

## Evaluation of the event study in the case of mergers and acquisitions

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**Abstract.** *The subject under analysis pertains to the research field of semi-strong informational efficiency, which is established when the autocorrelation coefficient of stock prices during the event period being analyzed is zero. This indicates that stock price fluctuations before and after the mergers and acquisitions (M&A) event occur randomly. If the release of new information regarding mergers and acquisitions is followed by abnormal returns before or after the M&A event, then semi-strong efficiency is not confirmed.*

*There is a notable movement in stock prices one day prior to the official announcement of mergers and acquisitions, followed by a significant reverse movement for several subsequent days. This fluctuation in returns, along with market movements, exceeds 11% over a 10-day period. The day of the event is considered to be the day when the Board of Directors' decision regarding the acquisition is made public.*

*Firstly, we highlighted the purpose of the event study, namely, to identify the „residuals” of returns between actual returns ( $R_{it}$ ) and expected returns during the period when M&A information was publicly disseminated. Furthermore, we reviewed elements of the literature that addressed event studies in general, with a focus on the impact of M&A on the capital market in particular. Subsequently, we outlined the research methodology and hypotheses, and the models used to identify return residuals.*

*For analyzing the impact of M&A on market reactions, we used the market model and the Capital Asset Pricing Model (CAPM). Our empirical study estimates the impact on the stock price of Transilvania Bank resulting from the acquisitions of Volksbank Romania and Bancpost. Finally, we analyzed the impact of the merger between the Bucharest Stock Exchange (BVB) and SIBEX Sibiu. This paper offers a thorough empirical analysis of the economic advantages received by shareholders of acquiring companies after mergers and acquisitions. Our research findings show that, in general, acquiring firms yield positive abnormal returns. This stands in contrast to much of the existing literature, which indicates that, on average, there are losses (although not always statistically significant) associated with merger and acquisition transactions in developed countries.*

**Keywords:** mergers and acquisitions, event study, semi-strong informational efficiency, abnormal returns, Market Model, Capital Asset Pricing Model (CAPM).

**JEL Classification:** G14.

## Introduction

To examine the semi-strong form of informational efficiency, we investigated the autocorrelation of stock prices before and after the public dissemination of information. Semi-strong efficiency is confirmed if the autocorrelation coefficient is zero, indicating that price movements occur randomly, with any fluctuations being driven by factors beyond historical trends and public disclosures.

The event studies uses the „residuals” method, comparing actual returns ( $R_{it}$ ) and expected returns ( $R_{it}^*$ ) during the period of public information dissemination:

$$\varepsilon_{it} = R_{it} - R_{it}^*,$$

$$\text{where } R_{it}^* = \alpha_i + \beta_i R_{Mt}$$

Where,

$\varepsilon_{it}$  = the „residual” profitability of the security, estimated at any given time, before and after the publication of the information.

$R_{it}$  = the actual profitability of the security at time  $t = 1, 2, \dots, T$  during the period when the information was disseminated.

$R_{it}^*$  = the discounted profitability of the security „t” according to the market model, based on the actual profitability of the market portfolio and the  $\beta_i$  and  $\alpha_i$  coefficients of the linear regression between  $R_{it}$  and  $R_{Mt}$  from the previous period.

The average of all „ $\varepsilon_{it}$ ” residuals before and after the information is made public, must statistically remain close to zero to prove that the financial market has semi-strong efficiency. These residuals ( $\varepsilon_{it}$ ) are considered abnormal profits compared to the expected profitability ( $R_{it}^*$ ) according to the market model or compared to the market profitability ( $R_{Mt}$ ). These abnormal returns are due to the integration of new information into the price, which has become accessible to the investing public.

Aligned with the semi-strong form of capital market efficiency, these abnormal returns are expected to emerge at the time „t” when new information is made public (regarding mergers/acquisitions, dividend rate, etc.). If the dissemination of new information at time „t” is associated with abnormal returns before or after time „t”, then the confirmation of semi-strong efficiency is undermined.

Event studies statistically examine whether new information known at time „t” leads to abnormal returns at the same time „t” ( $AR_t$ ) or at different times („t-1” or „t+1”):

$$AR_t = R_{it} - (\alpha_i + \beta_i R_{Mt}), \text{ or more simply, } AR_t = R_{it} - R_{Mt}$$

A more detailed examination is conducted by studying cumulative abnormal returns (CAR) for a selection of companies that have disclosed the same new information (such as the absence of dividend distribution). In line with the semi-strong efficiency, CAR should reveal a significant drop in stock prices at time zero or at time -1 from the announcement of the dividend non-distribution. This decline in stock prices validates that the negative news was entirely factored into the stock price, neither before nor after, but on the day of the announcement.

## Literature review

The relationship between the public disclosure of important information and market liquidity has been the focus of numerous researchers who have delved into this subject. Frost et al. (2006) demonstrated that the procedures for public announcement of significant information (represented by regulation, monitoring of their implementation) are directly related to market liquidity.

Haddad et al. (2009) studied the voluntary disclosure of significant information and the liquidity of public companies, reaching the conclusion that a high level of voluntary disclosure implies a reduction in the gap between supply and demand, significantly increasing market liquidity.

According to researcher Lakhal F. (2004), negative information tends to be more credible for investors compared to positive information. Furthermore, the disclosure of mergers and acquisitions enhances market liquidity. However, the varying impact of this information is notably emphasized by financial forecasts both preceding and following the official announcement. The author suggests that financial forecasts could potentially be manipulated and, therefore, should be viewed with less credibility by market participants.

Taking into consideration all the above mentioned scientific works, our goal was to assess the economic ramifications of acquisition and merger announcements, examining their effects both on individual investors in the market (micro level) and on the broader conditions of the capital market, particularly market liquidity (macro level). We observed that the operating profit's value significantly impacts investor behavior, and any failure to meet future performance commitments and target values results in various consequences. The impact of the event on the market is significant, considering that it directly influences market liquidity.

The announcement of mergers and acquisitions affects the regulated capital market. Studies in this area have focused on uncovering the effects brought about by such announcements.

**Table 1.** *Synthesis of the most important studies regarding the impact produced by the announcement of mergers and acquisitions*

Author	Year	Purpose	Methodology	Key points, results, conclusions
Cheung D.K.C. and Sami H.	2000	They examined how prices and trading volumes responded to announcements of mergers and acquisitions.	The Hong Kong market showed significant price fluctuations for both Blue Chip and Non-Blue Chip stocks, with corresponding effects on trading volumes.	The study revealed notable price and volume reactions for four days surrounding the annual announcements of mergers and acquisitions.
Ali A., Klasa S. and Zhen Li O.	2008	They tracked the correlations between the actions taken by institutional owners and the information provided to traders at the time of announcements of mergers and acquisitions.	They examined institutional investors holding varying proportions of shares in public companies: small, medium, and large investors. Small investors lack justification for fixed costs associated with providing private information, while large investors minimize all transactions around announcements of mergers and acquisitions.	Institutional investors holding medium-sized shares are most incentivized to gather private information during the pre-announcement period of mergers and acquisitions and to speculate based on such information.

Author	Year	Purpose	Methodology	Key points, results, conclusions
Francis J., Schipper K. and Vincent L.	2002	They studied the value of private information during the announcement period of mergers and acquisitions.	A positive relationship was found between absolute abnormal returns in two types of announcements: the dissemination of private information and official announcements.	The informative nature of announcements regarding mergers and acquisitions is diminished by competitive information presented in analytical reports.
Balakrishnan K., Bartov E. and Faurel L.	2010	They depicted the post-announcement trends of mergers and acquisitions, revealing the market's shortcomings in fully responding to public announcements.	The analysis conducted after forming the portfolio has distributed profitability across two portfolios: one formed from extreme losses and the other from extreme profits.	The anomaly of loss/profit is significantly influenced by adjustments in risk, insolvency risk, company size, short sale restrictions, and transaction costs.

**Source:** Source: Author's consolidation.

An important aspect in measuring the impact of mergers and acquisitions announcements is the correct selection of the analyzed window. According to the study conducted by Trueman B. Et al. (2003), there is a significant movement in stock prices one day before the actual announcement of mergers and acquisitions, followed by an aggressive reverse movement for several days. This evolution of returns, associated with market movements, exceeds 11% over a period of 10 days.

Ball R. and Kothari S. P. (1991) conducted a thorough analysis of stock returns during the announcement of mergers and acquisitions. They concluded that a period of 10 days before the announcement, 10 days after the announcement, and one day for the announcement itself (a total of 21 days) constitutes an optimal window for study.

Zhang Y. (2008) investigated how forecasts made by analysts respond to actual earnings announcements. The researcher suggests that these forecasts prompt the market to react more during the announcement stage than in the post-announcement stage. The study reveals that the most substantial change occurs within the first 10 days, accounting for up to 70%, with as much as 40% occurring on the first day alone, while the remaining 30% is spread out over the remainder of the analyzed quarter.

Researchers Lev B. and Zarowin P. (1999) take a critical stance towards the limitations of financial reporting. They argue that the usefulness of announcements regarding acquisitions, mergers, cash flows, and asset book values has declined over time. The authors highlight that current reporting methods fail to adequately capture innovation, competitiveness, and changes in operational flows or economic conditions. For instance, significant investments such as restructuring or research and development are initially recorded as expenses over multiple financial periods before eventually translating into tangible benefits. The authors suggest that the mergers and acquisitions process, reliant on periodic comparisons of company revenues and expenses, often inaccurately reflects the true state of the company. Ultimately, they conclude that changes in the business environment contribute to the weakening connection between market conditions and reported accounting values.

For conducting any event study, the following steps are mandatory<sup>(1)</sup>:

1. Defining the event: This stage involves identifying the event of interest and the time/period during which the effects of the event will be analyzed (the so-called event window). It is crucial to estimate an appropriate window to avoid omitting any significant effects.
2. Selecting criteria: The selection criteria must be clearly presented and justified. For instance, publicly traded companies from a specific industry can be selected. The characteristics of the firms must be measurable, such as market capitalization, industry representation, and the frequency of certain events. Additionally, the analysis periods must be identical for all representatives.
3. Quantifying normal and abnormal returns: The importance of the event is defined based on the magnitude of abnormal returns. Abnormal returns refer to the differences between actual returns and expected or normal returns (those expected to be attained in the absence of the event). Abnormal returns can be calculated using statistical or economic models. This paper will present both types of models, using one representative model from each class.
4. Estimation procedure: Referring to the period preceding the window analyzed in the event study is crucial to eliminate any potential influence stemming from the event itself.
5. Testing procedure: Abnormal returns can only be calculated after the normal returns model is determined. The testing framework of the model is developed by defining the null hypothesis and aggregating abnormal returns into alternative hypotheses. Determining the significance levels of the test is also essential.
6. Empirical results: At this stage, presenting the results and conducting a subsequent diagnosis are crucial aspects. It's important to conduct a preliminary assessment of the obtained results to ascertain if they can be generalized to the entire sample.
7. Interpretations and conclusions: The purpose of the conducted event study is to determine if the empirical results obtained contribute to explaining the effects on the capital market. Certain additional factors that could provide further explanations regarding the obtained results should also be mentioned at this stage.

The day of the event is considered the day of the publication of the Board of Directors' resolution regarding the acquisition.

## Research Methodology and Hypothesis Setting

### Established Hypotheses

- $H_0$ : There is no correlation between the announcement of mergers and acquisitions and the stock market price. Daily abnormal returns are close to zero during the acquisition announcement period.
- $H_1$ : Daily abnormal returns will be different from zero during the pre-acquisition announcement sub-period.
- $H_2$ : Daily abnormal returns will be different from zero during the acquisition announcement sub-period.
- $H_3$ : Daily abnormal returns will be different from zero during the post-acquisition announcement sub-period.

### Quantification of Normal And Abnormal Returns According to the Market Model

The calculation of abnormal returns specified in step three poses a real challenge for researchers in terms of quantifying abnormal returns. This subsection will address in detail the method of calculating abnormal returns based on the statistical model.

The typical hypothesis examined in the literature is that shareholders of acquiring firms involved in mergers and acquisitions activities do not experience excess returns. Therefore, our baseline methodology involves using the market model to determine the expected return of the acquiring firm's stock around the announcement date of the takeover:

$$R_{it} = \alpha_i + \beta_i R_{Mt} + \varepsilon_{it}$$

Where  $E[\varepsilon_{it}] = 0$ , and  $\text{var}[\varepsilon_{it}] = \sigma^2 \varepsilon_{it}$ ;  $t$  is the time index,  $i = 1, 2, \dots, N$  is the position of the stock,  $R_{it}$  and  $R_{Mt}$  are the returns of stock  $i$  and the market portfolio for period  $t$ , and  $\varepsilon_{it}$  is the residual term of the return of asset  $i$ . With the help of estimates  $\alpha_i$  and  $\beta_i$  from this equation, the "normal" return can be predicted for the analyzed period window. The prediction error (the difference between the actual return and the predictable "normal" return) is widely termed as abnormal return (AR)<sup>(2)</sup> and is calculated as follows:

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{Mt}$$

When calculating abnormal returns, great attention is given to formulating the null hypothesis correctly. The null hypothesis of the study represents the probability of the absence of economic effects associated with the event under consideration. Under the influence of this hypothesis, the mean and variance of abnormal returns will be determined.

To provide a general conclusion regarding the generation of abnormal returns in a specific event, the aggregation of abnormal returns into a single calculation operation is practiced. Thus, the aggregated abnormal returns ( $AAR_t$ )<sup>(3)</sup> on day  $t$  represent the summed value of abnormal returns, where  $N$  is the number of companies in the analyzed sample, and are calculated as follows:

$$AAR_t = \frac{1}{N} \sum_{i=1}^N AR_{it}$$

Cumulating daily abnormal returns for the entire period of the analyzed event ( $T_2 - T_1$ ) shows us the intensity of the impact produced by the studied event and is quantified with the help of the index ( $CAR_i(T_1, T_2)$ )<sup>(4)</sup> for company  $i$  in the period ( $T_2 - T_1$ ):

$$CAR_i(T_1, T_2) = \sum_{t=T_1}^{T_2} AR_{it}$$

Aggregating the  $CAR_i$  variables can also be done at the level of period and event, also named aggregate cumulative abnormal returns (ACAR). In such a scenario, the cumulative abnormal return is defined as follows<sup>(5)</sup>:

$$ACAR(T_1, T_2) = \frac{1}{N} \sum_{i=1}^N CAR_i(T_1, T_2)$$

Now, the central question here is whether all AAR and/or ACAR at a certain date are significantly different from zero statistically. In order to establish the statistical significance of the variables, the robust t-statistic test and the Wilcoxon z-statistic test are applied. The t-statistic test value must be significantly different from zero and is calculated as follows:

$$t = \frac{AAR_{it}}{[Var(AAR_{it})]^{1/2}}$$

The Wilcoxon z-statistic test is an alternative to the t-statistic test. It is a non-parametric test that compares sets of data by calculating the differences between each set. The test also performs an analysis of these differences. In this way, the Wilcoxon z-statistic test attempts to detect abnormal changes/fluctuations in the compared data.

The market model is part of a group of models that, throughout its existence, has endured a significant number of harsh criticisms. However, it has withstood all challenges and is still used to estimate normal returns in event studies. The primary criticisms focus on its effectiveness in a stable and predictable market environment.

For analyzing the impact of an event on market reaction, the Capital Asset Pricing Model (CAPM) can be used. However, there is a probability that the results obtained from CAPM could be influenced by the model's restrictions. Given that these deviations can be eliminated by using the market model, the use of CAPM has become increasingly rare for such studies.

In the study we conducted, the parameters of the market model as well as the CAPM model are determined for each company over a period of up to 230 trading days on the stock exchange prior to the event window, which represents approximately one year before the announcement of the acquisition. The event window was set for a period covering 20 days before the announcement, +1 day of announcement, +60 days thereafter.

Our study estimates the impact on the stock price of Transilvania Bank from the acquisitions:

- Volksbank Romania, on December 10, 2014;
- Bancpost, on December 31, 2018.

Subsequently, we will analyze the impact of the absorption merger of BVB with SIBEX Sibiu.

### **The Acquisition of Volksbank Approved on December 10, 2014**

We tracked the stock prices over a period of two years (01.01.2014 – 31.12.2015), during which the acquisition event of Volksbank by Transilvania Bank (TLV) occurred (10th of December 2014). The monitoring window for the impact of the acquisition was set at a pre-announcement window of 20 days + 1 announcement day + 60 post-announcement days.

Market model:  $R_{it} = \alpha_i + \beta_i \times R_{Mt} + \varepsilon_{it}$

For estimating the expected returns through the market model in the chosen window, we estimated the alpha coefficient (=0.0007) and the beta coefficient (= 0.6284) over a period preceding the acquisition (01.01. – 10.12.2014), and can be seen in table 2.

**Table 2.** *The selected window for estimating expected returns through the market model*

Date	TLV %	BET%	
Jan 03, 2014	-0.51%	-0.41%	<b>alpha</b>
Jan 06, 2014	-1.88%	0.64%	<b>0.0007</b>
Jan 07, 2014	1.22%	0.77%	
...			<b>beta</b>
Dec 29, 2015	-1.62%	-0.29%	<b>0.6284</b>
Dec 30, 2015	0.87%	0.34%	

**Source:** Author's calculations.

The calculation of abnormal returns (AR), listed in table 3, as well as cumulative abnormal returns (CAR), was performed for each day within the chosen window.

**Table 3.** *Calculating AR and CAR for the market model*

Date	Day	AR	CAR
Nov 11, 2014	-20	-2.59%	-2.59%
Nov 12, 2014	-19	0.24%	-2.35%
...			
Dec 09, 2014	-1	-0.85%	-4.71%
Dec 10, 2014	0	2.03%	-2.68%
Dec 11, 2014	1	-2.45%	-5.13%
...			
Mar 11, 2015	59	-0.91%	11.23%
Mar 12, 2015	60	1.45%	12.67%

**Source:** Author's calculations.

The evolution of AR and CAR is illustrated in figure 1, which also indicates the days where CAR is statistically insignificant (the interval between day 16 and day 30, post-announcement, with p-values > 5%):

**Figure 1.** *The evolution of AR and CAR in the market model*

**Source:** Author's computation.

According to the market model, the acquisition of Volksbank generated significant decreases (with a p-value of 1%) in the TLV stock price during the pre-announcement, announcement, and post-announcement phases until the 7th day. From the 7th day onwards, significant benefits are recorded, statistically speaking (with a p-value < 1%), for the acquiring bank (TLV) up to the 15th day.



$$\text{CAPM Model: } R_{it} = R_{ft} + (E_{Mt} - R_{ft}) \times \beta$$

For estimating the expected returns through the CAPM model, table 4, in the chosen window, we estimated the beta coefficient ( $= 0.6284$ ), as well as the evolution of the returns of the entire Romanian stock market (the variation of the BET index) during the period prior to the acquisition (01.01. - 10.12.2014).

**Table 4.** The chosen window for estimating expected returns through the CAPM model

Date	TLV %	BET%	R <sub>f</sub>	beta
Jan 03, 2014	-0.51%	-0.41%	5.27%	<b>0.6284</b>
Jan 06, 2014	-1.88%	0.64%	5.27%	
Jan 07, 2014	1.22%	0.77%	5.24%	
...				
Dec 29, 2015	-1.62%	-0.29%	3.70%	
Dec 30, 2015	0.87%	0.34%	3.70%	

**Source:** Author's calculations.

We proceeded, in table 5, to calculate the abnormal returns (AR), as well as the cumulative abnormal returns (CAR) in relation to the expected returns according to the CAPM, for each day within the selected window:

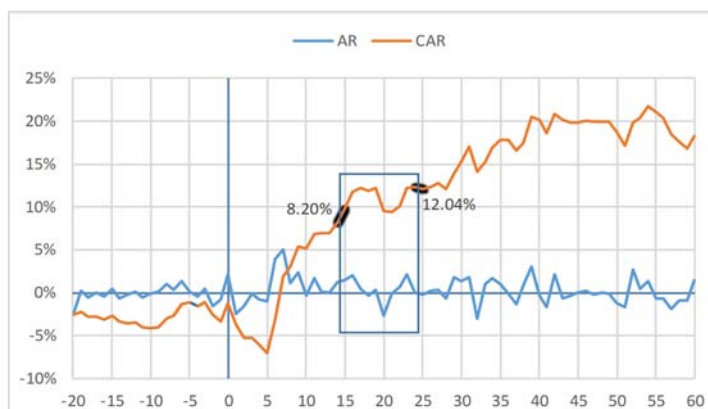
**Table 5.** The calculation of AR and CAR relative to expected returns according to the CAPM

Date	Day	AR	CAR
Nov 11, 2014	-20	-2.52%	-2.52%
Nov 12, 2014	-19	0.31%	-2.21%
...			
Dec 09, 2014	-1	-0.78%	-3.35%
Dec 10, 2014	0	2.10%	-1.24%
Dec 09, 2014	-1	-0.78%	-3.35%
...			
Mar 11, 2015	59	-0.84%	16.75%
Mar 12, 2015	60	1.52%	18.27%

**Source:** Author's calculations.

The evolution of AR and CAR is illustrated in figure 2 below, and indicates the days when CAR is not statistically significant (the interval between day 14 and day 25, post-announcement, with p-value  $> 5\%$ ):

**Figure 2.** The evolution AR and CAR in the CAPM model



**Source:** Author's computation.

According to the CAPM model, the acquisition of Volksbank resulted in significant reductions, with a statistical p-value < 1%, in the TLV stock price during the pre-announcement, announcement, and post-announcement phases until the 13th day. Significant benefits (p-value < 1%) for the acquiring bank (TLV) are recorded only from the 29th day to the 60th day. These benefits may also be generated by the announcement of preliminary mergers and acquisitions in preparation for the TLV's AGM.

### The Acquisition of Bancpost Approved on December 31, 2018

We tracked the stock price movements over a period of two years (01.01.2018 - 31.12.2019), during which the acquisition event of Bancpost by Banca Transilvania (on December 31, 2018) occurred. The monitoring window for the impact of the acquisition was chosen to be the same pre-announcement window of 20 days + 1 announcement day + 60 post-announcement days.

Market Model:  $R_{it} = \alpha_i + \beta_i \times R_{Mt} + \varepsilon_{it}$

To estimate the expected returns through the market model within the chosen window, we estimated the alpha coefficient (=0.0005) and the beta coefficient (= 1.4234) over a period preceding the acquisition, (02.01.18 - 28.12.18), as it can be observed in table 6 below.

**Table 6.** The chosen window for estimating expected returns through the market model

Date	TLV %	BET%	
Jan 03, 2018	2.11%	2.03%	alpha
Jan 04, 2018	-0.20%	0.69%	0.0005
Jan 05, 2018	-0.47%	0.25%	
...			beta
Dec 27, 2019	0.19%	0.71%	1.4234
Dec 30, 2019	0.19%	0.29%	

Source: Author's calculations.

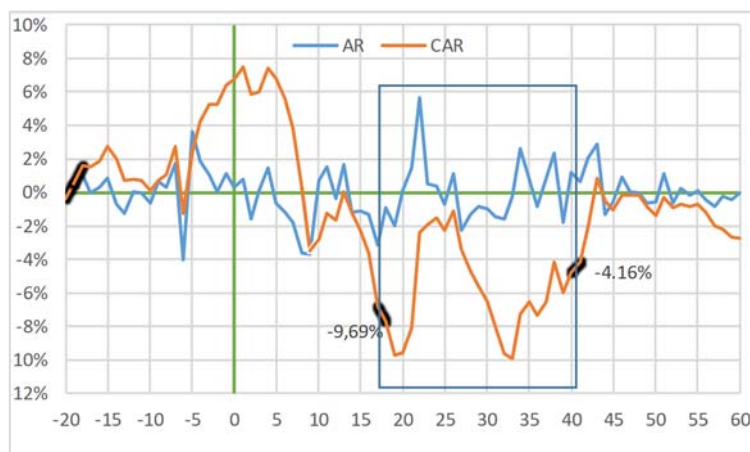
The calculation of abnormal returns (AR), as well as cumulative abnormal returns (CAR), was performed for each day within the chosen window, as seen in table 7 below.

**Table 7.** Calculation AR and CAR through the market model

Date	Day	AR	CAR
Nov 28, 2018	-20	-0.34%	-0.34%
Nov 29, 2018	-19	0.87%	0.52%
...			
Dec 28, 2018	-1	1.13%	6.42%
Dec 31, 2018	0	0.30%	6.72%
Jan 03, 2019	1	0.75%	7.46%
...			
Mar 27, 2019	59	-0.47%	-2.70%
Mar 28, 2019	60	-0.03%	-2.72%

Source: Author's calculations.

The evolution of AR and CAR is illustrated in figure 3, which also shows the days where CAR is not statistically significant (the interval between day 19 and day 41, post-announcement, which have a p-value > 5%).

**Figure 3.** The evolution of AR and CAR with the acquisition of BANCPOST (market model)

**Source:** Author's computation.

According to the market model, the acquisition of Bancpost generated significant benefits, statistically with a  $p$ -value  $< 1\%$ , for the acquiring bank (TLV) both in the pre-announcement phase, at the announcement, and in the post-announcement period up to the 8th day. From January 9th to 17th, 2019, TLV recorded significant reductions, statistically with a  $p$ -value  $< 1\%$ , in stock market profitability, reductions that can also be generated by the January effect.

$$\text{CAPM Model: } R_{it} = R_{ft} + (E_{Mt} - R_{ft}) \times \beta$$

To estimate expected returns through the CAPM model, in the selected window, we estimated in table 8, the beta coefficient ( $= 0.6284$ ) as well as the evolution of the overall Romanian stock market profitability (the variation of the BET index) for the period before the acquisition (January 1st, 2018 – December 28th, 2018).

**Table 8.** The selected window for estimating expected returns through CAPM

Date	TLV %	BET%	R <sub>i</sub>	
Jan 03, 2018	2.11%	2.03%	4.32%	<b>beta</b> <b>1.4234</b>
Jan 04, 2018	-0.20%	0.69%	4.31%	
Jan 05, 2018	-0.47%	0.25%	4.28%	
...				
Dec 27, 2019	0.19%	0.71%	4.44%	
Dec 30, 2019	0.19%	0.29%	4.44%	

**Source:** Author's calculations.

We also proceeded to calculate abnormal returns (AR), as well as cumulative abnormal returns (CAR), in relation to expected returns according to CAPM, for each day within the selected window, as it can be seen in table 9 below.

**Table 9.** Calculation of AR and CAR through CAPM

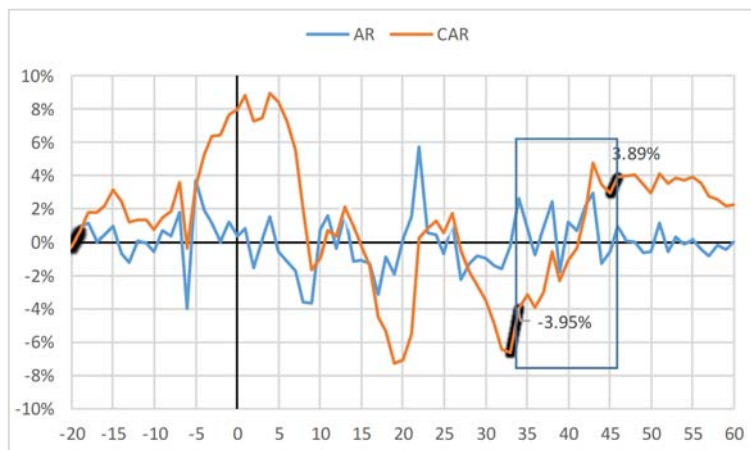
Date	Day	AR	CAR
Nov 28, 2018	-20	-0.28%	-0.28%
Nov 29, 2018	-19	0.93%	0.64%
...			
Dec 28, 2018	-1	1.19%	7.64%

Date	Day	AR	CAR
Dec 31, 2018	0	0.36%	8.00%
Jan 03, 2019	1	0.81%	8.81%
...			
Mar 27, 2019	59	-0.40%	2.19%
Mar 28, 2019	60	0.03%	2.22%

Source: Author's calculations.

The evolution of AR and CAR is illustrated in figure 4, which also shows the days when CAR is not statistically significant (the interval between day 34 and day 46, post-announcement, with p-value > 5%).

**Figure 4.** The evolution of AR și CAR with the acquisition of BANCPOST (CAPM model)



Source: Author's computation.

Similar to the results of the market model, the results of the CAPM model show that the acquisition of Bancpost generated significant benefits, with a statistical p-value of 1%, for the acquiring bank (TLV) both in the pre-announcement phase, during the announcement, and in the post-announcement period until the 8th day. With small exceptions (January 11th - 14th and January 22nd - 26th, 2019), TLV recorded significant reductions (p-value < 1%) in stock market returns, reductions that could also be influenced by the January effect.

#### **The Merger by Absorption between the Bucharest Stock Exchange and SIBEX - Sibiu Stock Exchange S.A. Approved by the ASF Board on May 23, 2017.**

We monitored the movement of stock prices for a span of 80 days (May 24, 2017 - August 21, 2017), coinciding with the merger of SIBEX Stock Exchange with the Bucharest Stock Exchange on May 23, 2017. The monitoring window for assessing the impact of the merger was chosen to include a pre-announcement period of 20 days, the announcement day, and 60 post-announcement days.

Market Model:  $R_{it} = \alpha_i + \beta_i \times R_{Mt} + \varepsilon_{it}$

To estimate the expected returns using the market model within the selected window, we estimated the alpha coefficient (= 0.0001) and the beta coefficient (= 1.5413) over the 80-day period (table 10).

**Table 10.** *The chosen window for estimating expected returns through the market model (BVB & SIBEX merger)*

Date	BVB %	BET%	
Apr 24, 2017	1.13%	0.48%	<b>alpha</b>
Apr 25, 2017	1.05%	1.22%	
Apr 26, 2017	1.60%	0.30%	
...			<b>beta</b>
Aug 18, 2017	0.23%	1.07%	
Aug 21, 2017	1.78%	1.05%	

**Source:** Author's calculations.

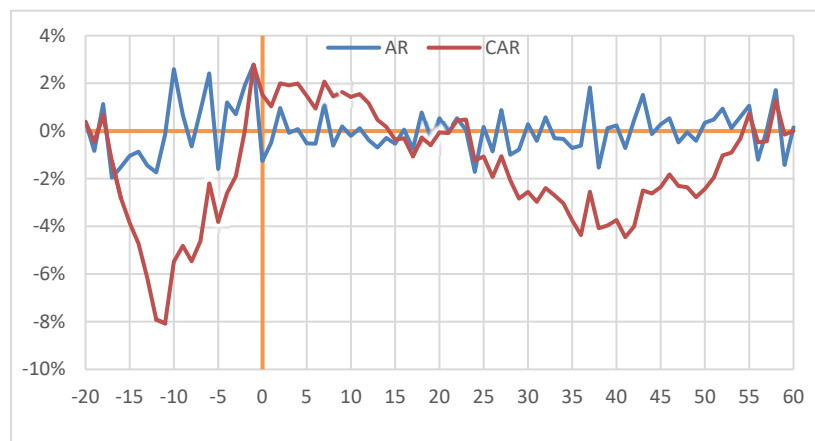
The calculation of abnormal returns (AR), as well as cumulative abnormal returns (CAR), was performed for each day within the selected window (table 11).

**Table 11.** *Calculation of AR and CAR through the market model (BVB & SIBEX merger)*

Date	Day	AR	CAR
Apr 24, 2017	-20	0.38%	0.38%
Apr 25, 2017	-19	-0.84%	-0.46%
...			
May 22, 2017	-1	2.78%	2.78%
May 23, 2017	0	-1.26%	1.52%
May 24, 2017	1	-0.49%	1.03%
...			
Aug 18, 2017	59	-1.43%	-0.15%
Aug 21, 2017	60	0.15%	0.00%

**Source:** Author's calculations.

The evolution of AR and CAR is illustrated in graph number [insert number], which also shows the days when CAR is statistically insignificant (the interval between day -19, -17, and -16, and day 30, pre-announcement, with a p-value > 5%)<sup>(6)</sup>:

**Figure 5.** *The evolution of AR and CAR estimated through the market model*

**Source:** Author's computation.

According to the market model, the BVB-SIBEX merger resulted in significant decreases (with a p-value of 1%) in the BV stock price during the pre-announcement phase, from day -16 to day -3, followed by significant increases from day -1 to day 9 in the post-

announcement phase. In other words, the BVB-SIBEX merger recorded significant benefits from day -13 to day 9 (table 12 below).

**Table 12.** Significant decreases/increases (p-value of 1%) in the stock price of BVB through the market model

-13	-1.45%	-6.18%	-2.757	=> significant with 1%
-12	-1.74%	-7.91%	-3.085	=> significant with 1%
-11	-0.16%	-8.08%	-3.495	=> significant with 1%
-10	2.59%	-5.48%	-3.976	=> significant with 1%
-9	0.66%	-4.82%	-4.429	=> significant with 1%
-8	-0.65%	-5.47%	-4.904	=> significant with 1%
-7	0.85%	-4.62%	-5.342	=> significant with 1%
-6	2.41%	-2.21%	-5.488	=> significant with 1%
-5	-1.60%	-3.81%	-5.855	=> significant with 1%
-4	1.20%	-2.61%	-6.070	=> significant with 1%
-3	0.70%	-1.91%	-6.165	=> significant with 1%
-2	1.91%	0.00%	-5.849	=> significant with 1%
-1	2.78%	2.78%	-4.920	=> significant with 1%
0	-1.26%	1.52%	-4.521	=> significant with 1%
1	-0.49%	1.03%	-4.274	=> significant with 1%
2	0.96%	1.99%	-3.924	=> significant with 1%
3	-0.08%	1.91%	-3.640	=> significant with 1%
4	0.08%	1.99%	-3.385	=> significant with 1%
5	-0.52%	1.47%	-3.213	=> significant with 1%
6	-0.54%	0.93%	-3.108	=> significant with 1%
7	1.13%	2.07%	-2.904	=> significant with 1%
8	-0.62%	1.45%	-2.771	=> significant with 1%
9	0.19%	1.64%	-2.631	=> significant with 1%

Source: Author's calculations

According to the market model, the significant benefits of the merger (within the window -2; 2) indicate that the impact of this event was mainly observed after the approval by the ASF Board (within the window -1; 9).

CAPM Model:  $R_{it} = R_{ft} + (E_{Mt} - R_{ft}) \times \beta$

For estimating expected returns using the CAPM model, in the chosen window, we estimated in table 13, the beta coefficient (= 1.5413) as well as the evolution of the overall Romanian stock market returns (variation of the BET index) during the 80-day period prior to the analyzed acquisition.

**Table 13.** Estimation of expected returns through the CAPM model for BVB and BET

Date	BVB %	BET%		
Apr 24, 2017	1.13%	0.48%		
Apr 25, 2017	1.05%	1.22%		
Apr 26, 2017	1.60%	0.30%		<b>beta</b>
...				<b>1.5413</b>
Aug 18, 2017	0.23%	1.07%		
Aug 21, 2017	1.78%	1.05%		

Source: Author's calculations

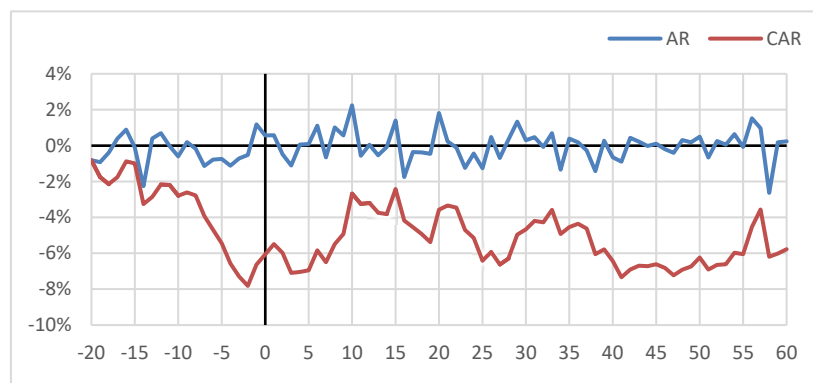
We proceeded in table 14 to calculate abnormal returns (AR), as well as cumulative abnormal returns (CAR), in relation to expected returns according to the CAPM, for each day within the chosen window.

The evolution of AR and CAR is illustrated in figure 6, which also presents the days when CAR is statistically insignificant (the interval between day 14 and day 25, post-announcement, with p-value > 5%).

**Table 14.** Calculation of AR and CAR in relation to the expected returns according to CAPM

Date	Day	AR	CAR
Apr 24, 2017	-20	0.39%	0.39%
Apr 25, 2017	-19	-1.62%	-1.23%
...			
May 22, 2017	-1	4.18%	5.51%
May 23, 2017	0	0.18%	5.70%
May 24, 2017	1	-1.04%	4.65%
...			
Aug 18, 2017	59	-1.73%	7.45%
Aug 21, 2017	60	-0.43%	7.02%

Source: Author's calculations.

**Figure 6.** Evolution of AR and CAR

According to the CAPM model, the BVB-SIBEX merger has generated significant decreases (with  $p$ -values  $< 1\%$  and  $< 5\%$ ), in the BVB stock price during the pre-announcement phase from day -16, announcement until day -3, followed by significant increases until day 2, the post-announcement phase. These benefits could also be generated by the announcement of preliminary mergers and acquisitions in preparation for the merger decision.

**Table 15.** Significant decreases/increases ( $p$ -value of 1%) in the stock price of BVB (CAPM model)

-16	-1.51%	-3.55%	-2.067	=> significant with 5%
-15	-1.04%	-4.58%	-2.553	=> significant with 5%
-14	-0.86%	-5.44%	-3.022	=> significant with 1%
-13	-1.44%	-6.88%	-3.387	=> significant with 1%
-12	-0.93%	-7.81%	-3.759	=> significant with 1%
-11	-0.15%	-7.96%	-4.198	=> significant with 1%
-10	3.69%	-4.27%	-4.652	=> significant with 1%
-9	-0.13%	-4.40%	-5.117	=> significant with 1%
-8	-0.10%	-4.49%	-5.590	=> significant with 1%
-7	1.14%	-3.36%	-5.935	=> significant with 1%
-6	2.16%	-1.20%	-5.828	=> significant with 1%
-5	-1.59%	-2.78%	-6.082	=> significant with 1%
-4	1.21%	-1.58%	-6.106	=> significant with 1%
-3	0.99%	-0.59%	-5.917	=> significant with 1%
-2	1.92%	1.33%	-5.291	=> significant with 1%
-1	4.18%	5.51%	-3.864	=> significant with 1%
0	0.18%	5.70%	-2.998	=> significant with 1%
1	-1.04%	4.65%	-2.507	=> significant with 5%
2	2.73%	7.38%	-1.859	=> significant with 5%

Source: Author's calculations.

Based on the CAPM model, the substantial advantages resulting from the merger, observed both prior to and following approval by the ASF Board (within the window of -2 to 2), underscore the pronounced impact of this event, particularly surrounding the merger decision.

## Conclusions

Proving semi-strong informational efficiency requires a zero autocorrelation coefficient, signaling random price movements. However, if the introduction of new information at time "t" yields abnormal returns before or after this point, it contradicts semi-strong efficiency.

Our focus has been on identifying the economic ramifications of acquisition and merger announcements, spanning both micro and macro levels. At the micro level, these announcements affect market investors, while at the macro level, they influence overall market conditions and liquidity. The public disclosure of such events impacts the regulated capital market, and scientific inquiries have concentrated on elucidating the repercussions of acquisition and merger announcements.

There is a significant movement in stock prices one day before the actual announcement of mergers and acquisitions, followed by aggressive reversals for several days. This return pattern, coupled with market movements, exceeds 11% over a 10-day period. The day of the event is considered to be the day of the publication of the Board of Directors' decision regarding the acquisition.

For analyzing the market's reaction to an event, we predominantly used the market model as well as the Capital Asset Pricing Model (CAPM). Our study estimates the impact on the stock price of Banca Transilvania due to the acquisitions of Volksbank Romania and Bancpost. Lastly, we analyzed the impact of the merger between BVB and SIBEX Sibiu.

This paper offers an in-depth empirical examination of the economic advantages gained by shareholders of acquiring firms through their involvement in merger and acquisition endeavors. Our empirical findings regarding the returns acquired by these firms suggest that, overall, acquirers experience positive abnormal returns. This stands in contrast to much of the existing literature, which indicates that, on average, acquiring firms in developed countries tend to incur losses, although not always statistically significant ones.

## Notes

- (1) These steps are very well described in the book by Seiler, M. J. (2004), "Performing Financial Studies: A Methodological Cookbook", published by Prentice Hall in Upper Saddle River, NJ.
- (2) AR – Abnormal Return
- (3) AAR – Aggregate Abnormal Return
- (4) CAR – Cumulative Abnormal Returns
- (5) ACAR – Aggregate Cumulative Abnormal Return
- (6) Rules for two-tailed t-stat:  
 If the t-stat is between -1.64 and 1.64, then the t-stat is insignificant.  
 If the t-stat is  $< -1.64$  or  $> 1.64$ , then the t-stat is significant at 10%.  
 If the t-stat is  $< -1.96$  or  $> 1.96$ , then the t-stat is significant at 5%.  
 If the t-stat is  $< -2.58$  or  $> 2.58$ , then the t-stat is significant at 1%.



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