t-1) of Cost of Goods Sold (COGS), Selling, General and Administrative Expenses (SG&A), Total Cost (TC), and Net Sales Revenue (NSR), respectively; d-logNSR: dummy variable for a decrease in NSR multiplied by the log of the variation (t/t-1) of NSR; VIF: Variance Inflation Factor.
Source: Research data

Just as with COGS, TC also exhibited asymmetric anti-sticky behavior. For a 1% increase in NSR, TC rose by 0.4324%, whereas for a 1% decrease in NSR, TC dropped by 0.5868%. Therefore, during the recovery phase, only SG&A did not show significance in terms of asymmetric behavior. These results indicate that even modest economic improvement tends to influence the asymmetric behavior of COGS and TC, with a tendency toward anti-sticky behavior.

Table 6 presents the regression results for asymmetric cost behavior during the recession phase.

The recession phase comprised the years 2011, 2012, 2022, and 2023, as these years showed negative variations, albeit still above average. Table 6 shows that COGS did not demonstrate significant asymmetric behavior. On the other hand, significance was found for the asymmetric behavior of SG&A and TC. For SG&A, each 1% increase in NSR led to a 0.4596% increase in SG&A, while each 1% decrease in NSR resulted in a 0.3091% reduction. Regarding TC, each 1% increase in NSR led to a 0.8342% increase in TC, and each 1% decrease in NSR resulted in a 0.708% reduction. In both SG&A and TC, the direction of asymmetric behavior was sticky.

Table 6
Asymmetric Cost Behavior Calculation – Recession Phase

Dependent Variables	Independent Variables	Prob>F	R^2	Coefficient	P>t	VIF
logCOGS	logNSR (β_1)	0.0000	0.7179	0.9579	0.000	2.65
	d-logNSR (β_2)			-0.0084	0.894	2.46
logSG&A	logNSR (β_1)	0.0000	0.2478	0.4596	0.000	2.65
	d-logNSR (β_2)			-0.1505	0.050	2.46
logTC	logNSR (β_1)	0.0000	0.7452	0.8342	0.000	2.65
	d-logNSR (β_2)			-0.1262	0.010	2.46
Observations: 736						

Legend: logCOGS, logSG&A, logTC, and logNSR refer to the logarithm of the variation (t/t-1) of Cost of Goods Sold (COGS), Selling, General and Administrative Expenses (SG&A), Total Cost (TC), and Net Sales Revenue (NSR), respectively; d-logNSR: dummy variable for a decrease in NSR multiplied by the log of the variation (t/t-1) of NSR; VIF: Variance Inflation Factor.
Source: Research data.

Table 7 presents the regression results for the asymmetric cost behavior during the expansion phase.

Table 7
Asymmetric Cost Behavior Calculation – Expansion Phase

Dependent Variables	Independent Variables	Prob>F	R²	Coefficient	P>t	VIF
logCOGS	logNSR (β_1)	0.0000	0.7185	0.9521	0.000	2.65
	d-logNSR (β_2)			-0.0112	0.864	2.46
logSG&A	logNSR (β_1)	0.0000	0.3536	0.4825	0.000	2.65
	d-logNSR (β_2)			-0.0371	0.630	2.46
logTC	logNSR (β_1)	0.0000	0.7592	0.8508	0.000	2.65
	d-logNSR (β_2)			-0.1077	0.034	2.46
Observations: 736						

Legend: logCOGS, logSG&A, logTC, and logNSR: log of the variation (t/t-1) of Cost of Goods Sold (COGS), Selling, General and Administrative Expenses (SG&A), Total Cost (TC), and Net Sales Revenue (NSR), respectively; d-logNSR: dummy variable for decrease in NSR multiplied by the log of the variation (t/t-1) in NSR; VIF: Variance Inflation Factor.
Source: Research data.

The expansion phase, which refers to the years in which the GDP variation was positive and above average, was identified for the years 2010, 2013, 2018 and 2021. Based on Table 7, it can be seen that only TC was significant for the asymmetric behavior. Thus, for each 1% increase in NSR, TC increased by 0.8508%, and for each 1% decrease in NSR, TC decreased by 0.7431%. Thus, the direction of the asymmetric behavior identified was *sticky*.

4.4 Sensitivity Analysis

This section presents a sensitivity analysis to further explore the results discussed in the previous section. Table 8 displays the asymmetric cost behavior model incorporating an interaction dummy for economic cycles, where β3 was added to the original asymmetric cost behavior model (presented in Chapter 3). This interaction consists of a dummy for each economic cycle phase combined with the variable d-logNSR (a dummy variable indicating a decrease in NSR, multiplied by the log of the variation [t/t-1] in NSR). This equation follows the specifications adopted by Anderson et al. (2003) and Richartz and Borgert (2021).

Table 8 shows that all models were significant, with explanatory power ranging from 24% to 74% for the independent variables in relation to the dependent ones. The least explanatory models were those with Selling, General and Administrative Expenses (SG&A) dependent variable, while the most explanatory were those with Cost of Goods Sold (COGS) and Total Cost (TC).

Regarding the significant variables of interest in the models, and considering the economic cycle phases, it was observed that in the contraction phase, TC showed significance for asymmetric cost behavior. In this case, when Net Sales Revenue (NSR) increased by 1%, TC increased by 0.8056% (coefficient of the variable logNSR). However, when NSR decreased by 1%, TC fell by 0.6875% (sum of the coefficients of logNSR and dlogNSR). Thus, sticky behavior was observed, confirming the main analysis highlighted in Table 4. However, it is worth noting that β3 (interaction of the contraction phase dummy with the d-logNSR variable) was not significant.

Table 8
Regression of the Asymmetric Cost Behavior Model with Economic Cycle Dummy Interaction

Phases	**Contraction**			**Recovery**		
Dependents	logCOGS	logSG&A	logTC	logCOGS	logSG&A	logTC
Variables	**Coef.** **P>t**	**Coef.** **P>t**	**Coef.** **P>t**	**Coef.** **P>t**	**Coef.** **P>t**	**Coef.** **P>t**
logNSR (β1)	0.9207498 0.000	0.4235997 0.000	0.8056762 0.000	0.9257555 0.000	0.4249164 0.000	0.8080829 0.000
d-logNSR (β2)	-0.0501949 0.424	-0.0775038 0.215	-0.1180821 0.007	-0.0021706 0.969	-0.049366 0.429	-0.0932297 0.018
Cycle * d-logNSR (β3)	0.0450152 0.619	0.1144486 0.177	0.0333127 0.622	-0.327817 0.002	-0.0006157 0.995	-0.1478684 0.071
R^2	0.7157	0.2410	0.7351	0.7188	0.2400	0.7360
Prob>F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	2576	2576	2576	2576	2576	2576
Phases	**Recession**			**Expansion**		
Dependents	logCOGS	logSG&A	logTC	logCOGS	logSG&A	logTC
Variables	**Coef.** **P>t**	**Coef.** **P>t**	**Coef.** **P>t**	**Coef.** **P>t**	**Coef.** **P>t**	**Coef.** **P>t**
logNSR (β1)	0.9212603 0.000	0.4296268 0.000	0.8074672 0.000	0.9197999 0.000	0.4236795 0.000	0.8045729 0.000
d-logNSR (β2)	-0.0391816 0.513	-0.0181966 0.767	-0.100577 0.017	-0.0554062 0.323	-0.0630687 0.308	-0.1263826 0.003
Cycle * d-logNSR (β3)	0.0002179 0.998	-0.255936 0.009	-0.0764824 0.310	0.1735743 0.297	0.145612 0.248	0.1759146 0.130
R^2	0.7156	0.2435	0.7353	0.7162	0.2407	0.7360
Prob>F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	2576	2576	2576	2576	2576	2576

Observations: The regressions were controlled using fixed effects for sector, with robust regression. Year was not controlled, since the economic cycle dummy variable already accounts for the years in its measurement.
Source: Research Data.

In relation to the recovery phase, as shown in Table 8, both COGS and TC exhibited significance for asymmetric cost behavior. For COGS, when NSR increased by 1%, COGS rose by 0.9257% (coefficient of logNSR). However, when NSR decreased by 1% and interacted with the recovery phase dummy, COGS decreased by 0.5979% (sum of logNSR and cycle*dlogNSR coefficients). For TC, a 1% increase in NSR led to a 0.8080% rise in TC (coefficient of logNSR). When NSR dropped by 1%, TC decreased by 0.7148% (sum of the coefficients logNSR and dlogNSR), and when NSR dropped by 1% interacted with the recovery dummy, TC decreased by

0.6602% (sum of logNSR and cycle*dlogNSR). Therefore, Table 8 also indicates sticky cost behavior.

However, in the analysis presented in Table 5, which considered only the years within the recovery phase, an anti-sticky behavior was observed. Thus, the results in Table 5 are considered more accurate and aligned with the research hypothesis (H2: In the recovery phase, costs exhibit anti-sticky asymmetric behavior). In other words, the research hypothesis does not predict a relationship or influence of the recovery cycle dummy on asymmetric cost behavior (as shown in Table 8), but rather that during this phase (i.e., in the specific periods of the recovery cycle), there would be a tendency for a certain type of cost behavior.

The results of Table 8 should be interpreted with caution, since the analysis considered all years collectively and used only the interaction of the economic cycle dummy to infer the observed phenomena. Moreover, the original asymmetric cost behavior model includes only β1 and β2. By introducing β3, which results from multiplying β2 by the cycle dummy, there is a risk of interference in the estimates of the other independent variables. Nevertheless, future studies are encouraged to examine more deeply this specific phase of the economic cycle recovery and its relationship with managerial cost decisions in organization.

Regarding the recession phase, it was observed that SG&A and TC exhibited asymmetric cost behavior. For SG&A, when NSR increased by 1%, SG&A rose by 0.4296% (coefficient of the logNSR variable). When NSR decreased by 1% and was interacted with the recession phase dummy, SG&A dropped by 0.1736% (sum of the coefficients of logNSR and cycle*dlogNSR). For TC, a 1% increase in NSR led to a 0.8074% increase in TC (coefficient of logNSR), and a 1% decrease in NSR led to a 0.7068% decrease in TC (sum of the coefficients of logNSR and dlogNSR). Thus, sticky behavior is observed, which is consistent with the main analysis results presented in Table 6.

Finally, regarding the expansion phase, it was observed that the cycle dummy had no effect on the d-logNSR variable. However, asymmetric cost behavior was identified for TC. When NSR increased by 1%, TC rose by 0.8045% (coefficient of the logNSR variable), and when NSR decreased by 1%, TC fell by 0.6781% (sum of the coefficients of logNSR and dlogNSR), indicating sticky behavior. This result is consistent with the findings presented in Table 7.

4.5 Discussion of the Results

This section presents the discussion of the results based on the hypotheses defined for this study. According to Hypothesis 1, costs are expected to exhibit anti-sticky asymmetric behavior during the contraction phase. It was found that only TC showed significance for asymmetric behavior in this phase, with the direction of asymmetry being sticky. Based on the results, Hypothesis 1 is rejected.

According to Hypothesis 2, costs are also expected to exhibit anti-sticky asymmetric behavior during the recovery phase. In this phase, anti-sticky behavior was identified for both COGS and TC; however, the sensitivity analysis showed the opposite result, indicating sticky behavior. Therefore, the results became contradictory, and the hypothesis was not accepted, even though the main analysis (Table 5) indicated anti-sticky behavior during the recovery phase.

Thus, for the recovery phase, it is recommended that the main analysis result anti-sticky behavior be considered. However, future studies are encouraged to investigate this phase of the economic cycle more thoroughly. In the recovery phase, the economy starts to grow again, although still below the equilibrium trend. Managers adopted more conservative cost management practices. In this case, even when NSR increased, managers chose not to raise production costs proportionally, possibly due to a more pessimistic outlook. That is, they were more inclined to regard the increase in NSR as temporary, which led to anti-sticky asymmetric behavior for both COGS and TC.

In comparison with the findings for Hypotheses 1 and 2 of this study, Zonatto et al. (2018) identified anti-sticky asymmetric behavior for COGS, SG&A, and TC in Brazilian publicly traded companies during periods of economic instability. Conversely, Ibrahim (2015) found different cost behaviors for the three variables in Egyptian publicly traded companies: sticky asymmetric behavior for COGS and anti-sticky for SG&A, while TC did not show significant asymmetry. Furthermore, Pamplona et al. (2018) identified sticky asymmetric behavior for SG&A and TC during periods of economic instability.

According to Hypothesis 3, costs are expected to display sticky asymmetric behavior during the recession phase. The regression results for this phase showed significant asymmetric behavior for SG&A and TC, both exhibiting sticky asymmetry. As outlined in Hypothesis 4, it is assumed that costs present sticky asymmetric behavior during the expansion phase. The results indicate that in this phase only TC showed significant asymmetric behavior, with the asymmetry directed toward sticky.

Based on the results presented for the expansion and recession phases, Hypotheses 3 and 4 of this study are partially accepted, indicating that during phases of the economic cycle in which GDP is above the average (expansion and recession), costs exhibited sticky asymmetric behavior. The findings for these phases show that managers, during periods when GDP is above average, tend to have a more optimistic outlook regarding increases in NSR. Thus, during periods of rising NSR, managers are quicker to increase resources. Moreover, when NSR decreases, managers are more likely to delay decisions regarding resource reductions, which consequently leads to sticky asymmetric cost behavior in companies.

Consistent with the results of Hypotheses 3 and 4 of this study, Ibrahim (2015) identified sticky asymmetric cost behavior for both COGS and SG&A in publicly traded companies in Egypt; however, TC did not show significant asymmetry. Pamplona et al. (2018) found sticky asymmetry for SG&A and TC during periods of economic prosperity, while COGS did not show significance for asymmetry. In contrast, Zonatto et al. (2018) did not identify asymmetric behavior for any of the three dependent variables (COGS, SG&A, and TC) in Brazilian publicly traded companies during periods of economic growth.

Overall, the findings suggest that the economic environment influenced managers' optimism or pessimism, which in turn affected their decisions regarding the maintenance or reduction of idle resources during periods of decline in NSR. Economic growth trends led managers to adopt a more optimistic outlook, prompting them to increase resources during periods of rising NSR and to maintain idle resources during periods of falling NSR, thereby resulting in sticky asymmetric cost behavior.

On the other hand, the pessimistic outlook caused by periods of economic instability led managers to reduce costs more aggressively in response to declines in NSR. Furthermore, even during periods of increasing NSR, managers chose to delay the allocation of new resources, which resulted in anti-sticky asymmetric cost behavior in these organizations.

5 CONCLUSIONS

This study aimed to analyze the asymmetric cost behavior of Brazilian publicly traded companies across different phases of the economic cycle between 2010 and 2023. Asymmetric cost behavior was examined separately for COGS, SG&A and TC. The classification of economic cycles was divided into four phases—contraction, recovery, recession, and expansion—as proposed by Schumpeter (1939), using the average variation in quarterly real GDP over the analyzed period.

The approach proposed in this study expands the understanding of the relationship between the economic environment and managerial cost decisions, as it enables the identification of specific behavioral patterns in each phase of the economic cycle. Furthermore, it differs from previous studies that adopted only a dichotomous classification of the environment (Ibrahim, 2015; Zonatto et al., 2018; Pamplona et al., 2018) by considering four distinct phases, thereby contributing to a more refined analysis.

The results obtained in this study allow us to conclude that cost behavior varies across the four phases of the economic cycle, and that the degree of cost asymmetry may differ among COGS, SG&A, and TC in Brazilian publicly traded companies. It is thus understood that the phases of the economic cycle influenced managerial decisions differently regarding the maintenance or reduction of idle resources during periods of declining NSR, as well as in relation to increasing resources during periods of rising NSR.

In the economic cycle phases in which GDP is below average (contraction and recovery), anti-sticky asymmetric behavior was identified for COGS and TC during the recovery phase. This suggests that managers adopted more conservative strategies in times of economic instability. In this context, sales declines tend to be perceived by managers as permanent, prompting sharper cost-cutting measure (Banker et al., 2014).

In the economic cycle phases in which GDP is above average (recession and expansion), sticky asymmetric behavior was identified for SG&A and TC during the recession phase, and for TC only during the expansion phase. This indicates that managers, in a context of economic stability, tended to increase resources when NSR increased, and to maintain idle resources during periods of declining NSR (Anderson et al., 2003; Ibrahim, 2015).

The research reveals that companies' actions are aligned with the country's economic environment; in other words, many of their cost-related decisions do not necessarily reflect fluctuations in NSR (growth or decline in revenue), but rather the broader national economic context. Therefore, it becomes clear that macroeconomic factors significantly influence how a company is managed and that such influence is ultimately reflected in accounting figures.

In light of these conclusions, this study may offer managers and researchers a distinct perspective on cost management in response to changes in the economic environment, providing more comprehensive information through the lens of the four phases of the economic cycle as defined by Schumpeter (1939). Identifying different cost behavior patterns across economic phases can help managers devise more appropriate strategies for cost control. Furthermore, accounting information users, regulatory bodies, and other stakeholders may gain a better understanding that companies can adopt different managerial cost practices depending on the economic cycle.

It should be noted that the findings of this research are limited to the 184 companies analyzed, based on annual observations and the criteria previously defined for inclusion in the study. For future research, it is suggested to analyze cost behavior across economic cycle phases individually by sector, as well as to conduct comparative analyses across different countries. Additionally, future studies could consider employing alternative models for measuring cost asymmetry, such as those proposed by Weiss (2010) or Banker et al. (2014), in order to compare the results presented.

REFERENCES

Anderson, M. C., Banker, R. D., & Janakiraman, S. N. (2003). Are selling, general, and administrative costs "sticky"?. *Journal of accounting research*, *41*(1), 47–63. https://doi.org/10.1111/1475-679X.00095

Baltagi, B. H. (Ed.). (2015). *The Oxford handbook of panel data*. Oxford Handbooks.

Balakrishnan, R., Petersen, M. J., & Soderstrom, N. S. (2004). Does capacity utilization affect the "stickiness" of cost?. *Journal of Accounting, Auditing & Finance*, *19*(3), 283–300. https://doi.org/10.1177/0148558X0401900303

Banker, R. D., Byzalov, D., Ciftci, M., & Mashruwala, R. (2014). The moderating effect of prior sales changes on asymmetric cost behavior. *Journal of Management Accounting Research*, *26*(2), 221–242. https://doi.org/10.2308/jmar-50726

Bubeck, S. K., & Hein, N. (2024). CEO duality and asymmetric behavior of operating costs. *Contabilidad y Negocios*, *19*(37), 78–97. https://doi.org/10.18800/contabilidad.202401.004

Burns, A. F., & Mitchell, W. C. (1946). The basic measures of cyclical behavior. In *Measuring Business Cycles* (pp. 115-202). NBER.

Chen, C. X., Lu, H., & Sougiannis, T. (2012). The agency problem, corporate governance, and the asymmetrical behavior of selling, general, and administrative costs. *Contemporary Accounting Research*, *29*(1), 252–282. https://doi.org/10.1111/j.1911-3846.2011.01094.x

Degenhart, L., Lunardi, M. A., da Silva Zonatto, V. C., & Dal Magro, C. B. (2021). Effect of Financial Restriction on Sticky Costs: Empirical Evidence from Brazil. *Revista de Negócios*, *26*(1), 6–21. https://doi.org/10.7867/1980-4431.2021v26n1p6-21

Dierynck, B., Landsman, W. R., & Renders, A. (2012). Do managerial incentives drive cost behavior? Evidence about the role of the zero earnings benchmark for labor cost behavior in private Belgian firms. *The Accounting Review*, *87*(4), 1219–1246. https://doi.org/10.2308/accr-50153

Fávero, L. P., & Belfiore, P. (2017). *Manual de análise de dados: estatística e modelagem multivariada com Excel®, SPSS® e Stata®*. Elsevier.

Fortunato, G., Funchal, B., & Motta, A. P. D. (2012). Impacto dos investimentos no desempenho das empresas brasileiras. *Revista de Administração Mackenzie*, *13*, 75–98. https://doi.org/10.1590/S1678-69712012000400004

Gujarati, D. N., & Porter, D. C. (2011). *Econometria básica.* (5. ed.). Amgh Editora.

Google Acadêmico (2024). Citações da obra "Business cycles" de Schumpeter (1939). https://scholar.google.com.br/scholar?hl=pt-BR&as_sdt=0%2C5&q=Schumpeter+%281939%29&btnG=

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2009). *Análise multivariada de dados*. (6. ed.). Bookman.

Ibrahim, A. E. A. (2015). Economic growth and cost stickiness: evidence from Egypt. *Journal of Financial Reporting and Accounting*. https://doi.org/10.1108/JFRA-06-2014-0052

Ibrahim, A. E. A., Ali, H. M. H. O., & Aboelkheir, H. N. E. R. (2022). Cost stickiness: a systematic literature review of 27 years of research and a future research agenda. *Journal of International Accounting, Auditing and Taxation, 46*, 1–45. https://doi.org/10.1016/j.intaccaudtax.2021.100439

Ipeadata. (2024). Produto interno bruto (PIB) real. http://www.ipeadata.gov.br/exibeserie.aspx?serid=38414

Lande, E. (2000). Macro-accounting and Micro-accounting Relationships in France. *Financial Accountability & Management*, *16*(2), 151–165. https://doi.org/10.1111/1468-0408.00102

Malik, M. (2012). A review and synthesis of 'cost stickiness' literature. *Available at SSRN*: https://ssrn.com/abstract=2276760

Medeiros, O. R. D., Costa, P. D. S., & Silva, C. A. T. (2005). Testes empíricos sobre o comportamento assimétrico dos custos nas empresas brasileiras. *Revista Contabilidade & Finanças*, *16*(38), 47–56. https://doi.org/10.1590/S1519-70772005000200005

Pamplona, E., Leite, M., & Costa da Silva Zonatto, V. (2018). Fatores associados ao comportamento dos custos em períodos de prosperidade e crise econômica em empresas dos países que compõem o PIIGS. *Estudios Gerenciales*, *34*(148), 305–319. https://doi.org/10.18046/j.estger.2018.148.2603

Paulo, E., & Mota, R. H. G. (2019). Ciclos econômicos e estratégias de gerenciamento de resultados contábeis: um estudo nas companhias abertas brasileiras. *Revista Contabilidade & Finanças*, *30*, 216–233. https://doi.org/10.1590/1808-057x201806870

Reis, L. S., & Borgert, A. (2018). Análise das pesquisas em comportamento dos custos. *Custos e Agronegócio*, *14*(1), 184–210. http://www.custoseagronegocioonline.com.br/numero1v14/OK%209%20comportamento.pdf

Richartz, F., & Borgert, A. (2021). Fatores explicativos para o comportamento assimétrico dos custos das empresas listadas na B3. *Revista Universo Contábil*, *16*(3). https://doi.org/10.4270/ruc2020313

Schumpeter, J. A. (1939). *Business cycles*. New York: McGraw-Hill.

Weiss, D. (2010). Cost behavior and analysts' earnings forecasts. *The Accounting Review*, *85*(4), 1441–1471. https://doi.org/10.2308/accr.2010.85.4.1441

Zonatto, V. C. D. S., Magro, C. B. D., Sant'Ana, C. F., & Padilha, D. F. (2018). Effects of economic growth in the behavior of sticky costs of companies belonging to BRICS countries. *Contaduría y Administración*, *63*(4), 1–25. https://doi.org/10.22201/fca.24488410e.2018.1110

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding this submitted work.

CONTRIBUTIONS OF THE AUTHORS

Roles	1º author	2ª author
Conceptualization	♦	♦
Data Curation	♦	♦
Formal Analysis	♦	
Funding Acquisition		
Investigation	♦	
Methodology	♦	
Project Administration	♦	
Resources		
Software		
Supervision		♦
Validation	♦	♦
Visualization	♦	
Writing – Original Draft	♦	
Writing – Review & Editing	♦	♦