
Are academic studies reliable in Brazil? Financial variables in an inflationary environment

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Key words

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Abstract

After the stabilization of inflation rates in Brazil, Monetary Correction for financial data was extinguished. Since then, the distinct reflections of prices variations on monetary and non-monetary variables presented on balance sheets are no longer considered. From 2004 to 2013, however, the cumulative inflation reaches 226%. In this situation, questions about the reliability of the greatest tools we have in the finance research world - financial data of companies - emerges. This work compared financial indicators and empirical models built with data adjusted for inflation and original data issued by firms. A database of 143 Brazilian companies traded on Bovespa was adjusted for inflation, from 2004 to 2013, on the precepts of the extinct Monetary Correction. We obtained two different samples: the first containing financial data adjusted for inflation and the second corporate data originally released. Statistical tests showed that financial indicators such as ROI, Asset Turnover, Debt and Market-to-book are significantly higher when we do not consider the effects of inflation. In addition, the panel regression models, when adjusted, had higher predictable power (greater R^2) and representative changes of significance on the variables and coefficients. The results indicated that inflation is essential in the analysis of financial data and must be considered in the preparation of reliable databases, although assumed as stable in recent years.

Introduction

Financial statements are one of the main tools that financials studies use to evaluate companies and make empirical tests. Bell (1961) states that the underlying capital can only be determined when we measure the current value of the company with perfection, but historical data are not sufficient for this feat. Analyzing a company at two different times, or comparing it to another - whose operation began earlier or later - would only be possible with financial values adjusted accordingly. For Martins (2000) the only factors potentially responsible for variations in the measurement of companies' financial results are inflation and cost of opportunity, for which we apply simplistic corrections from a methodological point of view, characteristic indicated as an "inexcusable failure" of counters, as the author's words.

After the stabilization of The Real Plan in 1994 Brazilian inflation rates reached stable levels and the law number 9.249/95 vetoed the use of any monetary adjustment policy for issued balances sheets. After this milestone, some studies as the ones made by Bonizio e Vicente (2001), Gabriel, Neto e Corrar (2005), Ambrozini (2006), Oliveira, Marques e Canan (2007) and Moribe, Panosso e Marroni (2008) dedicated themselves to analyze the impacts that the end of Monetary correction had on accounting and profitability indicators.

Since the end of Monetary Correction, inflation rates in Brazil were annually controlled but reached a cumulative value of 226% between 1995 and 2004, a representative value. Under these conditions, it is important to reflect about how this condition affects financial indicators, since we no longer have the accounting corrections idealized for significant inflation times. More

than that leads us to a question: are the finance studies in Brazil reliable? Although some databases offer the adjustment option for inflation, they do not differ partially adjusted “market” variables (such as net income, debt and market value) of non-monetary variables (such as permanent assets). The first possible problem may come mainly from the use of indicators composed by two of these variables, being one “market” adjusted and the other not.

This study does not intend to any accounting approach, nor will address with details the techniques of monetary adjustment. Our objective is primarily to examine whether the recognition of inflationary effects cause significant differences in financial indicators commonly used. Moreover, aim to analyses if this difference also causes changes in estimators and significance of statistical models present in empirical studies of finance.

Applying the precepts of the Monetary Correction, the accounting data of 143 Brazilian companies traded on Bovespa were corrected for inflation, from 2004 to 2013, resulting in two different samples: the first containing adjusted financial data (considering inflation) and the second containing corporate data originally released. For the two samples we calculated financial indicators frequently used in analysis and empirical research, for comparative purposes. Statistical tests showed that financial indicators such as ROI, Asset Turnover, Debt and Market-to-book are significantly greater when we do not consider the effects of inflation.

1 Literature Review

1.1 Inflation and Financial Results

Before the stabilization of inflation rates in the Brazilian market, inflation was a recurring subject in academic researches of finance and decision-making business process. The dramatic effect on the economy was an evidence that the role of financial manager had become increasingly important (Puggina, 1981).

Grazziotin (1980) conducted a detailed study on the impact of inflation in the financial management of working capital, cash, accounts receivable, inventories, cost of capital and dividends. The author proposes a reflection on the necessary adjustments in an inflationary context, mainly based on the distinction between non-monetary and monetary variables. The need to maintain equity substance proved to be one of the biggest challenges in maximizing the company's value in uncertain scenarios.

After 1996, Brazil had a less peculiar inflation scenario, where the price changes did not achieved three digits or more – as before – and Monetary Correction for financial data was extinguished. In this environment, Junior (1997) developed a work that brought to the Brazilian market theories that were applicable only in stable countries, and complemented the studies made by Grazziotin (1980) and Puggina (1981). Studies begin to relate financial management to an inflation environment, no longer conditioned to hyper inflation.

Some years later authors as Bonizio and Vicente (2001), Gabriel, and Corrar Neto (2005), Ambrozini (2006), Oliveira Marques and Canan (2007) and Moribe, Panosso and Marroni (2008) studied the impact of the end of Monetary Correction on accounting data and profitability indicators in Brazil. There is consensus among all the authors that when we do not consider the effects of inflation, results show a superior performance of indicators, a significant impact on the financial analysis. In addition to previous work, this study aims to analyze the impact of not considering the effects of inflation on financial indicators, using a greater number of financial indicators and empirical models built with these variables.

1.2 Monetary Correction: Income or Expense?

When the Monetary Correction was still in force, the effects of inflation were indirectly considered by registering them in a single account named Monetary Correction, which can be

creditor or debtor. The technique consists of the restatement of permanent assets and shareholders' equity, both non-monetary items.

When a company had more value on equity compared to fixed assets, will have inflationary loss, while another that has higher fixed assets in relation to equity will have inflationary gain. We need to clarify that these gains and losses do not represent on income or expense, but rather are an indirect setting to consider the inflationary effects on monetary accounts.

Imagine, for example, two fictitious Brazilian companies that had the same total equity in 2004, but different levels of immobilization compared to its equity. Let's consider the accumulated inflation between 2004 and 2014, approximately 62% (IPCA):

Company 01	
<i>Monetary Assets</i>	<i>Monetary Liabilities</i>
R\$ 20.000	R\$ 15.000
<i>Fixed Assets</i>	<i>Equity</i>
R\$ 25.000	R\$ 30.000
Company 02	
<i>Monetary Assets</i>	<i>Monetary Liabilities</i>
R\$ 5.000	R\$ 18.000
<i>Fixed Assets</i>	<i>Equity</i>
R\$ 40.000	R\$ 27.000

Applying the Monetary Correction not on the exercise, but on the period, we would have:

Company 01:

$$\text{Fixed Assets} = \$25.000 \times 62\% = \$15.500$$

$$\text{Equity} = \$30.000 \times 62\% = \$18.600$$

$$\text{Monetary Correction} = -\$3.100 \text{ (Debt)}$$

Company 02:

$$\text{Fixed Assets} = \$40.000 \times 62\% = \$24.800$$

$$\text{Equity} = \$27.000 \times 62\% = \$16.740$$

$$\text{Monetary Correction} = \$8.060 \text{ (Credit)}$$

Note that companies that maintain liquid resources in larger quantities have higher monetary loss when present in an inflationary environment. This characteristic was also studied by Blejer (1979), who examined the relationship between changes in inflation rate and the cash demand, from companies (high liquidity asset). Contrary to the findings of Falls and Natke (1996), his research suggests that the financial risk due to high inflation has a negative effect on the demand for money. The positive effect exerted on the same variable, which is when companies increase the liquidity of its assets in order to hedge the risk was not significantly strong.

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2. Methodology

2.1 Sample Construction

This work aims to analyze the inflation importance on indicators extracted from financial statements, which are often used to analyze the financial situation of companies and in academic research. Therefore, we obtained on Economática a sample of original issued accounting data of 143 non-financial Brazilian companies.

For comparison purposes, we adjusted the original base according to the principles of Monetary Correction, in force until the year 1995. We applied the general price index to correct non-monetary items, which are, fixed assets and equity:

$$E_{A_{i,t}} = (E_{O_{i,t}} - NP_{O_{i,t}}) \times F_t$$

$$FA_{A_{i,t}} = FA_{O_{i,t}} \times F_t$$

$$NP_{A_{i,t}} = NP_{O_{i,t}} + [(FA_{A_{i,t}} - FA_{O_{i,t}}) - (E_{A_{i,t}} - E_{O_{i,t}})]$$

Where:

$E_O; NP_O, FA_O$ correspond respectively to the shareholders' equity, net income and fixed assets not adjusted for inflation (originally issued) for each company (i) at each observed year (t);

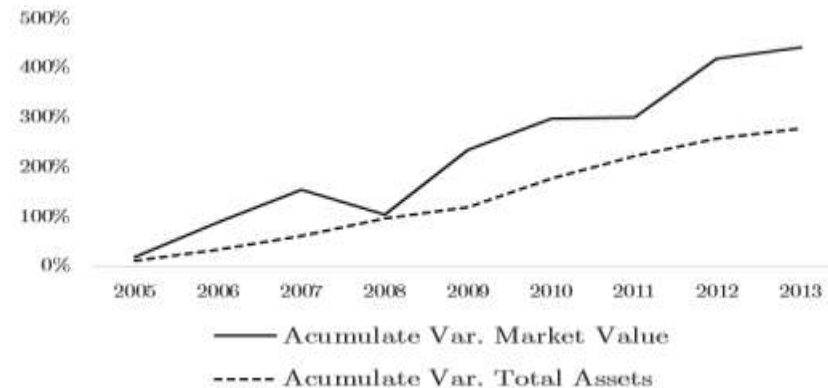
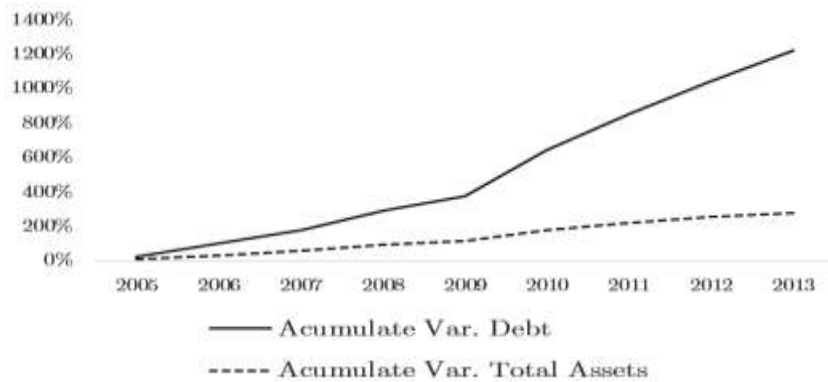
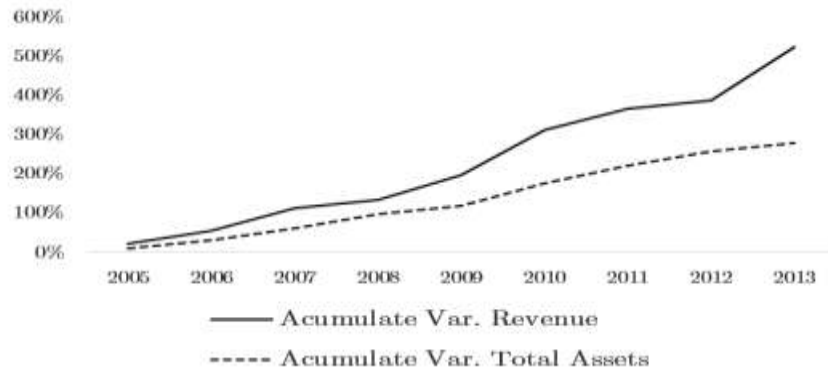
$E_A; NP_A, FA_A$ correspond to shareholders' equity, net income and fixed assets adjusted for inflation, as proposed under the precepts of the Monetary Correction.

F corresponds to the correction factor. IPEAD (Federal University of Minas Gerais) offers monthly a table of factors based on the IPCA that update assets quoted in currencies from previous periods, translated into the corporate values for the same time analysis (end of 2014). With these settings, we started working with two samples, the first of corporate data officially released by the companies, and another set based on the assumptions of the former monetary balances Correction.

2.2 "Market adjusted" and monetary variables

We define as real assets and liabilities, or non-monetary accounts, those whose current value changes when there are changes in the price level, for example, accounts that keeps the purchasing power in these situations (GRAZZIOTIN, 1980). Since 1995, with the inflation stabilization in Brazil, the monetary adjustment, which allowed the accounting recognition of inflationary effects, was extinguished. Since then, financial accounts are no longer adjusted. However, monetary accounts may be considered as partially adjusted by the "market", since they incorporate in their value the effects of inflation every year. Note, before any further analysis, we may have a problem using variables of these two groups together.

The following tables present the accumulated variation of variables considered as market adjusted and non-monetary variables, the second ones not adjusted by Monetary Correction since 1996:



Even when we look at a stable environment in terms of inflation in Brazil, between the years of 2004 and 2014 the cumulative inflation in Brazil reaches a representative value of 226%. Market adjusted variables seem to reflect it in a sensitive way. The non-monetary indicators - which since the end of Monetary Correction do not incorporate the effects of inflation on their value - are not following the variation in the same intensity.

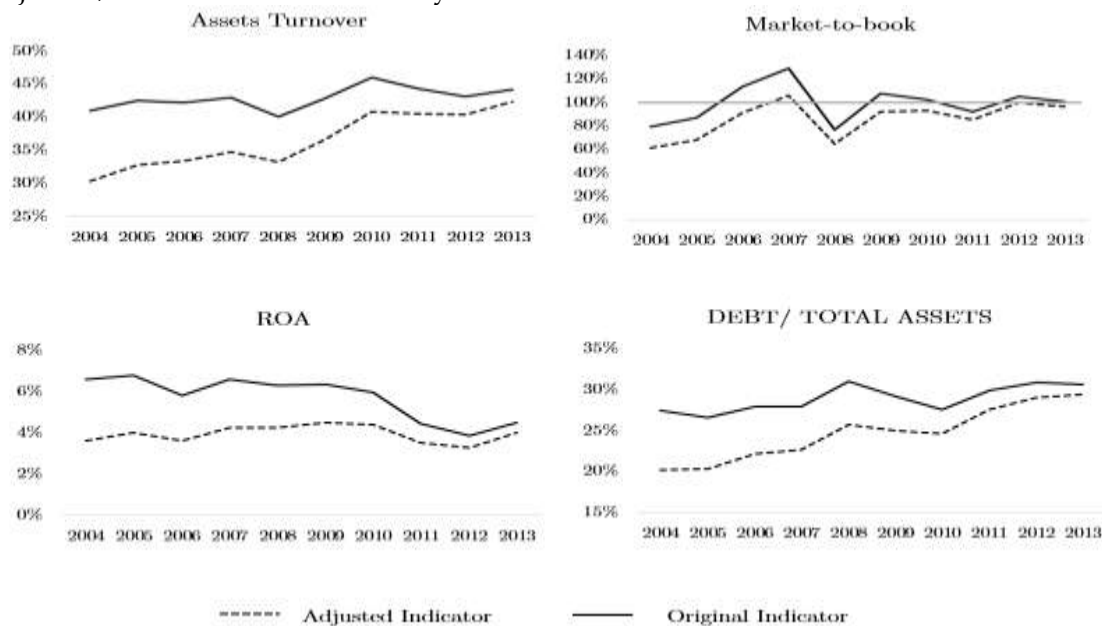
3 Results

The next table shows the results of paired mean tests for financial ratios relating accounts considered as "market adjusted" and non-monetary accounts. We found that p-values has a less than zero for all indicators, allowing the rejection of the null hypothesis (H_0), that the medium does not differ significantly:

Comparison	Mean Diff. Test		P-Value	Normality Test P-Value	
	Aver. Original Ind.	Aver. Adjusted Ind.		Original Ind.	Adjusted Ind.
ASSETS TURN	0,4288	0,3646	0,000***	0,9452	0,2610
ROA	0,0570	0,0392	0,005***	0,0553	0,5346
MKT BOOK	0,9930	0,8582	0,000***	0,8459	0,1675
DEBT AT	0,2884	0,2461	0,000***	0,2461	0,5436

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Even with the low annual variations in the Brazilian inflation rate, the accumulated value causes significantly changes on common indicators. The graphs below compare the behavior of indicators containing market adjusted accounts with those who contain accounts no longer adjusted, since the end of Monetary Correction:



Overall, it is clear that all indicators calculated based on corporate values (not adjusted) are significantly higher than those corrected by inflation are.

a. Assets Turnover

The asset turnover corresponds to revenue from sales divided by total assets of each company for each period. The asset turnover calculated on original corporate data indicates that the sample companies had higher efficiency in using its assets to generate revenue than when we analyze the same indicator adjusted.

b. Return on Assets

Return on assets shows us how a company is being effective in implementing its assets. The also called ROA is one of the most common indicators on fundamental analysis of investment. As in the work of Gabriel, Neto and Corrar (2005), the original values indicated a higher return on assets than when we look to adjusted data. When the effects of inflation are not considered, the analysis signals the company's operation as more profitable than actually is.

c. Market-to-book

The market-to-book indicator is the ratio between market and book value of a company and is also used as a growth opportunity proxy. It is assumed that the higher this indicator is, the higher growth opportunities the company have, a fact reflected in the valuation of market value. The non-adjusted market-to-book suggests that the sample companies have an average chance of high growth (more than one) at various times. However, after we adjusted the indicator, only in 2007 the indicator subtly exceeds the level of one. The effect of inflation, when not considered, also causes the false impression that the market evaluated the companies as prone to growth, or above their book value.

d. Debt

The debt for each period and company represents the total gross debt divided by total assets. The original indicator denote the sample companies as they have higher debt than when we analyze the same indicator, but adjusted.

The four indicators mentioned are frequently used not only to study the economic and financial performance of companies, but as part of finance empirical models.

On the next session, we estimated some statistical models that contains these indicators, based on previous academic papers. Our objective is to find out if not considering the effects of inflation on accounting can cause impacts beyond the indicators alone, affecting the magnitude of the coefficients and significance of variables. The regressions were made with the original corporate data and then with inflation adjusted data, for comparative purposes.

3.1 Capital Structure

Six factors are common in studies that test capital structure of the companies over some perspective: profitability, risk, size, composition of assets and growth. Taking inspiration from previous works such as Toy et al. (1974), Ferri and Jones (1979), Titman and Wessels (1988) and Klock Thies (1992), recent studies such as Perobelli and fame (2003), Nakamura et al. (2007), Brito, Corrar and Batistella (2007) and Gonçalves and Bishop (2012) present regression model contains these variables.

Based on these studies, we elaborated the following model:

$$DEBT_{i,t} = \beta_0 + \beta_1 Rent_{i,t} + \beta_2 Risk_{i,t} + \beta_3 Size_{i,t} + \beta_4 FixedAssets_{i,t} + \beta_5 Growth_{i,t} + a_i + u_{i,t}$$

The panel data regression has been estimated with the two samples: first with original corporate data, and then with adjusted data, under the precepts of the Monetary Correction. The results are shown in the table below:

Variables	Coeff.		Effect
	Original Regression	Adjusted Regression	
Profitability	-0,0529*** (0,0136784)	-0,0473*** (0,0120281)	- 12% Remains significant
Risk	0,0113* (0,0059856)	0,0083 (0,0059856)	- 36% Loses significance
Size	0,0145** (0,0072379)	0,0211*** (0,0068808)	+ 46 % Increases significance
Fixed Assets	-0,0410* (0,0296546)	-0,1767*** (0,0231159)	+ 331 % Increases significance
Growth	-0,0183** (0,0081444)	-0,0204*** (0,007162)	+ 11% Increases significance
R^2	0,0987	0,2612	+ 165% Increases the predictive power

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

When the model is estimated with adjusted data, there is a substantial increase on its predictive power, which R^2 increases 165%. The coefficient magnitude also changes: the variables Size, Fixed Assets and Growth explains the variations on Debt more intensively, as they have a higher statistical significance. Profitability variable was already significant at 1% level, but lost a little intensity on its coefficient. Finally, the Risk variable lost significance in determining the debt level of companies in the sample.

3.2 Market Value of Shares

To analyze now the impacts with a model dedicated to the market, we elaborated the following equation, which has as dependent variable the market value of companies, measured in ln:

$$MV_{i,t} = \beta_0 + \beta_1 Rent_{i,t} + \beta_2 Risk_{i,t} + \beta_3 Debt_{i,t} + \beta_4 Size_{i,t} + \beta_5 Profitability_{i,t} + a_i + u_{i,t}$$

Variables	Coeff.		Effect
	Original Regression	Adjusted Regression	
Net Income/ Total Assets	-1,0003	1,6534**	Change in the signal
	(0,6468516)	(0,7444751)	Becomes significant
Debt	1,7845***	3,5978***	+ 107%
	(0,4202005)	(0,4202005)	Remains significant
Risk	-0,1260***	-0,0195	- 556%
	(0,0393952)	(0,0328931)	Loses significance
Size	0,3897***	0,4715***	+ 21%
	(0,0416187)	(0,0384305)	Remains significant
Revenue/ Total Assets	0,5340	2,3249***	+ 335%
	(0,4611)	(2,324869)	Becomes significant
R^2	0,2172	0,4778	+ 120% Increases the predictive power

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Comparing the results generated by original and adjusted data we can notice an improve on the model predictive power: 120% increase in the R^2 . It is originally expected to profitability indicators (as Net Income/ Total Assets and Revenue/ Total Assets) to be positively related with market value: companies that are more profitable should have significantly higher market value. The regression containing original data shows the two variables as not significant when explaining the market value changes of companies. The variable Net Income/ Total Assets showed sign contrary to expectations. When we analyze adjusted data instead, the two variables become significant for the model and there is a sign change of the variable Net Income/ Total Assets to the initially expected (the variable becomes positive). The Risk variable lost significance, while debt level and size remains significant at 1% level, but showed substantial increase in coefficients.

The recognition of inflationary effects caused noticeable changes in the economic significance of models taken as examples, and proves the importance of inflation not only for financial indicators separately, but for regression models composed of them.

Conclusion

After the stabilization of the Real Plan, the Law 9,249/ 95 vetoed the use of any monetary adjustment policies on Brazil. Since then, data from financial statements do not have a formal adjust that consider impacts of price changes in monetary and non-monetary assets or liabilities. Although controlled annually, in the years that follow the extinction of monetary correction, inflation reaches a representative cumulative value: 226%.

Researches and financial analysis have as object of study the financial statements issued by the companies, often comparing the evolution of indicators constructed with financial data from different companies and large time horizons. It is necessary to have values measured accurately in order to generate reliable results.

We made two different samples: one composed by financial data originally issued by companies and the other one by financial indicators corrected based on the precepts of the extinct Monetary Correction.

First, our study compared financial indicators frequently used on research and financial evaluations, made with the two different databases (original and adjusted). Moreover, we compared panel regression models estimated with original and adjusted variables, to check for changes in coefficients and predictive power of the models.

Our results suggests that it is essential to consider effects of inflation on accounting variables, even in a scenario pointed as stable on this level. The original financial indicators were significantly higher when compared to the adjusted ones, what could take analysis to wrong conclusions about Assets Turnover, Return on Assets, Growth Opportunities (Market-to-Book) and Level of Debt.

Even more problematic, panel data regression indicated substantial changes on the coefficients and predictive power of models frequently used on financial studies. The adjusted data led us to results of greater economic significance and reliability.

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