AN EVENT STUDY ANALYSIS OF STOCK PRICE REACTION TO MERGERS OF GREEK INDUSTRIAL AND CONSTRUCTION FIRMS

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ABSTRACT

Using the event study methodology introduced by Brown and Warner (1985) for six Greek industrial and construction firms, we attempt to measure the abnormal returns on stock prices on the day of the acquisition announcement. Estimation period and event period in our market model is -211 -11 -10, +10 respectively. In order to allow for asymmetric effect of news on the abnormal returns we use an E-GARCH model for period -211,-1. Empirical results show that on day t=0, AAR go slightly positive, while CAAR remain positive (0.4% and 1.3% respectively). E-GARCH model results show that good news have a positive effect on abnormal returns, while bad news a marginal negative one.

INTRODUCTION

Since the start of the transition process of the ex-communist countries in Southeast Europe there has been a dramatic increase of FDI (Foreign Direct Investment) in the form of cross border acquisitions. This process, although having started at 1989, is still evolving. Countries like Bulgaria, Romania, Skopje, Serbia/Montenegro, Poland, Hungary, Albania, even Egypt and Jordan, were the recipients of new investments. Many improvements of their economic status took place in the last few years, since these countries need to achieve several strict pre-requisites in order to enter the European Union. With the 2004 E.U. enlargement 10 new countries joined in, namely Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia, Cyprus and Malta, while Bulgaria and Romania entered the E.U. just in the 1/1/2007.

The majority of the FDI come from their neighbouring countries, of which Greece has a leading role, due to the similarities of the economic and political climate that exists in the countries mentioned. Western countries find it rather unpleasant or too risky to invest heavily in the Balkans, since neither geographical distance nor cultural state enables any attempt to do so.

The most important factors that attract FDI from Greece in these countries are low labor costs, the similarities of the bureaucratic system that controls investments and close geographical distance. Cross-border acquisitions have some potential disadvantages, as well. For example, the premium paid for the buy, the kind of information that managers and the market have (insider/outsider information), the expectations of the acquirers and of the market as a whole, which is reflected on the stock's price and the eventual over-evaluation of the acquiring company by the acquirer-company's managers (known as 'the hubris phenomenon'). Mergers and acquisitions continue to emerge strong globally, according to Dealogic's data, a company that thoroughly studies companies' concentrations in any form (be it merger, acquisition, joint venture, conglomerate merger, and so on). Their total value surpassed $1.1 trillion within the year 2005. This rising trend has commenced about a year and a half ago (in the year 2005). Mergers and acquisitions total value during the year 2005 has risen by $871 billion comparing with 2004. Some worth-mentioned examples, Guidant, a big company dealing with medical equipment, accepted a bid offer from Boston Scientific, a bid worth of $27 billion; Mittal Steel's bid over $18 billion for acquiring Arcelor is still being discussed. In most cases, a company's motive to carry on an acquisition is

the search for further development, and the company's optimism about the economy in which it is willing to invest.

In this research, we use the event study methodology in order to determine the effect of the announcement of acquisitions on the average abnormal returns and the abnormal return volatility for Greek construction and industrial firms listed on the Athens Stock Exchange (A.S.E.). Daily data of stock prices is used. According to Brown and Warner (1985), daily data are more accurate than monthly when using the market model. Beyond the methodological issues, the principal results of this study reflect and confirm previous literature.

The rest of this paper is organized as follows: in the 2nd section we briefly review past similar studies on announcement days and on mergers and acquisitions in general, in section 3 we present the sample data in detail and discuss the methodology used, while the 4th section deals with the empirical investigation and results. Finally, 5th section summarises the conclusions.

LITERATURE REVIEW

Sanjin Bhuyan (2002) in his study examines the effect of forward vertical integration on industry profitability by regressing profitability against a number of variables (advertising, value-added per worker, R&D, and so on). Using an input-output methodology, he proves that there exist negative impact profits from mergers. This may be due to the failure of firms to create differential advantages from the acquired firm.

In a study of foreign direct investments towards central and eastern Europe, Balaz Egert, Peter Backe and Tina Zumer (2005) exhibit the level of credit that the private sector of the Balkan economies accept in GDP terms. Generally, the banking sector is the main source of foreign investment. Using a cross sectional analysis and a framework which includes factors driving both the demand for and the supply of private credit, they find that credit growth will very likely remain fast in central and eastern Europe. Moreover, this rapid growth of credit expansion does not pose any risks of deterioration of asset quality.

A. Koulakiotis, N. Papasyriopoulos and Ap. Dasilas (2006), who investigated the effect of the announcement date of acquisitions on the value of stock prices of seven Greek financial firms listed on the Athens Stock Exchange, carried out a similar study. Using the Market adjusted model, GARCH and E-GARCH techniques, they conclude that cumulative abnormal returns start to decline right after the announcement of acquisitions, while the impact of 'bad news' tend to be significant at 15% level of significance.

Annalisa Caruso and Fabrizio Palmucci (2004) use the event study methodology to investigate the market reaction to mergers and acquisitions in the Italian banking sector. They compare the outcomes of using three different dates as the event date, namely rumours, announcement, and outcome date. Interestingly enough, they use 'rumours date' as t=0 instead of the announcement date. Apart from that, they use 4 different models to calculate the ARs: i) the Market return model, $AR_{j,t} = R_{j,t} - R_{M,t}$, ii) the Sector index return model, $AR_{j,t} = R_{j,t} - R_{S,t}$, iii) the Market model expected return with beta calculated with respect to the market index, $AR_{j,t} = R_{j,t} - (\alpha_j + \beta_j R_{M,t})$, and iv) the Market model expected return, with beta calculated with respect to the sector index, $AR_{j,t} = R_{j,t} - (\alpha_j + \beta_j R_{S,t})$. They conclude that, using different event dates will lead any similar observation to different results, while the market believe in the possible value creation from mergers-and-acquisitions operations, but if there is any, it is beneficial to the targets' shareholders and the buyers' management only.

An interesting comparison of event studies methodology and simulation approach was carried out by Thomas Dyckman, Donna Philbrick and Jens Stephan (1984), where they compare 5 different models in

order to examine the interaction of portfolio size, event date uncertainty and the magnitude of the abnormal performance from a database of 20,690 observations. Models used were i) the Mean-adjusted returns, ii) the Market-adjusted returns, iii) the Market model using an OLS beta, iv) the Scholes-Williams beta model, which is a variation of the Market model, and v) the Dimson beta model, another variation of the Market model. Parameters for each of the five models were calculated from the period -120,-60 and +60, +120. Event period was -59, +59. Comparison shows that the abilities of the first three models to detect correctly the presence of abnormal performance are similar, with a slight preference for the Market model.

A useful review of the event study methodology since 1969 is available at John J.Binder's paper (1998), where he justifies the reasons why the event study methodology has become the standard method of measuring security price reaction to an announcement or, generally, an event. Event studies are used to test the null hypothesis that the market efficiently incorporates information, while under the maintained hypothesis of market efficiency, they enable the examination of the impact of some event on the wealth of the firm's security holders. Again, the Market model is used. A useful note is that, if there is a great change in the beta coefficient because of the event, AAR will be calculated from a period after that event. Verifying others, he points out that when a large sample of unrelated securities is used or the event dates are not clustered in calendar time, the Market model estimation of the AAR is generally unbiased. Finally, he justifies that non-normality of individual abnormal return and having or not cross-sectional data do not affect the model's performance.

DATA AND METHODOLOGY

We take into account a total of 221 days of stock pricing. The Athens Stock Exchange distributes information through its Daily Price Bulletin and other means details about the prices and the composition of the indexes. Prices of indexes are calculated every 30 seconds during the days of conferencing of the Athens Stock Exchange, using the current stock prices.

Table 1 presents the population of the study, which consists of 10 events of acquisitions of shares that six Greek companies performed. Details about the announcements were taken from the daily press releases of the Athens Stock Exchange. All of the acquiring companies are listed in the Athens Stock Exchange market.

Table 1: Greek Companies and Acquired Companies

Announcement date	Acquirer Company	Sector	Target Country	Sector	% of acquisition
20/9/2002	Eurodrip	Industrial	Jordan	Industrial	100%
4/6/2002	ETEM	Industrial	Romania	Industrial	20%
2/4/2002	Intracom Constr.	Construction	Bulgaria	Construction	30%
10/05/01	Sidenor	Industrial	Bulgaria	Industrial	75%
25/02/04	Sidenor	Industrial	Bulgaria	Industrial	6%
28/12/2001	TITAN	Industrial	Serbia & Montenegro	Industrial	70%
5/7/2002	TITAN	Industrial	Egypt	Construction	44%
1/12/2003	TITAN	Industrial	Skopje	Industrial	47%
17/07/01	Chalkor	Industrial	Bulgaria	Industrial	93%
19/12/2003	Chalkor	Industrial	Bulgaria	Industrial	7%

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The aim of this study is to detect and analyse the effects of the Greek firms' acquisition announcement on their stock returns and the asymmetric effect of good and bad news. We use the event study methodology of Brown & Warner (1980, 1985). A great advantage of the OLS estimation technique is that, residuals of a stock sum up to 0 in the estimation period, in order to counteract coefficient α's bias with β's. The estimation period begins 211 prior the announcement day and ends 11 before. The event period starts 10 days prior the announcement and ends 10 days after (-10, +10).

Brown and Warner explain the OLS Market Model (1985) and use it to calculate the Abnormal Returns (AR).

$$AR_{i,t} = R_{it} - (\alpha_i + \beta_i * R_{mt}) \quad (1)$$

where AR_{it} is the abnormal return of firm i on day t, R_{it} is the rate of return for stock i on day t, α_i and β_i are OLS coefficients from the estimation period, and R_{mt} is the market return on day t.

In order to find out the impact the announcements have on the stocks, we calculate the average of the Abnormal Returns (AAR), which implies that particular change. We use the period of -211, +10 to calculate the following:

$$AAR_t = \frac{\sum_{t=-211}^{10} AR_{it}}{n} \quad (2)$$

where AR_{it} is the abnormal return for the i^{th} firm on day t and n is the length of the estimation period. According to the theory, when abnormal performance is spread in a period, that is, not clustered, the best way to calculate AR is CAR. Cumulative Average Abnormal Return (CAAR) is the sum of AAR_t of the firms during the estimation period –211, +10, that is:

$$CAAR_{(-211,+10)} = \sum_{t=-211}^{10} AAR_t \quad (3)$$

The t statistic of the CAAR is used to test the hypothesis whether the AAR on the exact day of the announcement and the CAAR during the estimation period are both zero. Since the event dates spread into periods, we can assume cross sectional independence of the data. The t statistic of AAR is calculated as follows:

The standard deviation of the AR_{it} is found as follows:

$$SD(AR_{it}) = \sqrt{\frac{\sum_{t=-211}^{10} (AR_{it} - \overline{AR_i})^2}{n-1}} \quad (5)$$

where AR_{it} is the abnormal returns of firm i on day t, $\overline{AR_i}$ is the mean of the abnormal returns of firm i and n is the number of time observations [n=211 + 1 (t=0) + 10=222].
Then, t statistic then is:

$$t = \frac{\overline{AR_{it}}}{\overline{SD}_{\overline{AR}}} \quad (6)$$

where $\overline{SD}_{A\bar{R}}$ is the average standard deviation of the mean abnormal returns in event period calculated as shown in equation (5).

The asymmetric effect of 'good' and 'bad' news on stocks' volatility is an interesting feature, which is captured by the Exponential General Autoregressive Conditional Heteroscedasticity (E-GARCH) model. This particular model allows for negative coefficients, while when using the standard GARCH model, it is necessary to ensure that all of the estimated coefficients are positive. The tendency for volatility to decline when returns rise and to rise when returns fall is called leverage effect. The E-GARCH model allows for the asymmetric effect of good and bad news in the estimation period of an acquisition to take place. We use period -211,-1 of AAR to test this effect.

The form of our E-GARCH model is as follows:

$$AAR_{-211,-1} = \beta_0 + \beta_1 D_1 + \beta_2 D_2 + \varepsilon_t \quad (7)$$

where $AAR_{-211,-1}$ is the estimated average abnormal return of -211,-1 period, D_1 and D_2 are two dummy variables for good and bad news respectively and are:

$D_1 = 1$ if $t \in \{-211,-11\}$ $\quad$ $D_2 = 0$ if $t \in \{-211,-11\}$
$\quad\quad 0$ if $t \in \{-10,-1\}$ $\quad\quad\quad\quad$ 1 if $t \in \{-10,-1\}$

and

$$\ln(h_t) = \alpha_0 + \alpha_1 \frac{\varepsilon_{t-1}}{h_{t-1}^{0.5}} + \lambda_1 \left| \frac{\varepsilon_{t-1}}{h_{t-1}^{0.5}} \right| + \alpha_2 \ln(h_{t-1}) \quad (8)$$

Assumptions of the model are:

$$\varepsilon_t^2 = v_t^2 . h_t \quad (9)$$

$$E_{t-1} . \varepsilon_t^2 = h_t \quad (10)$$

$$\text{or } h_t = \alpha_0 + \sum_{i=1}^{q} a_i \varepsilon_{t-i}^2 + \sum_{i=1}^{p} \beta_i h_{t-i} \quad (11)$$

where ε_t^2 is the squared error term, h_t is the conditional variance of ε^2 and $E_{t-1} . \varepsilon_t^2$ is the lagged expected value of ε_t^2.

Our model permits some coefficients to be negative and the standardised value of ε_{t-1} allows for more natural interpretation of the size and persistence of shocks. If coefficient of $\frac{\varepsilon_{t-1}}{h_{t-1}^{0.5}}$ is positive (negative), the effect of the shock on the log of the conditional variance is equal to $\alpha_1 + \lambda_1$ ($-\alpha_1 + \lambda_1$). This is a way of allowing financial leverage effects.

EMPIRICAL RESULTS

Looking at table 2, there is a variation between negative and positive AARs before the announcement, while all the CAARs at the same period are positive (exceptions exist). Negative CAAR seems to cluster

between day -140 and -179. On the day of the announcement, t=0, AAR goes slightly above zero, while CAAR are still positive. At day zero, we have 0.4% AARs and 1.3% CAARs.

Both AARs and CAARs on day 0 are statistically insignificant (t value=0.255 and 0.772), which means that we cannot reject the hypothesis that the announcement of the acquisitions does not affect abnormal returns on that day. Similarly, the values of AAR and CAAR on day 0 (0.4% and 1.3% correspondingly) are economically insignificant as well. These findings are in line with other studies of different sectors (i.e. banking and financial sector of industry). Therefore, we can conclude that the announcement of an acquisition does not have a significant impact on the firms' stock values.

The results of the E-GARCH technique are (t-values in parentheses):

$$AAR_{-211,-1} = \underset{(0.2686)}{0.00113}.D_1 - \underset{(-0.6459)}{0.0011157}.D_2 \quad (12)$$

while the parameters of the conditional heteroscedasticity model are:

$$\ln(h_t) = -10.2471 - 0.028391 \frac{\varepsilon_{t-1}}{h_{t-1}^{0.5}} - 0.64292 \left| \frac{\varepsilon_{t-1}}{h_{t-1}^{0.5}} \right| \quad (13)$$

s.e. (0.11760) (0.10846) (0.17614)

Table 2: AARt and CAARt of event period -211, +10

t	AAR	t value	CAAR	t value
-211	0.00006	0.00338***	0.00006	0.00338***
-200	0.02127	1.24788	0.03140	1.84206
-180	-0.00136	-0.07957*	0.00156	0.09126
-160	-0.00310	-0.18171	-0.03083	-1.80858
-140	0.00656	0.38458	-0.00948	-0.55600
-120	-0.00682	-0.40009	0.00028	0.01671**
-100	0.00678	0.39760	0.04583	2.68814
-80	0.00371	0.21786	0.04049	2.37520
-60	-0.00603	-0.35343	0.00388	0.22771
-40	-0.00145	-0.08479*	0.03230	1.89467
-20	0.00027	0.01570	0.01045	0.61276
-10	0.00247	0.14502	0.02250	1.32001
-5	-0.00222	-0.13015	0.00809	0.47439
-4	0.00263	0.15409	0.01071	0.62848
-3	0.00261	0.15295	0.01332	0.78143
-2	-0.00218	-0.12795	0.01114	0.65349
-1	-0.00233	-0.13674	0.00881	0.51675
0	0.00436	0.25575	0.01317	0.77251
1	-0.00069	-0.04065**	0.01248	0.73186
2	-0.00538	-0.31586	0.00709	0.41600
3	-0.00068	-0.03961**	0.00642	0.37639
4	-0.00309	-0.18145	0.00332	0.19494
5	-0.00258	-0.15138	0.00074	0.04356**
10	0.00394	0.23127	0.00001	0.00059***

This table shows the average and cumulative average abnormal returns around Greek firm mergers.

The log-linear form of the conditional variance's equation allows coefficients to be negative, while a standard GARCH model does not allow for that, as mentioned before. It is clear that bad news have a negative but small effect (- 0.0011157) on the abnormal returns up until day -1, while the presence of good news positively affect AAR in the same period (0.00113). In equation (12), since α_1 is negative, the effect of the shock on the conditional variance h_t is:

$$h_t = - \alpha_1 + \lambda_1 = -0.028391 – 0.64292 = - 0.67131 \quad (14)$$

that is, shocks on stock prices have a negative effect on the conditional variance.

CONCLUSIONS

This study examines the effect of acquisition announcements on the abnormal returns of six Greek industrial and constructing firms in the time of 2001-2004. We calculated the average and cumulative average abnormal returns using the Market model in combination with the event study methodology. The OLS parameters (α and β) of the model were calculated from the estimation period -211, -11 and were applied for the calculation of AAR and CAAR of period -211, +10. We found the AAR and CAAR for the period -211, +10. Firstly, results show that, the announcement (t = 0) of an acquisition does not significantly affect the AAR and CAAR. Although AAR is positive on day 0, it begins to decline right after that. Apart from that, CAAR is positive between days -120 and way after the announcement day. More generally, it seems that both AAR and CAAR on day t = 0 are statistically and economically insignificant, that is, they do not seem to have a great effect on abnormal returns on that particular day. Secondly, we use the Exponential GARCH model technique to find if there is any correlation between the current return and the future volatility. We include 2 dummy variables in our estimation, namely D_1 and D_2 , which measure the effect of 'good' and 'bad' news on abnormal returns respectively. Results from the E-GARCH model show that the presence of 'good news' positively affects the average abnormal returns in the pre-announcement period -211, -1, while the presence of 'bad news' has a slight negative effect.

We anticipate that the issues addressed in this study will receive further attention by others. We encourage researchers to extend the present study by examining the actual distributions of abnormal return levels across firms or to apply the same methodology by using a different event date, for example, rumours date or outcome date, as t=0.

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