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**The Stock Market Reaction to Mergers and Acquisitions: Evidence from the Banking Industry**

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# The Stock Market Reaction to Mergers and Acquisitions: Evidence from the Banking Industry<sup>1</sup>

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## **Abstract**

Mergers and acquisitions (M&As) are mainly a mechanism used in the Latin American banking industry to carry out business consolidation. This paper focuses on the effect of M&A announcements on stocks of Latin American banks and their rivals between 2000 and 2019. We evaluate two impacts of M&A announcements: impacts on cumulative abnormal returns (CAR) and impacts on event-induced variance (EIV). We use the GARCH-based event-study method. We find that acquirers and target banks have a statistically significant CAR, however, the sign is inconclusive. Rivals of acquirers and targets are not affected by M&A announcements. In general, we observe that EIV is negative for acquirers, targets, and rivals. Finally, we estimate a multivariate GARCH model to isolate the effects of co-movements of volatility between the acquirer and the target, and we find that the results remain qualitatively equal.

## **Keywords**

Emerging Markets; GARCH event study; Latin America; Banking industry

## **JEL classification**

C32; G14; G21; G34;

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## Introduction

In the past few decades, the banking industry has engaged in consolidation mainly through mergers and acquisitions (M&As) (Amel, Barnes, Panetta, & Salleo, 2004; Weiß, Neumann, & Bostandzic, 2014). From the 1980s to the 2010s, M&A activity in the banking industry, measured by the average number of announcements per year, grew by 37% around the world.<sup>5</sup> As a result, both academics and practitioners have become interested in this issue (Buch & DeLong, 2004; Di Giovanni, 2005). Therefore, the literature has evaluated two impacts of deals: those on acquirers and target banks (e.g., efficient gain, abnormal returns, bank risk profile) and those on their rivals (e.g., market power and risk changes).<sup>6</sup> Understanding how markets react to these events is important for both shareholders and regulators. On the one hand, shareholders need to have information that allows them to comprehend whether M&As in the banking sector destroy or generate value to make better investment decisions. On the other hand, policy makers need to know how business decisions can affect the performance of the market as a whole.

Most studies have been carried out in developed economies (Lebedev, Peng, Xie, & Stevens, 2015). However, the empirical evidence shows the impact of M&As on company stocks can be different in emerging countries than in developed countries. For instance, Goddard, Molyneux, and Zhou (2012) study the effect of M&A announcements on acquirer shareholder wealth and point out that in the US and Europe, the bank M&As create value, while in Latin America and Asia they do not. This might be attributable to differences in the institutional environments, corporate governance policies, and the financial markets between emerging markets and developed economies (Burns & Liebenberg, 2011; Lebedev et al., 2015).

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<sup>5</sup> Thomson Reuters Eikon.

<sup>6</sup> For a comprehensive review of M&As in the banking industry, see Berger, Demsetz, and Strahan (1999) and De Young et al. (2009).

Therefore, this paper contributes to the literature by focusing on M&A activity by Latin American banks because of great interest in the region in obtaining synergy through the consolidation of the industry. Between the 1980s and the 2010s, M&A activity in the banking industry, measured by the average number of announcements per year, grew by 116.5%.<sup>7</sup> However, as mentioned above, the effects may be different in emerging economies. Specifically, one relevant issue in M&As is the effect of announcements in terms of creating value for shareholders and their possible impact on stock volatility (Elyasiani, Staikouras, & Dontis-Charitos, 2016; Hankir, Rauch, & Ueber, 2011; Houston & Ryngaert, 1994; Humphery-Jenner, Sautner, & Suchard, 2017; Hutson & Kearney, 2001; Nain & Wang, 2016; Piloff & Santomero, 1998). Thus, this paper has two goals: first, to quantify whether M&A announcements generate abnormal returns for the acquirer, the target, and rival banks; second, to measure whether M&A announcements create market volatility due to evidence about acquirers, targets, and rivals.

In that respect, a large proportion of the financial literature about M&As focuses on the performance of the firms involved in the deals and the impact on their stakeholders (Alexandridis, Antypas, & Travlos, 2017; Cortés, García, & Agudelo, 2015; De Young, Evanoff, & Molyneux, 2009; Jensen & Ruback, 1983). Performance is generally evaluated in market terms, i.e., how M&A announcements affect firm securities. M&A announcements are events that incorporate new information about firms that are directly or indirectly involved in this process. This information modifies both the return and the volatility of firms (Carroll & Kearney, 2015). Therefore, the empirical literature has evaluated the two effects of M&As: on the creation of value for shareholders and on market volatility. This evaluation is generally conducted separately (Alexandridis et al., 2017; Amihud, DeLong, & Saunders, 2002; Bozos, Koutmos, & Song, 2013;

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<sup>7</sup> Thomson Reuters Eikon.

Chang & Cho, 2017; Eckbo, 1983; Humphery-Jenner et al., 2017; Nain & Wang, 2016; Song & Walkling, 2000).

First, concerning the quantification of the creation of value in the aftermath of the M&A announcements, the empirical evidence is inconclusive. For instance, Houston and Ryngaert (1994) find that M&As generate negative abnormal returns for acquirer banks, positive abnormal returns for target banks, and zero return for the net deal (Return target + Return acquirer). Nonetheless, Goddard et al. (2012) identifies that in bank M&As, acquirers have zero abnormal returns while targets have positive abnormal returns. Akhigbe and Madura (2001) find positive and significant valuation effects for publicly traded acquirer and target insurance companies. In general, the positive effects can be explained by the market power obtained by firms due to the deal, the reduction in information asymmetry about companies, and improvement in corporate governance policies (Alexandridis et al., 2017; Hankir et al., 2011; Humphery-Jenner et al., 2017); whereas the negative effects are related to irrational or behavioral motivations (Cortés et al., 2015; Gugler, Mueller, & Weichselbaumer, 2012; Shleifer & Vishny, 2003) and to personal motivations of managers that are not in line with the interests of shareholders (Fama, Fisher, Jensen, & Roll, 1969; Jensen, 1986; Kosnik & Shapiro, 1997). Therefore, we conclude that deals involving strategic decisions or that generate synergy for companies participating in M&As correspond to events that create value for shareholders. Other motivations may have the opposite effect.

Concerning the impact of M&A announcements on rivals, the empirical literature shows the opposite results. Studies pose different theoretical explanations for positive abnormal returns by rivals. Eckbo (1983) studies whether positive abnormal returns by rivals in horizontal M&As can be explained by an increase in the likelihood of successful collusion among rivals. He finds that positive abnormal returns by a target's rivals are independent of whether the government

declares the M&As deal a violation of antitrust laws. This shows that positive abnormal returns are explained by the efficient production hypothesis and not by the collusion hypothesis. Similarly, Shahrur (2005) finds that when M&As generate value (combined target and acquirer) the rivals show positive abnormal returns, but if it destroys value, the rivals have negative abnormal returns. This behavior depends on whether the M&As generate efficiency gains. In contrast, Hankir et al. (2011) and Nain and Wang (2016) show that this effect is caused by the market power that acquirers and targets gain because of the deal. Another justification for positive abnormal returns by rivals is signaling theory. Akhigbe and Madura (1999, 2001), Akhigbe and Martin (2000), and Song and Walkling (2000) postulate that rivals of target firms obtain positive abnormal returns because after M&As announcements, the probability that the rivals will become targets increases.

Second, the impact of M&As on the volatility of acquirers, targets, and rivals in the bank industry has also been researched. Most of the literature shows a reduction in the volatility of stock returns. This may be due to the convergence in the diversity of opinions of the market operators on stock prices of acquirers, targets and rivals. After M&As announcements, market operators have more information about the intrinsic value of the companies involved in the deal. This causes opinions on the company's stock price to converge, which leads to an decrease in volatility (Chang & Cho, 2017; Elyasiani et al., 2016; Gelman & Wilfling, 2009; Hutson & Kearney, 2001). However, an increase in volatility could result either because of the unclear purpose of the deal or because of the rise in the concentration of market power (Amihud et al., 2002; Bozos et al., 2013; Casu, Dontis-Charitos, Staikouras, & Williams, 2016; Elyasiani et al., 2016). Although the literature focuses on the effects of the M&A announcements on shareholder wealth for acquirers, targets, and rivals, the impact on volatility has been explored less. In fact, to our

knowledge, this is the first paper to study the effect of M&As on volatility in the banking industry in Latin American countries.

We use a GARCH event study to estimate the impact of M&A announcements not only on the mean return but also on variance (Wang, Salin, Hooker, & Leatham, 2002). We model bank stock returns with two equations: one for conditional mean and one for the conditional variance. For the first, we use the market model plus a dummy variable to estimate cumulative abnormal returns (CAR). For the conditional variance equation, we use a GARCH(1,1) model plus a dummy variable to estimate the event-induced variance (EIV).

This allows us to identify how the financial market reacts to M&A announcements and the individual effect it generates on the acquirer, the target, and rivals' stocks. To generalize conclusions about the effect of M&A announcements in the Latin American banking industry, we conduct two cross-sectional tests to identify whether the estimated effect on each event can be generalized at the country level, i.e., whether the average cumulative abnormal return (ACAR) and the average event-induced variance of each country are significantly different from zero.

Finally, we estimate a multivariate model of conditional volatility for three events in the sample in which both the acquirer and the target are publicly owned banks. We seek to isolate co-movements among bank returns generated by the dynamic in the industry to show that the EIV generated for M&A announcements do not change because of the possible transfer of volatility between the acquirer and the target.

In general, we find that at the country level, the ACAR cross-sectional test is not significant. However, we observe that CARs of acquirers are significant in 83% of the cases, of which 49% have a positive sign and 51% have a negative sign. We show that the acquirers' rivals are not

affected by the M&A announcements whereas the targets' rivals have positive or negative effects depending on the country.

Regarding the impact on variance, we find that the cross-sectional test is negative for most countries. This test is significant for acquirers and rivals in Brazil and Colombia. We cannot estimate the cross-sectional test for the targets, because of the limited number of events per country. The test results of the rivals are not significant in any event.

This paper proceeds as follows. Section 2 describes the sample construction process and shows the design of the event study. Section 3 presents a discussion about results. We present a robustness multivariate analysis in Section 4. Finally, we conclude in Section 5.

## **Methodology**

### *Data*

The information concerning M&A announcements for five Latin American countries (Brazil, Chile, Colombia, Mexico, and Peru) between January 1, 2000, and June 30, 2019, come from the Bloomberg and Thomson Reuters EIKON databases. Our initial database contained 257 announcements. Table 1 lists the number of deals in which a Latin American bank is the acquirer or target by country and year. Panel A shows that in the late 1990s and early 2000s, the banking industry experienced a peak in M&A activity. During this period, Latin American countries carried out financial liberalization, which led banks to look for opportunities to become more competitive in a more globalized environment, and many of them found M&As a way to achieve it (Daniel & Jones, 2007). Panel B shows that during periods of financial crisis as the early 2000s and between 2007 and 2008, purchases of Latin American banks exceeded those than in other periods.

**Table 1.** M&A announcements in the Latin American banking industry by country, 2000-2019



Panel A: by acquirer											
Country	2000-2001	2002-3	2004-5	2006-7	2008-9	2010-11	2012-13	2014-15	2016-17	2018-19	Total
Brazil	12	22	12	8	20	14	13	12	7	5	125
Chile	1	2	0	2	0	1	3	3	5	2	19
Colombia	0	1	7	4	1	2	5	1	0	0	21
Mexico	1	1	1	0	1	4	2	5	2	0	17
Peru	2	2	0	1	2	3	1	2	0	4	17
Total	16	28	20	15	24	24	24	23	14	11	199

  

Panel B: by target											
Country	2000-2001	2002-3	2004-5	2006-7	2008-9	2010-11	2012-13	2014-15	2016-17	2018-19	Total
Brazil	6	7	1	0	8	1	1	2	3	1	30
Chile	2	1	0	0	0	0	0	1	2	2	8
Colombia	1	0	3	2	0	1	1	0	0	0	8
Mexico	2	2	0	0	0	2	0	0	0	1	7
Peru	0	1	1	0	2	0	0	1	0	0	5
Total	11	11	5	2	10	4	2	4	5	4	58

Table 2 presents the number of deals according to the type of deal: domestic or cross-border. Panel A shows that 76% of the purchases by Latin American banks are domestic (deals between companies in the same country). The remaining 24% are purchases by regional companies (in Latin America) and other parts of the world. Panel B shows the type of deal in which a Latin American bank is a target. Note that 68% of the deals are domestic deals, while the remaining 32% are cross-border deals.

**Table 2.** M&A announcements by Latin American banks by type of deal, 2000-2019

Panel A: by acquirer											
Country	2000-2001	2002-3	2004-5	2006-7	2008-9	2010-11	2012-13	2014-15	2016-17	2018-19	Total
Domestic	13	28	19	11	20	16	14	15	12	5	153
Cross-border	3	0	1	4	4	8	10	8	2	6	46
Total	16	28	20	15	24	24	24	23	14	11	199

  

Panel B: by target											
Country	2000-2001	2002-3	2004-5	2006-7	2008-9	2010-11	2012-13	2014-15	2016-17	2018-19	Total
Domestic	6	8	4	2	9	3	0	3	2	3	40
Cross-border	5	3	1	0	1	1	2	1	3	1	18
Total	11	11	5	2	10	4	2	4	5	4	58

Finally, we filtered our sample using the following criteria, which are usually applied in the M&A literature:

- We excluded leveraged buyouts (LBOs), spin-offs, recapitalizations, repurchases, and government privatization.

- Acquirers or targets are public banks listed on any of the stock exchanges of the selected countries.
- The announcement must be the first news to the public.
- The acquirer or target has not missed returns during the event window.<sup>8</sup>

We obtain a database of 126 announcements of which 116 concern an acquirer that is a Latin American public bank and 8 of which are target banks. Only in three of them are both the acquirer and target Latin American listed banks. Regarding rivals, we select firms that meet these criteria and have a SIC code between 6000 and 6200. We obtained the following data from Bloomberg: daily stock prices of acquirers, targets, and rivals and the daily stock market index of each country.<sup>9</sup>

## **Methodology**

The event-study method enables us to estimate the effect that an event has on firms' securities (Fama et al., 1969; MacKinlay, 1997). However, traditional event studies only estimate abnormal returns of stocks around M&A announcements (Akhigbe & Madura, 2001; Alexandridis et al., 2017; Amihud et al., 2002; Balaban & Constantinou, 2006; Eckbo, 1983; Elyasiani et al., 2016; Goddard et al., 2012; Hankir et al., 2011; Houston & Ryngaert, 1994; Humphery-Jenner et al., 2017). Because the objective of this article is to analyze the effect of M&A announcements on the mean and variance of bank returns, we conduct a GARCH event study, which allows us to estimate the impact of M&A announcements on stocks' mean and variance of acquirer, target, and rival banks.

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<sup>8</sup> Following Cortés et al. (2015) and Savickas (2003).

<sup>9</sup> BOVESPA in Brazil, IPSA in Chile, COLCAP in Colombia, IPC in Mexico, and IGBVL in Peru.

Following Balaban and Constantinou (2006), Goddard et al. (2012), and Savickas (2003), we use a canonical model as follows: equation 1 is the mean equation, in which returns are explained for the market model, and equation 2 is the conditional variance, which is modeled with GARCH(1,1).<sup>10</sup> The full model is as follows:

$$R_{i,t} = \alpha_i + \beta_i R_{M,t} + \gamma_i D_{i,t} + \epsilon_{i,t} \quad \epsilon_i \sim t_n(0, h_i) \quad (1)$$

$$h_{i,t} = c_i + a_i \epsilon_{i,t-1}^2 + b_i h_{i,t-1} + \delta_i D_{i,t} \quad (2)$$

where  $R_{i,t}$  is the daily return of bank  $i$  on day  $t$ ,  $R_{M,t}$  is the index market return of the country where the deal takes place,  $D_{i,t}$  is a dummy variable that takes a value of 1 if  $t$  is in the event window, and 0 otherwise.  $h_{i,t}$  is the conditional variance of  $i$  on day  $t$ , and  $\epsilon_{i,t}$  is the random innovations.  $\alpha_i, \beta_i, \delta_i, c_i, a_i,$  and  $b_i$  are parameters to estimate. Coefficient  $\gamma_i$  is the cumulative abnormal return (CAR), and  $\delta_i$  is the EIV.

We determine an event window of 520 days, 260 days before and after the event window. We use two event windows: the announcement day [0,0] and two days around the announcement day [-1,1]. We use the shortest event windows to avoid capturing effects generated by other types of events (Balaban & Constantinou, 2006; Goddard et al., 2012; Leledakis & Pyrgiotakis, 2019).

Also, we calculate two cross-sectional tests by country to identify how M&A announcements affect acquirers' stocks, targets' stocks, and their rivals' stocks as a whole. Employing these tests, we estimate the statistical significance of the M&A announcement effect on the mean and variance of bank returns. Following Savickas (2003), we use  $Test_1(\hat{\gamma})$  to compare the null hypothesis that the average cumulative abnormal return (ACAR) is different from 0:

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<sup>10</sup> However, the order of the GARCH(p,q) must be checked with the respective tests in each estimation.

$$Test_1(\hat{\gamma}) = \frac{\sum_{i=1}^N \frac{S_{i,t}}{N}}{\sqrt{\frac{1}{N(N-1)} \sum_{i=1}^N \left( S_{i,t} - \sum_{i=1}^N \frac{S_{i,t}}{N} \right)^2}} \quad (3)$$

where  $N$  is the number of M&A announcements, and  $S_{i,t} = \gamma_i / \sqrt{\widehat{h}_{i,t}}$ .

We use the cross-sectional t-statistic  $Test_2(\widehat{\delta})$  posed by Balaban and Constantinou (2006). With this test, we evaluate whether the variance of banks' stock changes during the event window, i.e., whether the average event-induced variance (AEIV), is different from 0:

$$Test_2(\widehat{\delta}) = \frac{\sum_{i=1}^N \frac{S_i}{N}}{\sqrt{\frac{1}{N(N-1)} \sum_{i=1}^N \left( S_i - \sum_{i=1}^N \frac{S_i}{N} \right)^2}} \quad (4)$$

where  $N$  is the number of M&A announcements,  $S_i = \widehat{\delta}_i / \widehat{\sigma}_i$ , and  $\widehat{\sigma}_i$  is the standard deviation of daily conditional volatility for each bank  $i$ .  $Test_1$  and  $Test_2$  distribute Student-t with  $N - 1$  degrees of freedom.

## Results

### *Acquirers*

In this subsection, we present results for acquirer banks from Brazil, Chile, Colombia, Mexico, and Peru. Table 3 shows CAR and EIV for 116 deals in which the acquirers are Latin American listed banks. Column 5 reports the estimates of acquirer CAR for the event window  $[0,0]$ ,<sup>11</sup> showing that 93% of the events have a statistically significant CAR; 49% of the deals report a

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<sup>11</sup> We report only the results for the event window  $[0,0]$ , and the results of the events window  $[-1,1]$  are qualitatively the same.

positive sign, which can be interpreted as a signal of value creation for shareholders; and 51% of the deals are negative, which signals that they destroy value, or the market does not consider them strategic for companies.

In column 7, we report the EIV for the event window [0,0]. We found that in 47% of the M&A announcements, the impact on the volatility of acquirer stocks is statistically significant. However, the direction of the effect is not always the same, and 83% of the significant coefficients are negative. From the theoretical and empirical point of view, the impact of M&A announcements on stock volatility depends on the interaction between the positive and negative effects of the deal (Amihud et al., 2002; Bozos et al., 2013; Casu et al., 2016). On the one hand, the synergy and profits that the deal may generate create uncertainty about the future of the company, which may increase stock volatility, but, on the other hand, the new information provided by announcement of the deal may cause investors' opinions about the price of the acquirer's stock to converge, which reduces volatility (Elyasiani et al., 2016).

**Table 3.** Cumulative Abnormal Returns and Event-Induced Variance of Acquirers, 2000-2019

Country	Acquirer	Event day	Target	CAR [0,0]	p-value	EIV [0,0]	p-value
Brazil	Unibanco, Uniao de Bancos Brasileiros	02-28-2000	Banco Credibanco	0.0202 ***	(0.0000)	-0.0002 **	(0.0363)
Brazil	Banco Bradesco	04-28-2000	Banco Boavista Interatlantico	0.0738 ***	(0.0000)	-0.0001	(0.3784)
Brazil	Unibanco, Uniao de Bancos Brasileiros	07-03-2000	Banco Bandeirantes	0.0301 ***	(0.0000)	-0.0006 ***	(0.0000)
Brazil	Itau Unibanco Holding	12-14-2000	LineInvest.com	-0.0078 ***	(0.0000)	-0.0002	(0.1003)
Brazil	Unibanco, Uniao de Bancos Brasileiros	12-19-2000	Banco Fininvest	-0.0326 **	(0.0494)	0.0003 ***	(0.0000)
Brazil	Banco Bradesco	03-27-2001	BCN Alliance Capital Management	0.0039 ***	(0.0017)	-0.0001	(0.5082)
Brazil	Unibanco, Uniao de Bancos Brasileiros	08-27-2001	Banco Investcred	-0.0002 ***	(0.0000)	-0.0004 ***	(0.0000)
Brazil	Itau Unibanco Holding	10-04-2001	Lloyds TSB Asset Management	0.0225 ***	(0.0000)	-0.0001	(0.5184)
Brazil	Banco do Brasil	11-30-2001	Max Blue Americas	-0.0159 ***	(0.0000)	-0.0007 ***	(0.0000)
Brazil	Itau Unibanco Holding	12-21-2001	Banco Sudameris Brasil	-0.0334 ***	(0.0000)	-0.0001	(0.7563)
Brazil	Banco Bradesco	01-14-2002	Banco Mercantil de São Paulo	0.0275 ***	(0.0000)	-0.0002	(0.1432)
Brazil	Banco Bradesco	02-25-2002	Banco Cidade	0.0232 ***	(0.0000)	-0.0000	(0.6331)
Brazil	Itau Unibanco Holdings	05-13-2002	Banco Brascan	-0.0090 **	(0.0234)	0.0001	(0.4615)
Brazil	Itau Unibanco Holdings	11-05-2002	Banco BBA Creditanstalt	-0.0081 ***	(0.0000)	-0.0001	(0.2948)
Brazil	Itau Unibanco Holdings	12-03-2002	Banco Fiat	-0.0187 ***	(0.0000)	-0.0002	(0.3056)
Brazil	Banco Bradesco	01-13-2003	Banco Alvorada	0.0060 ***	(0.0000)	-0.0001	(0.4228)
Brazil	Itau Unibanco Holdings	06-10-2003	Banestado, Banco BEG, and Banco Bemge	-0.0049 ***	(0.0000)	-0.0001	(0.6303)
Brazil	Banco do Brasil	09-26-2003	Maxblue DTVM	-0.0561 ***	(0.0000)	-0.0001	(0.4021)
Brazil	Banco Bradesco	11-07-2003	Banco Zogbi	0.0167 ***	(0.0000)	0.0000	(0.5458)
Brazil	Unibanco, Uniao de Bancos Brasileiros	11-18-2003	Creditec Financiamento e Investimento	-0.0033 ***	(0.0000)	-0.0001 **	(0.0252)
Brazil	Unibanco, Uniao de Bancos Brasileiros	03-01-2004	Hipercard	0.0053 ***	(0.0000)	-0.0001 ***	(0.0000)
Brazil	Unibanco, Uniao de Bancos Brasileiros	06-16-2004	Banco BNL do Brasil	-0.0352 ***	(0.0000)	-0.0001 *	(0.0618)
Brazil	Itau Unibanco Holding	11-08-2004	Orbitall	-0.0110 ***	(0.0000)	0.0000	(0.6278)
Brazil	Unibanco, Uniao de Bancos Brasileiros	06-03-2005	Banco Dibens	0.0192 ***	(0.0000)	-0.0000	(0.6892)
Brazil	Itau Unibanco Holding	05-02-2006	Bankboston Brazil	0.0234 ***	(0.0000)	0.0000	(0.6038)
Brazil	Banco Bradesco	05-15-2006	Bradesplan Participacoes	0.0003 ***	(0.0000)	0.0002 ***	(0.0000)
Brazil	Itau Unibanco Holding	11-28-2006	BankBoston Trust and BankBoston International	0.0005 ***	(0.0000)	-0.0001 ***	(0.0000)
Brazil	Banco Bradesco	01-24-2007	Banco BMC	-0.0008	(0.2821)	-0.0000	(0.8147)
Brazil	Banco Bradesco	01-22-2008	Mediservice	-0.0489 ***	(0.0000)	0.0000	(0.7165)
Brazil	Banco Bradesco	03-06-2008	Agora Holdings	-0.0184 ***	(0.0000)	-0.0001 ***	(0.0004)
Brazil	Banco do Brasil	07-07 -2008	Cia de Seguros Alianca do Brasil	-0.0258 ***	(0.0000)	0.0002	(0.5024)
Brazil	Banco Bradesco	09-04-2008	Leader S/A Administradora de Cartoes de Credito	0.0191 ***	(0.0000)	0.0006 **	(0.0463)
Brazil	Itau Unibanco Holding	11-03-2008	Unibanco, Uniao de Bancos Brasileiros	0.1239 ***	(0.0000)	-0.0005	(0.1520)
Brazil	Unibanco, Uniao de Bancos Brasileiros	11-26-2008	Unibanco AIG Seguros	-0.0000	(0.9558)	-0.0007 ***	(0.0045)
Brazil	Banco Industrial e Comercial	11-03-2009	Sul FinancairaCredito Financiamentos e Investi	-0.0155 ***	(0.0000)	0.0000	(0.9788)
Brazil	Banco Bradesco	02-02-2009	Europ Assistance Brasil	-0.0087 ***	(0.0000)	0.0001	(0.6418)
Brazil	Banco Bradesco	06-05-2009	Banco ibi	-0.0051 ***	(0.0000)	-0.0001	(0.1828)
Brazil	Banco do Brasil	10-27-2009	Brasilprev Seguros e Previdencia	-0.0022	(0.1329)	0.0001	(0.1790)
Brazil	Itau Unibanco Holding	11-13-2009	XL Seguros Corporativos	0.0187 ***	(0.0000)	-0.0000	(0.4387)
Brazil	Banco Bradesco	01-22-2010	Ibi Mexico	0.0046 ***	(0.0000)	-0.0005 ***	(0.0000)
Brazil	Banco Bradesco	04-06-2010	ITP Partners	-0.0101 ***	(0.0000)	-0.0000	(0.2777)
Brazil	Banco do Brasil	12-15-2009	Banco Patagonia	0.0003	(0.1466)	0.0000	(0.8148)

Brazil	Banco do Brasil	05-05-2010	Brasilveiculos Cia de Seguros	0.0054 ***	(0.0000)	0.0001	(0.4820)
Brazil	Banco Bradesco	01-26-2011	Companhia Brasileira de Solucoes e Servicos	0.0032 ***	(0.0000)	-0.0001 ***	(0.0000)
Brazil	Banco do Brasil	04-25-2011	EuroBank	-0.0038 ***	(0.0008)	-0.0000	(0.4169)
Brazil	Banco Bradesco	05-20-2011	Banco do Estado do Rio de Janeiro	-0.0063 ***	(0.0000)	-0.0001 **	(0.0137)
Brazil	Banco Indusval	06-16-2011	Guide Investimentos Corretora de Valores	-0.0053 ***	(0.0000)	-0.0002 ***	(0.0000)
Brazil	Itau Unibanco Holding	02-07-2012	Redecard	0.0024 ***	(0.0000)	-0.0000 ***	(0.0000)
Brazil	Itau Unibanco Holding	08-09-2012	Financeira Americanas	-0.0092 ***	(0.0000)	-0.0001 ***	(0.0000)
Brazil	Banco Indusval	02-19-2013	Voga Empreendimentos e Participacoes	-0.0011 ***	(0.0000)	-0.0001 ***	(0.0000)
Brazil	Itau Unibanco Holding	05-14-2013	Banco Citicard	0.0036 ***	(0.0000)	-0.0000	(0.1347)
Brazil	Itau Unibanco Holding	06-17-2013	CAT Administradora de Tarjetas	0.0108 ***	(0.0000)	0.0000	(0.8768)
Brazil	Banco Indusval	06-26-2013	Banco Intericap	0.0059	(0.2339)	0.0007 *	(0.0789)
Brazil	Itau Unibanco Holding	06-27-2013	BMG Seguradora	0.0115 ***	(0.0000)	-0.0000	(0.1673)
Brazil	Banco Bradesco	10-15-2013	Odontoprev	-0.0133 ***	(0.0000)	-0.0000	(0.8288)
Brazil	Banco Santander Brasil	04-07-2014	GetNet	0.0241 ***	(0.0000)	-0.0008 ***	(0.0000)
Brazil	Itau Unibanco Holding	08-04-2014	Munita Cruzat and Claro	0.0012 ***	(0.0000)	-0.0003 ***	(0.0000)
Brazil	Itau Unibanco Holding	09-10-2014	Maxipago Servicos de Internet	-0.0014 ***	(0.0000)	-0.0001	(0.3661)
Brazil	Banco Bradesco	12-09-2014	2bCapital	0.0225 ***	(0.0000)	0.0001	(0.6039)
Brazil	Parana Banco	12-11-2014	Cardinal Cia de Seguros	0.0093 ***	(0.0060)	-0.0005 **	(0.0279)
Brazil	Banco Daycoval	12-12-2014	Banco Commercial Investment Trust do Brasil	0.0055 **	(0.0244)	0.0002	(0.2779)
Brazil	Banco Bradesco	08-03-2015	HSBC Bank Brasil	-0.0132 ***	(0.0000)	0.0001	(0.2113)
Brazil	Itau Unibanco Holding	12-30-2015	Recovery do Brasil Consultoria	0.0063 ***	(0.0000)	0.0000 ***	(0.0000)
Brazil	Banco Santander Brasil	03-14-2016	ContaSuper	0.0177 ***	(0.0000)	-0.0001	(0.3259)
Brazil	Itau Unibanco Holding	09-29-2016	Banco Itau Consignado	-0.0072 ***	(0.0000)	-0.0000	(0.9106)
Brazil	Banco Santander Brasil	06-13-2017	Banco Original	-0.0069 ***	(0.0000)	0.0000	(0.9626)
Brazil	Banco Santander Brasil	08-08-2017	Ipanema	0.0238 ***	(0.0000)	-0.0007 ***	(0.0000)
Brazil	Banco Bradesco	10-01-2018	Fidelity Processadora	-0.0014 ***	(0.0000)	-0.0001 ***	(0.0000)
Brazil	Banco Bradesco	10-02-2018	RCB Investimentos	0.0112	(0.2044)	0.0001 ***	(0.0000)
Brazil	Banco Bradesco	05-06-2019	BAC Florida Bank	-0.0146 ***	(0.0000)	-0.0000	(0.7599)
Chile	Banco de Chile	08-08-2001	Banco de A Edwards	-0.0024 ***	(0.0004)	0.0001	(0.7812)
Chile	Banco Santander Chile	05-07-2002	Banco Santiago	0.0017 ***	(0.0002)	-0.0006 ***	(0.0000)
Chile	Banco de Credito e Inversiones	11-18-2003	Banco Conosur	0.0020 ***	(0.0000)	0.0000	(0.7160)
Chile	Banco de Chile	12-04-2007	Legg Mason Chile Administradora General de Fondos	-0.0019 ***	(0.0000)	-0.0002 ***	(0.0000)
Chile	Banco de Chile	06-29-2007	Citibank Agencia de Valores	0.1309 ***	(0.0000)	-0.0000	(0.8655)
Chile	Corpbanca	12-06-2011	Banco CorpBanca Colombia	-0.0149 ***	(0.0000)	-0.0001	(0.3104)
Chile	Corpbanca	10-09-2012	Helm Bank	0.0036 ***	(0.0000)	0.0001	(0.5779)
Chile	Banco de Credito e Inversiones	05-24-2013	City National Bank of Florida	-0.0368 ***	(0.0000)	0.0001	(0.1130)
Chile	Corpbanca	01-29-2014	Banco Itau Chile	-0.1230 ***	(0.0000)	-0.0002 **	(0.0281)
Chile	Banco de Chile	07-10-2015	Banco Penta	0.0024 ***	(0.0031)	0.0000	(0.2849)
Chile	Banco de Credito e Inversiones	12-01-2017	TotalBank	-0.0198 ***	(0.0003)	-0.0004 ***	(0.0000)
Chile	Banco de Credito e Inversiones	12-19-2017	Credit Card Operations Walmart Chile	-0.0094	(0.1195)	0.0002 ***	(0.0012)
Chile	Corpbanca	05-29-2019	MCCCorredores de Bolsa	-0.0213 ***	(0.0000)	0.0000	(0.9659)
Colombia	BanColombia	2003-09-03	Cia Suramericana de Financiamiento Comercial	-0.0013 ***	(0.0011)	0.0000	(0.7875)
Colombia	Banco de Bogota	2005-01-03	BankBoston Colombia	-0.0045 ***	(0.0000)	0.0001 ***	(0.0000)
Colombia	BanColombia	2004-09-14	Corp Financiera Nacional y Suramericana	0.0222 ***	(0.0000)	0.0002	(0.5843)
Colombia	BanColombia	2005-12-12	Comercia	-0.0011 ***	(0.0000)	-0.0001 ***	(0.0000)
Colombia	Banco de Bogota	2006-03-16	Megabanco	0.0202 ***	(0.0000)	-0.0003 ***	(0.0000)

Colombia	BanColombia	2006-12-22	Banagricola	0.0121 ***	(0.0012)	-0.0001	(0.1619)
Colombia	Helm Bank	2010-06-22	Helm Leasing	-0.0096 ***	(0.0000)	-0.0002 ***	(0.0000)
Colombia	Banco Davivienda	2012-01-24	Banco HSBC from El Salvador, Costa Rica, and Honduras	-0.0138 ***	(0.0041)	-0.0005 ***	(0.0000)
Colombia	BanColombia	2012-08-30	UFFI Mobile SAS	-0.0123 ***	(0.0000)	-0.0001 ***	(0.0000)
Colombia	BanColombia	2013-02-19	Banistmo	0.0012 ***	(0.0000)	-0.0001 *	(0.0916)
Colombia	Banco Davivienda	2013-11-15	Corredores Asociados	0.0168 ***	(0.0000)	-0.0001	(0.5707)
Colombia	BanColombia	2015-12-30	Grupo Agromercantil Holding	0.0081 ***	(0.0000)	-0.0002 ***	(0.0000)
Mexico	Grupo Financiero Banorte	2009-06-10	Ixe Afore	-0.0576 ***	(0.0000)	-0.0010 ***	(0.0000)
Mexico	Grupo Financiero Inbursa	2010-06-04	Chrysler Financial Services de Mexico	0.0015	(0.6054)	-0.0002 **	(0.0251)
Mexico	Grupo Financiero Banorte	2010-10-19	IXE Grupo Financiero SAB	0.0088 ***	(0.0000)	-0.0002 ***	(0.0000)
Mexico	Genera SAB	2011-03-28	Compartamos Financiera	0.0096 ***	(0.0000)	-0.0002 ***	(0.0000)
Mexico	Grupo Financiero Banorte	2013-06-11	Pensiones Banortede and Seguros Banorte	-0.0166 ***	(0.0000)	-0.0001	(0.6735)
Mexico	Banco Santander Mexico	2013-06-14	ING Hipotecarias de Mexico	0.0030 ***	(0.0007)	0.0008	(0.1368)
Mexico	Grupo Financiero Inbursa	2014-03-14	Banco Standard de Invertementos	-0.0061 ***	(0.0000)	0.0000	(0.6075)
Mexico	Genera	2014-10-16	Pagos Intermex	0.0038 ***	(0.0000)	0.0000	(0.9591)
Mexico	Regional	2014-11-20	Arrendadora Capita Corp	-0.0043 ***	(0.0000)	-0.0002 ***	(0.0000)
Mexico	Grupo Financiero Inbursa	2014-12-18	Banco Wal-Mart de Mexico Adelante	0.0055 ***	(0.0069)	-0.0001	(0.1483)
Mexico	Genera	2015-03-23	Compartamos Financiera	0.0022 ***	(0.0047)	-0.0001 ***	(0.0026)
Mexico	Grupo Financiero Banorte	2017-10-25	Grupo Financiero Interacciones	-0.0638 ***	(0.0000)	0.0002 **	(0.0252)
Peru	Credicorp	2006-07-24	AFP Union Vida	0.0100 ***	(0.0000)	-0.0003 ***	(0.0000)
Peru	Scotiabank Peru	2008-05-20	Banco del Trabajo	0.0112 ***	(0.0000)	-0.0002 **	(0.0470)
Peru	Credicorp	2010-10-21	El Pacifico Vida Cia de Seguros y Reaseguros	-0.0077 ***	(0.0000)	-0.0002 ***	(0.0000)
Peru	Credicorp	2011-07-01	La Esperanza del Peru and San Isidro	-0.0014 ***	(0.0000)	-0.0003 ***	(0.0000)
Peru	Credicorp	2012-04-24	Inversiones IMTrust	-0.0056 **	(0.0109)	0.0001	(0.4612)
Peru	Credicorp	2014-02-10	Mibanco Banco de la Microempresa	0.0213 ***	(0.0000)	0.0000	(0.9864)
Peru	Credicorp	2019-03-27	Multicaja	0.0022 **	(0.0126)	-0.0003 ***	(0.0000)
Peru	Credicorp	2019-04-23	Correval Panama	-0.0576 ***	(0.0000)	0.0001 ***	(0.0013)
Peru	Credicorp	2019-06-28	Banco Compartir	-0.0102 **	(0.0213)	-0.0000	(0.5252)

CAR = cumulative abnormal return, EIV = event-induced variance. Leveraged buyouts (LBOs), spin-offs, recapitalizations, repurchases, and government privatization are excluded. \*\*\*, \*\*, and \* represent significance at 10%, 5%, and 1%, respectively



Table 4 presents the results of cross-sectional  $Test_1$  (equation 3) and  $Test_2$  (equation 4) for the event window  $[0,0]$  and  $[-1,1]$  by country. In general,  $Test_1$  is not statistically significant. This result suggests that, at the country level, these strategies do not produce abnormal returns, and we can infer that M&As do not create or destroy value for stockholders of acquirer banks between 2000 and 2019. Goddard et al. (2012) find bank M&As in Latin American countries do not generate value for shareholders in the period 1998 to 2010. These results are also consistent with those reported by Leledakis and Pyrgiotakis (2019) for US banks between 1990 and 2014. In the event window  $[-1,1]$ , the results are robust. However, in Chile,  $Test_1$  shows a marginally significant result at the level of 10%.

But the AEIV is negative in all cases. According to Hutson and Kearney (2001), this is because investors have more information about the intrinsic value of the stock, thus leading to better price formation and less volatility.  $Test_2$  is statistically significantly different from zero in Brazil and Colombia.

**Table 4.** Average Cumulative Abnormal Returns and Average Event-induced Variance of acquirers: Cross-sectional test

Country	n	[0,0]		[-1,1]	
		ACAR	AEIV	ACAR	AEIV
Brazil	70	0.0021 (0.2890)	-8.91e-05*** (0.0038)	0.0013 (0.2987)	-1.93e-05* (0.0588)
Chile	13	-0.0068 (0.3370)	-7.89e-05 (0.7246)	-0.0033* (0.0947)	-7.58e-05 (0.7599)
Colombia	12	0.0032 (0.3311)	-1.05e-04 (0.1141)	0.0020 (0.3216)	-4.36e-05* (0.0707)
Mexico	12	-0.0095 (0.2077)	-8.30e-05 (0.8765)	0.0009 (0.8153)	-4.69e-05 (0.3297)
Peru	9	-0.0043 (0.3815)	-1.01e-04 (0.1336)	0.0039 (0.2836)	-6.31e-05 (0.7064)

This table reports estimates of cross-sectional tests for acquirers by country:  $Test_1$  for average cumulative abnormal returns (ACAR) and  $Test_2$  for average event-induced variance (AEIV).  $n$  is the number of M&A announcements between 2000 and 2019. The p-values are in parentheses. \*\*\*, \*\*, and \* significance at 10%, 5%, and 1%, respectively.

Table 5 shows the results of  $Test_1$  and  $Test_2$  for the rivals of acquirers.  $Test_1$  suggests that in general M&As do not affect the rivals of the acquirers. At the country level, ACAR is different from zero.  $Test_2$  that AEIV is negative in all cases, however, it is only significant in Brazil and marginally in Colombia. From these results, we infer that after M&A announcements, the rivals' stock price converges to their intrinsic value, which leads volatility to decrease (Chang & Cho, 2017; Elyasiani et al., 2016; Gelman & Wilfling, 2009; Hutson & Kearney, 2001).

**Table 5.** Average Cumulative Abnormal Returns and Average Event-induced Variance of acquirers' rivals: Cross-sectional test

Country	n	[0,0]		[-1,1]	
		ACAR	AEIV	ACAR	AEIV
Brazil	70	0.0021 (0.2890)	-8.91e-05*** (0.0038)	0.0013 (0.2987)	-1.93e-05* (0.0588)
Chile	13	-0.0068 (0.3370)	-7.89e-05 (0.7246)	-0.0033 (0.0947)	-7.58e-05 (0.7599)
Colombia	12	0.0032 (0.3311)	-1.05e-04 (0.1141)	0.0020 (0.3216)	-4.36e-05* (0.0707)
Mexico	12	-0.0095 (0.2077)	-8.30e-05 (0.8765)	0.0009 (0.8153)	-4.69e-05 (0.3297)
Peru	9	-0.0043 (0.3815)	-1.01e-04 (0.1336)	0.0039 (0.2836)	-6.31e-05 (0.7064)

This table reports estimates of cross-sectional tests of acquirers' rivals by country:  $Test_1$  for average cumulative abnormal returns (ACAR) and  $Test_2$  for average event-induced variance (AEIV).  $n$  is the number of M&A announcements between 2000 and 2019. The p-values are in parentheses. \*\*\*, \*\*, and \* significant at 10%, 5%, and 1%, respectively.

### ***Targets***

In this section, we present the results for Latin American target banks in Brazil, Chile, Colombia, and Mexico.<sup>12</sup> The price information on a large proportion of target banks is not available, as, after an M&A, the target is often delisted. For this reason, the number of events decreases more than the number of acquirers.

Table 6 shows the CAR and EIV for Latin American target banks. We observe statistically significant CAR with both negative and positive signs. The finance literature often finds that

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<sup>12</sup>Peru does not have events that can be analyzed taking into account the criteria that we apply.

targets have a positive CAR, as deals generally generate synergies and increase efficiency at targets (Akhigbe & Madura, 2001; Hankir et al., 2011). However, some evidence indicates that when deals are carried out under conditions of uncertainty and inefficiency, the targets may have a negative CAR (Cortés et al., 2015). We found that in three deals, the target's CAR is negative. According to Bloomberg news, the three agreements involved problems related to favoring one of the participants, undervaluation of the stocks, and difficulties in the negotiation. This is one possible reason that the market views these transactions negatively.

**Table 6.** Cumulative Abnormal Returns (CAR) and Event-Induced Variance (EIV) of targets, 2000-2019

Country	Acquirer	Event day	Target	CAR [0,0]	p-value	EIV [0,0]	p-value
Brazil	Itau Holding	11-03-2008	Unibanco, Uniao de Bancos Brasileiros	0.0581 ***	(0.0000)	0.0007	(0.4617)
Brazil	Banco BTG Pactual	01-31-2011	Banco Panamericano	-0.0271 ***	(0.0000)	-0.0156 ***	(0.0000)
Brazil	China Construction Bank	10-31-2013	Banco Industrial e Comercial	0.0023	(0.3620)	-0.0052 ***	(0.0000)
Chile	Quinenco	12-13-2000	Banco de Chile	-0.0726 ***	(0.0000)	-0.0106	(0.6615)
Chile	Banco de Chile	08-08-2001	Banco de A Edwards	0.0728 ***	(0.0000)	0.0008	(0.1500)
Colombia	BanColombia	09-14-2004	Corfinsura	0.0606 ***	(0.0000)	0.0008	(0.1236)
Colombia	Corpbanca	10-09-2012	Helm Bank	-0.0151 ***	(0.0000)	-0.0006 ***	(0.0000)
Mexico	Gentera	09-05-2011	Banco Compartamos	0.0012	(0.8495)	0.0011	(0.2039)

Leveraged buyouts (LBOs), spin-offs, recapitalizations, repurchases, and government privatizations are excluded. \*\*\*, \*\* and \* significant at 10%, 5%, and 1%, respectively.

Table 7 lists the results of  $Test_1$  and  $Test_2$  for the targets' rivals. In general,  $Test_1$  shows that M&A announcements do not affect the value of rival stocks. We observe that in Colombia, ACAR is negative and significantly different from zero. This indicates that, on average, the deals carried out in this country generated losses in value for rival banks. This may be a consequence of increased synergies or gains in market power that the target obtains with the transaction (Shahrur, 2005).  $Test_2$  reveals that AEIV is negative in all cases, and the results are qualitatively similar to those for the acquirer.

**Table 7.** Average Cumulative Abnormal Returns and Event-induced Variance of targets' rivals: Cross-sectional test

Country	n	[0,0]		[-1,1]	
		ACAR	AEIV	ACAR	AEIV
Brazil	25	0.0099 (0.2857)	-1.18e-03 (0.2405)	0.0051 (0.2859)	-4.17e-05 (0.8447)
Chile	4	0.0077 (0.1236)	9.61e-05 (0.7831)	0.0050 (0.3360)	4.73e-05 (0.4178)
Colombia	4	-0.0036 (0.2069)	-4.10e-05 (0.1389)	-0.0024* (0.0318)	2.31e-06 (0.9963)
Mexico	8	0.0108* (0.0604)	-1.67e-04* (0.0775)	0.0021 (0.7293)	-1.05e-04 (0.1945)

This table reports estimates of cross-sectional tests for targets' rivals by country:  $Test_1$  for average cumulative abnormal returns (ACAR) and  $Test_2$  for average event-induced variance (AEIV).  $n$  is the number of M&A announcements between 2000 and 2019. The p-values are in parentheses. \*\*\*, \*\*, \* significant at 10%, 5%, and 1%, respectively.

## Multivariate Analysis

Stylized facts in financial returns show that volatility between assets and markets is correlated (Wang et al., 2002). Consequently, we present a multivariate representation of the GARCH model to isolate the effect of the M&A announcement on the volatility of the acquirer and target stock of co-movements between two banks. The canonical model proposed by (Bollerslev, Engle, & Wooldridge, 1988) is described below:

$$H_t = C'C + \sum_{i=1}^p A_i \odot (\epsilon_{\{t-i\}} \epsilon'_{\{t-i\}}) + \sum_{i=1}^q B_i \odot H_{\{t-i\}} \quad (5)$$

where  $H_t$  is the variance-covariance matrix,  $C$  is a diagonal  $n \times n$  matrix,  $A$  and  $B$  are diagonal matrices.  $\epsilon$  is an  $n \times 1$  vector of random innovations.  $A$  measures the effect of  $p$  random innovations' lags on the variance, which means the effect of the news, and  $B$  measures the impact of  $q$  variance's lags on variance in  $t$ .

We use the bivariate diagonal VEC (1,1) representation with exogenous regressors  $\gamma$ , which measures the impact of M&A announcements on the target and acquirer. The model is as follows:

$$H_t = \begin{bmatrix} h_{\{11\}} \\ h_{\{12\}} \\ h_{\{22\}} \end{bmatrix} = \begin{bmatrix} c_{\{11\}} \\ c_{\{12\}} \\ c_{\{22\}} \end{bmatrix} + \begin{bmatrix} a_{\{11\}} & 0 & 0 \\ 0 & a_{\{12\}} & 0 \\ 0 & 0 & a_{\{22\}} \end{bmatrix} \begin{bmatrix} \epsilon_{\{1,t-1\}}^2 \\ \epsilon_{\{1,t-1\}} \epsilon_{\{2,t-1\}} \\ \epsilon_{\{2,t-1\}}^2 \end{bmatrix} \\ + \begin{bmatrix} b_{\{11\}} & 0 & 0 \\ 0 & b_{12} & 0 \\ 0 & 0 & b_{\{22\}} \end{bmatrix} \begin{bmatrix} h_{1,t-1} \\ h_{\{1,t-1\}} h_{\{2,t-1\}} \\ h_{2,t-1} \end{bmatrix} + \begin{bmatrix} \gamma_1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & \gamma_2 \end{bmatrix} \begin{bmatrix} x_{1,t-1} \\ x_{\{1,t-1\}} x_{\{2,t-1\}} \\ x_{2,t-1} \end{bmatrix} \quad (6)$$

where the coefficients  $a_{11}$  and  $a_{22}$  measure the lagged effect of news from the same asset, and  $a_{12}$  is the effect of asset 2 news on asset 1 variance.

The coefficients  $b_{11}$  and  $b_{22}$  measure the impact of the lagged volatility from the same asset, whereas  $b_{12}$  is the impact of the lagged volatility of asset 2 on asset 1.  $x_1$  and  $x_2$  are dummy variables that take a value of 1 if  $t$  is in the event window, and 0 otherwise. The coefficients  $\gamma_1$  and  $\gamma_2$  measure the impact of the M&A announcement on the variance of assets 1 and 2, respectively. It is assumed that the sign of these coefficients is negative for both the acquirer and the target, for the reasons mentioned earlier.

$\epsilon$  is an  $n \times 1$  vector of random innovations that distributes the t-Student multivariate with  $\nu$  degrees of freedom, mean  $\mu$ , and variance  $H_t$ . We use the t-Student distribution because it accommodates the heavy tails of returns better than the normal distribution. In this way, we improve the capacity for adjustment and convergence of the maximum likelihood function.

In period  $t$ , the conditional log likelihood function can be expressed as:

$$L_t(\theta) = -\frac{N}{2} \log 2\pi - \frac{1}{2} \log |H_t(\theta)| - \frac{1}{2} \epsilon_t(\theta)' H_t^{-1}(\theta) \epsilon_t(\theta) \quad (7)$$

where the parameters are combined into vector  $\theta = (C', \text{vec}(A_1)', \dots, \text{vec}(A_q)', \text{vec}(B_1)', \dots, \text{vec}(B_p)')$

**Table 8.** Event-induced variance: a multivariate GARCH model

Acquirer	Unibanco	Banco de Chile	Bancolombia
Target	Itau	Banco de A Edwards	Corfinsura
$c_1$	0.00014 (0.0001)	0.00025* (0.0001)	0.00005 (0.0001)
$c_2$	0.00008 (0.0001)	0.00000 (0.0000)	0.00000 (0.0000)
$c_3$	0.00014 (0.0001)	0.00019 (0.0001)	0.00001* (0.0000)
$a_{11}$	0.04108 (0.0357)	0.80778 (0.5151)	0.04033 (0.0398)
$a_{12}$	0.05374** (0.0256)	-0.18820 (0.236)	0.03621 (0.0432)
$a_{22}$	0.03771 (0.027)	0.35581 (0.2799)	0.08156** (0.0369)
$b_{11}$	0.56720 (0.4101)	0.13787* (0.0813)	0.54781 (0.4978)
$b_{12}$	0.60904*** (0.2344)	0.53513 (0.5503)	0.56034 (0.6838)
$b_{22}$	0.55985 (0.4043)	0.56738*** (0.1777)	0.86541*** (0.0535)
$\gamma_1$	-0.00022 (0.0005)	-0.00031 (0.0018)	-0.00014 (0.0003)
$\gamma_2$	-0.00022 (0.002)	0.00659 (0.0191)	0.00011 (0.0042)

This table reports estimates of a multivariate diagonal VEC model. We estimate for the event windows [0,0]. The standard errors are in parentheses. \*\*\*, \*\*, and \* significant at 10%, 5%, and 1%, respectively.

Only three deals in the total sample involve both an acquirer and a target that are public banks: Itau Unibanco, Banco de Chile-Banco de A Edwards, and Bancolombia-Corfinansura. Therefore, we use these three events for the multivariate estimate. Table 8 shows the results of the multivariate VEC model. We found volatility transmission between Banco Itau and Unibanco. Coefficient  $a_{12}$  is statistically different from zero, which implies that Itau Bank's news affects Unibanco Bank's volatility. Coefficient  $b_{12}$  is also statistically different from zero, which shows that Itau Bank's volatility affects Unibanco Bank's volatility. However, after isolating this effect in the multivariate model, we found that the dummy coefficients of the event are not significant, and their magnitude does not differ significantly from the univariate estimate.

We found no evidence of transmission of volatility between the acquirer and target in the other two events. The significance and magnitude of  $\gamma_1$  and  $\gamma_2$  do not change significantly with respect to the univariate estimates. Given these facts, we can infer, at least regarding the events studied here, that even with joint estimates the effects of the announcement of M&As on the volatility of targets and acquirers remain qualitatively the same.

## **Conclusions**

We studied the implications of M&A announcements on banks in Brazil, Chile, Colombia, Mexico, and Peru between 2000 and 2019. We analyze the effects of these announcements on the mean and variance of returns from the acquirer, target, and rival stocks. For this purpose, we use a GARCH event study, which allows us to estimate the cumulative abnormal return (CAR) and the event-induced variance (EIV). In addition, we perform two cross-sectional tests to identify the effect of M&A announcements at the country level.

We found that M&A announcements can generate positive and negative CARs for acquirers, targets, and rivals, which is consistent with the literature. In the cross-sectional test, we found



that the ACAR of acquirers and rivals is not significantly different from zero. This result suggests that M&A announcements in Latin America do not generate or destroy value for acquirers and rivals. We observe positive effects for the target, and when motivations do not lead to a strategic deal, the result can be negative.

With regard to the effect on variance, we find that EIV is negative in most cases. Cross-sectional test results show that M&A announcements decrease the volatility of acquirer, target, and rival stocks. This evidence suggests that, after the announcement, investors' expectations converge, and, as a consequence, volatility decreases.

Finally, we run a multivariate GARCH model to isolate the effect of the M&A announcement on the volatility of the acquirer and target stock of co-movements between two banks. The model results, at least on the events we study, indicate that even with joint estimates, the effects of the announcement of M&As on the volatility of targets and acquirers remain qualitatively the same.

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