An empirical study of abnormal return on stock and operating performance as a result of acquisition in banking industry
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1. Introduction

The phrase mergers and acquisitions (abbreviated M&A) refers to the aspect of corporate strategy, corporate finance and management dealing with the buying, selling and combining of different companies that can aid, finance or help a growing company in a given industry grow rapidly without having to create another business entity. Mergers occur when an acquiring firm and a target firm agree to combine under legal procedures established in the states in which the merger participants are incorporated. A tender offer is an offer to purchase a proportion of the outstanding shares of the target firm at specified terms on or before a specified date. Those shareholders not tendering their shares retain an ownership interest in the firm. The term "acquisition" is used in a generic sense to refer to any takeover.

Mergers and acquisitions in banking sector have become familiar in the majority of all the countries in the world. A large number of international and domestic banks all over the world are engaged in merger and acquisition activities. A significant amount of attention is placed on deals in banking industry, which is huge by its weight in world economics (40 largest banks in the world had 52, 5 trillion USD in assets as of 2010, while world GDP is estimated to be 61, 9 trillion USD) and appears to have broad effect on various economical subjects as a result of merger or acquisition. One of the principal objectives behind the mergers and acquisitions in the banking sector is to reap the benefits of economies of scale. With the help of mergers and acquisitions in the banking sector, the banks can achieve significant growth in their operations and exploitation of potential cost, product differentiation and revenue synergies from merging. Another important advantage behind this kind of merger is that in this process, competition is reduced because merger eliminates competitors from the banking industry.

During the last two decades, forces of change such as globalization, improved financial conditions, excess capacity and technological development have fundamentally transformed banking markets, which have become increasingly integrated in recent years. Rapid progress within the information technology field, together with deregulation of financial markets, has opened the door for bank mergers and acquisitions in different countries. However, the most active markets for M&A’s traditionally are US and European
Union. With regards to EU, legislative environment has become more conducive to more successful M&A’s, as there have been important drivers of change in the political, social and economic environment within the EU, which have been significant in underpinning the integration of the European’s banking system. Such changes include the completion of the European Single Market, the enlargement of the EU to 27 member states, the establishment of the Euro and the establishment of the Financial Services Act Plan. Other changes, based on the Basel Accords, have also taken place in the global regulatory framework and these have been significant in decisions relating to bank consolidation in and across countries. Since 1980 US Congress consistently implemented deregulation politics regarding finance industry passing several crucial acts like Monetary Control Act, Garn–St. Germain Depository Institutions Act, Riegle-Neal Interstate Banking and Branching Efficiency Act, Gramm–Leach–Bliley Act. Additionally, In US, firms have gone away from traditional “Greenfield” investments in the 1990s and early 2000s, which led to a tremendous increase in the volume of cross-border mergers and acquisitions (M&As) by US firms. It is also due to the growth in international financial markets, which has allowed firms to pursue investment opportunities both at home and abroad.

When a merger is announced, it may cause abnormal stock price jumps for both the acquirer and target at or around the date of the announcement. However, most of the researches give evidence that return to shareholder of bidder’s enterprise has no effect or even negative during the announcement period, despite the fact that main incentive for M&A is to create value.

There are only few papers that explore abnormal performance in the global banking industry, with relation to acquirer’s pre-merger activity and financial state. The majority of studies on acquisitions within banking industry have concentrated on the analysis of the deals in a specific country or market (like EU or North America). Previously, regulation had significantly narrowed possibilities of presenting results that could be considered relevant to the global banking sector. It should be noted that in effort to deal with aftermath of the former financial crisis, regulations have been substantially tightened both in EU and North America, making these two markets comparable.

Another motivation of this study is that M&A that take place between two banks are qualitatively different from the same operation between a bank and non-financial entity,
because in the latter the entity acquiring non-banking institutions will get presence in different sectors of the financial industry. However, acquisition of financial entity by another bank allows the companies to introduce themselves, efficiently and swiftly into new markets and to establish new product lines basically searching for scope economies.

1.1. Problem statement

This study will analyze both domestic and cross-border transactions in banking industry for 5 consecutive years from December 2005 to December 2010. The paper will examine if there is abnormal return on stock of an acquirer at announcement period and whether or not company’s pre-merger financial state has significant impact on the result of a deal. Considering the above, the following research questions are raised:

- Is there any abnormal return for the shareholder of the acquirer at announcement period?
- Do bidders tend to acquire targets with high return on equity, return on assets and total assets growth?
- Is market reaction significantly influenced by pre-merger performance of the two involved parties, with return on assets being the primary comparison criteria?
- Do acquirers experience any short-term gain or loss after acquisition is announced, with respect to net interest margin, return on equity, return on assets, solvency ratio and asset quality?

The main purpose of this thesis is to test for abnormal performance from both stock and accounting figures’ perspective, which leads to a deeper insight into acquisition and its consequences to the acquirer. Presented in the above combination, this approach aims to provide reliable evidence of whether or not acquirers gain value in world banking sector.

1.2. Definitions and clarifications

In this thesis clarification of “merger” and “acquisition” is presented, whereas the research itself is conducted with regards to acquisitions only. Apart from that, no specific definitions are made, as the glossaries used in this research are in line with the ones in existing research in the area.
1.3. Delimitations

Several delimitations have been set mainly to the scope of the sample. The research includes the latest deals, announced between 12/2005 and 12/2010, in order to obtain topical data and results that can be attributed to recent trends in merger and acquisition markets. Furthermore, the primary focus is on the deals that result in gaining control over the firm, hence we include acquisitions where bidder gets majority ownership, i.e., 50% + 1 share of the total stake or more. The current status of the deal should be “completed”, in order to be included in the final sample.

To ensure availability of data and exclude small deals that do not cause significant reaction of the market, we limited the sample with a deal value constraint of 50 million EUR. Additionally, a number of deals had to be dropped out due to insufficient or absent financial data of either acquirer or target.

Due to time and database constraints, analysis is performed, based on the following performance indicators: bidder’s net interest margin, return on average assets, return on average equity, capital ratio, asset quality ratio, solvency ratio and target’s asset growth and return on average equity.

1.4. Evaluation of sources

The sources that this thesis refers to are mainly event studies and research papers, which provide comprehensive and reliable recommendations and form a theoretical base that is used in our event study. We looked into different approaches and have taken the most suitable tests for the specification of our data sample. This allows us to construct a well-balanced and structured study, which contributes to the existing researches in this area.

A part of this thesis, mainly a theoretical, is based on academic papers and study books, for the reason of quoting correct mathematical formulas and ensuring its correct adaptation to our sample.
2. Literature review

2.1. Mergers and acquisitions activity in recent years

There are two clear-cut trends in global mergers and acquisitions market during our research period. The gradual increase both in number of deals and total deal value up until 2007 could be extensively explained by continuing globalization, stock market boom and deregulation in both EU and US. In support of this economists reported the increasing tendency towards cross-border mergers and acquisitions, which indicates that the importance of possible obstacles such as bureaucratic complications or different regulations has declined over the past few years. Thus, a higher number of transactions signal an increased degree of integration of the banking markets. Particularly, retail-banking markets appeared to be more integrated, since the most effective way to gain access to foreign banking markets seem to remain the merger with or the acquisition of an existing local bank.

The explanation to this merger and acquisition trend as observed in 2006 and 2007 also lay in the robust growth recorded by the Private Equity Funds. The other factors propelling this trend were the emphasis on short term earnings growth and the strict regulatory structure of public sector enterprises.

*Figure 2.1.1: Global deals by volume and value*

![Graph showing global deals by volume and value from 2005 to 2010](image)

*Source: CD appendix and Zephyr published by BvD (2010)*
The above tendency came to an end with the burst of the stock market bubble. S&P 500 index reached the highest level in October, 2007 (1549.38) and already in the second half of 2007 the dynamics of both stock and merger and acquisition market changed direction.

*Figure 2.1.2: S&P500 Index Close Prices*

Source: CD appendix and Yahoo! Finance (2010)

Global mergers and acquisitions activity reached the lowest level since the onset of the financial crisis in the first half of 2010, and total deal value of USD 1,478 billion was the weakest result since 2004. Deal value declined for the third successive period, with 17 per cent of total value wiped away in the six months from the second half of 2009 and 26 per cent since the first half of 2009. Volume rescinded at a similar rate over the six months from the same period of 2009. Compared with the M&A peak in 2007, the result of the last six months of 2010 represents a decline of a quarter by volume and 53 per cent by value. The picture below graphically presents steady decrease in M&A deals over the last 5 years. It should be pointed out that tendencies in merger and acquisition market in banking industry go in line with what global M&A market displays.
2.2. Overview of efficient market hypothesis

Significant part of this paper is based on challenging conditions of efficient market hypothesis, in terms of detecting abnormal return on stock as a result of announcement of acquisition. A generation ago, the efficient market hypothesis was widely accepted by financial economists; for example, see Eugene Fama’s (1970) influential survey article, —Efficient Capital Markets. It was generally believed that securities markets were extremely efficient in reflecting information about individual stocks and about the stock market as a whole.

The efficient market hypothesis is associated with the idea of a random walk, which is a term loosely used in the finance literature to characterize a price series where all subsequent price changes represent random departures from previous prices. The logic of the random walk idea is that if the flow of information is unimpeded and information is immediately reflected in stock prices, then tomorrow’s price change will reflect only tomorrow’s news and will be independent of the price changes today. But news is by definition unpredictable and, thus, resulting price changes must be unpredictable and random. (Burton G. Malkiel, 2003).

EMH states it is impossible to "beat the market" because stock market efficiency causes existing share prices to always incorporate and reflect all relevant information. According to the EMH, stocks always trade at their fair value on stock exchanges, making it
impossible for investors to either purchase undervalued stocks or sell stocks for inflated 
prices. As such, it should be impossible to outperform the overall market through expert 
stock selection or market timing, and that the only way an investor can possibly obtain 
higher returns is by purchasing riskier investments. (Investopedia, n.d.). There are three 
types of efficiency:

- Weak form efficiency – prices already reflect all past publicly available information.
- Semi-strong form efficiency – prices reflect all publicly available information and prices instantly change to reflect new public information.
- Strong form efficiency – additionally claims that prices instantly reflect even hidden or "insider" information.

In “International Mergers and acquisitions: A jump diffusion model application” (2004) by Kilic and Osman conclude that announcement of acquisition is perceived as a shock by the market, but prices seem to adjust rather rapidly, supporting the semi-strong form of the efficient market hypothesis. In this paper we tested semi-strong form of the EMH as well, assuming that there are no significant deviations and limitations in acquiring new public information in different markets.

There is a substantial amount of literature and empirical evidence both in support and critique of efficient market hypothesis. For example, von Gensdoff and Bacon in their event study “US mergers and acquisitions: A test of market efficiency” analyze the effects of U.S. company mergers and acquisition announcements on stock price’s risk adjusted rate of return using twenty recent mergers. The findings show that there definitely is an action in the stock price around Day 0, but the analysis displays that the merger may not be significant in determining the reason for the particular action. The Semi-Strong Efficiency theory begins to show signs in 30 days after the announcement only.

On the other hand the findings of the research “Abnormal returns to Mergers and Acquisitions in Ten Asian stock market”, conducted by Ma, Pagan and Yun Chu (2009), confirm that the stock markets have expected positive cumulative abnormal returns. These findings are not in line with conclusions of most US studies, which indicate that the abnormal returns were either negative or neutral (for example, Hackbarth & Morellec, 2008).
The Franks, Broyles and Hecht (1977) study offered evidence on the profitability of mergers of quoted companies within the Breweries and Distilleries sector in the United Kingdom for the period 1955 - 72 as well as reviewing the efficiency of the London Capital Market. Initially Franks, Broyles and Hecht based their analysis on the theoretical framework of the one-sector model, but later in their study they found it necessary to include the Industry Index to the right hand side of the market model to remove the upward bias which was observed in the initial results. They reported that on the average, the market was anticipating a takeover bid three months prior to the announcement. Although this was consistent with Firth's (1976) findings, unlike Firth they found price increases in the attackers' shares at least for the first five months after the merger. In marked contrast, Barnes (1978) found, from a sample of 39 mergers over the period 1974-76, that there was a sharp drop in the price immediately after the merger. In a follow up study, however, utilizing the same sample and employing a similar methodology to that contained in this study, Barnes (1984) found there were slight share price gains initially followed by substantial decreases as time elapsed.

2.3. Abnormal operating performance

During the last decade there have been numerous researches that focused on abnormal operating performance of companies that experienced acquisition. In general, results of these studies are mixed and don’t paint a solid picture of whether or not acquisition lead to improved performance.

The merger literature has attempted to answer the above question and has reached, in general, consistent conclusions that on average mergers have either resulted in a decline in overall performance (e.g. Kwan & Eisenbeis, 1999; Knapp, Gart, & Becher, 2005) or have resulted in no profitability improvement (Akhavein, Berger, & Humphrey, 1997; Berger & Humphrey, 1992; Chamberlain, 1998; Linder & Crane, 1992; Pilloff, 1996). Furthermore, Ismaila, Davidson and Frank (2007) conclude that cost-efficiency ratios improved, although the improvement was not large enough to offset the profitability decrease. They also find that low profitability levels, conservative credit policies and good cost-efficiency status before merger are the main determinants of industry-adjusted cash flow returns and provide the source for improving these returns after merger. Additionally, Vander Vennet (2002)
reports a limited improvement in profit efficiency but not in cost efficiency with reference to cross-border deals only. In turn, Correa (2008) concludes that post-acquisitions performance does not improve in the first two years after a cross-border acquisition. This is caused by a decrease in Net Interest Margins and an increase in Overhead Costs in targets located in emerging economies. The absence of net performance gains is linked to diseconomies in managing international subsidiaries, in particular differences in language between the host- and home-country.

There are, however, exceptions such as Cornett and Tehranian (1992) Spindt and Tarhan (1992) and Cornett, McNutt and Tehranian (2006), which find that bank mergers are associated with a significant increase in industry-adjusted performance around the merger. The merged banks experience a significant increase in their industry-adjusted accounting based measures of profit (ROA, ROE, and NIM) as well as OPCFROA. The performance increases are attributed to increases in both costs cutting as well as revenue enhancement activities. However, the revenue enhancement opportunities appear to be most profitable in those mergers that offer the greatest opportunity for cost cutting activities, i.e., activity focusing and high MSA overlap mergers. Altunbas and Ibáñez (2004) report that bank mergers taking place in the EU banking industry between 1992 and 2001 do lead on average to improved accounting profitability. Hagendorff and Keasey find that M&A leads to performance gains for European banks in the years following a merger. On the other hand, Figueira and Nellis (2007) in their study conclude that banks involved in M&A activity are slightly more efficient after the M&A. Their results also provide evidence that the majority of banks have generally increased efficiency over time. This could be the result of banks being more market aware and more focused on customer needs, and hence striving for product differentiation, so that they can achieve higher non-interest-based revenues. Additionally, consolidation often gives banks access to more customers but it should be noted that it does not always lead to profitable growth or an improvement in the quality of the loan portfolio and it sometimes destroys shareholder value. The above leads to the following conclusion: only a solid differentiated client proposition, together with a competitive cost structure remains crucial ingredients for banks that aim at becoming more efficient and ultimately grow successfully via M&A activity.
Some other studies have looked specifically at changes in bank cost behavior and showed that cost ratios either do not improve on average or deteriorate after merger (Berger & Humphrey, 1992; Linder & Crane, 1992, 1993; Spindt & Tarhan, 1992; Spong & Shoehair, 1992; Srinivasan & Wall, 1992; Pilloff, 1996). However, Kwan and Eisenbeis (1999) found that one ratio only (the expenses to assets ratio) improved after merger. Some of the previous literature has examined the impact of M&A operation on cost efficiency as measured by simple accounting cost ratios (Rhoades 1990, 1993; Pilloff 1996; DeLong and DeYoung 2007), the impact on cost X-efficiency (Berger and Humphrey 1992; DeYoung 1997; Peristiani 1997; Berger 1998; Rhoades 1998), the impact on profitability ratios such as ROE and ROA (Berger and Humphrey 1992; Pilloff 1996; Knapp et al. 2006; DeLong and DeYoung 2007), and the impact on profit X-efficiency (Akhavein et al. 1997; Berger 1998). Although an improvement in performance is found for more recent deals, on balance neither the earlier studies nor more recent analysis find evidence of clear positive effects of M&A operations on the performance of banks (primarily from US).

As a graphic example of how distinct the results are, Beccalli and Frantz (2008) find that M&A operations are associated with a slight deterioration in profit efficiency, return on equity and cash flow returns, and a pronounced improvement in cost efficiency in 5 years after the deal (in comparison to the 3-6 years prior to the deal). Hence, the improvements in cost efficiency appear to be transferred to bank clients rather than to bank shareholders. Interestingly, these changes in performance are directly attributable to the M&A operations and would not have occurred in their absence. Besides, banks involved in M&A operations (both acquirers and targets) are more efficient and profitable than their peers not involved in M&A operations. Finally, Altunbas and Marques (2008) found that there are improvements in performance after a merger has taken place, particularly in the case of cross-border M&As. On average, they found that consistency in the efficiency and deposit strategies of merging partners is performance-enhancing, both for domestic and for cross-border M&A’s.
3. Event study approach

3.1. Event study technique

An event study in general can be presented as a research method that uses transactions data from financial markets to predict the financial gains and losses associated with newly disseminated information (Sharma, 2010). For instance, the announcement of a merger or acquisition between two banks can be analyzed to make predictions about the potential merger-related changes to the price of the service or product subject to the merger.

Generally speaking, event studies measure stock price reactions to events. Price reactions are represented by abnormal returns, which are stock returns adjusted for normal daily stock price and market index movements. Researchers examine test statistics to infer whether to attribute observed abnormal returns to chance or to the event under investigation. Event studies start with hypothesis about how a particular event affects the value of a firm. The hypothesis that the value of the company has changed will be translated in the stock showing an abnormal return. Coupled with the notion that the information is readily impounded in to prices, the concept of abnormal returns (or performance) is the central key of event study methods. (Serra, 2002).

Before we introduce the actual test statistics to be used in this research it is useful to briefly discuss the structure of an event study. According to MacKinlay (1997), the initial task of conducting every event study is to define the event of interest and identify the period over which the security prices of the firms involved in this event will be examined. For example, if one is looking at the information content of earnings with daily data, the event will be the earnings announcement and the event window will include the one day of the announcement. However, it’s fairly common to define the event window to be larger than the specific period of interest. This permits examination of periods surrounding the event. In practice, the period of interest is often expanded to multiple days, including at least the day of the announcement and the day after the announcement. This captures the price effects of announcements that occur after the stock market closes on the announcement day. The periods prior to and after the event may also be of interest. For example, in the earnings announcement case, the market may acquire information about the earnings prior
to the actual announcement and one can investigate this possibility by examining pre-event returns. Considering the above recommendations from Brown and Warner (1985) and MacKinley (1997), we construct event window that includes the announcement date and one day before and after the event.

After identifying the event, it is necessary to determine the selection criteria for the inclusion of a given firm in the study. The criteria may involve restrictions imposed by data availability such as listing on the stock exchange or may involve restrictions such as membership in a specific industry.

In order to be able to test for the impact of an event a measure of the abnormal return should be clearly defined. The abnormal return is the actual ex post return of the security over the event window minus the normal return of the firm over the event window. The normal return is defined as the expected return without conditioning on the event taking place. For firm i and event date t the abnormal return is

\[ AR_{it} = R_{it} - E(R_{it}|X_t) \]

where \( AR_{it} \) is the abnormal return, \( R_{it} \) stands for actual return and \( E(R_{it}|X_t) \) refers to normal return for time period X, \( X_t \) is the conditioning information for the normal return model.

Elaborating on the definition of normal return, Peterson (1989) suggests that there are three classes of techniques used to estimate normal or expected stock returns: market models, mean-adjusted models and market-adjusted models. In this research we employ market model, following the recommendations from Barber & Lyon (1997) and Bartholdy et al. (2007), whereas returns on a given security i are regressed against the concurrent returns of the market. For any security i the market model is:

\[ R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \]

\[ E(\epsilon_{it} = 0) \]

\[ \text{var}(\epsilon_{it}) = \sigma^2_{\epsilon_i} \]

Where \( R_{it} \) and \( R_{mt} \) are the period-t returns on security i and the market portfolio, respectively, and E is the zero mean disturbance term, while alpha and beta is predicted by
ordinary least squares (OLS) regression on the estimation period. The market model assumes a stable linear relation between the market return and the security return. An important point here is that after security returns are obtained, one is advised to take logarithms of a respective return index on a certain date divided by this index from the day before. The log transformation provides data that is much better behaved.

In order to assure reliable results of the test, the correct event window needs to be defined. The most common approach is to use the 120-200 days period prior to the event window. It should be noted that the event window itself is not included in the estimation period to prevent the event from influencing the normal performance model parameter. In this paper we decided to use local market indexes as a benchmark of normal performance of the stocks, assuming that having placed no restrictions on geography of acquisitions, no global indexes are able to fully cover the sample. Hence, in attempt to ensure trustworthiness, precision and logical sense of the results, each acquiring company was given its own market index, whereas each index was checked and presence of a company in this index verified.

Next we have to design the testing framework for the abnormal returns, including the null hypothesis and development of techniques for aggregating the individual firm abnormal returns, i.e., test statistics. While null hypothesis will be presented later on, in the following subsections more detailed insight into different test statistics groups that were used in the research is given.

3.2. Test statistics

The majority of previous researches in this area were constructed upon 2 kinds of tests:

1) Parametric tests
2) Nonparametric tests

MacKinley (2007), Brown and Warner (1985) and other authors suggest that although each test has its own good characteristic, typically they should not be used in isolation, rather in conjunction with the counterpart. For instance, inclusion of nonparametric tests provides a check of the robustness of conclusions based on parametric tests, as advised by Campbell and Wasley (1993).
Parametric test statistics for abnormal performance on event days are based on a standard t test of the difference between two means (Bartholdy et al., 2007). In order for results to be reliable, one essential assumption is required: the variables have to be normally distributed. If this assumption holds, then the power of parametric tests is deemed to be stronger. Hence normality check should always be performed to make sure distribution of abnormal returns meets or violates Gaussian assumptions of normal distribution.

On the other hand, nonparametric tests are not based upon the assumption of normality and the only important assumption is that observations are independent. The most common tests according to MacKinley (1997), Corrado (1989) and Cowan (1992) are

1) Sign test
2) Generalized sign test
3) Rank test

The explicit description of the abovementioned tests, together with motivation for including a particular test into the research is provided below.

3.2.1. Parametric tests
In general, there are five widely used parametric tests, similar by their nature and characteristics, except for the way they adjust for various problems encountered in the data, as discussed by Bartholdy et al. (2007).

- $T_1 – cross sectional dependence$

$$T_1 = \frac{\bar{A}}{s_A} \quad t(T-1), t = -1, 0, +1$$

To make use of this test statistic, one should estimate the market model for each stock over the estimation period with T observations, then calculate excess return and take average for each period. The final step is to calculate standard deviation of the average abnormal return over the estimation period.

- $T_2 – cross sectional independence$

$$T_2 = \frac{1}{N} \sum_{i=1}^{N} \left( \frac{T}{T-1} \sum_{t=1}^{T} [A_{it} - \frac{1}{T} \sum_{t=1}^{T} A_{it}]^2 \right)$$
The approach is the same as in the above test, with one remark – the data is assumed to be identically and independently distributed.

- **T3 – Standardised excess return. Cross sectional independence**

\[
T_i^3 = \frac{1}{N_i} \sum_{j=1}^{N_i} A_{ij}^s = \frac{1}{\sqrt{N_i}} \sum_{j=1}^{N_i} A_{ij}^s \quad \text{N}(0,1) \text{urns in the test statistic. Here abnormal returns are standardized and then added together.}
\]

- **T4 – Adjusting for event induced variance. Cross sectional method**

\[
T^4 = \frac{1}{N} \sum_{j=1}^{N} A_j^s \sqrt{\frac{1}{N(N-1)} \sum_{i=1}^{N} A_{ij}^s - \frac{1}{N} \sum_{j=1}^{N} A_j^s}^2
\]

The motive behind adjusting for induced variance is that often event leads to increases in the variance of the returns around the event, mainly due to temporary increase in systematic risk and uncertainty regarding the effect of the event. This test statistic does not correspond directly to any of the previous ones, as they estimated the variance over the estimation period, whereas here the event window is used.

- **T5 – Adjusting for event induced variance. Standardised cross sectional method**

\[
T^5 = \frac{1}{N} \sum_{j=1}^{N} A_j^s \sqrt{\frac{1}{N(N-1)} \sum_{i=1}^{N} \left[A_{ij}^s - \frac{1}{N} \sum_{j=1}^{N} A_j^s \right]^2}
\]

In this test statistic we ensure that all A’s have the same distribution by dividing by the individual variances.

### 3.2.2. Non-parametric tests

In addition to parametric statistics, event studies typically make use of a nonparametric test. As non-parametric statistics do not require as stringent assumptions about return distributions as parametric ones, this approach is widely used when it’s doubtful whether or not sample is normally distributed or its characteristics clearly testifies this (for instance, if some values are “off the scale”, i.e., too high or too low to measure). Furthermore, non-
parametric tests are useful for small portfolios and stock exchanges with small stocks and few trades, because of fewer assumptions that need to be designed.

In this paper the following tests are conducted:

*Sign test*

This test is based on the sign of the abnormal return and requires that the abnormal returns (or more generally, cumulative abnormal returns) are independent across securities and that the expected proportion of positive abnormal returns under the null hypothesis is 0.5. The basis of the test is that, under the null hypothesis, it is equally probable that the CAR will be positive or negative (MacKinlay, 1997). In other words, the motive of this test is to check that excess return is zero in the event window. Therefore an equal number of negative excess returns to positive excess returns in the event window is expected.

The underlying technique is pretty much straightforward – to record the difference obtained by subtracting the hypothesized median from each sample value, that is, record the sign of the N differences. In turn, hypothesis is in general that the excess return is zero, so if one observes small number of either plus or minus signs, the null hypothesis is rejected and vice versa. Corrado and Zivney (1992) advise the explicit formula of test statistic,

\[ T_4 = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} G_{ri0} / S(G). \]

whereby \( G_{ri0} \) stands for signs and \( S(G) \) represents standard deviation that is calculated using the entire sample period.

One of the weak points of this test is that the probability of a positive value is equal to the probability of a negative value regardless of any asymmetry in the original distribution. As discussed in Corrado and Zivney (1992) and Brown and Warner (1985), this can lead to a misspecification. In attempt to assess the performance of nonparametric tests, Corrado and Zivney conducted an event study, and the results indicate that a sign test based on sample excess return medians provides reliable, well-specified inferences. The sign test is clearly better specified than the t-test and has a power advantage over the t-test in terms of detecting small levels of abnormal performance. However, it should be noted that the same findings assert that the sign test is dominated by the rank test.
**Rank test**

This test statistic involves transforming each stock’s time series of market-model excess returns into their respective ranks. The main advantage of the rank test is that it transforms the distribution across the possible rank values regardless of any asymmetry in the original distribution; hence it may be used in samples where normal distribution is not ensured. In order to construct test statistic, one should rank abnormal returns for each stock so that 1 corresponds to the lowest return, and the highest number is assigned to the highest excess return. Then, according to Corrado and Zivney (1992), one should scale the ranks by the number of observations for each stock to eliminate the problem of thin trading, taking into account only non-missing excess returns for the particular stock over the entire period. The test statistic is presented below,

\[ T_4 = \frac{1}{\sqrt{N}} \sum_{j=1}^{N} \left( U_j - \frac{1}{2} \right) \]

whereas \( \frac{1}{2} \) represents the mean of scaled ranks and \( S(K) \) is the average standard deviation of the ranks of all the stocks in both the estimation and event period.

According to Corrado (1989), the rank test is shown to be better specified under the null hypothesis. In addition, it is robust to misspecification caused by excess returns variance increase on event date.

The findings of Corrado indicate that in case abnormal performance is present, the rank test is more powerful than its parametric counterparts, the reason for that being non-normal distributions that characterize daily stock returns. Thus the rank test as a part of nonparametric test is advised to be used in event studies, except for cases, where ideal conditions for the parametric t-tests can be created.

**Generalized sign test**

The invention of generalized sign test is predicated by possible misspecification of the ordinary sign test, which requires equal numbers of positive and negative abnormal returns, absent a reaction to an event. A number of researchers, such as Cowan, Nayar and Singh (1990), Sanger and Peterson (1990) and Cowan (1992) use a variation of sign test called the generalized sign test, which compares the proportion of positive abnormal returns around
an event to the proportion from a period unaffected by the event. Hence the generalized
sign test takes account of a possible asymmetric return distribution under the null
hypothesis.
More specifically, this test examines whether the number of stocks with positive
cumulative abnormal returns in the event window exceeds the number expected in the
absence of abnormal performance. The number expected is based on the fraction of positive
abnormal returns in the estimation period.
Test statistic should be constructed as follows:

\[ T_i = \frac{w_i - N \times \hat{p}}{\sqrt{N \times \hat{p} (1 - \hat{p})}} \]

In this t-statistic \( w_i \) is the number of positive abnormal returns in the event window, for a
given \( t \), across stocks. \( P \) stands for the expected number of abnormal returns and is given
by:

\[ \hat{p} = \frac{1}{N} \sum_{j=1}^{N} \frac{1}{T_j} \sum_{t=1}^{T_j} \phi_{jt} \]

Overall, in accordance with Cowan (1992), the generalized sign test performs better than
the rank test when examining abnormal returns in event window of several days. Also, the
power of the test increases when the sample contains thinly traded stocks or the variance
increases on the event date.

To sum up, the trustfulness of the aforementioned tests vary to a large extent, depending on
several important factors, such as construction of correct sample, choosing the adequate
estimation period and obtaining sufficient data for the research. All of the above has a
critical impact on the results of the tests; hence we need to distinguish which test statistics
seem to be the most reliable and robust to specification of our sample. A brief discussion of
this topic follows in the next section.
3.2.3. Recommendations to choice of tests

One of the main decisions to take before actually getting started with this study is reliance on which of the tests - parametric or nonparametric, is determinative in case the results of the two differ. As suggested by Motulsky (1995), the answer depends on sample size. The central limit theorem ensures that parametric tests work well with large samples even if the population is non-Gaussian. In other words, parametric tests are robust to deviations from Gaussian distribution, so long as the samples are large. On the other hand, nonparametric tests are only slightly, but less powerful than their parametric counterparts with large samples.

In attempt to figure out which tests behave better, Corrado and Zivney (1992) assess the ability of parametric and nonparametric test statistics to detect abnormal performance, with the condition that each stock’s price performance is simulated by adding a constant. According to the results, with +/- 1 percent of additional abnormal performance, the rank test is more powerful than the parametric t-test, and the t-test is more powerful than the sign test. However, if we decrease the added constant to 0.5%, the results turn to be different, whereby the rank test dominates the sign test and the sign test dominates the t-test. Overall, these findings suggest that a researcher should choose the rank test over the sign test from nonparametric set of tests.

Corrado (1989) reports striking results in terms of remarkable resistance of the rank test to misspecification when an increase in the variance of the day 0 returns distribution is realized. While parametric t-tests experience severe misspecification (more than doubled Type 1 error), the rank test is largely immune to that.

As shown above, none of the tests could be considered ideal for examining statistical significance of abnormal returns. However, taking into consideration that our sample is relatively large, we will mainly rely on the results of parametric tests. However, in order to make sure we may use the findings of parametric tests, we will run Kolgomolov-Smirnoff test to check if the distribution is normal. From nonparametric tests the rank test is of special interest for the reasons discussed above.
3.2.4. Final remarks to event study approach

This thesis is conducted by means of event study method, the specification of which is proved to be reliable by various researches in the area of our interest, i.e., mergers and acquisitions. As this method is well documented and our research goes in line with recommendations from Bartholdy et al. (2007), Cowan (1992), Corradi and Zivney (1992), MacKinley (1997) and others, we believe that the results of this thesis will contribute to the existing researches, despite the fact that one important bias has not been properly considered due to time limitation for preparation of the thesis.

As discussed in the previous sections, presence of event-induced variance may cause some misspecifications of the test statistics and failure to adjust to it may lead to incorrect results. According to Bartholdy et al. (2007), this variance takes place due to the fact that markets need time to react to the new information, which in turn leads to an increase in systematic risk and eventually impacts variance of the individual stock. Furthermore, large increase of the event induced variance affects the results to the extent that they are not reliable in event studies.

In this study we assume that the effect of event-induced volatility may not be significant due to the fact that all the stocks represent the same industry and are mainly quoted on the largest stock exchanges, which decreases possibility of non-synchronous or extremely opposite reaction on the market.
4. Definition and elaboration of financial ratios

In order to conduct a study based on performance of the deal participants certain ratios were taken into consideration:

- Net interest margin
- Return on equity
- Return on assets
- Tier 1 ratio
- Solvency ratio
- Loan Loss Res./ Gross Loans
- Asset growth rate

Each ratio (except asset growth ratio) has been obtained for a year when the deal was announced and one year before, both for a bidder and a target. Asset growth ratio was taken only for target for the period three years before the deal was announced. In the next section the elaborated ratios description is presented in order to choose one ratio that is the most applicable for measuring a company’s performance and could be used to test performance efficiency hypothesis. Other ratios will mainly be used to make descriptive statistics analysis.

4.1. Net interest margin

Net Interest Margin (NIM) is a measure of the difference between interest income generated by banks (in our case) by their lending and interest paid on borrowings (deposits). It is considered analogous to the gross margin of non-financial companies. In our paper net interest margin is expressed as net interest revenue as a percentage of average total earning assets.

\[
NIM = \frac{\text{interest income} - \text{interest expenses}}{\text{average Total earning assets}} = \frac{\text{net interest revenue}}{\text{average Total earning assets}}
\]

The findings of Gerald Hanweck and Lisa Ryu working paper “The Sensitivity of Bank Net Interest Margins and Profitability to Credit, Interest-Rate, and Term-Structure Shocks
Across Bank Product Specializations” show that net interest margins (NIM) remain one of the principal elements of bank net cash flows and after-tax earnings despite the rising importance of fee-based income as a proportion of total income for many banks, except for very large institutions and credit card specialists, noninterest income still remains a relatively small and usually more stable component of bank earnings. As a result, despite earnings diversification, variations in net interest income remain a key determinant of changes in profitability for a majority of banks. Net interest income accounts for approximately 60% of banking industry managed revenue — and roughly 50% for the more diversified large-cap banks (H. K. Mason, M. G. Howard, Bekezela Ncube 2006). To sum up bank interest margin is an important component of bank profitability. An adequate interest margin should generate sufficient income to increase the capital base as risk exposure increases (cf. Angbazo, 1997).

As it was stated previously that net interest revenue is a considerable proportion of total income in banking industry. As a result net interest revenue could be interpreted as a gross income in banking industry. The bank gross income is used for covering total operating expenses, increase in loan provision, income tax and return attributable to shareholders. Shareholders require certain returns on their investment for the comparable risk they are taking in business. Bank business is not an exception – if shareholders of the bank don’t get certain return for the comparable risk at least in the long run, they will sell shares and make alternative invest in economy. Therefore increase risk for management that bank could be acquired and most probably they will lose their private benefits and even could be fired and that is a not desirable scenario for management. By this it is meant that in the long run the deal of total income that is assigned to shareholders at least should not decrease. So the amount of the return to shareholders is determined exogenously by the possible alternative investments in the market. Corporate tax proportion of gross income as well couldn’t be influenced by internal company’s factors and is fixed by the government. However both operating expenses and loan loss provision are under control of company’s management. The amount of gross income that is need to cover operating expenses and loan loss provision shows the bank efficiency in management operating expenses and risk management. Consequently if it is fewer amount of gross profit is needed to cover operational costs and loan loss provision, net interest margin is less, as numerator is less.
We therefore can conclude that low net interest margin shows high bank efficiency and vice versa.

In some of the research papers net interest margin and interest spread are parallel analyzed. However, we think that (average) interest spread is a very general ratio that shows the difference in borrowing and lending rates of financial institutions (such as banks) in nominal terms. This ratio expresses the nominal average difference between borrowing and lending rates, without compensating for the fact that the amount of earning assets and borrowed funds in the balance sheet may be different therefore conclusions based on this ratio might be biased. Net interest margin equation could further be rearranged to show that it is also determined by the share of corresponding assets in total earning assets and by the share of corresponding liabilities in total liabilities.

\[
NIM = \frac{\sum_{i=1}^{n} r_i A_i - \sum_{j=1}^{m} r_j L_j}{\sum_{i=1}^{n} A_i}
\]

\[
\sum_{i=1}^{n} A_i 
\] – Average interest bearing assets in the period under observation;

\[
\sum_{i=1}^{n} r_i A_i 
\] – Sum of the interest incomes in the period;

\[
\sum_{j=1}^{m} r_j L_j 
\] – Sum of the interest expenses in the period.

Consequently, net interest margin ratio is used in our research, as it is considered to be more precise.

**4.2. ROA and ROE**

It is commonly known that profit alone does not reflect company’s performance, success and its competitiveness. Executives could just invest huge amounts of money to increase profit; however, increase in profit will not show how well those assets are put to work. As a result investors track bank returns by two key statistics: Return on Equity and Return on Assets (Monks, Matthew 2010). The detailed description of both is presented below.
**ROE**

ROE shows one of the key aspects of company’s profitability – what proportion of the earnings of a corporation is generated using its own equity, that is, the money raised from shareholders. Investors analyzing ROE have an opportunity to get an overview of which company is better at making profit and thus has a competitive advantage. It is commonly known that owning stock of the company with the competitive advantage leads to the higher returns for the investor.

By means of the ROE analysis, one could make an assumption about the maximum possible earning growth of a company. According to that, earnings cannot grow at a higher rate than ROE level without borrowing funds or selling shares. However, the company has to pay additional interest for any extra amount of debt; as a result, net income (which is shown in the numerator) will decrease. At the same time, issuing more shares will increase equity (denominator) of the company and decrease earnings per share. In both cases ROE will decrease, which is a confirmation of our previously mentioned statement that ROE sets the limit for company earnings growth.

In our research paper return is expressed as profit before tax as a percentage of shareholders equity.

\[
ROE = \frac{Profit \ before \ tax}{Total \ equity}
\]

In the numerator profit before tax is used to dispose difference in tax system so as to make ROE even more comparable. We cannot but mention that ROE is not absolutely unbiased metric of profitability as management could manipulate with accounting figures. Company could reduce income in one year by taking a large write-down; however the write-down has a more significant negative effect on shareholders’ equity in the following years as a result ROE will increase without any improvement in company’s performance. Similarly share buy-back has a bigger impact on shareholders’ equity than on earnings.

Another ratio that often goes along with ROE is Return on Average Equity (ROAE). The definition is to a large extent in line with ROE and refers to the company’s overall performance during a fiscal year. The most important distinction between these two is that
ROAE can provide a more accurate picture of the profitability of a company as it uses the shareholder’s average equity as the denominator than the return on equity version.

The financial crisis and its aftermath have lowered the bar for bank returns. Before the recession, investors in high-performing banks could expect a top lender to return as much as $20 to $25 for every $100 of shareholder equity on its balance sheet. Experts say that even good lenders' returns could max out at $15 after the economy rebounds as new banking rules put an indefinite squeeze on profits (Monks, Matthew 2010).

Recently pursuit of high ROE has become a serious challenge in the banking industry. Terry Moore, a managing director with the North American banking practice of Accenture, said delivering decent returns may be a make-it-or-break-it challenge for banks as they emerge from the recession. "The name of the game is to drive towards that 15%" return on equity, he said. "Those that are able to do that are going to be the winners and those that aren't, are not." Brian Moynihan, the CEO of B of A in Charlotte, said that 1% return on assets is the "minimum hurdle" that banks are going to have to pass to "get a reasonable return on equity". The banks that will not overcome this barrier most probably will become a target for acquisition. The research paper “A binary choice model for prediction bank acquisitions” corroborates that ROE is negatively related to merger likelihood (Check Jr., Henry F.; Walker, John S.; Randall, Karen L. 2009). Consequently, one can conclude that low ROE favors acquisition.

**ROA**

ROA is an indicator of how profitable a company is comparing to its total assets. ROA is the most commonly used profitability financial ratio to evaluate a bank’s ability to make a profit (Madura, 2006). ROA gives an idea of how efficient the management is at using its assets to generate earnings. Therefore ROA is used in financial analysis as a comparative measure. It could be used with the company's previous ROA numbers to capture the company’s progress. In order to analyze potential and see how successful the company is managed comparing with its competitors, its ROA may well be set against analogous ratios of the companies within the industry.
In this paper ROA is calculated in the following way:

\[ ROA = \frac{\text{Profit before tax}}{\text{Total assets}} \]

Being similar to the ROE, profit before tax is used in the numerator to dispose difference in tax system so as to make ROA even more comparable. The assets of the company are comprised of both debt and equity. Both of these types of financing are used to fund the operations of the company. The ROA figure gives investors an idea of how effective the company is at converting the money it possesses to invest into net income (in our case – profit before tax). Hence, the higher the ROA number the better, because it indicates that the company is earning more money from less investment.

In addition to the abovementioned, ROA could be expressed in another way. According to DuPont formula

\[ ROE = \left( \frac{\text{Net profit}}{\text{Sales}} \right) \cdot \left( \frac{\text{Sales}}{\text{Assets}} \right) \cdot \left( \frac{\text{Assets}}{\text{Equity}} \right) = \frac{\text{Net profit}}{\text{Equity}} \]

\(^*\)In our case profit before tax

The above equation shows that \( ROE = ROA \cdot \text{Equity Multiplier} \)

This implies, \( ROE = \text{Profit Margin} \cdot \text{Asset Turnover} \cdot \text{Equity multiplier} \)

Based on the above equation it could be finally concluded that:

\[ ROA = \text{Profit Margin} \cdot \text{Asset Turnover} \]

According to this equation ROA may rise as a result of improvements in profit margin or asset turnover, given that they both are perceived as good news by investors.

It should be mentioned that ROA fixes one of the defects of ROE, which is the fact that ROE could be boosted by adding huge debt. However ROA is independent of financing sources. Despite this advantage it should be emphasized that ROA is not a perfect measure as well. Management could manipulate with accounting figures in order to achieve assigned tasks. For instance, to show higher ROA than competitors published in their reports.

In many cases it proves to be useful to look at the Return on average assets (ROAA) that is a measure of profits relative to size. The final ratio is expressed as a percentage of total average assets. This metric displays how efficiently a company is utilizing its assets and is
also useful to aide comparison among peers in the same industry. The formula is fairly straightforward:

\[ ROAA = \frac{net\ profit}{average\ assets} \]

As numbers for assets are usually only available for the ends of reporting periods, the average is an approximation that may not reflect highs or lows between the ends of reporting periods: it implicitly assumes that changes are fairly smooth. Nonetheless, it is reasonably useful efficiency measure for banks that is not dissimilar to margin numbers for non-finance businesses.

To sum up, given that both ROA and ROE ratios are feasible and widely used in financial analysis, it is reasonable to analyze both ROA and ROE, as in combination they provide much more clear profitability picture and thus the company’s performance within a particular industry.

### 4.3. Tier 1 Capital ratio

Latest financial crisis showed that failure of subprime lending is costing banks and other financial institutions billions of dollars. Merrill Lynch is the best example – after a write-down of approximately $8.0 billion for its collateralized debt obligations and U.S. subprime mortgages led to a third quarter loss of $2.3 billion (Jeffrey Ham, 2011). The reasonable question is asked by investors whether company’s capital or earnings are substantial enough to absorb the impact of losses.

In light of the above mentioned, Tier 1 Capital ratio has become a popular measure among investors, as it is considered to be a core financial metric used to measure the financial health of a bank from a regulator’s point of view. It is calculated as proportion of banking firm’s core equity to total risk-weighted assets. A firm’s core equity capital is known as its Tier 1 capital that was first defined in the Basel I capital accord and remained substantially the same in the replacement Basel II accord.

\[ \frac{Tier\ 1\ capital}{Total\ risk - weighted\ assets} \]

According to Basle capital accord Tier 1 capital consists of paid-up share capital/common stock and disclosed reserves. Tier 1 capital shows the bank’s durability against losses under
distressed conditions. Total risk-weighted assets include all assets that the company holds that are systematically weighted for credit risk. Each country’s banking regulator develops methodology for valuation of risk weight for different asset classes, such as cash and coins, which have zero risk, versus a letter or credit, which carries more risk. There might be also small differences in Tier 1 capital calculation within different countries. But it is still appropriate as the legal framework varies in different legal systems and it follows the main reason – to indicate the ability of the bank to weather unexpected losses. Based on the Tier 1 capital ratio regulators can rank banks. To be classified as well-capitalized, a firm must have Tier 1 Capital ratio equal or more 6% and may not pay dividends or distributions that would change its ranking. Adequately Capitalized grades are given to firms that have a Tier 1 ratio greater than or equal to 4%, while firms classified as Undercapitalized have a Tier 1 ratio below 4 percent. A Significantly Undercapitalized grade is given to companies with a Tier 1 Capital Ratio below 3%. Firms that are ranked undercapitalized or below are prohibited from paying any dividends or management fees. In addition, they are required to file a capital restoration plan.

4.4. Solvency ratio

This ratio is also known as proprietary ratio or equity ratio. Formula of solvency ratio used in this paper is as follows:

\[
\text{Solvency ratio} = \frac{\text{Shareholders funds}}{\text{Total assets}}
\]

Shareholder’s funds include equity share capital plus all reserves and surpluses items. Total assets include all assets, including Goodwill.

Solvency ratio for investors is perceived as one of the measurements of company general financial strength. It indicates the long-term or future solvency position of the business. The general rule: higher solvency ratio indicates company better long-term solvency position of the company. And lower ratio brings greater risk to the creditors. But this is not always true and indeed this ratio depends a lot on the industry in which company operates. Stockholders will benefit from low equity ratio as long as return on assets is greater than the interest paid to creditors. However, if the cost of debt servicing outweighs the return that the company generates on the debt through investment and business activities, the
company will get losses and it might lead to bankruptcy, which would leave shareholders with nothing. Therefore this ratio is often analyzed by unsecured creditors as high ratio compared to other companies with the industry carries conviction for them.

### 4.5. Loan loss reserve ratio

In detail, the ratio of the loan loss provisions to loans (LLP/L) is used as a proxy for the quality of the credit portfolio. There are several hypotheses that concentrate on the relationship between operating expenses and credit quality. Under the ‘bad management’ hypothesis, credit quality is endogenous to the quality of bank management, indicating that ‘bad’ managers are underperforming both in terms of the day-to-day operations and the quality of bank’s credit portfolio (Berger & DeYoung, 1997). Under the ‘bad luck’ hypothesis, an exogenous increase in non-performing loans would force even the most efficient banks to purchase additional inputs necessary to deal with these problematic credits. Lastly, under the ‘skimming’ hypothesis, there is a trade-off between short-term operating expenses and future loan performance problems, as banks which spend more resources on loan screening would have less non-performing loans at the expense of higher operating expenses (Mester, 1996). The loan loss reserve ratio is calculated in the following way:

\[
\text{Loan loss reserve ratio} = \frac{\text{Loan loss reserve}}{\text{Gross loans}}
\]

Loan loss reserves are made by the bank to get insurance for potential problem loans which may prove to be uncollectible. Loan loss reserves typically show up as a contra-asset on the balance sheet. So the higher the ratio, the more problematic loans are and vice versa. Agusman et al. (2008) finds that the loan loss reserve ratio is a good measure of credit risk, and can be used as a surrogate for market-based risk measures. In the banking industry credit risk is perceived as a major threat thus increase in loan loss reserves shows that bank has problem loans. It is logical to assume that bank performance suffers from loan loss reserves as they entail expenses to the bank. Our statement is supported by Ahmed et al. (1999), Docking et al. (1997 and 2000), Agusman et al. (2009) research papers where was found negative relation between loan loss reserve ratio and stock returns, suggesting that increase in credit risk reduces bank returns.
As loan reserve influence bank performance and based on the stock returns could be argued about company success, bank with high loan loss reserve ratio is considered as a poor performer thus become an attractive target for acquisition.

### 4.6. Asset growth rate

The firm asset growth rate maintains an economically and statistically important ability to forecast returns in both large capitalization and small capitalization stocks. In the cross-section of stock returns, the asset growth rate maintains large explanatory power with respect to other previously documented determinants of the cross-section of returns (i.e., size, prior returns and book-to-market ratios). The underlying technique is simple: asset growth rates are calculated for a 12-month period. The percentage is determined by subtracting the account balance as of the corresponding reporting period in the previous year from the current period account balance and dividing the result by the previous year balance.

In this paper asset growth rate is calculated only for targets to test if banks prefer fast growing companies or companies that grow at the small rate. Furthermore the average asset growth rate is calculated as average for the period of three years before the deal was announced. Total asset growth shows the amount of business growth.
5. Selection of data

In order to conduct a qualitative event study, the process of selection of data sample is of outmost importance. In this event study the sample is initially constructed and further adjusted using the most comprehensive database of M&A deal information – “Zephyr”. Not only does it contain extensive information about deals, it is also a powerful analytical tool which can be made use of in various types of in-depth researches. We build our sample upon the following search steps, inspired by recommendations of previous researches in this field of study:

1) Since we examine banking industry, only transactions where both acquirer and target represent the above mentioned industry, are included in the sample

2) Deal type is acquisition, for the reason of making a clear separation between acquirer and target and being able to assess whether or not a deal ended up with getting control over majority of target’s stock.

3) Current deal status is completed.

4) Time period is on or after 01/12/2005 and up to and including 01/12/2010, which enables to us look into the most recent deals.

5) Percentage of final stake – minimum 51%. This is a very important step, which is aimed at selecting only those deals, which result in gaining ultimate control over a target. The underlying reason is that it is more likely to observe abnormal return on stock if the acquisition is ultimate.

6) For a deal to be included in the sample, the acquirer should be a listed company. This is done in order to be able to obtain daily returns on stock, using acquirer’s ISIN number.

7) Deal value should be minimum 50 million EUR (including estimates). As we might have come across difficulties with obtaining the returns on stock and financial data of smaller banks, it has been decided to concentrate on deals with relatively high value. Another reason is that deals with higher value cause more significant reaction on the market; hence it should be easier to detect abnormal performance.
The above selection resulted in finding 453 deals. A number of deals had to be excluded due non-compliance with the above criteria, i.e., absence of valid ISIN code or missing data about percentage of final stake. The final sample to work with contained 329 deals.

The above mentioned deals were sorted and the next step to take was to extract daily returns on stock and market. For this purpose we used “Datastream”, whereby historical prices for each stock and each market were obtained for the selected interval – one calendar year before announcement of an acquisition and 30 days after that. As “Datastream” automatically excluded holidays, the returns for 250 trading days were extracted. For a deal to be included in the study, the above data should be completely available, so the sample had to be somewhat reduced by several deals where these conditions have not been met.

For the second part of the thesis, which examines changes in operating performance, the accounting figures from three years before a transaction and one year after transaction are downloaded from “Orbis”. Both acquirers and targets are included in this search; however, the database does not contain sufficient information about all targets due to the fact that many of the targets lost their identity after being acquired. In this case, we work with available data and do not drop a deal out for the sake of maintaining a relatively large sample size.

Finally, the tests are conducted in Excel using both standard and modified formulas for sorting and preparation of the data. Test statistics are constructed by means of formulas provided in the subsequent sections, but tests for normality of the sample are done via SPSS Statistics.
6. Hypotheses

Hypothesis I: At announcement period, there is positive abnormal return on stock price for the shareholders in banking industry.

In this study we challenge the Efficient Market hypothesis, which asserts that financial markets are “informationally efficient” and one cannot consistently achieve returns in excess of average market returns. We assume that investors perceive the announcement of acquisition in banking industry as good news, due to the fact that common driving forces for a deal are cost and revenue synergies. The revenue synergy is based on three dimensions:

- Firstly, acquiring a bank in a growing market may enhance revenues, in a way of adding greater array of products and new business areas. Another point is that a target in a growing market would have spent substantially more resources had it been trying to expand on its own. As a result, both acquirer and target benefit from the deal, which is a trigger to treat the acquisition as value-adding.

- Secondly, the acquiring bank’s revenue stream may become less volatile, being the result of more diversified portfolio of the newly established company. In case of a cross-border deal, a geographically diversified portfolio exhibits different interest rates, credit risk and other variables and thereby reduces the probability of insolvency. On the other hand, domestic deals may produce a more stable revenue stream due to different credit policy and increased market power, which result in higher non-interest-based revenues.

- Thirdly, there may exist a possibility to enhance revenue by cross-selling each bank’s products and services at the same time as the macroeconomic risk for the bank thereby may be reduced.

In turn, cost synergies may arise from consolidating certain operations and eliminating redundant costs, which most likely is carried out by reducing workforce and closing of overlapping branches, which leads to considerable gains in banks productivity. Additionally, Piloff and Santomero (1998) concluded that on average, the market values the combined firm no higher than it did the separate components if cost cutting had not been performed.
Hypothesis II: Bidders tend to acquire firms with worse financial state and operating performance

Hypothesis III: By means of pre-merger performance of the two involved parties, there is positive abnormal return on stock if better-performing bidder bank acquires worse-performing target.

These hypotheses are mainly inspired by study of Hernando, Nieto and Wall (2009), which concludes that one of the most important reasons for acquisitions is to improve the efficiency of the target. Consequently, banks with lower profitability or greater inefficiency might be more attractive for acquisition.

Following the efficiency hypothesis, we expect that transactions are more successful if acquirers are more profitable than targets. The underlying logic is very straightforward: in these transactions bidders may be able to make use of efficiency potentials by transferring their superior management skills to the target assets. Advocates of the poor target management perspective, which is rooted in agency theory, claim that inefficient, self-serving incumbent managers who fail to maximize stockholder value will be forced out of office by acquirers attempting to extract such value (Fama, 1980).

There is a significant amount of literature in support of our hypothesis, such as Pilloff and Santomero (1998), Hawawini and Swary (1990) Banerjee and Cooperman (2000). As shown in these papers, bidding banks on average are more profit efficient than the average target, that consequently provide for a sufficient efficiency potential. There is also some evidence that takeover of less cost efficient target is significantly more value creating for the bidding banks, the targets and the combined entity. According to Hannan and Piloff (2006) research, there is clear evidence that less profitable banks in the US are more likely to be acquired, regardless of the type of acquirer.

Hypothesis IV: Both parametric and non-parametric tests yield similar results if assumptions hold.

As discussed before, in order for parametric test results to be reliable, one essential assumption is required: the variables have to be normally distributed. However, non-parametric test results are not dependant on population distribution. Despite parametric tests are deemed to be slightly more efficient than their non-parametric counterparts, both
should give similar results in case the sample corresponds to the above mentioned assumption.

**Hypothesis V:** Acquirers experience short-term decline in key operating performance ratios (net interest margin, return on equity etc.) after acquisition is completed.

Becalli and Frantz (2009) find that mergers and acquisitions are to large extent associated with a slight deterioration in profit efficiency, return on equity and cash flow returns. Furthermore, post-acquisition performance does not improve in the first two years after a cross-border acquisition. One of the main factors causing this decline is principal agency problems. It is linked to the interest and individual objectives of managers. In this perspective, the occurrence of large inter-state bank mergers may very well be a product of a classical managerial objective: empire-building in order to gain higher status and reputation. According to the agency theory, all individuals are assumed to choose actions that maximize their own personal welfare. With regards to that, CEO of the acquiring company is more motivated by perspective of increased status and reputation than by returns to shareholders. In case the management salary is linked to bank’s income, acquisition might be the simplest way to maximize its prosperity.

An alternative interpretation of poor bidders’ performance is that bidding firms overpay for the targets they acquire. It is commonly known as hubris hypothesis. According to this hypothesis overconfident managers overvalue deals, synergies and their own abilities. In other words, when there are no actual gains in a takeover, the takeover can be explained by the overbearing presumption of bidders that their valuations are correct.

However, in case there are number of bidders, the bidder with the highest valuation of the target acquires it; hence the winner will inevitably bid too much. Therefore, shareholders of the acquiring firm suffer from managers’ excessive pride and arrogance.

The above arguments can serve as a comprehensive explanation of decline in performance of the acquirer, but it is likely to vary across the different acquisitions.
*Hypothesis VI: Majority of bidders choose faster growing targets*

The results of Becalli and Frantz (2007) study show that excess returns of both bidder and the combined entity are significantly lower when bidders acquire slowly growing targets, indicating that shareholders prefer fast growing targets. It turns out that successful bidders can be identified by investigating their choice of a target: one can tell which bidder is successful from the target the bidder chooses. Successful bidders choose smaller and faster growing targets with bad relative efficiency measures. From management perspective, an acquisition of faster growing company might give boost to the performance of the newly established company and adds positive reputation to the CEO who managed to capture and acquire a fast growing company.
7. Presentation of empirical results based on the accounting data

In this section or main findings are presented. This part of the paper is organized in the following way: firstly, we work with general data and draw overall conclusions about the given sample, operating performance of acquirers and targets over the years, in order to get deeper understanding of how the average acquirer or target look like at different times, as well as to prepare some ground for testing of the hypotheses. Subsequently, testing of hypotheses is set to follow right after that, starting with the broader hypotheses and ending with the ones that require t-tests to be performed. Conclusions and remarks are collected and presented in the separate section.

7.1. Descriptive statistics of the data

7.1.1. Overall description

First of all, in order to get a glimpse let us introduce an overview of the M&A market. Judging from below charts North America is a strongly marked leader in number and aggregate deal value of acquisitions. Indeed, United States contributes the most to this statistics.

*Source: CD Appendix X and Zephyr (2010)*
To begin with, US have one of the most saturated banking market and historically small banks numerically dominated the US banking industry. The reason for that could be tracked back in US history to two major pieces of legislation. In 1927 the McFadden Act was passed that prohibited banks to operate across state boundaries. Thus different banks operated in each state and interstate consolidation was blocked. The second enacted legislation was Glass-Steagall Act of 1933. This Act prevented any company from acting as any combination of an investment bank, a commercial bank, and insurance company. So the introduced separation of bank types according to their business eventually increased number of financial institutions in each state. In 1934 there were 14146 banks on the list. First considerable deregulation in US banking industry showed up only during the 1980s and opened the door for merger and acquisition. Depository Institutions Deregulation and Monetary Control Act of 1980 and the Garn–St. Germain Depository Institutions Act of 1982 diminished the distinctions between banks and other financial institutions in the United States. Based on the graph it is seen that this deregulation gave rise to major wave of mergers and, as a result, gradual decrease in number of bank.

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### Figure 7.1.1.2: Target descriptive statistics based on aggregate deal value (mil EUR)

<table>
<thead>
<tr>
<th>Region</th>
<th>Aggregate deal value (mil EUR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Europe</td>
<td>209,808</td>
</tr>
<tr>
<td>South and Central America</td>
<td>14,798</td>
</tr>
<tr>
<td>Oceania</td>
<td>15,960</td>
</tr>
<tr>
<td>North America</td>
<td>262,556</td>
</tr>
<tr>
<td>Middle East</td>
<td>16,016</td>
</tr>
<tr>
<td>Far East and Central Asia</td>
<td>64,302</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>17,727</td>
</tr>
<tr>
<td>Africa</td>
<td>2,943</td>
</tr>
</tbody>
</table>

*Source: CD Appendix X and Zephyr (2010)
Furthermore in 1994 the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 was passed, which repealed the Bank Holding Company act, hence removed restrictions on geographic expansion in banking. Indeed strong stock market also stimulated banks mergers and acquisitions. In 1999 Congress continued deregulation policy and reformed U.S. financial system by passing the Gramm–Leach–Bliley Act (GLB). Gramm–Leach–Bliley Act repealed the Glass-Steagall Act allowing commercial banks, investment banks, securities firms, and insurance companies to consolidate. 

To sum up, legal framework that was established in 1930s supported high concentration level in the U.S. banking industry. Since 1980 Congress has been running for deregulation that stimulated financial institutions to consolidate. As a result there was a sharp decrease in number of banks. However, the US banking industry is still one of the most concentrated in the world. Based on the latest data there are 6529 commercial banks and 1128 Saving institutions operated in 2010, thus there is still plenty of opportunities for mergers and acquisitions.

It should be noted that the focus has been switched over the years and no the main motivation for consolidation is to increase profit and cost efficiency. Recent empirical
studies in US provide statistical evidence that bank mergers, in general, result in increased cost and profit efficiency. Al-Sharkas A. et al. in their research paper “The Impact of Mergers and Acquisitions on the Efficiency of the US Banking Industry: Further Evidence” (2008) concludes that there is economic rationale for future mergers in the banking industry. Mergers seem to allow efficient banks to gain control over weaker banks, thus helping to increase input efficiency. Based on the DEA analysis they also find that the most significant cause of efficiency among merged banks versus non-merged banks is technical efficiency, suggesting that merged banks are on average more technically efficient than non-merged banks.

Based on our sample there were 16 acquisition with aggregate deal value 4481 millions (EUR) in Canada. This number of deals is already large if we compare to only eleven banks that consistently operated from 1920 to 1980 (Bordo 1995). The banking industry in Canada has remained so stable mainly due to strict constraints on the entry of foreign banks to the Canadian market. Similar to U.S., there was a segmentation of bank types according to their business: commercial banking, trust business, insurance underwriting and brokerage, and securities underwriting and dealing. Framework of banking industry started to transform only in 1980s. Important legislative amendments regarding the entry of foreign banks into Canada was made in 1980 and 1999. Additionally in 1987 and 1992 certain acts were passed that allowed banks to enter other business. For most of the banks it was more profitable to acquire already existing invested dealers, brokerage houses, trust companies. Hence, deregulation stimulated mergers and acquisition in Canada during last 25 years, despite the fact that Canada has a highly concentrated banking market (the largest six banks account for more than 90 per cent of the assets in the banking system).

From both figures an interesting conclusion is made, which is that Western Europe takes the lead over North America in value per deal. Roughly speaking, one deal’s value in Western Europe was 2280 million euro compared to only 1353 million euro in U.S. As a matter of fact, banks located in Western Europe are bigger then in U.S. despite the fact that U.S. stock market capitalization in banking industry is much higher (S. Kleimeier, 2002).

Finally, it is worth to point out Africa. In spite of lowest aggregate deal value these figures is already a significant result for the continent. The continent has an abundance of natural resources such as minerals, timber and oil but it remains among the most under-developed
regions in the world. Issues such as shortage of power and lack of adequate infrastructure coupled with government instability and the scourge of aids are some of the pressing concerns in the region. However, there is no doubt that Africa has tremendous potential. In the report by Credit Suisse First Boston the US ambassador to the African Union stated that African countries compare very favorably in terms of governance, education and economic policies to East Asia in the 1970s, a time that was followed by its period of dramatic economic growth. Discovered potential in continent encourages foreign banks to enter perspective markets. Mergers and acquisitions of local banks was one of the most favorable ways. Striking example are British banks, led by Barclays PLC & Standard Chartered, which now dominate Anglophone countries. French banks, Societe Generale, Credit Lyonnais and Banque Nationale de Paris, have strong operations in Francophone Africa, while Citigroup is represented in 16 African countries.

7.1.2. Operating performance of the deal participants

In the theory section we have drawn some assumptions and considered the findings of previous authors with regards to the impact that mergers & acquisitions have on the operating performance of an acquirer. Hence, we take it from there and look at the given banks’ key performance indicators throughout the research period, in order to follow dynamics and identify development trends that prevail after an acquisition has been completed. A brief insight into a company’s premerger performance also is given there. All of the above builds a solid ground to the upcoming hypotheses testing.

For the convenience purposes, the sample was divided into 5 groups, each representing one year from the period 2005-2010, with the last group including data from 2009 and 2010 together, since the full 2010 year data was not available at the time of conducting this research. Descriptive statistics were mainly obtained from Orbis.

Acquisition announced in 2005

For the purpose of analyzing operating performance, we have taken the following key indicators: profit margin, return on shareholder funds (ROE) and solvency ratio (which is a company’s ability to meet its short-term obligations). In order to avoid citing cumbersome tables, we present a simple chart that shows the development of the abovementioned ratios.
As we see from the chart, the year after the acquisition was announced, acquirers experience gains in profit margin and return on equity for roughly 20%, while solvency ratio stays firmly on its level (7.5 – 7.8) for all period, which means that the acquirer’s liquidity does not suffer from acquisition. Hence, this finding goes in line with the assumptions of Altunbas and Ibanez (2004) and Vander Vennet (2002), which predict short-term increase in profitability after the acquisition. It should be noted that the increase in profitability is further offset almost to the premerger level, but it could very well coincide with the beginning of the world financial crisis.

We would like to emphasize that the above results seem to be biased, as all financial institutions eventually became affected by the global economic crisis in 2008. In this chart we clearly see the dramatic decline in profit margin and ROE, which, no doubt, was rather stimulated by global decrease in profitability, than by the individual performance of the acquirer after the acquisition.
Acquisition announced in 2006

*Source: Orbis*

According to the information from the above chart, there has been a sharp decline in profitability the year after the acquisition, whereas profit margin and return on shareholder funds fell by almost 30%. Furthermore, both ratios continued to drop in two subsequent years, reaching the lowest level in 2009 with negative figures of -2.38 as a profit margin and -1.08 as a return on equity, comparing with 35.20 and 20.03 respectively in 2006. The fact that both ratios regained their positions in 2010 also supports the evidence of ultimate impact of the crisis on all aspects of economics and business. Once again, the conclusion, resulting from the above, is that acquisition, however successful it was, could not overcome the prevailing market and economic conditions, hence it is difficult to make certain conclusions about the topic.

Talking about the solvency ratio, it has been quite stable all over the period, indicating that there were no major changes in liquidity for the acquirers after the deal was done. A bit surprisingly, the ratio rose by almost 40% from 2008 to 2010 (from 4.8 to 7), which can partially be explained with banks’ growing activities of enhancing their liquidity, in order to avoid financial distress.
Acquisition announced in 2007

Chart 7.1.2.3 Evolution in indices of several variables, 2007

Having analyzed the above chart, it can be said that again consequences of acquisition can be barely seen as all the effect is swept by the worsening of global economic state. Acquirers experienced sharp drop in profitability, from 35.19 on average to 16.83 as a profit margin. Liquidity (solvency ratio) was kept high both before and after acquisition, varying from 5 to 6 from 2005 to 2008. Additionally, development tempo is recovering starting from 2008, and profitability is steadily regaining its positions (up to 40% in key ratios).

Acquisition announced in 2008

All in all, the same trends are observed in the sample of banks, which participated in acquisition in 2008, with the only difference in the shape of the curve. This group of banks made an acquisition in tough times; hence the performance that they showed in 2008 was far from optimal. The year after profit margin and ROE began to slightly rise, but didn’t
show as skyrocket growth as banks from previous samples. Description continues after the chart:

*Chart 7.1.2.4 Evolution in indices of several variables, 2008*

Referring to the supplementary figures, we conclude that the profit margin rose by ~15%, from 13.72 to 15.7 for the first year after the acquisition. Return to equity generally remained on the same level, and so did solvency ratio, with minor changes of almost ~10%, from 6.99 to 7.68.

*Acquisition announced in 2009*

Finally, in the sample of acquirers that took part in acquisition process in 2009, slight increase in profitability and ROE is detected the next year after the event. Solvency ratio has almost two times increased after a small decline in 2008 and keeps a firm level of 6-7 points, which overall is a good result, indicating no problems with liquidity. The results are graphically shown at the below chart:
Concluding the above, it can once again be emphasized that the findings occasionally coincide with the results from previous researches, due to the strong impact of global economic crisis on the banking industry performance, which substantially biases the results and limits possibilities of their correct interpretation. In order to draw robust conclusions, one should choose a battery of methods, which will follow in the next sections. Hence, the above information is of descriptive nature only.

_Pre- and post-merger ROE – comparison between banks_

In this subsection we use quartile method to make comparison of changes in return on equity in our sample after the acquisition. In descriptive statistics, quartiles often are used to divide populations into four equal groups, each representing a fourth of the distributed sampled population. First quartile cuts off lowest 25%, second quartile, the median, cuts data set in half, and upper quartile cuts off highest 25% of data, or lowest 75%.

*Source: Orbis*
Table 7.1.2.1 Return on equity in pre- and post-merge state using a quartile method

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>First quartile</td>
<td>0</td>
<td>5.86</td>
<td>0.66</td>
<td>-74.47</td>
<td>-77.13</td>
<td>2.51</td>
<td>-68.88</td>
<td>-76.63</td>
</tr>
<tr>
<td>Third quartile</td>
<td>50</td>
<td>20.13</td>
<td>19.28</td>
<td>17.07</td>
<td>12.72</td>
<td>18.56</td>
<td>5.77</td>
<td>16.88</td>
</tr>
<tr>
<td>Fourth quartile</td>
<td>75</td>
<td>24.2</td>
<td>23.75</td>
<td>21.84</td>
<td>20.03</td>
<td>23.65</td>
<td>13.61</td>
<td>20.9</td>
</tr>
</tbody>
</table>

*Source – Orbis, authors’ shaping*

We constructed the above table in attempt to show how the average ROE figure changed across our samples after the acquisition. The first quartile represents the lowest result; the second quartile shows the highest value in the first 25% of the sample and so on. All in all, this method is very demonstrative and is widely used in statistics.

Looking at the results, the major conclusion is that in all samples except the latest deals (2009) the average ROE figure across acquirers turned to be lower after the acquisition, comparing with the pre-merger state. This supports the before mentioned assumption that acquisition leads to a short-term decline in operating performance. To be more precise, in the sample “2007” 50% of the companies had ROE figure up to 18.56, while the year after the acquisition this figure dropped to only 5.77. For 75% of the companies, the decline was from 23.65 to 13.61, or by 43%.

The same negative tendencies are spotted in the sample “2008”, while the decrease in ROE is not that strongly marked in samples “2005” and “2006”.

Finally, in the sample “2009” 50% of the banks reported ROE up to 8.18, while after the merger half of the companies fell below 11.37, which is an increase by 29%. The same trend is applied to 75% of the banks, with 21% increase in ROE.
7.2. Examining operating performance based on key ratios

In this section we will test some of our hypotheses based on the accounting data that was extracted from Orbis. Afterwards initial findings will be thoroughly tested with different kinds of t-tests, to verify robustness of the results.

7.2.1. Operating performance, acquirer vs target

To begin with, we test the assumption of whether or not acquiring banks tend to bid for worse performing targets, for the reason of improving operating efficiency of the target. We take the main ratios for both involved parties and calculate average, standard deviation, minimum and maximum state.

Table 7.2.1.1 Pre-merger key performance ratios of acquirers and targets

<table>
<thead>
<tr>
<th></th>
<th>Net Interest Margin %</th>
<th>Return on total assets %</th>
<th>Return on Avg Assets (ROAA) %</th>
<th>Return on Avg Equity (ROAE) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquirer</td>
<td>3.24</td>
<td>2.51</td>
<td>1.40</td>
<td>14.65</td>
</tr>
<tr>
<td></td>
<td>standard deviation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.19</td>
<td>5.82</td>
<td>2.02</td>
<td>8.23</td>
</tr>
<tr>
<td>min.</td>
<td>0.28</td>
<td>-44.71</td>
<td>-3.68</td>
<td>-36.26</td>
</tr>
<tr>
<td>max.</td>
<td>19.57</td>
<td>43.33</td>
<td>22.30</td>
<td>50.05</td>
</tr>
<tr>
<td>Target</td>
<td>3.92</td>
<td>2.18</td>
<td>1.27</td>
<td>11.11</td>
</tr>
<tr>
<td></td>
<td>standard deviation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.89</td>
<td>4.99</td>
<td>1.89</td>
<td>15.85</td>
</tr>
<tr>
<td>min.</td>
<td>0.18</td>
<td>-27.87</td>
<td>-4.52</td>
<td>-111.82</td>
</tr>
<tr>
<td>max.</td>
<td>30.65</td>
<td>45.66</td>
<td>20.80</td>
<td>47.43</td>
</tr>
</tbody>
</table>

* Source: Orbis, authors’ shaping

The above results go along with previously made studies Pilloff and Santomero (1998), Hawawini and Swary (1990), Banerjee and Cooperman (2000) and support our hypothesis. Beitel, Schiereck and Wahrenburg in their study “Explaining the M&A-success in European bank mergers and acquisitions” (2003) found the same relation between acquirer and target key ratios. Our calculated figures differ from numbers obtained by Beitel et al. in their research as we used profit before tax in our calculations, but Beitel et al. used net income. However, from both observed results the same conclusion could be drawn - an average bidder has better return on equity than the target bank.
Table 7.2.1.2 Comparison of average ROE of acquirer and target to Beitel research paper

<table>
<thead>
<tr>
<th></th>
<th>ROE % based on our sample</th>
<th>ROE % from Beitel et al. research paper</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acquirer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>standard deviation</td>
<td>13.74</td>
<td>7.99</td>
</tr>
<tr>
<td>min.</td>
<td>-76.63</td>
<td>-17.61</td>
</tr>
<tr>
<td>max.</td>
<td>135.05</td>
<td>34.08</td>
</tr>
<tr>
<td><strong>Target</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>standard deviation</td>
<td>25.26</td>
<td>18.48</td>
</tr>
<tr>
<td>min.</td>
<td>-228.20</td>
<td>-95.18</td>
</tr>
<tr>
<td>max.</td>
<td>120.57</td>
<td>51.41</td>
</tr>
<tr>
<td>Difference between acquirer and target ratio</td>
<td>3.79</td>
<td>3.26</td>
</tr>
</tbody>
</table>

*Source: Authors’ shaping*

It should be pointed out that almost all obtained ratios have quite big standard deviation. This could be explained by the fact that figures are obtained from the whole research period that includes both impetuous growth of world economies and financial crisis that had strong impact on performance of banks. Therefore, to get more precise evidence in support of our hypothesis, we calculated proportion of deals that corresponds to our statement that bidder bank acquires firms with worse financial state and operating performance.

Table 7.2.1.3 Comparison of key operating performance ratios between acquirer and target

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Number of deals</th>
<th>% of deals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquirer Net Interest Margin&gt;Target Net Interest margin</td>
<td>70</td>
<td>40%</td>
</tr>
<tr>
<td>Acquirer Net Interest Margin&lt;Target Net Interest margin</td>
<td>105</td>
<td>60%</td>
</tr>
<tr>
<td>Acquirer ROE &gt; Target ROE</td>
<td>127</td>
<td>60%</td>
</tr>
<tr>
<td>Acquirer ROE &lt; Target ROE</td>
<td>84</td>
<td>40%</td>
</tr>
<tr>
<td>Acquirer Return on total assets&gt;Target Return on total assets</td>
<td>122</td>
<td>58%</td>
</tr>
<tr>
<td>Acquirer Return on total assets&lt;Target Return on total assets</td>
<td>89</td>
<td>42%</td>
</tr>
</tbody>
</table>
Based on all figures it could be concluded that deals which support our hypothesis dominate in our sample. However there is still a sizeable part of deals where less profitable and a certain bank gains control upon more successful company. Acquisition of better performing company might be driven by other non-financial motives that are not considered in our hypothesis. Frohlich and Kavan (2003) makes an example of geographical diversification. The geographic diversification is an attempt to increase the bank’s market, decrease its risk, and in the long run increase profits.

Moreover, analyzing more specific bank ratios like Tier 1 the opposite result is obtained – banks that are less durable against losses under distressed conditions acquire better performing banks. Based on asset quality and solvency ratio proportion of deals is almost equal.

Table 7.2.1.4 Comparison of key operating performance ratios between acquirer and target, continued

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Number of deals</th>
<th>Percent of deals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquirer Tier 1 &gt; Target Tier 1</td>
<td>42</td>
<td>39%</td>
</tr>
<tr>
<td>Acquirer Tier 1 &lt; Target Tier 1</td>
<td>67</td>
<td>61%</td>
</tr>
<tr>
<td>Acquirer Solvency &gt; Target solvency</td>
<td>112</td>
<td>53%</td>
</tr>
<tr>
<td>Acquirer Solvency &lt; Target solvency</td>
<td>100</td>
<td>47%</td>
</tr>
<tr>
<td>Acquirer Loan Loss Res. / Gross Loans% &gt; Target Loan Loss Res. / Gross Loans%</td>
<td>79</td>
<td>51%</td>
</tr>
<tr>
<td>Acquirer Loan Loss Res. / Gross Loans% &lt; Target Loan Loss Res. / Gross Loans%</td>
<td>77</td>
<td>49%</td>
</tr>
</tbody>
</table>

*Source: Orbis, authors’ shaping*
To sum up, our analysis shows that banks tend to acquire firms with worse financial state and operating performance in terms of investment returns ratios (ROE, ROA, ROAA, ROAE) and net interest margin. But analysis of more specific ratios produces inconclusive results. Anyway in this issue is more important to discover if acquirer benefits in deals that follows this conditions. Answer to this question will be presented in next section.

7.2.2. Change in operating performance of the bidder after acquisition

Before going forward to the analysis of the empirical results, one crucial remark should be pointed out and discussed. It is often contented that the lack of market data biases studies of accounting data. We faced the problem of not being able to collect enough data to include a ratio to the analysis, because the accounting reports for certain years are not available anymore as the company changed its name after the acquisition. Hence, in separate cases it is merely impossible to measure the effect of acquisition on the bank’s performance. S. Pilloff and A. Santomero (1996) in their study “The Value of Bank Mergers and Acquisitions” suggested that many performance gains may take time to either be achieved or be reflected in financial reports, thus it is argued that perhaps the post-merger time period is insufficiently long to capture the gains.

However, in spite of extensive data problems, one cannot dismiss the entire literature on the topic. These problems are clearly of concern and bias of the results is always there, but none of the abovementioned has sufficient power to reverse the great quantity of evidence against gains in performance and value.

With the abovementioned arguments in mind and taking into consideration that the general findings of the merger literature indicate overall decline in profit efficiency, return on equity and other important measures of a company’s operating performance, we attempted to test these results in the banking industry. The extensive preparation of the accounting data had been performed. First of all, we selected the most comprehensive ratios from different groups, such as asset quality, liquidity, capital, operations and structure. This lets us look at the given bank’s performance from various angles, thus following to more robust conclusions. After that we collected data for the year preceding the acquisition and the year after, in order to monitor the short-term changes. Using a standard approach, we compared the year before acquisition with the year after it was done and obtained the below results for the general 5-year period sample:
Table 7.2.2.1 Change in operating performance the year after acquisition, general sample

<table>
<thead>
<tr>
<th>Change, total</th>
<th>Net Interest Margin</th>
<th>ROE</th>
<th>ROA</th>
<th>Tier 1 Ratio</th>
<th>ROAA</th>
<th>ROAE</th>
<th>Current ratio</th>
<th>Solvency ratio</th>
<th>Loan Loss Res. / Gross Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative change</td>
<td>120</td>
<td>205</td>
<td>204</td>
<td>112</td>
<td>167</td>
<td>88</td>
<td>18</td>
<td>125</td>
<td>105</td>
</tr>
<tr>
<td>Positive change</td>
<td>114</td>
<td>60</td>
<td>61</td>
<td>74</td>
<td>68</td>
<td>147</td>
<td>11</td>
<td>137</td>
<td>112</td>
</tr>
<tr>
<td>Negative change, %</td>
<td>51,3%</td>
<td>77,4%</td>
<td>77,0%</td>
<td>60,2%</td>
<td>71,1%</td>
<td>37,4%</td>
<td>62,1%</td>
<td>47,7%</td>
<td>48,4%</td>
</tr>
<tr>
<td>Positive change, %</td>
<td>48,7%</td>
<td>22,6%</td>
<td>23,0%</td>
<td>39,8%</td>
<td>28,9%</td>
<td>62,6%</td>
<td>37,9%</td>
<td>52,3%</td>
<td>51,6%</td>
</tr>
</tbody>
</table>

*Source: Orbis, authors’ shaping*

Our findings share the point of previous studies of Becalli and Frantz (2009), Correa (2008), Kwan & Eisenbeis (1999) and other authors, i.e., we see that the majority of key performance indicators have declined. Among the most substantial drops are return on equity and return on assets - both dropped in 77% of cases. The evidence does not seem to be unambiguous for net interest margin, reporting the negative change in slightly more than 50% of selected banks. The same tendency is observed for the majority of other ratios, with only loan loss reservation ratio climbing for more than a half of the sample. But as this ratio shows quality of the credit portfolio and the higher it is, the more problematic loans are, this result also means a “negative” change for the bank. Surprisingly, return on average equity (ROAE) turned to improve for 62.6% of the banks.

Overall, we cannot reject the hypothesis and confirm that acquirers experience short-term decline in key operating performance after acquisition is done. This decline is applied to all aspects of a bank’s performance, from profit to liquidity and asset quality. This empirical evidence is also a confirmation of a well-known management hubris hypothesis, described by various authors, for example, S. Pilloff and A. Santomero (1996). Bad results of the acquisition may be attributed to the overconfidence and strategic mistakes done by management of the acquiring company.

Having looked at the general findings, let us introduce a year-by-year results, in order to separate crisis years and check if this will bias the results. We decided to exclude current ratio from the analysis, as there are too less information available.

For a sample of acquisitions done in 2005 we observe significant contradiction to the general results. As we see, the majority of ratios had improved. This can be partially
explained by the overall economic growth that prevailed in the markets in 2006, and by a better selection of targets. However, this can also be justified by imperfection of sample and too less available information that leads to a strong bias in the results.

In 2006 and 2007 there is a significant amount of evidence in support of the previous empirical findings, as we observe that more than 70% of acquirers experience drop in profit and operating efficiency, liquidity and overall financial strength. It should be noted, that despite the majority of the results in 2007 and 2008 are negative, net interest margin stayed positive for 55-58% of the banks, which means that more than a half of companies was able to generate even more profit than the year before the acquisition.

Table 7.2.2.2 Change in operating performance the year after acquisition, yearly samples

<table>
<thead>
<tr>
<th>Year</th>
<th>Change, %</th>
<th>Net Interest Margin</th>
<th>ROE</th>
<th>ROA</th>
<th>Tier 1 Ratio</th>
<th>ROAA</th>
<th>ROAE</th>
<th>Solvency ratio</th>
<th>Loan Loss Res. / Gross Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Negative change</td>
<td>13</td>
<td>17</td>
<td>12</td>
<td>13</td>
<td>10</td>
<td>13</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Positive change</td>
<td>15</td>
<td>14</td>
<td>19</td>
<td>5</td>
<td>18</td>
<td>15</td>
<td>19</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Negative change, %</td>
<td>46,4%</td>
<td>54,8%</td>
<td>38,7%</td>
<td>72,2%</td>
<td>35,7%</td>
<td>46,4%</td>
<td>38,7%</td>
<td>77,8%</td>
</tr>
<tr>
<td></td>
<td>Positive change, %</td>
<td>53,6%</td>
<td>45,2%</td>
<td>61,3%</td>
<td>27,8%</td>
<td>64,3%</td>
<td>53,6%</td>
<td>61,3%</td>
<td>22,2%</td>
</tr>
<tr>
<td>2006</td>
<td>Negative change</td>
<td>59</td>
<td>78</td>
<td>80</td>
<td>59</td>
<td>58</td>
<td>42</td>
<td>51</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Positive change</td>
<td>38</td>
<td>32</td>
<td>31</td>
<td>15</td>
<td>40</td>
<td>56</td>
<td>56</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Negative change, %</td>
<td>60,8%</td>
<td>70,9%</td>
<td>72,1%</td>
<td>79,7%</td>
<td>59,2%</td>
<td>42,9%</td>
<td>47,7%</td>
<td>72,9%</td>
</tr>
<tr>
<td></td>
<td>Positive change, %</td>
<td>39,2%</td>
<td>29,1%</td>
<td>27,9%</td>
<td>20,3%</td>
<td>40,8%</td>
<td>57,1%</td>
<td>52,3%</td>
<td>27,1%</td>
</tr>
<tr>
<td>2007</td>
<td>Negative change</td>
<td>35</td>
<td>76</td>
<td>77</td>
<td>34</td>
<td>70</td>
<td>24</td>
<td>45</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Positive change</td>
<td>42</td>
<td>6</td>
<td>5</td>
<td>30</td>
<td>7</td>
<td>53</td>
<td>37</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Negative change, %</td>
<td>45,5%</td>
<td>92,7%</td>
<td>93,9%</td>
<td>53,1%</td>
<td>90,9%</td>
<td>31,2%</td>
<td>54,9%</td>
<td>24,7%</td>
</tr>
<tr>
<td></td>
<td>Positive change, %</td>
<td>54,5%</td>
<td>7,3%</td>
<td>6,1%</td>
<td>46,9%</td>
<td>9,1%</td>
<td>68,8%</td>
<td>45,1%</td>
<td>75,3%</td>
</tr>
<tr>
<td>2008</td>
<td>Negative change</td>
<td>13</td>
<td>33</td>
<td>34</td>
<td>6</td>
<td>28</td>
<td>9</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Positive change</td>
<td>18</td>
<td>6</td>
<td>5</td>
<td>23</td>
<td>3</td>
<td>22</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Negative change, %</td>
<td>41,9%</td>
<td>84,6%</td>
<td>87,2%</td>
<td>20,7%</td>
<td>90,3%</td>
<td>29,0%</td>
<td>43,6%</td>
<td>12,9%</td>
</tr>
<tr>
<td></td>
<td>Positive change, %</td>
<td>58,1%</td>
<td>15,4%</td>
<td>12,8%</td>
<td>79,3%</td>
<td>9,7%</td>
<td>71,0%</td>
<td>56,4%</td>
<td>87,1%</td>
</tr>
</tbody>
</table>

7.2.3. Asset growth of the target

In order to test the assumption of whether or not bidders prefer faster growing targets, we collected accounting data for targets in our sample and calculated their asset growth for the 3 years period, preceding the acquisition. The average asset growth ratio for that period was further compared with a benchmark, which is constructed by means of average asset growth in banking industry for a certain year, in two biggest banking industries in the world – US and EU. The logic behind this statement is that majority of acquisitions presented in our sample are originated either in Europe or in US. Furthermore, as these markets are
considered as leaders and main trend determinants, the results can be applied to the other markets as well. Based on the information from ECB and Federal Deposit Insurance Corporation, the following average asset growth ratios were identified:

*Chart 7.2.3.1 Average asset growth in banking industry, 2003-2009*

Consequently, the average between EU and US has been taken as a “normal” asset growth and calculated for each year. It was further compared to the asset growth ratio of each target and if the target’s ratios turned to be higher than the “normal”, it was labeled a “fast growing target”, or “low growing target” if vice versa.

The above steps led to the following results:

*Chart 7.2.3.2 Asset growth distribution across targets*

As we see, the hypothesis cannot be rejected and bidders tend to acquire faster growing targets, but the power of this statement is relatively week, as faster growing targets
supersede low growing ones only by 4%, which leads to the general conclusion that, in banking industry, the asset growth factor is irrelevant in making a decision about acquisition. The question of whether or not target’s asset growth level has a significant impact on bidder’s abnormal performance is not presented in this research due to time limitations, so it remains open and provides a field for further studies.

We can also look at the results from quartile method perspective, noticing that in 2008 and 2009 there was a significant decline, caused by instability in banking sector all around the world, so half of all targets experienced a sharp drop, with only 50% of the banks reporting positive asset growth ratio in 2008, while in 2009 almost 65% of targets had negative figures. The industry in total reacted to the global changes as well, but the magnitude of these changes was different. In EU, total asset growth around all banks in the union stayed positive up until 2009, when -1% was reported, comparing with 2% in 2008 and 11% growth in 2007. United States have reacted to the crisis with -3.76% in 2009, while in 2008 the ratio froze at 10.14%. By this we mean that the results seem to be biased to certain extent due to strong external factors that prevailed in the markets at that time.

Table 7.2.3.1 Target asset growth, using a quartile method

<table>
<thead>
<tr>
<th>Quartiles, %</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>first quartile</td>
<td>0</td>
<td>-5.8%</td>
<td>-12.9%</td>
<td>-9.7%</td>
<td>-4.0%</td>
</tr>
<tr>
<td>second quartile</td>
<td>25</td>
<td>1.5%</td>
<td>8.2%</td>
<td>5.1%</td>
<td>-1.7%</td>
</tr>
<tr>
<td>third quartile</td>
<td>50</td>
<td>7.2%</td>
<td>12.7%</td>
<td>17.6%</td>
<td>0.8%</td>
</tr>
<tr>
<td>fourth quartile</td>
<td>75</td>
<td>12.6%</td>
<td>24.0%</td>
<td>36.8%</td>
<td>19.0%</td>
</tr>
</tbody>
</table>

* Source: Authors’ shaping

To sum up, the results of our study do not contradict with the ones presented by Becalli and Frantz (2007), as we found that the majority of bidders acquire banks that grow faster than the industry in average, but have relatively low power to state that bidders always choose smaller and faster growing targets. We examined the main indicator of a fast growing company, but there are many others to consider in future studies.
8. Presentation of empirical results based on t-tests

In this part of the thesis we examine the presence of significant abnormal return on stock in the banking industry, utilizing the samples we constructed earlier. There are three samples we make use of in tests. The first one includes all deals that match the before mentioned data selection criteria, cut by a number of deals that did not have returns on either own stock or its corresponding market available. This yielded a sample of 224 deals. The second and third samples were built in accordance with the proposed assumption about presence of abnormal returns in case a better performing bank acquires a worse performing target. Subsequently, we obtained accounting data for both bidders and targets, using ROA as a primary measure for performance of the two involved parties. After reducing our samples significantly, as there were no sufficient information available about the targets mainly, we came up with the sample, which contains deals where the acquirer had a higher average ROA (75 deals in total) than the target before the acquisition – abbreviated “ROA>” and vice versa (62 deals in total) – abbreviated “ROA<”.

This closing section is organized in the following fashion: first of all, we analyze average abnormal returns in our samples, to see if there are any visible fluctuations, and then we will test the initial observations with statistical tests. As our study is aimed at detection of short-term gains or losses, the analysis is conducted over two time intervals – 200 days preceding the acquisition announcement date and the event window that includes the event day itself and one day before and after the event. The conclusions are drawn in accordance with the findings in event window timeframe.

8.1. Average abnormal returns on stock

Before we proceed with testing of our hypotheses, let us have a look at the average abnormal returns across the samples 10 days before the announcement date and in the event window itself. This is done in attempt to check whether or not the market “anticipates” the deal and reacts accordingly. In broader sense, this is a check of efficient market hypothesis, which states that it is impossible to outperform the market and make an abnormal profit, because the share price always incorporate and reflect all relevant information. Below is the graphical representation of the results.
As we see, there are no outstanding abnormal returns visible in the event window and the returns vary insignificantly, constantly striving to zero. This is a very important point to consider, because this result is a circumstantial acknowledgement of efficient market hypothesis. However, such tendencies are not new in this field of study – for instance, Hackbarth & Morellec (2008) in their relatively recent study of US industries, report either neutral or insignificant abnormal returns. Nevertheless, this assumption should be carefully verified using a battery of statistical tests.

Chart 8.1.2 Average abnormal return 10 days before the announcement date, “ROA>” sample
In the sample of acquisitions where the acquirer performed better than the target we observe a clearly visible deviation on the event date and the day after. Needless to mention, the magnitude of this deviation is way more significant than in the preceding 10 days. It should be emphasized that the nature of fluctuations is negative. This leads to a conclusion that in case a better performing bank announces its acquisition with a worse performing bank, such news cause negative reaction on the market and immediate drop in acquirer’s share price. Generally speaking, similar results may be found in previous studies of Broyles and Hecht (1977) and Firth (1976), however, their researches were conducted on an undoubtedly less specific sample.

To elaborate on this idea, investors perceive the announcement of acquisition of worse performing bank negatively, because the average worse performing bank tend to have larger proportion of problem loans. Institutions with non-performing loans experience high costs and generate low profits relative to institutions on the ‘best practice’ efficient frontier (A. Berger, R. DeYoung, 1997). Earlier issued loans are a sizeable part of banks’ assets, and those loans’ quality cannot be improved by change of management. By this it is meant that quality of already issued loans depends on economic conditions, which are often region or industry specific as only such conditions influence borrowers’ capacity. Bank industry is one of the most regulated in the world and this should not come as a surprise, because banks are most capitalized in the world. Therefore shareholders, debt holders, depositors want to know precise financial state of banks. Moreover, banks are analyzed and rated by world rating agency. Information precision is supervised by internal and external auditors, Members of Supervisory Council. Indeed they have a closer look at information concerning loan quality that is presented in risk rating reports, reports on past-due and nonaccrual loans, renegotiated and restructured loan reports, and policy exception reports. To sum up this idea, investors do not believe that vague benefits of synergy could outweigh losses from instantaneous disadvantages of adding a worse performing bank to an organization. In such situation an investor compare well-understood figure with dim possibilities of improvements due to merger or acquisition.
Finally, the sample of worse performing banks acquiring a better performing target, again there is no significant movement neither around the event window, nor in the event window itself. We do see a gradual decline in returns starting from the day before the acquisition, but it is nowhere near the level which might be considered as significant. Hence, we can draw a preliminary conclusion that results obtained from this sample will also support the efficient market hypothesis. The motivation of this statement might be formulated as follows: the fact that worse operating bank acquires a better one does not lead to an increase in performance on the joint company, and coupled with a notion that a worse performing acquirer is less likely to build a successful company; the market negatively perceives news about acquisition.

8.2. Empirical evidence – abnormal stock performance in banking industry

Here we start presenting empirical results from different statistical tests that were applied to our samples. For convenience purposes, this subsection is divided into two parts, each representing the hypotheses that were tested.

8.2.1. Abnormal return on stock in general sample

To recall, the goal of this study is to challenge the efficient market hypothesis and check our assumption that the market perceives news about acquisition as positive, which in turn will lead to an increased share price, and, as a result, to positive abnormal return to the market.
shareholders. The main driving forces for that (such as revenue increase, new business ventures and cross-selling of each other’s products) were mentioned in the theory section and represent our view and anticipation of the result of statistical tests. However, there is a substantial amount of literature that takes opposite points of view, and majority of authors (for instance, Piloff and Santomero (1998)) stick to the opinion that the acquisition itself does not lead to enhanced share price unless additional details become known, like synergies, cost cutting or significant increase in operating performance of the joint company.

In light of the above, we used 7 tests to conduct the analysis – 4 parametric and 3 non-parametric ones. The results and brief conclusions are presented below.

**Parametric tests**

*Table 8.2.1.1 Empirical results of T1 – cross sectional dependence*

<table>
<thead>
<tr>
<th>Event window</th>
<th>T1</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>1.35550</td>
<td>0.17679</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-1.11503</td>
<td>0.26618</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>0.58561</td>
<td>0.55880</td>
<td>Cannot reject</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>T1CAR</strong></td>
<td><strong>P</strong></td>
<td><strong>Cannot reject</strong></td>
</tr>
<tr>
<td></td>
<td>0.47694</td>
<td>0.63393</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Authors’ shaping*

As we see, cross sectional dependence test yields fairly consistent results, failing to reject the null hypothesis, which in our case means absence of significant abnormal return in general sample. As previously seen on the average excess return chart, the fluctuation of the share price was too low to consider it substantial.

*Table 8.2.1.2 Empirical results of parametric tests, general sample*

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T2</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>0.00181</td>
<td>1.45867405</td>
<td>0.14623138</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-0.00149</td>
<td>-1.19991076</td>
<td>0.231600574</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>0.000782</td>
<td>0.63016878</td>
<td>0.529307096</td>
<td>Cannot reject</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>CAR</strong></td>
<td><strong>T2CAR</strong></td>
<td><strong>P</strong></td>
<td><strong>Cannot reject</strong></td>
</tr>
<tr>
<td></td>
<td>0.001103</td>
<td>0.51322517</td>
<td>0.608363115</td>
<td></td>
</tr>
</tbody>
</table>
The results of the above mentioned tests are seen as fairly unambiguous. All except one parametric test display the same results, being similar not only by tendency, but also by the “weight” of t-statistics. T2 and T4 were close to rejection when it comes to measuring one day before the event, but yielded consistent results for day 0 and 1. A bit surprisingly, T3, a modified version of T1 and T2, which uses standardized abnormal returns that are scaled by their individual standard deviations and then added together, was able to detect significant negative abnormal performance both in the event day 0, and across the whole event window. The T statistic of -4.22 and tiny P-value are the indicators of a strong rejection, which is a total contradiction to the other tests.

It has to be recalled that among parametric tests, a standardized cross-sectional method, adjusted by the induced variance (T4) is considered as the most reliable as it is adjusted by the variance, which often appears due to increased systematic risk and uncertainty about the effect of the event. Hence, adjusting the T-statistic by this deviation, we get more credible result, which in this case indicates absence of significant abnormal performance at 95% confidence level.

Analyzing these findings further, the question of reliability on parametric tests may arise. In order to clarify whether or not we can consider these results reliable, we look at the sample size, as advised by Motulski (1995). The size of 224 observations is relatively large and
therefore does not incur a problem of non-normal distribution. In case of large samples, parametric tests are proven to be even more trustworthy than the non-parametric.

**Non-parametric tests**

**Table 8.2.1.3 Empirical results of non-parametric tests, general sample**

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T5 Sign</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>1.069045</td>
<td>1.09489747</td>
<td>0.274884971</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-0.13363</td>
<td>-0.13686218</td>
<td>0.891278095</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>0.267261</td>
<td>0.27372437</td>
<td>0.784580346</td>
<td>Cannot reject</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>CAR</strong></td>
<td><strong>T5CAR</strong></td>
<td><strong>P</strong></td>
<td><strong>Cannot reject</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T6 Rank</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-0.16114</td>
<td>-0.55177601</td>
<td>0.581720911</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>0.354056</td>
<td>1.21233713</td>
<td>0.226820707</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>-0.03243</td>
<td>-0.1110281</td>
<td>0.911705963</td>
<td>Cannot reject</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>CAR</strong></td>
<td><strong>T6CAR</strong></td>
<td><strong>P</strong></td>
<td><strong>Cannot reject</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>SUM of positive signs</th>
<th>T7 Gen Sign</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>112</td>
<td>0.48936261</td>
<td>0.625123961</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>108</td>
<td>-0.04544552</td>
<td>0.963797771</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>109</td>
<td>0.08825651</td>
<td>0.929761552</td>
<td>Cannot reject</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>T7CAR</strong></td>
<td><strong>P</strong></td>
<td><strong>Cannot reject</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: Authors’ shaping

The aim of the non-parametric tests, the same as of their parametric counterparts, is to detect abnormal performance based on the null hypothesis of zero abnormal performance. A positive and significant test statistic indicates that value is being created and the abnormal return is larger than zero, while a negative significant test statistic corresponds to value destruction. Finally, an insignificant test statistic indicates that based on the data the test is unable to detect any deviations from zero abnormal return. In the above table T5 represents Sign test, while T6 shows results for Rank test and T7 stands for Generalized Sign test.
The results of non-parametric tests coincide quite perfectly, whereas all tests were unable to reject the null hypothesis. Moreover, none of the T-statistics and P-values is being evaluated “on the edge”, i.e. all tests display consistent results and are not even close to rejection. This lets us draw robust conclusions and state that acquisition itself does not cause any outstanding reaction on the market and one cannot get abnormal return on acquirer’s stock, if we consider banking industry only.

To sum up, both kinds of tests yielded the same results, and our findings contradict with the initial hypothesis that was set in this paper. To recall, the hypothesis that we brought up assumed there is a positive abnormal return for shareholders in the event window, for the number of reasons. Hence, this result is a triumph of semi-strong EMH, which implies that prices of the stock reflect all publicly available information and that prices instantly change to reflect new information. In turn, this leads to inability to consistently achieve returns in excess of average market returns on a risk-adjusted basis, given the information publicly available at the time the investment is made.

Comparing our results with previous studies, we should emphasize that there is a limited number of literature that studies abnormal return on stock in banking industry. Generally, our findings go in line with conclusions of the proponents and followers of the Efficient Market Hypothesis, such as B.Malkiel (2003), Fama (1970), von Gensdoff and Bacon (2007), Kilic and Osman (2004). We should also note specifications of the industry that we study. Banking industry has always been among the leaders in regulation, transparency and information exchange. By this we mean that this market could be called “informationally efficient”, and therefore, no hidden information could be used for the sake of obtaining excess return on stock. On the other hand, it is assumed that M&A’s in general lead to a decline in performance, unless some clear advantages of a certain deal become known, thus the market might perceive the news about acquisition as negative, but, as we see from empirical results, this effect is quickly faded away.

The last, but not the least remark is that a global financial crisis might have biased the results of this study. In the days when markets all around the world had been losing positions, but one of the reasons for a merger or acquisition was an attempt to save the bank from bankruptcy, rather than to explore synergies and advantages, the reaction to such deals
might have taken the opposite way to the one usually expressed in that case. History of the M&A market in banking industry provides with the graphic examples of such deals, and potentially each large acquisition might have given rise to rumors about financial distress of the target. Therefore, to some extent, we attribute the overall negative tendency to the crisis as well.

8.2.2. Abnormal return on stock in case a better performing bank acquires a worse performing one

Parametric tests

Table 8.2.2.1 Empirical results of parametric tests, “ROA>” sample

<table>
<thead>
<tr>
<th>Event window</th>
<th>T1</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-0.05762</td>
<td>0.95411</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>4.78766</td>
<td>0</td>
<td>Reject</td>
</tr>
<tr>
<td>1</td>
<td>1.06759</td>
<td>0.28700</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>Total</td>
<td>T1CAR</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-2.18105</td>
<td>0.030352</td>
<td>Reject</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T2</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-0.00071</td>
<td>-0.32137</td>
<td>0.748267295</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-0.00895</td>
<td>-4.0591884</td>
<td>7.07431E-05</td>
<td>Reject</td>
</tr>
<tr>
<td>1</td>
<td>0.00264</td>
<td>1.197579653</td>
<td>0.232505217</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>Total</td>
<td>CAR</td>
<td>T2CAR</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.00702</td>
<td>-1.83769364</td>
<td>0.067598543</td>
<td>Cannot reject</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T3</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-0.12321</td>
<td>-1.06699433</td>
<td>0.287267129</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-0.66225</td>
<td>-5.73521147</td>
<td>3.57825E-08</td>
<td>Reject</td>
</tr>
<tr>
<td>1</td>
<td>-0.02778</td>
<td>-0.24056713</td>
<td>0.810138284</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>Total</td>
<td>CAR</td>
<td>T3CAR</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.81323</td>
<td>-7.04277292</td>
<td>2.99988E-11</td>
<td>Reject</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T4</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-0.00071</td>
<td>-0.40222179</td>
<td>0.6879525</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-0.00895</td>
<td>-1.39115382</td>
<td>0.165732162</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>0.00264</td>
<td>0.770929613</td>
<td>0.441663011</td>
<td>Cannot reject</td>
</tr>
</tbody>
</table>

*Source: Authors’ shaping

The sample “ROA>” is constructed in order to challenge the hypothesis that was earlier formulated as follows: By means of pre-merger performance of the two involved parties,
there is positive abnormal return on stock if better-performing bidder bank acquires worse-performing target. In these regards, it was expected that the null hypothesis will be rejected and the positive sign of abnormal return appear. Surprisingly, tests yielded completely opposite results.

T1 and T3 were able to detect significant negative abnormal performance in the event window in general and in the event day 0 in particular. T2 joined the above with rejecting the null hypothesis in the event day, while being unable to do so in the whole event window. T4 is left as a standalone with no rejections whatsoever. Trying to interpret these results, we came to the conclusion, which is also supported by several authors, such as Srinivasan & Wall (1992), Pilloff, (1996) and others, that although many banks claim that acquisitions are done in attempt to increase profit and operating efficiency, just as many fail to do so eventually. Therefore, investors may pose a negative reaction to this event, knowing that, in reality, acquisitions in banking are often associated with management hubris theory. Even in case the reasons are quite rational, it may take years for the positive outcome of the deal to become visible. In light of this, drop in the share price is a justifiable reaction to the news about announcement of the acquisition.

Non-parametric tests

Table 8.2.2.1 Empirical results of non-parametric tests, “ROA>” sample

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T5 Sign</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-1.1547</td>
<td>-1.17847099</td>
<td>0.24001612</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-1.03923</td>
<td>-1.06062389</td>
<td>0.290146419</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>1.385641</td>
<td>1.414165186</td>
<td>0.158876004</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>Total</td>
<td>CAR</td>
<td>T5CAR</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.80829</td>
<td>-0.47627338</td>
<td>0.634402121</td>
<td>Cannot reject</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T6 Rank</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>0.31075</td>
<td>1.104429388</td>
<td>0.270740521</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>0.686594</td>
<td>2.440205552</td>
<td>0.015554358</td>
<td>Reject</td>
</tr>
<tr>
<td>1</td>
<td>-0.2966</td>
<td>-1.05413661</td>
<td>0.293098565</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>Total</td>
<td>CAR</td>
<td>T6CAR</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.700745</td>
<td>2.490498329</td>
<td>0.013574967</td>
<td>Reject</td>
</tr>
</tbody>
</table>
Judging from the above it can be concluded that non-parametric tests yielded different results. While Sign and Generalized Sign tests show that there is not significant abnormal return in this sample, Rank test rejects the null hypothesis in the event day 0 and in the whole event window. According to Corrado (1989), one should choose rank test over other non-parametric test as it proved to be quite consistent in handling different samples and largely immune to Type I and Type II errors. Hence we are able to draw a final conclusion that our initial hypothesis is empirically rejected, whereby the majority of t-tests display that there is no excess value creation as a result of announcement of the acquisition.

To sum up, the results obtained from empirical tests contradict with the theoretical assumptions from different authors, presented in the theory section. It turns out that the market does not believe in ability of the acquirer to improve efficiency of the target as one can observe a negative return on stock right before the announcement date. On the other hand, we deal with the significant amount of literature (Vander Vennet (2002), Correa (2008) etc.) that reports value destruction after acquisition and inability of the joint company to regain the pre-merger pace in the subsequent 2-5 years. In these regards, acquisition of a worse-performing target by a better performing bidder may be seen as a threat to profitability and efficiency of the acquirer for the next years, therefore, the reaction is negative. Another point to consider is the ability of management to run a successful organization. According to performance efficiency hypothesis managers with worse skills are not able to explore potential benefits from a better performing company and transfer them to the whole organization.

<table>
<thead>
<tr>
<th>Event window</th>
<th>SUM of positive</th>
<th>T7 Gen Sign</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>30</td>
<td>-1.47842649</td>
<td>0.140874723</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>32</td>
<td>-1.01634708</td>
<td>0.310698211</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>44</td>
<td>1.756129389</td>
<td>0.080604632</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>Total</td>
<td>T2CAR</td>
<td>-0.42645642</td>
<td>0.670236255</td>
<td>Cannot reject</td>
</tr>
</tbody>
</table>

*Source: Authors’ shaping*
It should also be noted that there are only a few researches in banking industry that examined return on stock across the world in such circumstances, and none of them seem to refer to the latest years, thus it is hard to make extensive comparison and draw parallels with previous studies. However, as the results are statistically robust, conclusions can be seen as reliable.

8.2.3. Abnormal return on stock in case a worse performing bank acquires a better performing one

*Parametric tests*

*Table 8.2.3.1 Empirical results of parametric tests, “ROA<” sample*

<table>
<thead>
<tr>
<th>Event window</th>
<th>T1</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>0.63382</td>
<td>0.52692</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-1.02404</td>
<td>0.30706</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>-1.07904</td>
<td>0.28188</td>
<td>Cannot reject</td>
</tr>
<tr>
<td><em>Total</em></td>
<td><em>T1CAR</em></td>
<td><em>P</em></td>
<td><em>H0</em></td>
</tr>
<tr>
<td></td>
<td>-0.84827</td>
<td>0.39731</td>
<td>Cannot reject</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T2</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>0.001173</td>
<td>0.651618</td>
<td>0.515399218</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-0.0019</td>
<td>-1.05258</td>
<td>0.293809062</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>-0.002</td>
<td>-1.1092</td>
<td>0.268682729</td>
<td>Cannot reject</td>
</tr>
<tr>
<td><em>Total</em></td>
<td><em>CAR</em></td>
<td><em>T2CAR</em></td>
<td><em>P</em></td>
<td><em>H0</em></td>
</tr>
<tr>
<td></td>
<td>-0.00272</td>
<td>-0.87189</td>
<td>0.997832996</td>
<td>Cannot reject</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T3</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>0.159934</td>
<td>1.259324</td>
<td>0.209388379</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-0.35856</td>
<td>-2.82331</td>
<td>0.005236181</td>
<td>Reject</td>
</tr>
<tr>
<td>1</td>
<td>-0.25033</td>
<td>-1.97112</td>
<td>0.050096804</td>
<td>Reject</td>
</tr>
<tr>
<td><em>Total</em></td>
<td><em>CAR</em></td>
<td><em>T3CAR</em></td>
<td><em>P</em></td>
<td><em>H0</em></td>
</tr>
<tr>
<td></td>
<td>-0.44896</td>
<td>-3.5351</td>
<td>0.000506942</td>
<td>Reject</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T4</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>0.001173</td>
<td>0.636621</td>
<td>0.525103402</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-0.0019</td>
<td>-0.66392</td>
<td>0.50751254</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>-0.002</td>
<td>-0.64166</td>
<td>0.521831611</td>
<td>Cannot reject</td>
</tr>
</tbody>
</table>

*Source: Authors’ shaping*
We built the sample “ROA<” as a counterbalance to the previous sample and collected the deals where a worse performing target acquired a better performed bidder.

According to the economic theory, such actions should lead to the negative reaction on the market as such disposition of forces is by default value-destructing and unpromising in terms of enhancing efficiency.

Parametric tests partially confirm the above assumptions, whereby T1, T2 and T4 were not able to detect any significant abnormal return, but T3 yielded rejection for day 0 and 1, as well as for the whole event window. However, analyzing conditions of this deal in pure mathematical way, adding better performing entity means that weight average performance figures at least in short term should be better. As a result two opposite forces could be mutually excluded. Consequently, there should not be any reaction in market. This statement is supported by T4 which according to recommendations from Bartholdy et.al (2007) is considered as the most reliable parametric test.

We put a special emphasis on the repeating negative tendency in all our samples. It means that, in general, announcements of acquisitions in banking industry during the last 5 years are treated as bad news, regardless of parties’ premerger state and performance. This is a very important conclusion, since it mainly does not align into modern studies of M&A market. Conversely, these results are more or less consistent with fundamental works of Franks, Broyles and Hecht (1977), Barnes (1978) and a theory of the Efficient Market Hypothesis, which does stand in our case, taking into consideration insignificance of the abnormal returns, discovered across all samples.

Nevertheless, keeping in mind that the sample in question is relatively small and after having obtained ambiguous results, we should refer to non-parametric tests in order to verify if the initial findings are correct.
Non-parametric tests

Table 8.2.3.2 Empirical results of non-parametric tests, “ROA<” sample

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T2</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>1.143001</td>
<td>1.096947</td>
<td>0.273990105</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>1.270001</td>
<td>1.21883</td>
<td>0.224351506</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>-1.524</td>
<td>-1.4626</td>
<td>0.145155416</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>Total</td>
<td>CAR</td>
<td>T5CAR</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.889001</td>
<td>0.492584</td>
<td>0.62284934</td>
<td>Cannot reject</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>A bar</th>
<th>T2</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-0.22661</td>
<td>-0.80372</td>
<td>0.422516728</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>-0.18739</td>
<td>-0.66462</td>
<td>0.507065535</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>0.392829</td>
<td>1.393265</td>
<td>0.165094006</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>Total</td>
<td>CAR</td>
<td>T2CAR</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.02117</td>
<td>-0.07507</td>
<td>0.940232119</td>
<td>Cannot reject</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event window</th>
<th>SUM of positive</th>
<th>T7</th>
<th>P</th>
<th>H0</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>33</td>
<td>0.682088</td>
<td>0.495976264</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>0</td>
<td>36</td>
<td>1.444275</td>
<td>0.150234232</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>1</td>
<td>24</td>
<td>-1.60447</td>
<td>0.110195922</td>
<td>Cannot reject</td>
</tr>
<tr>
<td>Total</td>
<td>T7CAR</td>
<td>P</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.227656</td>
<td>0.221026167</td>
<td>Cannot reject</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Authors’ shaping

As we see, non-parametric tests fully confirm the findings of their parametric counterparts, being unable to display the presence of statistically significant abnormal return in this sample. As a matter of fact, since the results of two kinds of tests coincide, the correctness of the above results is verified and the results are seen as reliable.

8.3. Choosing between parametric and non-parametric tests

Finally, we get down to the discussion of reliability of statistical tests and which of them can be considered as more trustworthy. In this matter, we use recommendations from different sources of statistical literature, as well as previous empirical studies, in order to test if our samples are normally distributed, which is a pivotal point in making a decision to prefer one kind of tests over another.
First of all, let us recall the Central Limit Theorem, which implies that the sampling distribution of any statistic will be normal or nearly normal, if the sample size is large enough. As a rule of thumb, many statisticians say that a sample of 30 is large enough and its distribution will be only moderately skewed and normality assumption fulfilled. The theorem states that a sampling distribution becomes closer to normality as the sample size increases, regardless of the shape of the population distribution. Based on this statement, Motulski (1995) concluded that even if the distribution of a large sample is not normal, parametric tests are robust to deviations, unless population distribution is really weird. In order to check if our samples contain normally distributed we made histograms of each of the samples, which are available in the Appendix X. As we can see, none of the samples seem to be normally distributed, with a pronounced skewness to the right. Running a Kolgomolov-Smirnov and Shapiro-Wilk tests we got the results that reject the hypothesis of a normal distribution and confirm that the sample comes from a non-normal distribution.

The above would normally mean that non-parametric tests are supposed to behave better than the parametric ones. Although we have obtained quite a large sample, there still is the possibility of interdependence between the values, which cannot be completely eliminated – another crucial point in assessing the power of parametric tests. Mitchell & Mulherin (1996) suggest the definition of merger waves, which are described by enhanced M&A activity in certain years. One of the reasons for that might be the companies follow general trends in the industry and make acquisitions just to be in the mainstream. This is hard to measure, but it might force the values in our sample be interdependent to some extent.

In light of the above, we consider the results of non-parametric tests as more reliable. There were just a few controversial results that were treated in favor of non-parametric tests. We explain similar results of the tests, which were obtained despite the normality assumption is not satisfied, with the large selected sample.
9. Conclusions

The main objective of this thesis was to conduct an analysis of acquisitions in global banking industry in terms of abnormal return on stock and operating performance. The study was based both on stock and accounting figures, which led to a deeper and all-around insight into acquisition and its consequences to the acquirer. Presented in the above combination, this approach aimed to provide reliable evidence of whether or not acquirers gain value in global banking industry. The empirical study was conducted by means of daily stock prices for a given bank and its corresponding market, as well as of several performance measures from different groups of ratios. Furthermore, in order to test for abnormal return on stock, we built 3 samples of deals, namely, a general one, including all deals that match our selection criteria, and 2 additional samples that were constructed in accordance with banks’ operating performance before acquisition. The study based on accounting figures was performed using 5 samples, each corresponding to a year during which an acquisition was announced. This division is motivated by an attempt to eliminate possible bias in the results due to changing economical conditions in different years. Consequently, the results were compared to each other and differences thoroughly examined.

We posed several research questions that were mainly divided into two categories. The first one implied whether or not there is an abnormal return on stock of an acquirer at announcement period. The second focused on whether or not performance of the acquirer improves after the acquisition and to what extent this is caused by both participants’ pre-merger performance. These questions were tested using six hypotheses, each of them addressed separately in the below. Some of them were evaluated using exclusively empirical results from parametric and non-parametric tests, while the others were tested with accounting data.

It should be noted that several serious violations of assumptions towards robustness of parametric tests were found; hence we build our conclusions upon results of the non-parametric tests.
Hypothesis I, which raised the assumption that at announcement period, there is positive abnormal return on stock for shareholders in banking industry, was strongly rejected due to serious discrepancies that the analysis showed, compared to this hypothesis. The results of non-parametric tests go in line with each other quite perfectly, whereas all tests were unable to reject the null hypothesis, and only one parametric test was able to detect significant negative abnormal performance. Moreover, none of the T-statistics and P-values is being evaluated “on the edge”, i.e. all tests display consistent results and are not even close to rejection. This lets us draw robust conclusions and state that acquisition itself does not cause any outstanding reaction on the market and one cannot get abnormal return on acquirer’s stock, if we consider banking industry only.

In relation to the hypothesis, we should note the overall negative tendency that prevails in testing for abnormal performance.

Hence, this result is a triumph of semi-strong EMH, which implies that prices of the stock reflect all publicly available information and that prices instantly change to reflect new information. Generally, our findings go in line with conclusions of the proponents and followers of the Efficient Market Hypothesis, but we should emphasize that there is a limited number of literature that studies abnormal return on stock in banking industry. We should also note specifications of the industry that we study. Banking industry has always been among the leaders in regulation, transparency and information exchange. By this we mean that this market could be called “informationally efficient”, and therefore, no hidden information could be used for the sake of obtaining excess return on stock.

Speaking about the Hypothesis II, concerning an assumption that bidders tend to acquire firms with worse financial state and operating performance, it could be concluded that deals which support our hypothesis dominate in the sample. All in all, our analysis shows that banks tend to acquire firms with worse financial state in terms of investment return ratios (ROE, ROA, ROAA, ROAE) and net interest margin. These measures are higher for the acquirer in about 60% of cases. In turn, the analysis of more specific ratios produces inconclusive results. For instance, analyzing more specific bank ratios like Tier 1 the opposite result is obtained – banks that are less durable against losses under distressed
conditions acquire better performing banks. Based on asset quality and solvency ratio proportion of deals is almost equal.

It should be mentioned that there is still a sizeable part of deals where less profitable and a certain bank gains control upon more successful company. Acquisition of better performing company might be driven by other non-financial motives that are not considered in our hypothesis.

In relation to Hypothesis III, which states that there is a positive abnormal return on stock if a better-performing bidder bank acquirer worse-performing target, taking 3-year pre-merger performance as a benchmark, we can conclude that the efficiency hypothesis that was taken as a cornerstone for this assumption did not seem to be proven. Based on the results primarily from the non-parametric tests, we are able to draw a conclusion that our initial hypothesis is empirically rejected, whereby the majority of t-tests display that there is no excess value creation as a result of announcement of the acquisition.

It turns out that the market does not believe in ability of the acquirer to improve efficiency of the target as one can observe a negative return on stock right before the announcement date. In these regards, acquisition of a worse-performing target by a better performing bidder may be seen as a threat to profitability and efficiency of the acquirer for the next years, therefore, the reaction is negative. It should also be noted that there are only a few researches in banking industry that examined return on stock across the world in such circumstances, and none of them seem to refer to the latest years, thus it is hard to make extensive comparison and draw parallels with previous studies. However, as the results are statistically robust, conclusions can be seen as reliable.

With regards to Hypothesis IV that was formulated in accordance with the thought that both parametric and non-parametric tests yield similar results if the assumptions are not violated, we can say that it was rejected due to several reasons, mostly accompanied with specifications of the selected data. Seeing the results of normality tests, none of the samples seem to be normally distributed, with a pronounced skewness. Running different statistical tests we got the results that reject the hypothesis of a normal distribution and confirm that the sample comes from a non-normal distribution.
Despite the results of both kinds of tests coincide to some extent, we consider the results of non-parametric tests as more reliable. There were just a few controversial results that were treated in favor of non-parametric tests. We explain similar results of the tests, which were obtained despite the normality assumption is not satisfied, with the large selected sample.

*Hypothesis V* states that acquirers experience short-term decline in key operating performance ratios after acquisition is completed. Overall, we cannot reject the hypothesis and confirm that acquirers experience short-term decline in key operating performance after acquisition is done. This decline is applied to all aspects of a bank’s performance, from profit to liquidity and asset quality. This empirical evidence is also a confirmation of a well-known management hubris hypothesis. Bad results of the acquisition may be attributed to the overconfidence and strategic mistakes done by management of the acquiring company. Moreover, we have checked a year-by-year distribution and have come to a generally consistent conclusion that financial crisis did not bias the data as there still is a significant amount of evidence in support of the previous empirical findings both in crisis and pre-crisis years.

Finally, *Hypothesis VI* was drawn with an idea that majority of bidders choose faster growing targets, with bad relative efficiency measures. The empirical results indicate that the hypothesis cannot be rejected and bidders tend to acquire faster growing targets, but the power of this statement is relatively week, as faster growing targets supersede low growing ones only by 4%, which leads to the general conclusion that, in banking industry, the asset growth factor is almost irrelevant in making a decision about acquisition. The question of whether or not target’s asset growth level has a significant impact on bidder’s abnormal performance is not presented in this research due to time limitations, so it remains open and provides a field for further studies.

To sum up, the results of this empirical study indicate that in most cases it was not possible to detect any abnormal return on stock, significantly different from zero. The only case where we can state that the acquisition resulted in significant negative abnormal return, was the sample “ROA>”, which included better-performing banks that acquire worse-performing target. Obviously, even in case the reasons for acquisition are quite rational, it may take years for the positive outcome of the deal to become visible. In light of this,
in the share price is a justifiable reaction to the news about announcement of the acquisition, regardless of how prosperous the acquirer is and how potential the target is.

The overall tendency of the short-term changes in stock price due to acquisition was negative, which means value destruction for the acquirer. These findings are in line with more traditional and fundamental studies of the 20th century, while not being able to align with modern researches. We attribute such difference with the specific data that we looked into and very limited amount of literature that is dedicated to empirical studies of global banking industry. However, the tests were performed using a well-known and established technique, therefore, we consider the findings reliable and contributing to the existing literature.
10. Closing remarks in relation to the acquisitions in banking industry

Conclusions that were drawn in the previous section clearly indicate that majority of acquisitions in banking industry result in value destruction for the acquirer, and the market perceives any announcement of a deal between two banks as negative. The main question that this study raises is “Why do banks merge then?” There is a number of articles devoted to this topic, and the majority of authors come to conclusion that acquisition in banking industry is of special interest to management in order to gain power and prosperity, while the real outcome of the deal is sometimes secondary.

The literature centers on agency problems when trying to address this issue. It is well known that there is a general lack of alignment between the interests of shareholders and managers. This point has received considerable attention in the recent corporate finance literature. To many, the recent wave of mergers in the banking industry is one more piece of evidence of this phenomenon. According to this view, mergers are in the best interest of managers but not necessarily shareholders. The former engage in the activity to increase own power and remuneration. However, this behavior comes at the expense of the shareholders of the acquiring institutions who, in general, overpay for such acquisitions and suffer dilution if not decline, in firm value itself. This issue demands significant piece of attention but has rarely been empirically investigated due to lack of a universal method. (Piloff and Santomero, 1996) However, in light of the above, some recent researchers have attempted to investigate the effect of merger activity using a different approach, namely, looking at the acquisition activity with close scrutiny of managerial process and the extent to which plans are developed and accomplished. The results from such studies report that the performance gains are unique to a specific merger and are difficult to estimate using standard cross-section tools.

The above leads to a conclusion that in order to investigate performance gains from a sample of companies, one should go on with a case-by-case study, while looking for estimates of pure efficiency and better understanding of why the standard cross-section analysis does not systematically find evidence of performance gains.
The above approach could be considered as a potential for future studies of the topic that we brought up with our thesis. While our research supports the evidence against gains in performance and value in acquisition, there still is a potential to explore this event from a different point of view, placing an emphasis on what motivates a merger or acquisition not exclusively from a profit or efficiency side, as absence of gains in value is proven by overwhelming quantity of economic literature.
11. Bibliography


Datastream 2011, *Datastream Advance for Office*.


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Appendix A. Test for normality of the samples

Normality in abnormal return for the general sample

![Histogram for general sample]

Normality in abnormal return for the “ROA>” sample

![Histogram for ROA> sample]
Normality in abnormal return for the “ROA<” sample
Appendix B

Example of a SAS code, used for testing abnormal return on stock (T-tests)

**T1 test**

```sas
data event; /*name of new dataset*/
set Asb; /*name of old which will be overwritten*/
count = _N_; /*We add a variable 'count' that is the observation number*/
run;
/*Here is the new dataset named event200 which includes only the first 200 observations from the dataset event*/
data event200;
set event;
where count <= 200;
run;
/*market model for the 224 stocks in the model. The estimates are written to the sas dataset beta*/
proc reg data=event200 outest=beta nointer;
model stock1  =  market1 ;
model stock2  =  market2 ;
model stock3  =  market3 ;
model stock4  =  market4 ;
model stock5  =  market5 ;
model stock6  =  market6 ;
model stock7  =  market7 ;
model stock8  =  market8 ;
model stock9  =  market9 ;
model stock10 =  market10 ;
model stock11 =  market11 ;
model stock12 =  market12 ;
model stock13 =  market13 ;
model stock14 =  market14 ;
model stock15 =  market15 ;
model stock16 =  market16 ;
model stock17 =  market17 ;
model stock18 =  market18 ;
model stock19 =  market19 ;
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model stock21 =  market21 ;
model stock22 =  market22 ;
model stock23 =  market23 ;
model stock24 =  market24 ;
model stock25 =  market25 ;
model stock26 =  market26 ;
model stock27 =  market27 ;
model stock28 =  market28 ;
model stock29 =  market29 ;
model stock30 =  market30 ;
model stock31 =  market31 ;
model stock32 =  market32 ;
model stock33 =  market33 ;
model stock34 =  market34 ;
model stock35 =  market35 ;
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model stock36 = market36;
model stock37 = market37;
model stock38 = market38;
model stock39 = market39;
model stock40 = market40;
model stock41 = market41;
model stock42 = market42;
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model stock212 = market212;
model stock213 = market213;
model stock214 = market214;
model stock215 = market215;
model stock216 = market216;
model stock217 = market217;
model stock218 = market218;
model stock219 = market219;
model stock220 = market220;
model stock221 = market221;
model stock222 = market222;
model stock223 = market223;
model stock224 = market224;

run;
quit;

/*Here we make the alpha and beta estimates ready to merge with the event
dataset so the abnormal returns can be calculated*/
data beta1; /*Name of the dataset where the estimates will be saved */
set beta;
if _n_=1 then do ;
beta1 = market1 ;
alpha1 = intercept ;
end ;
if _n_=2 then do ;
beta2 = market2 ;
alpha2 = intercept ;
end ;
if _n_=3 then do ;
beta3 = market3 ;
alpha3 = intercept ;
end ;
if _n_=4 then do ;
beta4 = market4 ;
alpha4 = intercept ;
end ;
if _n_=5 then do ;
beta5 = market5 ;
alpha5 = intercept ;
end ;
if _n_=6 then do ;
beta6 = market6 ;
alpha6 = intercept ;
end ;
if _n_=7 then do ;
beta7 = market7 ;
alpha7 = intercept ;
end ;
if _n_=8 then do ;
beta8 = market8 ;
alpha8 = intercept;
end;
if _n_ = 9 then do;
beta9 = market9;
alpha9 = intercept;
end;
if _n_ = 10 then do;
beta10 = market10;
alpha10 = intercept;
end;
if _n_ = 11 then do;
beta11 = market11;
alpha11 = intercept;
end;
if _n_ = 12 then do;
beta12 = market12;
alpha12 = intercept;
end;
if _n_ = 13 then do;
beta13 = market13;
alpha13 = intercept;
end;
if _n_ = 14 then do;
beta14 = market14;
alpha14 = intercept;
end;
if _n_ = 15 then do;
beta15 = market15;
alpha15 = intercept;
end;
if _n_ = 16 then do;
beta16 = market16;
alpha16 = intercept;
end;
if _n_ = 17 then do;
beta17 = market17;
alpha17 = intercept;
end;
if _n_ = 18 then do;
beta18 = market18;
alpha18 = intercept;
end;
if _n_ = 19 then do;
beta19 = market19;
alpha19 = intercept;
end;
if _n_ = 20 then do;
beta20 = market20;
alpha20 = intercept;
end;
if _n_ = 21 then do;
beta21 = market21;
alpha21 = intercept;
end;
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alpha22 = intercept;
end;
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if _n_=24 then do;
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alpha24 = intercept;
end;
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alpha25 = intercept;
end;
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end;
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if _n_=28 then do;
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alpha28 = intercept;
end;
if _n_=29 then do;
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alpha29 = intercept;
end;
if _n_=30 then do;
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alpha30 = intercept;
end;
if _n_=31 then do;
beta31 = market31;
alpha31 = intercept;
end;
if _n_=32 then do;
beta32 = market32;
alpha32 = intercept;
end;
if _n_=33 then do;
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alpha33 = intercept;
end;
if _n_=34 then do;
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alpha34 = intercept;
end;
if _n_=35 then do;
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alpha35 = intercept;
end;
if _n_=36 then do;
beta36 = market36;
alpha36 = intercept;
end;
if \_n\_ = 37 then do  
  beta37 = market37  
  alpha37 = intercept  
end  
if \_n\_ = 38 then do  
  beta38 = market38  
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end  
if \_n\_ = 39 then do  
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  alpha39 = intercept  
end  
if \_n\_ = 40 then do  
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end  
if \_n\_ = 46 then do  
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end  
if \_n\_ = 47 then do  
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  alpha47 = intercept  
end  
if \_n\_ = 48 then do  
  beta48 = market48  
  alpha48 = intercept  
end  
if \_n\_ = 49 then do  
  beta49 = market49  
  alpha49 = intercept  
end  
if \_n\_ = 50 then do  
  beta50 = market50  
  alpha50 = intercept  
end  
if \_n\_ = 51 then do  

beta51 = market51;
alpha51 = intercept;
end;
if _n_=52 then do;
beta52 = market52;
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end;
if _n_=53 then do;
beta53 = market53;
alpah53 = intercept;
end;
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if _n_==69 then do;
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alpha83 = intercept ;
end ;
if _n_ = 84 then do ;
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alpha84 = intercept ;
end ;
if _n_ = 85 then do ;
beta85 = market85 ;
alpha85 = intercept ;
end ;
if _n_ = 86 then do ;
beta86 = market86 ;
alpha86 = intercept ;
end ;
if _n_ = 87 then do ;
beta87 = market87 ;
alpha87 = intercept ;
end ;
if _n_ = 88 then do ;
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if _n_ = 89 then do ;
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alpha89 = intercept ;
end ;
if _n_ = 90 then do ;
beta90 = market90 ;
alpha90 = intercept ;
end ;
if _n_ = 91 then do ;
beta91 = market91 ;
alpha91 = intercept ;
end ;
if _n_ = 92 then do ;
beta92 = market92 ;
alpha92 = intercept ;
end ;
if _n_ = 93 then do ;
beta93 = market93 ;
alpha93 = intercept ;
end ;
if \_n\_=94 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta94} \hspace{1em} = \hspace{1em} \text{market94} \hspace{1em} ; \\
\text{alpha94} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=95 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta95} \hspace{1em} = \hspace{1em} \text{market95} \hspace{1em} ; \\
\text{alpha95} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=96 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta96} \hspace{1em} = \hspace{1em} \text{market96} \hspace{1em} ; \\
\text{alpha96} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=97 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta97} \hspace{1em} = \hspace{1em} \text{market97} \hspace{1em} ; \\
\text{alpha97} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=98 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta98} \hspace{1em} = \hspace{1em} \text{market98} \hspace{1em} ; \\
\text{alpha98} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=99 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta99} \hspace{1em} = \hspace{1em} \text{market99} \hspace{1em} ; \\
\text{alpha99} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=100 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta100} \hspace{1em} = \hspace{1em} \text{market100} \hspace{1em} ; \\
\text{alpha100} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=101 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta101} \hspace{1em} = \hspace{1em} \text{market101} \hspace{1em} ; \\
\text{alpha101} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=102 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta102} \hspace{1em} = \hspace{1em} \text{market102} \hspace{1em} ; \\
\text{alpha102} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=103 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta103} \hspace{1em} = \hspace{1em} \text{market103} \hspace{1em} ; \\
\text{alpha103} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=104 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta104} \hspace{1em} = \hspace{1em} \text{market104} \hspace{1em} ; \\
\text{alpha104} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=105 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta105} \hspace{1em} = \hspace{1em} \text{market105} \hspace{1em} ; \\
\text{alpha105} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=106 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta106} \hspace{1em} = \hspace{1em} \text{market106} \hspace{1em} ; \\
\text{alpha106} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=107 \hspace{1em} \text{then do} \hspace{1em} ; \\
\text{beta107} \hspace{1em} = \hspace{1em} \text{market107} \hspace{1em} ; \\
\text{alpha107} \hspace{1em} = \hspace{1em} \text{intercept} \hspace{1em} ; \\
\text{end} \hspace{1em} ; \\
if \_n\_=108 \hspace{1em} \text{then do} \hspace{1em} ;
beta108 = market108;
alpha108 = intercept;
end;
if _n_ = 109 then do;
beta109 = market109;
alpha109 = intercept;
end;
if _n_ = 110 then do;
beta110 = market110;
alpha110 = intercept;
end;
if _n_ = 111 then do;
beta111 = market111;
alpha111 = intercept;
end;
if _n_ = 112 then do;
beta112 = market112;
alpha112 = intercept;
end;
if _n_ = 113 then do;
beta113 = market113;
alpha113 = intercept;
end;
if _n_ = 114 then do;
beta114 = market114;
alpha114 = intercept;
end;
if _n_ = 115 then do;
beta115 = market115;
alpha115 = intercept;
end;
if _n_ = 116 then do;
beta116 = market116;
alpha116 = intercept;
end;
if _n_ = 117 then do;
beta117 = market117;
alpha117 = intercept;
end;
if _n_ = 118 then do;
beta118 = market118;
alpha118 = intercept;
end;
if _n_ = 119 then do;
beta119 = market119;
alpha119 = intercept;
end;
if _n_ = 120 then do;
beta120 = market120;
alpha120 = intercept;
end;
if _n_ = 121 then do;
beta121 = market121;
alpha121 = intercept;
end;
if _n_ = 122 then do;
beta122 = market122;
alpha122 = intercept;
end;
if _n_ = 123 then do;
beta123 = market123;
alpha123 = intercept;
end;
if _n_ = 124 then do;
beta124 = market124;
alpha124 = intercept;
end;
if _n_ = 125 then do;
beta125 = market125;
alpha125 = intercept;
end;
if _n_ = 126 then do;
beta126 = market126;
alpha126 = intercept;
end;
if _n_ = 127 then do;
beta127 = market127;
alpha127 = intercept;
end;
if _n_ = 128 then do;
beta128 = market128;
alpha128 = intercept;
end;
if _n_ = 129 then do;
beta129 = market129;
alpha129 = intercept;
end;
if _n_ = 130 then do;
beta130 = market130;
alpha130 = intercept;
end;
if _n_ = 131 then do;
beta131 = market131;
alpha131 = intercept;
end;
if _n_ = 132 then do;
beta132 = market132;
alpha132 = intercept;
end;
if _n_ = 133 then do;
beta133 = market133;
alpha133 = intercept;
end;
if _n_ = 134 then do;
beta134 = market134;
alpha134 = intercept;
end;
if _n_ = 135 then do;
beta135 = market135;
alpha135 = intercept;
end;
if _n_ = 136 then do;
beta136 = market136;
alpha136 = intercept;
end;
if _n_=137 then do;
beta137 = market137;
alpha137 = intercept;
end;
if _n_=138 then do;
beta138 = market138;
alpha138 = intercept;
end;
if _n_=139 then do;
beta139 = market139;
alpha139 = intercept;
end;
if _n_=140 then do;
beta140 = market140;
alpha140 = intercept;
end;
if _n_=141 then do;
beta141 = market141;
alpha141 = intercept;
end;
if _n_=142 then do;
beta142 = market142;
alpha142 = intercept;
end;
if _n_=143 then do;
beta143 = market143;
alpha143 = intercept;
end;
if _n_=144 then do;
beta144 = market144;
alpha144 = intercept;
end;
if _n_=145 then do;
beta145 = market145;
alpha145 = intercept;
end;
if _n_=146 then do;
beta146 = market146;
alpha146 = intercept;
end;
if _n_=147 then do;
beta147 = market147;
alpha147 = intercept;
end;
if _n_=148 then do;
beta148 = market148;
alpha148 = intercept;
end;
if _n_=149 then do;
beta149 = market149;
alpha149 = intercept;
end;
if _n_=150 then do;
beta150 = market150;
alpha150 = intercept;
end;
if \_n\_ = 151 then do ;
beta151 = market151 ;
alp\_alpha\_151 = intercept ;
end ;
if \_n\_ = 152 then do ;
beta152 = market152 ;
alp\_alpha\_152 = intercept ;
end ;
if \_n\_ = 153 then do ;
beta153 = market153 ;
alp\_alpha\_153 = intercept ;
end ;
if \_n\_ = 154 then do ;
beta154 = market154 ;
alp\_alpha\_154 = intercept ;
end ;
if \_n\_ = 155 then do ;
beta155 = market155 ;
alp\_alpha\_155 = intercept ;
end ;
if \_n\_ = 156 then do ;
beta156 = market156 ;
alp\_alpha\_156 = intercept ;
end ;
if \_n\_ = 157 then do ;
beta157 = market157 ;
alp\_alpha\_157 = intercept ;
end ;
if \_n\_ = 158 then do ;
beta158 = market158 ;
alp\_alpha\_158 = intercept ;
end ;
if \_n\_ = 159 then do ;
beta159 = market159 ;
alp\_alpha\_159 = intercept ;
end ;
if \_n\_ = 160 then do ;
beta160 = market160 ;
alp\_alpha\_160 = intercept ;
end ;
if \_n\_ = 161 then do ;
beta161 = market161 ;
alp\_alpha\_161 = intercept ;
end ;
if \_n\_ = 162 then do ;
beta162 = market162 ;
alp\_alpha\_162 = intercept ;
end ;
if \_n\_ = 163 then do ;
beta163 = market163 ;
alp\_alpha\_163 = intercept ;
end ;
if \_n\_ = 164 then do ;
beta164 = market164 ;
alp\_alpha\_164 = intercept ;
end ;
if \_n\_ = 165 then do ;
beta165 = market165;
alpha165 = intercept;
end;
if _n_ = 166 then do;
  beta166 = market166;
  alpha166 = intercept;
end;
if _n_ = 167 then do;
  beta167 = market167;
  alpha167 = intercept;
end;
if _n_ = 168 then do;
  beta168 = market168;
  alpha168 = intercept;
end;
if _n_ = 169 then do;
  beta169 = market169;
  alpha169 = intercept;
end;
if _n_ = 170 then do;
  beta170 = market170;
  alpha170 = intercept;
end;
if _n_ = 171 then do;
  beta171 = market171;
  alpha171 = intercept;
end;
if _n_ = 172 then do;
  beta172 = market172;
  alpha172 = intercept;
end;
if _n_ = 173 then do;
  beta173 = market173;
  alpha173 = intercept;
end;
if _n_ = 174 then do;
  beta174 = market174;
  alpha174 = intercept;
end;
if _n_ = 175 then do;
  beta175 = market175;
  alpha175 = intercept;
end;
if _n_ = 176 then do;
  beta176 = market176;
  alpha176 = intercept;
end;
if _n_ = 177 then do;
  beta177 = market177;
  alpha177 = intercept;
end;
if _n_ = 178 then do;
  beta178 = market178;
  alpha178 = intercept;
end;
if _n_ = 179 then do;
  beta179 = market179;
alpha179 = intercept;
end;
if _n_ = 180 then do;
beta180 = market180;
alp180 = intercept;
end;
if _n_ = 181 then do;
beta181 = market181;
alp181 = intercept;
end;
if _n_ = 182 then do;
beta182 = market182;
alp182 = intercept;
end;
if _n_ = 183 then do;
beta183 = market183;
alp183 = intercept;
end;
if _n_ = 184 then do;
beta184 = market184;
alp184 = intercept;
end;
if _n_ = 185 then do;
beta185 = market185;
alp185 = intercept;
end;
if _n_ = 186 then do;
beta186 = market186;
alp186 = intercept;
end;
if _n_ = 187 then do;
beta187 = market187;
alp187 = intercept;
end;
if _n_ = 188 then do;
beta188 = market188;
alp188 = intercept;
end;
if _n_ = 189 then do;
beta189 = market189;
alp189 = intercept;
end;
if _n_ = 190 then do;
beta190 = market190;
alp190 = intercept;
end;
if _n_ = 191 then do;
beta191 = market191;
alp191 = intercept;
end;
if _n_ = 192 then do;
beta192 = market192;
alp192 = intercept;
end;
if _n_ = 193 then do;
beta193 = market193;
alp193 = intercept;
if \_n\_ = 194 then do ;
beta194 = market194 ;
alpha194 = intercept ;
end ;
if \_n\_ = 195 then do ;
beta195 = market195 ;
alpha195 = intercept ;
end ;
if \_n\_ = 196 then do ;
beta196 = market196 ;
alpha196 = intercept ;
end ;
if \_n\_ = 197 then do ;
beta197 = market197 ;
alpha197 = intercept ;
end ;
if \_n\_ = 198 then do ;
beta198 = market198 ;
alpha198 = intercept ;
end ;
if \_n\_ = 199 then do ;
beta199 = market199 ;
alpha199 = intercept ;
end ;
if \_n\_ = 200 then do ;
beta200 = market200 ;
alpha200 = intercept ;
end ;
if \_n\_ = 201 then do ;
beta201 = market201 ;
alpha201 = intercept ;
end ;
if \_n\_ = 202 then do ;
beta202 = market202 ;
alpha202 = intercept ;
end ;
if \_n\_ = 203 then do ;
beta203 = market203 ;
alpha203 = intercept ;
end ;
if \_n\_ = 204 then do ;
beta204 = market204 ;
alpha204 = intercept ;
end ;
if \_n\_ = 205 then do ;
beta205 = market205 ;
alpha205 = intercept ;
end ;
if \_n\_ = 206 then do ;
beta206 = market206 ;
alpha206 = intercept ;
end ;
if \_n\_ = 207 then do ;
beta207 = market207 ;
alpha207 = intercept ;
end ;
if _n_ = 208 then do ;
beta208 = market208 ;
alp  
a end ;
if _n_ = 209 then do ;
beta209 = market209 ;
alp  
a end ;
if _n_ = 210 then do ;
beta210 = market210 ;
alp  
a end ;
if _n_ = 211 then do ;
beta211 = market211 ;
alp  
a end ;
if _n_ = 212 then do ;
beta212 = market212 ;
alp  
a end ;
if _n_ = 213 then do ;
beta213 = market213 ;
alp  
a end ;
if _n_ = 214 then do ;
beta214 = market214 ;
alp  
a end ;
if _n_ = 215 then do ;
beta215 = market215 ;
alp  
a end ;
if _n_ = 216 then do ;
beta216 = market216 ;
alp  
a end ;
if _n_ = 217 then do ;
beta217 = market217 ;
alp  
a end ;
if _n_ = 218 then do ;
beta218 = market218 ;
alp  
a end ;
if _n_ = 219 then do ;
beta219 = market219 ;
alp  
a end ;
if _n_ = 220 then do ;
beta220 = market220 ;
alp  
a end ;
if _n_ = 221 then do ;
beta221 = market221 ;
alp  
a end ;
if _n_ = 222 then do ;
beta222  =  market222  ;
alpha222  =  intercept  ;
end  ;
if  _n_ = 223  then do  ;
beta223  =  market223  ;
alpha223  =  intercept  ;
end  ;
if  _n_ = 224  then do  ;
beta224  =  market224  ;
alpha224  =  intercept  ;
end  ;
keep  beta1-beta224  alpha1-alpha224  ;
run  ;
/*to make all estimates appear in one row the following means procedure is used*/
/*the estimates will be saved in the dataset beta2*/
proc means data=betal  mean  noprint  ;
output out=beta2  ;
run  ;
data  beta2  ;
set  beta2  ;
where  _stat_ = 'MEAN'  ;
drop _type_ _freq_ _stat_  ;
run  ;
data  abnorm  ; /*new dataset called abnorm*/
set  event  ; /*the dataset is based on the event dataset i.e. data from both the estimation and event period*/
if  _n_ = 1  then set beta2  ; /*all the alpha and beta estimates are added to the dataset*/
run  ;
/*the abnormal returns are calculated in the dataset abnorm by using the market model estimates*/
data  abnorm  ;
set  abnorm  ;
abnor1  =  stock1  -  alpha1  -  beta1  *  market1  ;
abnor2  =  stock2  -  alpha2  -  beta2  *  market2  ;
abnor3  =  stock3  -  alpha3  -  beta3  *  market3  ;
abnor4  =  stock4  -  alpha4  -  beta4  *  market4  ;
abnor5  =  stock5  -  alpha5  -  beta5  *  market5  ;
abnor6  =  stock6  -  alpha6  -  beta6  *  market6  ;
abnor7  =  stock7  -  alpha7  -  beta7  *  market7  ;
abnor8  =  stock8  -  alpha8  -  beta8  *  market8  ;
abnor9 = stock9 - alpha9 - beta9 * market9;
abnor10 = stock10 - alpha10 - beta10 * market10;
abnor11 = stock11 - alpha11 - beta11 * market11;
abnor12 = stock12 - alpha12 - beta12 * market12;
abnor13 = stock13 - alpha13 - beta13 * market13;
abnor14 = stock14 - alpha14 - beta14 * market14;
abnor15 = stock15 - alpha15 - beta15 * market15;
abnor16 = stock16 - alpha16 - beta16 * market16;
abnor17 = stock17 - alpha17 - beta17 * market17;
abnor18 = stock18 - alpha18 - beta18 * market18;
abnor19 = stock19 - alpha19 - beta19 * market19;
abnor20 = stock20 - alpha20 - beta20 * market20;
abnor21 = stock21 - alpha21 - beta21 * market21;
abnor22 = stock22 - alpha22 - beta22 * market22;
abnor23 = stock23 - alpha23 - beta23 * market23;
abnor24 = stock24 - alpha24 - beta24 * market24;
abnor26 = stock26 - alpha26 - beta26 * market26;
abnor27 = stock27 - alpha27 - beta27 * market27;
abnor28 = stock28 - alpha28 - beta28 * market28;
abnor29 = stock29 - alpha29 - beta29 * market29;
abnor30 = stock30 - alpha30 - beta30 * market30;
abnor31 = stock31 - alpha31 - beta31 * market31;
abnor32 = stock32 - alpha32 - beta32 * market32;
abnor33 = stock33 - alpha33 - beta33 * market33;
abnor34 = stock34 - alpha34 - beta34 * market34;
abnor35 = stock35 - alpha35 - beta35 * market35;
abnor36 = stock36 - alpha36 - beta36 * market36;
abnor37 = stock37 - alpha37 - beta37 *
  market37 ;
abnor38 = stock38 - alpha38 - beta38 *
  market38 ;
abnor39 = stock39 - alpha39 - beta39 *
  market39 ;
abnor40 = stock40 - alpha40 - beta40 *
  market40 ;
abnor41 = stock41 - alpha41 - beta41 *
  market41 ;
abnor42 = stock42 - alpha42 - beta42 *
  market42 ;
abnor43 = stock43 - alpha43 - beta43 *
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abnor44 = stock44 - alpha44 - beta44 *
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abnor45 = stock45 - alpha45 - beta45 *
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abnor46 = stock46 - alpha46 - beta46 *
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abnor47 = stock47 - alpha47 - beta47 *
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abnor48 = stock48 - alpha48 - beta48 *
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abnor49 = stock49 - alpha49 - beta49 *
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abnor50 = stock50 - alpha50 - beta50 *
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abnor51 = stock51 - alpha51 - beta51 *
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abnor52 = stock52 - alpha52 - beta52 *
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abnor53 = stock53 - alpha53 - beta53 *
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abnor54 = stock54 - alpha54 - beta54 *
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abnor55 = stock55 - alpha55 - beta55 *
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abnor56 = stock56 - alpha56 - beta56 *
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abnor57 = stock57 - alpha57 - beta57 *
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abnor58 = stock58 - alpha58 - beta58 *
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abnor59 = stock59 - alpha59 - beta59 *
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abnor60 = stock60 - alpha60 - beta60 *
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abnor61 = stock61 - alpha61 - beta61 *
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abnor62 = stock62 - alpha62 - beta62 *
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abnor63 = stock63 - alpha63 - beta63 *
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abnor64 = stock64 - alpha64 - beta64 *
abnor65 = stock65 - alpha65 - beta65 *
  market65;
abnor66 = stock66 - alpha66 - beta66 *
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abnor67 = stock67 - alpha67 - beta67 *
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abnor68 = stock68 - alpha68 - beta68 *
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abnor69 = stock69 - alpha69 - beta69 *
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abnor70 = stock70 - alpha70 - beta70 *
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abnor71 = stock71 - alpha71 - beta71 *
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abnor72 = stock72 - alpha72 - beta72 *
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abnor73 = stock73 - alpha73 - beta73 *
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abnor74 = stock74 - alpha74 - beta74 *
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abnor75 = stock75 - alpha75 - beta75 *
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abnor76 = stock76 - alpha76 - beta76 *
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abnor77 = stock77 - alpha77 - beta77 *
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abnor78 = stock78 - alpha78 - beta78 *
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abnor79 = stock79 - alpha79 - beta79 *
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abnor80 = stock80 - alpha80 - beta80 *
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abnor81 = stock81 - alpha81 - beta81 *
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abnor82 = stock82 - alpha82 - beta82 *
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abnor83 = stock83 - alpha83 - beta83 *
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abnor84 = stock84 - alpha84 - beta84 *
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abnor85 = stock85 - alpha85 - beta85 *
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abnor86 = stock86 - alpha86 - beta86 *
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abnor87 = stock87 - alpha87 - beta87 *
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abnor88 = stock88 - alpha88 - beta88 *
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abnor89 = stock89 - alpha89 - beta89 *
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abnor90 = stock90 - alpha90 - beta90 *
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abnor91 = stock91 - alpha91 - beta91 *
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abnor92 = stock92 - alpha92 - beta92 *
abnor93 = stock93 - alpha93 - beta93 *
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abnor94 = stock94 - alpha94 - beta94 *
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abnor95 = stock95 - alpha95 - beta95 *
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abnor96 = stock96 - alpha96 - beta96 *
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abnor97 = stock97 - alpha97 - beta97 *
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abnor98 = stock98 - alpha98 - beta98 *
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abnor99 = stock99 - alpha99 - beta99 *
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abnor100 = stock100 - alpha100 - beta100 *
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abnor101 = stock101 - alpha101 - beta101 *
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abnor102 = stock102 - alpha102 - beta102 *
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abnor103 = stock103 - alpha103 - beta103 *
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abnor104 = stock104 - alpha104 - beta104 *
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abnor105 = stock105 - alpha105 - beta105 *
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abnor106 = stock106 - alpha106 - beta106 *
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abnor107 = stock107 - alpha107 - beta107 *
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abnor108 = stock108 - alpha108 - beta108 *
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abnor120 = stock120 - alpha120 - beta120 *
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abnor122 = stock122 - alpha122 - beta122 *
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abnor123 = stock123 - alpha123 - beta123 *
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abnor124 = stock124 - alpha124 - beta124 *
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abnor125 = stock125 - alpha125 - beta125 *
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abnor126 = stock126 - alpha126 - beta126 *
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abnor127 = stock127 - alpha127 - beta127 *
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abnor128 = stock128 - alpha128 - beta128 *
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abnor129 = stock129 - alpha129 - beta129 *
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abnor130 = stock130 - alpha130 - beta130 *
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abnor131 = stock131 - alpha131 - beta131 *
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abnor132 = stock132 - alpha132 - beta132 *
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abnor133 = stock133 - alpha133 - beta133 *
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abnor134 = stock134 - alpha134 - beta134 *
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abnor135 = stock135 - alpha135 - beta135 *
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abnor136 = stock136 - alpha136 - beta136 *
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abnor137 = stock137 - alpha137 - beta137 *
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abnor138 = stock138 - alpha138 - beta138 *
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abnor139 = stock139 - alpha139 - beta139 *
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abnor140 = stock140 - alpha140 - beta140 *
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abnor141 = stock141 - alpha141 - beta141 *
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abnor142 = stock142 - alpha142 - beta142 *
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abnor143 = stock143 - alpha143 - beta143 *
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abnor144 = stock144 - alpha144 - beta144 *
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abnor145 = stock145 - alpha145 - beta145 *
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abnor146 = stock146 - alpha146 - beta146 *
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abnor147 = stock147 - alpha147 - beta147 *
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abnor148 = stock148 - alpha148 - beta148 *
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abnor150 = stock150 - alpha150 - beta150 *
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abnor151 = stock151 - alpha151 - beta151 *
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abnor152 = stock152 - alpha152 - beta152 *
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abnor153 = stock153 - alpha153 - beta153 *
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abnor154 = stock154 - alpha154 - beta154 *
market154;
abnor155 = stock155 - alpha155 - beta155 *
market155;
abnor156 = stock156 - alpha156 - beta156 *
market156;
abnor157 = stock157 - alpha157 - beta157 *
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abnor158 = stock158 - alpha158 - beta158 *
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abnor159 = stock159 - alpha159 - beta159 *
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abnor160 = stock160 - alpha160 - beta160 *
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abnor161 = stock161 - alpha161 - beta161 *
market161;
abnor162 = stock162 - alpha162 - beta162 *
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abnor163 = stock163 - alpha163 - beta163 *
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abnor164 = stock164 - alpha164 - beta164 *
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abnor165 = stock165 - alpha165 - beta165 *
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abnor166 = stock166 - alpha166 - beta166 *
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abnor167 = stock167 - alpha167 - beta167 *
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abnor168 = stock168 - alpha168 - beta168 *
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abnor169 = stock169 - alpha169 - beta169 *
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abnor170 = stock170 - alpha170 - beta170 *
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abnor171 = stock171 - alpha171 - beta171 *
market171;
abnor172 = stock172 - alpha172 - beta172 *
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abnor173 = stock173 - alpha173 - beta173 *
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abnor174 = stock174 - alpha174 - beta174 *
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abnor175 = stock175 - alpha175 - beta175 *
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abnor176 = stock176 - alpha176 - beta176 *
abnor177 = stock177 - alpha177 - beta177 *
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abnor178 = stock178 - alpha178 - beta178 *
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abnor179 = stock179 - alpha179 - beta179 *
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abnor180 = stock180 - alpha180 - beta180 *
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abnor181 = stock181 - alpha181 - beta181 *
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abnor182 = stock182 - alpha182 - beta182 *
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abnor183 = stock183 - alpha183 - beta183 *
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abnor184 = stock184 - alpha184 - beta184 *
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abnor185 = stock185 - alpha185 - beta185 *
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abnor186 = stock186 - alpha186 - beta186 *
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abnor187 = stock187 - alpha187 - beta187 *
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abnor188 = stock188 - alpha188 - beta188 *
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abnor189 = stock189 - alpha189 - beta189 *
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abnor190 = stock190 - alpha190 - beta190 *
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abnor191 = stock191 - alpha191 - beta191 *
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abnor192 = stock192 - alpha192 - beta192 *
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abnor193 = stock193 - alpha193 - beta193 *
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abnor194 = stock194 - alpha194 - beta194 *
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abnor195 = stock195 - alpha195 - beta195 *
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abnor196 = stock196 - alpha196 - beta196 *
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abnor197 = stock197 - alpha197 - beta197 *
market197 ;
abnor198 = stock198 - alpha198 - beta198 *
market198 ;
abnor199 = stock199 - alpha199 - beta199 *
market199 ;
abnor200 = stock200 - alpha200 - beta200 *
market200 ;
abnor201 = stock201 - alpha201 - beta201 *
market201 ;
abnor202 = stock202 - alpha202 - beta202 *
market202 ;
abnor203 = stock203 - alpha203 - beta203 *
market203 ;
abnor204 = stock204 - alpha204 - beta204 *
run;

/*first, the average excess return is calculated for each day in the
 event and estimation window*/
data a_bar;
set abnorm;
a_bar = mean(of abnor1 - abnor224);
run;

/*calculate a_bar_bar (which is the sum of a_bar in the estimation period
divided by the number of observations i.e. average a_bar)*/
/*The a_bar_bar estimate is now in the dataset a_bar_bar*/
proc means data=a_bar noprint;
where count<201; /*only in the estimation period*/
var a_bar;
output out=a_bar_bar mean=a_bar_bar;
run;
/*calculating std of a_bar*/
/*first the squared deviations from a_bar_bar is calculated*/
data std_a_bar;
  if _n_=1 then set a_bar_bar; /* a_bar_bar is added to the table*/
  set a_bar;
  sqrd = (a_bar - a_bar_bar)**2;
run;
/*next we sum the squared deviation from the mean*/
proc means data=std_a_bar noprint;
  where count<201; /*only in the estimation period*/
  var sqrd;
  output out=sum_sqrd mean=sum_sqrd;
run;
/*lastly the variance used in the calculation of the test statistics is calculated*/
data sum_sqrd;
  set sum_sqrd;
  std_a_bar = sqrt(sum_sqrd); /*std used in the T1 test statistic*/
  std_car = sqrt(3*(std_a_bar**2));
run;
/*calculating the T1 test statistic in each day of event window*/
data event_window; /*new dataset with observations from the event window only*/
  set a_bar;
  where count gt 200;
  if _n_=1 then set sum_sqrd; /*the variance is added to the dataset*/
  t1 = a_bar/std_a_bar;
  pvalue_t1 = 2*(1- cdf('t',abs(t1), 199));
run;
/*print the t1 test statistics*/
proc print data=event_window;
  var t1 pvalue_t1;
run;
/*calculating the T1_car test statistic*/
/*first the sum of a_bar is calculated*/
proc means data=event_window noprint;
  var a_bar;
  output out=car SUM=car;
run;
/*next the variance calculated above is added to the dataset*/
data car;
  set car;
  set sum_sqrd;
  t1car = car/std_car; /*the value of the test statistic can then be found in the dataset sum a bar2*/
  pvalue_t1car = 2*(1- cdf('t',abs(t1car), 199));
run;
/*print the t1_bar test statistics*/
proc print data=car;
var tlcbar pvalue_tlcbar;
run;