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Analysis of mergers and acquisitions in Brazilian companies

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This article sheds light on how synergies arise through mergers and acquisitions (M&A) and how best to evaluate them in Brazil. Through a review of the literature, it was analysed how generated synergies are assessed across different methodologies. This article analysed the synergy gains in Brazilian mergers and acquisitions between 2000 and 2007. The study employed three of the four techniques identified: accounting indicators, business valuation by discounted cash flow (DCF), and a variation on DCF, where synergy can be broken down into its constituent elements. Through its findings, the study identified improvements in the economic situation of enterprises and showed that these processes generated managerial and financial synergies.

Key words: Mergers and acquisitions, synergy, indicators, discounted cash flow.

INTRODUCTION

Today’s business environment has been redefined by mergers and acquisitions (M&A). The rise of M&As may be seen as organizations reacting to an increasingly competitive economy. When a company invests energy and resources in an M&A, it expects the result to be an improvement in performance or the generation of some kind of synergy. As such, M&As function to increase the efficiency of the economy as a whole. It is possible that an efficiency existing in one organization involved in an M&A is conveyed to the other organizations, which previously possessed no such efficiency.

Kumar and Bansal (2008) argued that evaluating the performance of M&As is one of the most difficult problems a researcher can face. Different methodologies are used to identify the effects of M&As, and the reported results are, interestingly, always different.

Previous research highlights this fact. Kadapakkam et al. (2009) found forecasts were based on an estimated increase of 10.03% in earnings because of M&A. Studies such as that done by Kumar (2009), however, show that M&As failed to bring about an increase in profitability for the acquirers.

According to Damodaran (2005), Cigola and Modesti (2008) and Huyghetaert and Luypaert (2010), synergy can be conceptually described as the additional value generated by the joining of at least two companies, creating new market and management opportunities. In order to properly measure the gains or losses in synergy, researchers have presented a number of differing methods.

The current research then aims to contribute to the literature’s lack of evidence on synergistic gains through M&As. The objective of this article is to compare different methods of analysis for the gains or losses in synergy due to mergers and acquisitions in Brazil. In terms of theoretical contributions, this work enables us to verify...
that the results obtained by the use of varied methods arrive at a singular response, allowing for analysis of different methods in a single sample. In terms of a practical or managerial contexts, regarding the effectiveness of M&As, the study produces evidence that can be used for and against M&As in the Brazilian economy. Finally, the paper analyses the overall situation of the companies following M&As.

**MERGERS AND ACQUISITIONS**

Kummer and Steger (2008) believed that companies are motivated to go through with M&As mainly out of a search for growth. When alternatives for internal growth fail to materialize, the M&A is held out as the only way to achieve growth. Lodorfos and Boateng (2006) and Öberg and Holström (2006) laid out what M&As can offer a company: a means of acquiring knowledge, technology, products that complement on-going development; they reduce risk exposure and achieve economies of scale and scope. Christensen (2006) supports this by affirming that an M&A can acquire a company having technological capabilities and complementary business skills. Such an acquisition can be seen as a way for large enterprises to increase their innovative capacity. The M&A became the primary means of industry consolidation, according to Kumar (2009), especially in emerging countries. Driven by a need for economic and technological restructuring, M&As are seen to occur in waves, according to Gort (1969), Jensen (1993), Mitchell and Mulherin (1996), Harford (2005), Kadapakkam et al. (2009) and Hanby et al. (2009).

The financial literature, based mainly on America’s economy, presents four unquestionable waves of M&As (Figure 1). A relatively recent phenomenon has been construed by some authors, such as Kumar and Bansal (2008), as evidence of a fifth wave, a wave that began in the ’90s and has continued up to now. This period saw a continued growth of M&A activity and possibly reveals a trend towards centralization and concentration of capital. Kumar and Bansal (2008) suggested that the periods marked by fewer M&A transactions are used throughout the industry to develop new concepts and strategies to later be used to generate new M&As.

In Brazil, as a result of trade liberalization, economic structural reforms were passed that expanded Brazil’s economy to include the processes of M&As. Brazil’s economy, as shown by data in Figure 2, has followed the evolution of M&As as they developed in the global economy. From 1994 to 2010, 6574 M&As occurred. These involved 2966 Brazilian companies and 3608 cross border transactions.

**SYNERGY**

Many companies often justify M&As, as well as large investments, by arguing they create synergy. What then is synergy? It is the additional value generated by the combination of two companies, creating opportunities previously unavailable to them. That is according to Damodaran (2005), Cigola and Modesti (2008) and Huyghebaert and Luypaert (2010). Such a justification has been supported by theories of M&As, suggesting that, when following an M&A, the value of companies may tend to increase. The notion of synergistic gains accounts for a great deal of the justification for carrying out M&As. Where are such gains felt? In the financial (resulting from the utilization of fiscal benefits, greater financial leveraging with reduced costs, better capital structure, diversification, project investment, among other fiscal advantages), operational (resulting from increased revenue, economy of scale and scope, reduction of operational costs and capital investments), and managerial realms (resulting from improved managerial efficiency and substitution of inefficient administration), according to Cigola and Modesti (2008), Uddin and Boateng (2009), Kadapakkam et al. (2009), and Nogest (2010).

Damodaran (2005) stated that the issue surrounding synergy is not whether it can be evaluated but how it can be evaluated. To evaluate the success of M&A, we identified four methods: indicators accounting, business valuation by discounted cash flow (DCF), a variation of DCF, and abnormal returns.

**Evaluation of synergy through creation of indicators**

The most frequent methodology of assessing the occurrence of synergistic gains is the use of indicators. This might be because they require less information from the companies involved. Every researcher, however, advocates a particular indicator. Kumar and Bansal (2008) examined the recent growth of M&As in India and its long-term impact on corporate financial performance. In over 50% of the cases, financial performance improved following the merger. In 15% of the cases, not only did financial performance improve but also working capital increased.

In an analysis of the 25 largest M&As in Brazil, occurring between 1995 and 1997, Pasin and Matias (2001) confirmed that synergy was the outcome. They observed that most companies showed reductions in product costs as well as administrative costs, making them more profitable. Iooty et al. (2001) evaluated data from two years before and two years after 108 M&As. The researchers concluded that the results suggested no significant differences in financial performance after an M&A. Lau et al. (2008) examined 72 M&As in Australia, carried out between 1999 and 2004. They considered two years before and three years after the M&A announcement. The authors demonstrated the value creation brought about by an M&A, showing the
improvement in operating performance over the years prior to its completion. They observed an increase in corporate profitability, cash flow, efficiency, and leverage. Also using operating performance as an indicator, Kumar (2009) focused his study on empirical evidence of changes in performance of 30 private sector companies, in India, between 1999 and 2002. He found that M&As failed to improve the profitability of the acquiring company, failing, in other words, to create financial synergy.

Camargo and Barbosa (2005, 2009) used a comparatively large number of indicators to analyse the economic and financial performance of Brazilian companies that had undergone M&As. Their aim was to judge whether M&As produced synergy for the companies involved. Of the 11 indicators employed by the authors, liquidity and debt were intended to identify a company’s financial position after the merger. The liquidity ratios would provide a measure of the company’s ability to pay its debts, while the debt structure would show the composition of capital itself and how much of the company’s investments were financed by external entities. The indicators of profitability were intended to identify how the companies fared economically following the merger. Finally, the authors proposed indicators of synergy that would point to whether the transaction brought the companies positive or negative synergy.

The study then calculated 11 relationships across four areas:

1) Liquidity: general and current liquidity
2) Debt: debt profile, level of financial debt, and

Figure 1. Evidence of new waves of M&A.
Source: Kummer and Steger (2008).

Figure 2. Number of M&As between 1994 and 2010.
Source: Elaborated from data from KPMG (2012).
participation of third party capital
3) Profitability: return on assets, return on equity, and earnings per share
4) Synergy: gross margin, net margin, and general and administrative expenses compared to net income

These indices were calculated considering the six years surrounding the merger – the three years prior to it and the three years subsequent to it.

The authors discovered improvement in the three indicators of synergy. After merging, the companies achieved operational synergy - they were more efficient at controlling costs and producing higher revenues. They also achieved managerial synergy - becoming more efficient at controlling administrative and general costs as well as achieving higher efficient in their general management.

Evaluating companies to assess the creation of synergy

In the literature we found two methods of calculating synergy gains by evaluating companies. The first is the DCF, and the second, proposed by Kadapakkam et al. (2009), is a variation on DCF.

DCF methodology

Martelanc et al. (2010) asserted that investment banks, consulting firms, and entrepreneurs evaluate companies mainly by using the methodology of discounted cash flow (DCF). DCF helps them calculate the value of a company both for internal purposes and investment analysis. One can evaluate a company using the DCF method in two ways. The first evaluates the participation of the shareholders in the business (equity valuation). The second assesses the company as a whole (firm valuation), which besides equity includes third party capital. In the second case, the company’s value is obtained by discounting expected cash flows for it (free cash flow for the firm -FCFF). That is, the residual cash flows after the completion of all operating expenses and taxes – the weighted average cost of capital (WACC). In this approach the company’s value is determined by projected cash flows, discounted at a rate that reflects the risk associated with the investment. It is then obtained by projecting cash flow, determining the discount rate, estimating the terminal value and then calculating the company’s value.

Still, according to Damodaran (2005), one must estimate the value of the sum of the companies independently. This gives the value of the combined companies but takes no account of synergy. The same initial assessment is then made, but for the resulting company, where synergy is assumed to exist. The value of synergy is then the difference between the value of the merged company with its synergy minus the value of the sum of the companies evaluated individually. This second approach, however, was used by Damodaran (2005) and Martelanc et al. (2010) only in isolated M&A cases.

Methodology proposed by Kadapakkam et al. (2009)

Kadapakkam et al. (2009) presented a methodology for valuing companies that obtain the total synergy, that is, the operating synergy and the financial synergy of each M&A. To do so, estimates were made using Value Line Forecast, a database of forecasts for large firms. The data were collected from the acquiring firm, the target company, and the company resulting from the M&A. Value Line Forecast was able to extract sales forecasts (S), operating margin (OM), working capital (WC), depreciation (DEP), capital expenditures or investments in capital equipment (CAPEX), and long-term debt (DEBT).

Using the rate of working capital and sales forecasts for the intervening years, the authors estimated the working capital for each year. The annual change in working capital is \((WC_t - WC_t+1)\) for each set of estimates; this procedure generated a series of annual cash flows of capital (CCF) shown in Equation 1.

\[
CCF = [S \times (OM) \times (1 - T_{avg})] - [INVEST] + [DEBT \times R \times T_{avg}]
\]

where \((S \times OM) \times (1 - T_{avg})\) is the operating profit after taxes, \(INVEST\) is investment in fixed assets and working capital free of depreciation, and \((DEBT \times R \times T_{avg})\) are tax benefits of interest.

It took three sets of forecasts for each M&A: two predictions that preceded the M&A for each of the individual companies and one for the combined company following the M&A. For each of the three sets, the cash flow was calculated through the use of Equation 2. To estimate the present value of the final cash flows, it was assumed that the cash flows grew forever at a rate of expected inflation \((Inf, long-term\ forecast \ of the Philadelphia Federal Reserve Bank)\).

\[
PV(CCF) = \Sigma[CCF/(1+\text{K})^t] + [CCF_n \times (1+\text{Inf})/[(\text{K} - \text{Inf}) \times (1+\text{K})^n]]
\]

Where \(t\) varies from 1 to \(n\), and \(n\) is the last year of the forecast, that is, 5. \(K\) is the cost of the estimated equity using the CAPM equation and beta, assuming a market risk premium of 7% and the yield on ten-year Treasury bills \(R\) at a risk-free rate. The estimated value of total synergy is simply the difference between the present value of cash flows of the companies following M&A \((A + T)\) and the sum of present values of the cash flows of the acquiring \((A)\) and target \((T)\) companies, as shown in Equation 3.
Synergy = PV(\text{CCF})_{\text{post-merger, A}} + \text{T} - PV(\text{CCF})_{\text{pre-merger, A}} - PV(\text{CCF})_{\text{post-merger, T}} \tag{3}

The synergy was defined as an increase in operating profit after taxes minus the changes in investments, where we used only the sum of the first two terms of Equation 1, changes in tax benefits were considered financial synergy, and calculated from the third term of Equation 1.

Kadapakkam et al. (2009) analysed the cash flows of 264 M&As. Calculating the gains in synergy, the researchers found an increase in earnings of approximately 10.03%. Considering the financial synergy, gains were found to be near 1.64%, suggesting this type of synergy plays only a small role in M&As. As for the operational synergy, gains were found to be near 8.38%.

**Evaluation of the creation of synergy through abnormal returns**

Wang and Xie (2009) analysed a sample of 396 M&As between 1990 and 2004. Using the hypothesis of abnormal returns close to the date of announcement of M&A, Wang and Xie (2009) obtained evidence confirming the hypothesis. That is, poorly managed target companies, when acquired by well-managed companies, create greater value than other transactions. The authors also identified that the difference between shareholders’ rights have a significant and positive effect on the changes in operating performance of the combined companies.

Similar to the proposal by Bradley et al. (1988) and Pablo (2013), Kursten (2008) also studied the effects of M&As on shareholders. He was able to argue that in M&As that have no synergy shareholders typically lose. Moreover, they do not necessarily win in M&As having positive synergy. In addition, financial synergy may arise sometime after the M&A is completed. Healy et al. (1992) conducted empirical studies of 50 major M&As occurring between 1979 and 1984 in the industrial segment of the United States. The authors found that, in the period following an M&A announcement, there arose a significant increase in operating cash flows, which were attributed to an increase in productivity.

Linn and Switzer (2001) replicated Healy et al.’s (1992) study, using data from the US for a similar period of time. They confirmed that evidence exists that for the period in question in the USA operating performance increased after the completion of M&As. They also indicated that this result is unaffected by the hostility of the acquired company’s administration toward the acquiring company. More recent studies, however, such as Papadakis (2005) show a negative relationship between the hostility of the environment and the success of M&As.

Gugler et al. (2003) examined operating performances between 1979 and 1998 in several parts of the world including USA, UK, Europe, Japan, New Zealand, Australia, and Canada. The researchers found that in almost all countries profits increased, or at least remained stable. Sales, however, did not increase. Authors such as Kadapakkam et al. (2009), however, question the methodology of the aforementioned study. They believe that stock returns provide a summary measure of impact since it does not decompose the results into their proper types of synergy.

**MATERIALS AND METHODS**

This study is motivated by the need to improve our understanding of the sources of synergies in Brazilian M&As—an area that the literature has not yet seriously evaluated. To carry this out, the synergy gains of the same sample shall be calculated using the three methodologies identified, the effectiveness of which was not questioned: accounting indicators and two methods of business valuation. The sample selection was made from data collected by consulting firms, from which 29 M&As were selected from the period between January 2000 and December 2007. The research is limited to only public companies in Brazil’s stock market, in light of the ease of access to their financial statements. The historical data of financial statements and accounting will be obtained from the database Economática®. Then, in each of the methodologies, the synergy gains from each M&A will be analysed using three data sets—two sets for companies operating independently for the years leading up to the merger and a data set of the company resulting from the merger.

The proposed methodologies are applied considering the six years that encompass the M&A announcement. Statistical comparisons will be performed for the three years prior and the three that follow its announcement. The year of the notice will be disregarded, since, according to Healy et al. (1992) and Kumar (2009), the values during the year of the M&A are affected by the transaction’s proceedings, making them difficult to compare with results from other years. Once the sample is selected, the methodologies to be used on the model solution will be presented.

First, the sample is evaluated using the indicators method. For this, we use the indicators proposed by Camargos and Barbosa (2005), more fully described in literature. The method seeks evidence of synergistic gains by analysing four key parameters: liquidity, leverage, profitability, and synergy. Then synergy gains are calculated employing business valuation using DCF—the method used by Damodaran (2005) and Martelanc et al. (2010). Finally, the synergy of each M&A is calculated using the business valuation method proposed by Kadapakkam et al. (2009), where synergy can be broken down into its financial and operational components. However, some adjustments are needed.

Studies such as Kadapakkam et al. (2009) use standardized forecasts by Value Line. These forecasts, however, are used for the short and medium term, and the range, interpolated by the researchers, may not match the real cash flow. In addition, few if any Brazilian companies are followed by Value Line, significantly reducing the size of the sample. Therefore, we make the following adjustment, where to calculate cash flow historical data will be considered as assertive forecasts.

The results obtained from each method and a comparison of them will be achieved, with the aid of the statistical analysis software Minitab®, through analyses done using Mann-Whitney test, a non-parametric statistical hypothesis test. Initially, the test used was Mann-Whitney, called T1, where the hypothesis being tested is that the means before ($\mu_1$) and after ($\mu_2$) to implement the M&A differ, as shown in the null hypotheses ($H_0$) and the alternative ($H_a$) below.
H0: μ1 = μ2; Ha: μ1 ≠ μ2

If point T1, however, then the means should be considered statistically different, that is, p-value <0.05, and a new test is carried out. The alternative hypothesis is that the averages before (μ1) should be considered statistically higher than the averages after (μ2)—the performance of the M&A. Then, we performed new tests, called T2.

H0: μ1 <μ2; Ha: μ1 >μ2

RESULTS

This study aimed to analyse and identify whether M&As conducted in Brazil, between 2000 and 2007, resulted in synergy gains. It also compared methods for calculating this. The results are given as follows.

Results of the indicators method

We analysed the M&As through 11 financial indicators, summarized in Table 1. The table displays the number of successful M&As for each indicator, their average variation and the results of statistical tests T1 and T2, when comparing the values before and after the completion of M&A.

Analysing statistical indicators of liquidity, it was found that publicly traded companies after a merger showed no changes in liquidity. Such companies, however, use less of debt to finance their activities. An analysis of the debt profile suggests that companies are mainly using long-term resources. It could also be argued, after analysing the degree of financial indebtedness, that the combined companies reduced their dependence on foreign capital. This may come about because the companies' greater leverage and bargaining power. After all, the combined companies are larger, and that greater size can be associated with gains in financial and operational synergy. An analysis of the companies' economic situations, considered through the three indicators, suggests that, statistically, corporate profitability failed to improve following the M&A.

Following the merger, the averages of the indicators for gross margin showed no difference. It is evident that the sample generally failed to provide a more efficient control over and management of its cost structure. Although it is suggested that the companies after M&As grew and gained greater bargaining power, the indicators show that no economies of scale were achieved. That is, an analysis of these indicators shows that positive results were not obtained in operational synergy.

The net margin analysis has already suggested that, in most companies, the possible exchange of management control failed to generate greater efficiency, evidenced by the lack of gain in managerial synergy. However, results suggested that gains had been achieved in managerial synergy when the averages of the indicators of financial indebtedness were analysed. An analysis of the general and administrative expenses, which allowed us to assert an absence of statistically significant improvement in administrative efficiency and better management of companies when combined, resulted in gains of managerial synergy.

After the mergers, the average liquidity indicators remained unchanged. Debt ratios, following mergers, improved since they managed to raise the profile of its debt. This may result from a greater degree of leverage and greater bargaining power with suppliers of capital, since in theory the companies are much larger. As levels of financial indebtedness fell, the companies, to finance themselves, began to depend less on foreign capital. Regarding profitability, a decline was found in the indicators of return on assets, though indicators of return on equity and earnings per share were left unchanged. This shows that regarding the return on investments made in companies, contrary to all expectations, no improvement was realized.

Finally, there are the indicators of synergy, where the gross margin indicators would reflect improved efficiency gains in the control of operating costs; no evidence was found of this. The same happened with the net margin indicators, which generally remained unchanged, showing that companies retained their difficulties in translating their effects into profits for shareholders. Likewise, the indicators of general and administrative expenses (generally unchanged) suggest that companies failed to seize the opportunity of making their management more efficient. As noted earlier, this could have been effected through eliminating redundant processes, activities, and routines or by altering the organizational structure, announcing layoffs, and so forth.

Results of methodologies of company's assessments

We analysed M&As through the company’s assessments. The results can be found in Table 2. The table displays the number of successful M&As for each method, the variation and the mean results of the statistical tests T1 and T2, when the values before and after the respective M&A are compared.

Initially, through a review of cases after employing Equation 3, a divergence between the results of synergy was observed in only 4 (13.79%) cases, found by applying the two methodologies for assessing proposals. Still, it is interesting to note that when using the DCF methodology, the M&A resulted in positive synergy in 20 (68.97%) cases analysed. Similarly, when subjected to Kadapakkam and colleagues’ (2009) methodology, the synergies in the same sample showed a reduction in the number of unsuccessful M&As—those consisting of negative synergies consisted of only 7 (24.14%) cases.

We tried to observe the industrial sectors of the cases presenting negative synergies. We could find, however,
Table 1. Analysis of general indicators.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Number of M&amp;As</th>
<th>Average variation (%)</th>
<th>T1 (p-value)</th>
<th>T2 (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Improved</td>
<td>Worse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General liquidity</td>
<td>12</td>
<td>17</td>
<td>-36.92%</td>
<td>0.35</td>
</tr>
<tr>
<td>Current liquidity</td>
<td>17</td>
<td>12</td>
<td>-4.61%</td>
<td>0.73</td>
</tr>
<tr>
<td>Debt profile</td>
<td>21</td>
<td>8</td>
<td>-12.59%</td>
<td>0.01</td>
</tr>
<tr>
<td>Degree of financial Debt</td>
<td>11</td>
<td>18</td>
<td>-15.49%</td>
<td>0.04</td>
</tr>
<tr>
<td>Third party capital</td>
<td>16</td>
<td>13</td>
<td>-1.38%</td>
<td>0.25</td>
</tr>
<tr>
<td>Return on assets</td>
<td>10</td>
<td>19</td>
<td>-26.98%</td>
<td>0.03</td>
</tr>
<tr>
<td>Return on equity</td>
<td>12</td>
<td>17</td>
<td>-43.33%</td>
<td>0.12</td>
</tr>
<tr>
<td>Earnings per share</td>
<td>19</td>
<td>10</td>
<td>11.45%</td>
<td>0.51</td>
</tr>
<tr>
<td>Gross margin</td>
<td>13</td>
<td>16</td>
<td>-2.04%</td>
<td>0.88</td>
</tr>
<tr>
<td>Net margin</td>
<td>13</td>
<td>16</td>
<td>-26.48%</td>
<td>0.08</td>
</tr>
<tr>
<td>General administrative expenses</td>
<td>17</td>
<td>12</td>
<td>-14.49%</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Significance at the 5% level.

Table 2. General analysis of systematic evaluation.

<table>
<thead>
<tr>
<th>Systematic Evaluation</th>
<th>Number of M&amp;As</th>
<th>Average variation (%)</th>
<th>T1 (p-value)</th>
<th>T2 (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Improved</td>
<td>Worse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCF</td>
<td>20</td>
<td>9</td>
<td>14.46%</td>
<td>0.14</td>
</tr>
<tr>
<td>Kadapakkan et al.</td>
<td>22</td>
<td>7</td>
<td>24.40%</td>
<td>0.05</td>
</tr>
<tr>
<td>- Term (1+2)</td>
<td>22</td>
<td>7</td>
<td>9.43%</td>
<td>0.10</td>
</tr>
<tr>
<td>- Term (3)</td>
<td>23</td>
<td>6</td>
<td>143.15%</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Significance at the 5% level.

no association between them. It could thus be argued that the negative results found by the two methods cannot be justified through any market factor affecting specific sectors.

While every merger presented its individual results, be they positive or negative, the goal of this research is to present general findings on M&As in Brazil between 2000 and 2007 involving publicly traded companies. The study then looked for evidence of equivalence between the study’s two valuation methodologies. The first methodology assessed whether, in each of the proposed methodologies, the companies’ values before the mergers may be considered equal. The second methodology assessed whether, in each of the proposed methodologies, the companies’ values following the merger may be considered equal.

Again T1 and T2 tests were used. Performing the T1, p-values <0.01 were obtained. So, we could say that the two methodologies obtained values, statistically, the same. It was necessary to complete T2, obtaining <0.01 for p-values. Hence, it can be argued that, in both scenarios, before and after M&As, firms evaluated using the methodology proposed by Kadapakkan et al. (2009) presented a value higher than did those evaluated through the DCF.

The test results show that the two methods to evaluate the final value of companies produced different results; that is different values. However, there was a general analysis for each methodology.

**Results of the DCF methodology**

The DCF methodology assessed companies’ values prior to a merger. Values were then added to represent the total value of the companies involved before carrying out the merger. The total values of the companies were also estimated following the merger. This is where synergistic gains were expected, whether managerial, financial, or operational. The 29 cases of companies merging showed, on average, an increase in value of 14.46%, as shown in Table 2.

However, both sets of data obtained through the methodology of CFD were submitted to the previously proposed T1 test. Here, as shown in Table 2, there was obtained a p-value of 0.14. Thus in spite of the finding that 20 mergers resulted in higher company values, it could be argued that when comparing the total values of
the companies before and after the mergers no significant statistical difference separates them.

**Results of methodology proposed by Kadapakkam et al. (2009)**

As was done above, for this methodology, we obtained the companies' values prior to the mergers. The values were then added to represent the total number of companies involved prior to the business. The values of the companies following the merger were also estimated. Through an analysis of Table 2, it was found that the overall average of 29 cases of M&A companies showed an increase in value following their mergers, averaging 24.40%. However, when the samples were tested with T1 a p-value of 0.10 was the result. The null hypothesis was then accepted again. Thus, it could be argued that when comparing the total values of the companies before and after the mergers, no significant statistical difference separated them. Recall that Kadapakkam et al. (2009) advocated the use of their own methodology, arguing that it enabled the separation of the components according to their proper synergy.

During the calculations the values of the companies were also estimated for two situations. In the first—calculating the operational synergy—we considered only the sum of the first two terms of Equation 1, defined as an increase in operating profit after taxes less changes in investments. In the second—calculating financial synergy—we considered only the third term shown in Equation 1, defined as changes in tax benefits. Considering the evaluation of companies obtained by using only the sum of the first two terms, when the values are compared before and after the merger by the T1 test, a p-value of 0.10 was obtained, as shown in Table 2. That is, there is no statistical evidence demonstrating gains in operational synergy.

However, when the T1 was performed for samples of business valuation considering only the third term, a p-value of 0.04 was obtained. It can be said, in other words, that in the data analysed significant differences are present. It was thus necessary to complete a T2 test, where a p-value of 0.99 was obtained, as shown in Table 2. It can thus be said that the average value of the companies following their mergers was greater than it was prior. This fact reflects changes in tax benefits following the mergers. While such benefits were found, these values were of little significance in the composition of Kadapakkam and colleagues’ original proposal (2009). For this reason, it is believed that, when calculated by this methodology, no changes were actually found between evaluations before and after the merger.

**DISCUSSION**

It is evident that the literature is lacking for scientific studies investigating, in Brazil, the efficiency of M&As. Contributing to remedy this gap in the literature, this article compared the methodologies used to analyse the synergies generated by mergers and to collect data to prove the efficiency of such processes. The literature review makes it apparent that the creation of synergy is evaluated in the following ways: by assessing abnormal returns of stocks of companies involved in the process, through economic and financial indicators, or evaluation of the companies involved, through predictions. Determining the real value of the synergy, however, has been difficult. Indeed, the gains and losses resulting from the M&A are quite difficult to distinguish from other significant changes in the Brazilian economy.

The results obtained using the indicators methodology allow us to assert that, over the last few years, mergers in Brazil—between publicly traded companies—generally resulted in gains of financial and managerial synergy. Such gains, however, are reflected in only a few indicators. No gain was obtained, however, in operational synergy.

For the same sample, using the DCF methodology, there was generally no gain in synergy, be it managerial, financial, or operational. This fact suggests this method is more suitable for analysts of acquiring companies wanting to determine whether the amount invested reaped a profit in terms of synergy. In addition, the company’s own analysts have access to a larger amount of data, reducing the likelihood of errors in the assessment. And, it is still possible to identify the internal factors that might influence the results.

Neither did the study find gains in synergy by Kadapakkam and colleagues (2009) methodology. The method returned values considered statistically higher than the DCF methodology. However, when analysing the terms corresponding to each type of synergy, the small gains in financial synergy were from tax benefits. The gains found in the indicators methodology may be associated with gains made in such a methodology. Nonetheless, due to the fact that this analysis was carried out using a single sample, greater insight could be achieved by applying this analysis to a greater number of studies involving multiple samples using these methodologies.

This study has shown that, in Brazil, the gains realized through M&As involving large, publicly-traded companies have not performed as expected. This can be seen based on the fact that statistically significant results were not obtained. It is believed that, in Brazil, small- and medium-scale technological companies tend to present the greatest gains through M&As—an affirmation which has not been tested yet for validity. Finally, it is believed that, as a guideline for scenario studies, the indicator methodology is the most suitable, seeing that, with more accessible data, one can realize a sufficient analysis while still treating synergy in all of its different components. However, the evaluation methods require
data which, in some cases, the researcher might have difficulties in acquiring, thus reducing the size of the sample. Furthermore, the methodologies seek to obtain the value of the company, but do not capture the potential or future behavioral or structural shifts within the newly formed company, be they managerial, financial or operational.

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