




“Does company performance really improve following mergers? A pre-post analysis of differences in Greece”

AUTHORS	Michail Pazarskis  Nikolaos Giovanis Panagiotis Chatzigeorgiou Haralampos Hatzikirou 
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Panagiotis Chatzigeorgiou, Haralampos
Hatzikirou, 2022

Michail Pazarskis, Ph.D., Assistant
Professor, Department of Economics,
International Hellenic University,
Greece. (Corresponding author)

Nikolaos Giovanis, Ph.D., Associate
Professor, Department of Business
Administration, International Hellenic
University, Greece.

Panagiotis Chatzigeorgiou, MSc.,
Postgraduate student, Department of
Business Administration, International
Hellenic University, Greece.

Haralampos Hatzikirou, Ph.D.,
Associate Professor, Center for
Information Services and High-
Performance Computing, Technische
Universität Dresden, Germany;
Department of Mathematics, Khalifa
University of Science and Technology,
United Arab Emirates.



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Michail Pazarskis (Greece), Nikolaos Giovanis (Greece),
Panagiotis Chatzigeorgiou (Greece), Haralampos Hatzikirou (Germany; UAE)

DOES COMPANY PERFORMANCE REALLY IMPROVE FOLLOWING MERGERS? A PRE-POST ANALYSIS OF DIFFERENCES IN GREECE

Abstract

Merger transactions occur in various business sectors and are a drastic way of corporate restructuring. For several companies, mergers are the only path to gaining access to new resources, improving profitability, and achieving business excellence. The purpose of this study is to investigate the mergers that occurred among companies and reveal different aspects of their final results beyond the traditional and simple comparison methods of analysis. Thus, several merger events from Greek companies are tracked and compared by evaluating various accounting measures from their published financial accounts. The preliminary statistical results from univariate data analysis with accounting comparisons reveal no significant business performance changes after mergers. Then, the merger event is examined per company from each year's released financial statements with a not used before proposed method of analysis: comparison of pre- and post-merger performance by employing a heat-map with a multi-step approach. The results showed that five companies out of eighteen examined present a deterioration on separate sections of accounting performance (profitability, capital structure, and leverage). While univariate statistical analysis of comparison in pre- and post-merger performance failed to signalize these differences, the heat-map methodology approach with a multi-step approach revealed them. The obtained results show important differences in the accounting performance of almost one-third (27.8%) from the examined sample companies. Thus, the findings reveal the usefulness of the new proposed approach in merger analysis.

Keywords mergers, financial statements, accounting measures,
heat-map, Greece

JEL Classification G34, M40

INTRODUCTION

Mergers and acquisitions are one of the most crucial business operations that can drastically alter a company's worth (Rao-Nicholson et al., 2016; Tampakoudis et al., 2012, 2018). Mergers occur in a variety of businesses, including banks, industries, service companies, healthcare companies, and airlines (Cosh et al., 1980; De Leon, 2020). Mergers are a way for a firm to gain access to new resources, and as they grow, they will boost revenue and improve their market competitiveness (Kumar, 1984). Their adoption can have a microeconomic as well as a macroeconomic impact on a country's overall economic activity (Jensen & Ruback, 1983; Manson et al., 1995; Moeller & Schlingemann, 2005; Tao et al., 2017).

The aim of this paper is the examination of the mergers made by listed companies on the Athens Stock Exchange (ASE) during the period of the economic crisis in Greece. Thus, from the sample companies' financial statements, various accounting measures are used as accounting metrics of performance. The merger events are analyzed

and compared annually. Different accounting figures from their published statements are considered. The preliminary results come from accounting data comparison with independent samples *t*-tests and Mann-Whitney tests; they reveal no significant statistical change in business performance after mergers. Then, the examination of the accounting figures is done for the first time. The methodological approach for the data examination (not used before) proposed method of mergers' analysis (this is the contribution of this paper). Thus, the study compared differences from sample companies' pre- and post-merger performance by employing a heat-map with a multi-step approach that has not been used before in accounting and finance studies on mergers.

The structure of the paper is as follows: Section 1 shows the literature review. In the methodology section, the merger events to be examined during the economic crisis in Greece are presented. Section 3 describes the results, the annual comparison of different accounting measures from their published statements are examined with the newly proposed method of analysis. Finally, Section 4 presents the discussion, and the study ends with conclusions.

1. LITERATURE REVIEW AND HYPOTHESES

The term 'merger' means any transaction that results in a new organizational entity from two or more prior companies. The new business combination is a new independent entity, and companies involved into the merger deal have transferred their assets to it. The merged companies cease to be legally valid. Merged companies are often of similar size and capacity. A typical form of merger found in listed companies is that of full absorption from one company to another.

The fierce competition in a company's industry, technological advancements, and various other circumstances might all lead to such a decision (Rao-Nicholson & Salaber, 2013; Bhabra & Huang, 2013; Dutta et al., 2013; Rodionov & Mikhalchuk, 2016). In addition, it is often observed that there are industries in a country that are highly fragmented, consisting of a huge number of companies, the size of which is significantly below the optimal size (Pantelidis et al., 2018). The only way to create excellent in size business units during a short period is through the process of mergers as the more rational organization of a new company. Creating great size through the company's internal development requires a long time, as internal development is a slow process (Mueller, 1980; Kumar, 1984; Agorastos et al., 2013). Therefore, the state should encourage any move for mergers in certain industries and specific cases because it is the best means of creating a healthy domestic industry (Agorastos et al., 2013).

Over time, various methodologies have been proposed for the merged companies that generally examined: (i) either accounting figures for financial statements and referred to literature as accounting studies, (ii) or data from the price of shares of companies involved in mergers and referred to as event studies, (iii) or data from interviews and statements of business executives and was referred to economic literature as surveys of executives. The first examines accounting figures from financial statements (Mueller, 1980; Healy et al., 1992; Alexandrakis et al., 2012; Strasek & Gubensek, 2016). The financial statements prepared by companies are mainly used by individuals and entities, both inside and outside the entity, to extract useful accounting information.

Accounting information is useful mainly for external users because a company has internal information and can use its information systems for recording and analysis of financial activities without the need to comply with the statutory accounting procedures (Chatterjee & Meeks, 1996; Bhabra & Huang, 2013; Pazarskis et al., 2021). For this reason, the rules governing the accounting process are mandatory and strict to ensure that the objective information of external users and the financial statements have been audited for validity by certified auditors and thus are considered highly reliable (Sharma & Ho, 2002; Ramaswamy & Waegelien, 2003; Tampakoudis et al., 2011; Al-Hroot, 2016). Accounting provides external users through financial statements or other reports with information on the amount of the gross and net income of a company, the number and amount of their trans-

actions with customers and suppliers, the structure of their assets, their capital adequacy, their productivity, and their capacity and efficiency (Cosh et al., 1980; Healy et al., 1992; Pantelidis et al., 2018).

Furthermore, the most common approach in accounting studies is the calculation of changes in accounting measures from financial statements or ratios (extracted from the financial statements) such as net earnings or return on assets (Mueller, 1980; Ramaswamy & Waegelein, 2003; Alexandrakis et al., 2012; Strasek & Gubensek, 2016). Their correlations reveal in the case of corporate mergers essential information about the financial structure, cost structure, sources of profit and cash flows, operational efficiency, long-term balance, and prospects of the company, but also used to identify problem areas and its malfunctions (Manson et al., 1995).

The profitability improvement resulting from a merger activity has been the subject of much debate and controversy, especially in recent decades (Myers & Majluf, 1984; Kyei-Mensah, 2019). In this controversy, it was argued that the merger activities could destroy the investment value of the company's shareholders involved in merger operations. The main question was how to find the most proper and accurate measure of analysis for the merger decisions' success. Financial statements' analysis leads to in-depth analysis that signalizes any problem in the sample firms' accounting performance while providing options for various comparisons of different samples (Healy et al., 1992; Sharma & Ho, 2002; Agorastos et al., 2013). Therefore, accounting measures (accounting data from financial statements) were employed to study merger events (Mueller, 1980; Healy et al., 1992; Sharma & Ho, 2002; Ramaswamy & Waegelein, 2003; Francis & Martin, 2010; Alhenawi & Krishnaswami, 2015; Strasek & Gubensek, 2016; Rao-Nicholson et al., 2016).

However, several previous research on post-merger operating performance that used accounting characteristics with traditional comparison analysis methods on merger decisions came to conflicting conclusions (Alexandrakis et al., 2012; Alhenawi & Krishnaswami, 2015; Pazarskis et al., 2021). First, many believed that operating performance would improve as a result of the merger (Cosh et al., 1980; Mueller, 1980; Azhagaiah & Sathishkumar, 2014;

Aggarwal & Singh, 2015; Zhang et al., 2018). In contrast, other studies claimed a deterioration in the post-merger firm performance (Dickerson et al., 1997; Sharma & Ho, 2002; Strasek & Gubensek, 2016; Gupta & Banerjee, 2017). Some studies concluded a "zero" result or ambiguous results from the M&As action (Chatterjee & Meeks, 1996; Ghosh, 2001; Ahmed & Ahmed, 2014; Pervan et al., 2015; Al-Hroot, 2016). Next, several studies found a partial improvement per business sector and merger type (Pantelidis et al., 2018; Pazarskis et al., 2021), a deterioration (Agorastos et al., 2013), and some of them a "zero" result (Alexandrakis et al., 2012).

Last, none of previous studies compared the pre- and post-merger performance differences with a heat-map in a multi-step approach as a methodological approach for the data examination on merger events in accounting and finance studies. For the analysis of the above questions with the proposed methodology, the following hypotheses are formulated:

H_1 : *There is no relative change in the accounting measures of the companies in the pre- and post-merger periods.*

H_2 : *The company performance is not affected differently by the merger event.*

2. RESEARCH DESIGN

2.1. Sample selection

All merger events of listed companies in the Athens Stock Exchange (ASE) are tracked from 2011 to 2016. Listed companies are investigated because of their scale and data availability. Companies in the banking sector or with financial activities (due to the peculiarities of their financial statements), companies with no available data, and companies that present multiple mergers (more than once per year) are all excluded from this preliminary sample of all mergers because no financial statement comparisons can be made from year to year. The final sample includes eighteen mergers of companies listed in the ASE, which were selected randomly as three per year during the economic crisis in Greece (Appendix A).

2.2. Accounting measures

The financial accounting data (accounting measures) for the sample companies were obtained from the ASE website. Therefore, it is important to point out how dangerous and misleading it is to use a single accounting measure or financial ratio (Cosh et al., 1980; Chatterjee & Meeks, 1996; Sharma & Ho, 2002; Alexandrakis et al., 2012). Unfortunately, this phenomenon is often observed. The employment of a single accounting measure or ratio to identify a problem corresponds to a small part of the overall situation of a company, thus reversing the changes associated with another measure or ratio (Agorastos et al., 2013; Al-Hroot, 2016; Pantelidis et al., 2018; Pazarskis et al., 2021). For example, if the increase in gross profit is isolated, it does not necessarily mean an increase in profitability. If it is accompanied, for example, by a decrease in sales, it is not enough to study a single accounting measure to judge the quality of a company. Instead, academics and investors should consider combining different accounting figures into the overall context of their analysis to reduce the likelihood of losing important information for the company's performance. Thus, from the financial statements of the sample firms are extracted sixteen accounting measures to gain a better understanding of mergers. According to Kaplan (1983), "... any single measurement will have myopic properties that will enable managers to increase their score on this measure without necessarily contributing to the long-run profits of the firm."

The employment of additional and combined measures could provide a holistic view of the accounting performance of a firm (Alexandrakis et al., 2012; Pervan et al., 2015; Al-Hroot, 2016; Pantelidis et al., 2018). Thus, this study employs several account measures from a balance sheet of a company to analyze long-term debt and leverage, capital structure and adequacy: inventories, debtors, depreciation, total assets, long term loans, short term loans, interest expenses, current liabilities (apart from the short-term loans), total liabilities, shareholders' funds. Regarding the income statement, necessary accounting measures connected to profitability (in its first or the last stages) are gathered and analyzed for the sample firms in order to measure sources of profit and operational efficiency: sales, gross income, earnings before interest, taxes, depreciation and amortization, earnings before interest and taxes, earnings before taxes, net income. The sixteen quantitative variables employed in the data analysis with their desirable sign after mergers are shown in Table 1.

2.3. Methodology

This study looks into the mergers' companies beyond the traditional statistical analysis on merger decisions and reveals different aspects of the final results. For the first time, a methodological approach for the data examination is proposed and applied using a pre- and post-merger analysis of differences in accounting performance by employing a heat-map

Table 1. Accounting measures

Variables	Accounting data	Desirable sign after mergers
VAR01	Inventories	-
VAR02	Debtors	-
VAR03	Long term loans	-
VAR04	Short term loans	-
VAR05	Current liabilities (minus short term loans)	-
VAR06	Total liabilities	-
VAR07	Shareholders' funds	+
VAR08	Total assets	+
VAR09	Depreciation	-
VAR10	Interest expenses	-
VAR11	Sales	+
VAR12	Gross income	+
VAR13	Earnings before interest, taxes, depreciation and amortization (EBITDA)	+
VAR14	Earnings before interest and taxes (EBIT)	+
VAR15	Earnings before taxes (EBT)	+
VAR16	Net income	+

Note: Shareholder funds are all assets less all liabilities.

with a multi-step approach. The heat-map is broadly used in natural sciences and extensively applied in biological sciences (Weinstein, 2008; Wilkinson & Friendly, 2009). However, it was not used before as a proposed analysis method in merger transactions or accounting and finance studies. Thus, the study denotes for the sample companies the pre- and post-merger matrices named *A* and *B*, respectively. It is interesting to show the differences after company mergers in indices (accounting measures). In order to address this problem, the paper considered the absolute value of the two matrices' subtraction:

$$Z = |A - B|. \tag{1}$$

In turn, the data is normalized along the corresponding columns (indices), using the z-score (z-score is a measure of distance, in standard deviations, from the plate mean):

$$\frac{z_{ij} - \mu_j}{\sqrt{\sigma_j}}, \tag{2}$$

where *i* is the column number and the *z_{ij}* an element of the *Z* matrix. Furthermore, the normalized matrix is called *Z'*. Similar method has been used by Haroon et al. (2019).

3. RESULTS

Table 2 presents the descriptive statistics in the pre- and post-merger period of each accounting measure for the examined sample companies.

Next, Tables 3 and 4 show different aspects of their results from the traditional comparison methods of analysis on merger decisions: the comparison

Table 2. Descriptive statistics

Variables	minimum	Q1	Q3	Maximum	IQR	stdev	skewness	kurtosis
VAR01 _{pre}	610.99	2925.5	105071.75	1600625	102146.2	391484.11	3.1777	10.3499
VAR02 _{pre}	1995.61	12515.8	55029.99	938837	42514.1	256695.7	2.3037	4.6328
VAR03 _{pre}	85.99	7740	143916.51	1127878	136176.5	324261.47	2.2560	4.2817
VAR04 _{pre}	1433.00	8759.97	57881.84	1297103	49121.87	326263.52	2.9632	8.7229
VAR05 _{pre}	2056	12457.1	104577.53	1594958	92120.3	373635.23	3.3899	12.3337
VAR06 _{pre}	11611	36706.9	278713.70	4330354	242006	1094970.8	2.7496	7.6640
VAR07 _{pre}	-8943.6	13707.8	84718.75	2531618	71010.89	652612.42	2.4876	6.4582
VAR08 _{pre}	2966.34	50453.5	295501.58	6861972	245048	1734344.1	2.6986	7.5070
VAR09 _{pre}	711.21	1389.49	8129	156795	6739.51	45800.193	2.2500	4.1104
VAR10 _{pre}	340.32	1229.62	9648.235	414110	8418.61	94400.65	3.9433	16.0713
VAR11 _{pre}	11397.03	29876.5	187893.69	8476805	158017.1	2012818.2	3.4121	12.2377
VAR12 _{pre}	-2454	7307.25	33074.5	816868	25767.24	196150.59	3.0474	10.1622
VAR13 _{pre}	-19775.68	2116.56	20704.66	496848	18588.1	129212.81	2.4273	6.1600
VAR14 _{pre}	-11542	729.78	16761.5	343913	16031.71	89467.26	2.5126	6.4463
VAR15 _{pre}	-52096.67	-6671.7	5504.84	298713	12176.58	78387.861	2.7691	8.4317
VAR16 _{pre}	-63400	-8197.7	4054.21	187419	12251.97	55487.945	2.0175	4.9324
VAR01 _{post}	2304	4293.5	89266.63	1220122	84973.14	343876.57	2.5551	5.6420
VAR02 _{post}	1554.03	8333.3	72586.62	791300	64253.26	219137.14	2.2077	4.1137
VAR03 _{post}	1848	5190.4	86600.25	718716	81409.86	206673.58	2.0625	3.7492
VAR04 _{post}	336	9534.8	123357.68	2375097	113822.8	564582.98	3.3317	11.7052
VAR05 _{post}	2382	9082.5	90200.68	1926404	81118.12	457076.5	3.3294	11.8596
VAR06 _{post}	9284	31541.9	285792.8	4909008	254250.9	1223311.3	2.8501	8.4188
VAR07 _{post}	-79014	14291.2	85904.77	2495016	71613.55	670196.83	2.2412	4.9176
VAR08 _{post}	11421	46559	333101.7	7404024	286542.7	1870419.81	2.7016	7.5697
VAR09 _{post}	710.22	1147.5	23054	178580	21906.47	50437.87	2.3608	4.8474
VAR10 _{post}	-5126.89	1195.6	9463.03	66893	8267.40	19581.78	2.0656	3.3304
VAR11 _{post}	11456.02	22523.	584475.9	10468870	561952.1	2456596.6	3.4960	12.9120
VAR12 _{post}	-22548.42	4914.18	71589.29	535161	66675.11	157193.03	1.8301	2.3918
VAR13 _{post}	-40601.78	2189.2	26294.26	302545	24105.06	108407.56	1.5473	0.7939
VAR14 _{post}	-44403.63	575.73	8381.468	171817	7805.74	67843.06	1.4188	0.4157
VAR15 _{post}	-64947.24	-4248.8	5107.239	173465.8	9356.06	55005.49	1.5724	2.4206
VAR16 _{post}	-60340.18	-4682.7	3549.518	131008.1	8232.28	44646.41	1.2253	1.3392

Note: Amounts in thousands of euros.

Table 3. Comparison of the median for 16 accounting measures from pre- and post-merger period with Mann-Whitney tests

Variables	Accounting data	Median pre-merger	Median post-merger	p-value
VAR01	Inventories	16642.12	21514.73	0.558
VAR02	Debtors	24179.67	32170.49	0.812
VAR03	Long term loans	19701	16197.6	0.571
VAR04	Short term loans	24337.83	20321.95	0.812
VAR05	Current liabilities (minus short term loans)	22245.73	17700.34	0.624
VAR06	Total liabilities	97628.37	91159.79	0.887
VAR07	Shareholders' funds	28627.18	20958.15	0.887
VAR08	Total assets	130439.3	132823.3	0.862
VAR09	Depreciation	2662.58	2217.26	0.705
VAR10	Interest expenses	3891	2188.70	0.496
VAR11	Sales	99260.92	88435.35	0.937
VAR12	Gross income	14694.74	10746.31	0.837
VAR13	Earnings before interest, taxes, depreciation & amortization (EBITDA)	4186.88	3863.18	0.912
VAR14	Earnings before interest & taxes (EBIT)	2807.985	2826.24	0.937
VAR15	Earnings before taxes (EBT)	433.185	825.86	0.764
VAR16	Net income	289.97	661.69	0.692

Note: 1: Amounts in thousands of euros. 2: ***, **, * indicate that the mean change is significantly different from zero at a significance level of 0.01, 0.05, and 0.10, respectively, as calculated by comparing the median of two independent samples.

results of median and mean of each accounting measures for the sample. These preliminary results come from independent samples mean *t*-tests and Mann-Whitney tests (comparison of median) and show no significant statistical change in accounting performance from merger events.

Table 3 shows performed and tabulated Mann-Whitney tests using the medians' accounting

measures for the sample companies, while the use of the median as a measure of performance evaluation has been done in the past by Mueller (1980), Cosh et al. (1980), and Sharma and Ho (2002).

Table 4 applied two independent mean *t*-tests at accounting measures of sample companies using the means' data, which is applied following Agorastos et al. (2013), Ahmed and Ahmed (2014), Agarwal

Table 4. Comparison of the mean for 16 accounting measures from pre- and post-merger period with *t*-tests

Variables	Mean pre-merger	Mean post-merger	t-value	p-value	Confidential index
VAR01	166,423.20	167,254.33	0.01	0.995	(-256285; 257948)
VAR02	137,008.72	122,872.41	-0.17	0.864	(-180679; 152406)
VAR03	178,912.89	118,091.57	-0.62	0.540	(-262095; 140453)
VAR04	148,062.03	247,335.81	0.63	0.535	(-225226; 423774)
VAR05	169,316.44	196,208.91	0.19	0.852	(-264761; 318546)
VAR06	547,020.08	596,037.03	0.12	0.903	(-761109; 859142)
VAR07	331,987.39	342,617.21	0.05	0.963	(-450961; 472221)
VAR08	877,559.15	934,761.93	0.09	0.927	(-1201455; 1315860)
VAR09	23,824.75	26,364.26	0.15	0.882	(-32198; 37277)
VAR10	33,928.99	11,304.86	-0.97	0.346	(-71750; 26502)
VAR11	819,121.9	1,015,973	0.26	0.800	(-1372132; 1765835)
VAR12	96,374.32	91,642.30	-0.08	0.939	(-128914; 119450)
VAR13	64,689.38	58,199.94	-0.16	0.875	(-89716; 76737)
VAR14	43,418.70	33,416.43	-0.37	0.716	(-65543; 45538)
VAR15	22,210.53	20,192.71	-0.09	0.931	(-49451; 45415)
VAR16	11,751.08	15,944.00	0.24	0.810	(-30992; 39377)

Note: 1: Amounts in thousands of euros. 2: ***, **, * indicate that the mean change is significantly different from zero at a significance level of 0.01, 0.05, and 0.10, respectively, as calculated by comparing the average of two independent samples.

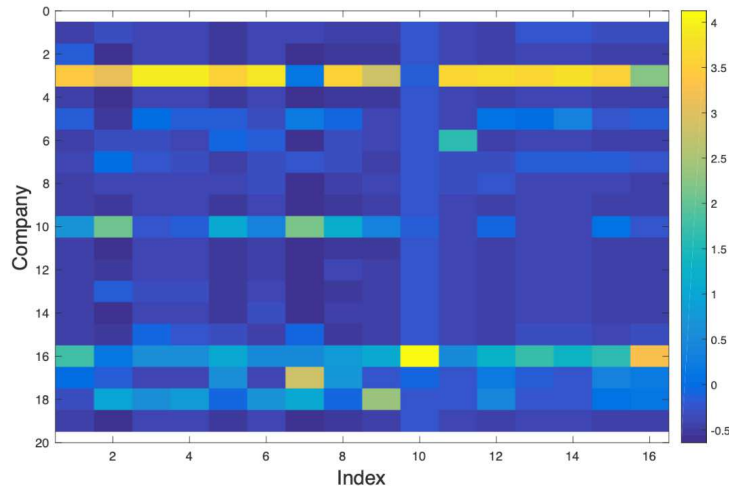


Figure 1. Heat-map of the Z' matrix (first step)

and Singh (2015), Al-Hroot (2016), Strasek and Gubensek (2016), Gupta and Banerjee (2017), and Pantelidis et al. (2018).

Next, denoting the pre- and post-merger matrices as A and B, respectively, the study shows the differences after company mergers in a set of accounting measures (Table 1). Also, it considers the absolute value of the two matrices' subtraction, as presented in the methodology section. Last, the corresponding heat-map of the Z' matrix looks as in Figure 1.

The heat map reveals that “company 3” showed significantly different results. Using a k-means clustering algorithm, the result is recapitulated where the “company 3” is clustered separately than the others.

Now the company “company 3” (row 3 of the matrix Z') is removed from the examined list since its “signal” is too strong when compared to the other companies. Then, the same analysis is repeated. The corresponding heat map matrix of the reduced normalized difference matrix Z' is presented in Figure 2.

It is observed that more companies stand out with potential differences after the merger process. Using again a k-means clustering algorithm, it is concluded that “company 16”, “company 17”, “company 15” and “company 9” cluster together, signifying the group with the most significant changes after the merger. However, only “company 15” in the heat map belongs clearly to the cluster, and the other three are rather marginal.

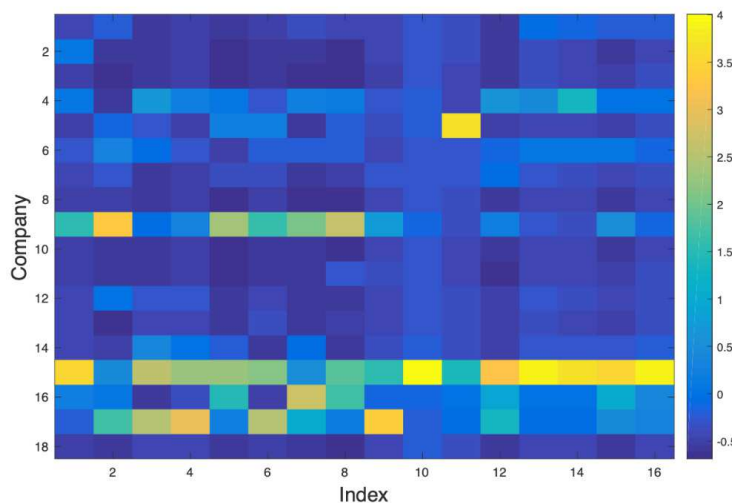


Figure 2. Heat-map of the Z' matrix (second step)

In conclusion, the companies that had the most significant changes after their merger are (listed by their importance): “company 3”, “company 15”, “company 16”, “company 17”, and “company 9”, while both hypotheses of this study are rejected.

4. DISCUSSION

Five companies from the total examined sample present unique peculiarities regarding the received results from the impact of mergers on accounting performance. More specifically, two companies (“company 3” and “company 15”) present deterioration of their accounting performance, while the other three companies (“company 16”, “company 17” and “company 9”) present marginal deterioration on separate sections of accounting performance (capital structure and leverage, operating performance, profitability). Furthermore, it is impressive that univariate traditional statistical methods of comparison in pre- and post-merger performance, used in almost every past paper in accounting and finance, failed to find these differences. However, they were extracted more easily with the heat-map methodology and multi-step approaches. Thus, the results signalize major changes in accounting performance for five out of eighteen companies, not revealed before. The findings with the comparison of differences from the pre- and post-merger performance in a heat-map with a multi-step approach, as they show important changes in the accounting performance of one part (27.8%) from the examined sample firms, indicate the usefulness of the new proposed approach in merger analysis.

Furthermore, the results of this study claimed that there is a deterioration in accounting measures dur-

ing the post-merger performance as other studies argued in the past that characterized mergers as a not success story (Dickerson et al., 1997; Sharma & Ho, 2002; Strasek & Gubensek, 2016; Gupta & Banerjee, 2017). However, these findings are in contrast with previous studies that believed that the operating performance would be improved due to the merger (Cosh et al., 1980; Mueller, 1980; Azhagaiah & Sathishkumar, 2014; Agarwal & Singh, 2015; Zhang et al., 2018). Moreover, other studies supported that mergers lead not to a significant change in accounting performance (thus, concluded a “zero” result results) from the mergers’ transactions (Chatterjee & Meeks, 1996; Ghosh, 2001; Ahmed & Ahmed, 2014; Pervan et al., 2015; Al-Hroot, 2016). Last, regarding the Greek market and the past merger events, this analysis presents a deterioration of sample companies’ accounting performance. These findings are in contrast with previous studies that found a partial improvement per sector (Pantelidis et al., 2018; Pazarskis et al., 2021) or some of them a “zero” result (Alexandrakis et al., 2012). In addition, the results are similar to some other studies for the Greek market that claimed a deterioration result from the merger events (Agorastos et al., 2013; Pazarskis et al., 2014).

As future research, a similar study is proposed with analysis of financial statements but with different samples, or within different time intervals, or from different countries, with the proposed methodology. It would be interesting to analyze different company samples and signalize essential differences from the traditional statistical analysis methods over a large scale of examined samples. Furthermore, the results of this study could also be compared with the received result from a different methodology of data analysis.

CONCLUSIONS

The present study compiles several accounting measures from financial statements of Greek listed firms to analyze their post-merger performance. An in-depth financial statements analysis reveals every problem in post-merger performance for the examined firms. Thus, this study compares the accounting performance of Greek listed firms in the Athens Stock Exchange pre- and post-merger periods by deploying a plethora of quantitative accounting measures to reveal any merger impact and particularities.

Furthermore, the examination of the accounting figures, apart from traditional statistical comparison methods in mergers (with mean and median tests), is done with a methodology of comparisons of the differences in pre- and post-merger performance by employing a heat-map on a multi-step approach,

not used before for the mergers' analysis. The examined sample consists of eighteen mergers in the economic crisis in Greece (from 2011 to 2016). The results indicate that a heat-map methodology approach with a multi-step approach can easily reveal potential differences of merger success for merged companies. In the present case, there is the deterioration of the post-merger accounting performance, which cannot be captured if it is only used in the sample, not sophisticated statistical analysis methods.

AUTHOR CONTRIBUTIONS

Conceptualization: Michail Pazarskis.

Data curation: Panagiotis Chatzigeorgiou.

Formal analysis: Michail Pazarskis, Nikolaos Giovanis, Haralampos Hatzikirou.

Investigation: Panagiotis Chatzigeorgiou.

Methodology: Michail Pazarskis, Haralampos Hatzikirou.

Project administration: Nikolaos Giovanis, Haralampos Hatzikirou.

Resources: Panagiotis Chatzigeorgiou.

Supervision: Nikolaos Giovanis, Haralampos Hatzikirou.

Validation: Nikolaos Giovanis.

Writing – original draft: Panagiotis Chatzigeorgiou.

Writing – review & editing: Michail Pazarskis, Haralampos Hatzikirou.

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APPENDIX A

Table A1. Greek examined listed firms with a merger decision

House of agriculture spirou s.a.	Mitilinaios s.a.
Galaxidi marine farm s.a.	Papoutsanis s.a.
Hellenic petroleum s.a.	Medicon Hellas s.a.
Paperpack s.a.	Perseus s.a.
Selonda aquaculture s.a.	Kleeman Hellas s.a.
Athina s.a.	Sidma s.a.
F.g europe s.a.	Viohalco s.a.
Elve s.a.	Jumbo s.a.
Space Hellas s.a.	Sfiakanakis s.a.