# THE CAPITAL STRUCTURE OF COMPANIES LISTED IN THE GREEK STOCK EXCHANGE

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**Abstract**:

*The paper's aim is to review the capital structure theories, and especially signalling theory. It investigates whether the capital structure signalling theory is reliable in cases of companies listed at the Athens Stock Exchange. The companies used in the sample, raised new equity from 2004 until 2006, and the paper examines their stock price reaction to the announcement.*

**Key Words:** *Capital structure, signalling theory*
**JEL Classification:** *G32*

## I.  Introductory notes and aim of the paper

The paper aims at finding new empirical results about signalling theory of the capital structure of companies listed at the Athens Stock Exchange.

The paper is divided in three parts. The first part includes a short description of the capital structure theories and an introduction to the signalling theory. The second part consists of the empirical findings of the investigation and their analysis. The third part includes the conclusions of the empirical investigation and some topics for further research.

## II.  Capital structure theories, signalling theory and the findings of previous empirical investigations

### 2.1     Capital structure theories

Capital structure shows the percentage of debt and equity in the balance sheet of a company and it is different from firm to firm. Other companies prefer to finance their activities with equity, while others with debt. The question is whether some capital structures are better than others. A capital structure is considered to be good, when it has as a consequence a fall in the cost of capitals. The weighted average cost of capital is the weighted sum of the costs of all sources of finance. The company's value is equal to the present value of the expected, future free cash flows, using the Weighted Average Cost of Capital. When the Weighted Average Cost of Capital is minimized, keeping the free cash flows stable, the value if the firm is maximized.

Debt has two main advantages. First, it contains less risk for the investors than equity. Second, interests have a tax advantage. But, on the other hand, debt has two disadvantages as well. First, it increases the variance of earnings. The greater variance of earnings, provokes the investors to ask for greater returns. So,  the increase of leverage may cause an increase in the cost of equity, decreasing the advantages of the low cost of debt. The second disadvantage is that it increases the cost of financial distress, which may be considerable, if the company uses debt often.

Academics have been arguing about the significance of the capital structure for the last 40 years, and we still don't have straight answers. Following the Modigliani and Miller proposals, researchers of the decades of 60s and 70s paid attention to the market's imperfections, which can make the value of the firm to depend on its capital structure. The main imperfections are: taxation, which encourages the undertaking of debt, but not the dividends and the expected costs of financial distress, which increase with the undertaking of debt.

At the end of the 70s, a new subject appeared. This new subject on capital structure was signaling. For example, there is a fall in the stock price, when the company announces an equity raise, and a rise in the stock price when the company announces a stock repurchase. These results seemed to confirm the existence of great costs of information, which could affect the choices of finance.

Capital structure is an important decision for every company. It is important, not because of the need to maximize the investments' returns, but due to its effect in the company's capability to face the competition's challenges. The best-known capital structure theory is Modigliani and Miller's (1958, 1963). In their first article they came to the conclusion that capital structure does not affect the company's value. So, there would be no optimal capital structure, nor minimal weighted average cost of capital (W.A.C.C.). In their second article, they included taxation, and found that a company should use as much debt as it can, to take advantage of the tax reduction and maximize their value.

The Modigliani – Miller theory was criticized, mostly for its hypotheses, and less for its content. Its most important flaw is the fact that presupposes the existence of perfect financial markets. In their second article, the writers import the notion of taxation, leaving all the other hypotheses the same. In this case, the optimal capital structure, is the one where the company was financed almost exclusively with debt, something that is not usual in reality, because the cost of debt increases, when leverage increases. The increase of a firm's leverage seems to be a solution, but in fact it is a short – term solution, since a company cannot constantly increase its debt.

J.M. Gordon (1989) suggests, the Modigliani and Miller theory is true, under a number of conditions. These conditions are referred to as perfect markets. In perfect markets there is no taxation, no transaction costs and information is available to everyone with costs.

Trade – off theory suggests as an optimal capital structure, that mix of equity and debt where present value of tax advantages equals to the present value of costs related to debt. Its main advantage is the fact that it suggests mediocre leverage and that it is easy to understand. Its disadvantage is the fact that it is a general, descriptive theory that does not explain which exactly is the right level of leverage. According to Berens and Cuny (1995), another problem of the trade-off theory is the fact that it predicts debt ratios which are greater than the real ones.

Myers and Majluf (1984), and Myers (1984) developed the pecking order hypothesis. According to this theory, companies prefer to be financed by internal funds, then by debt, and finally by raising new equity. Their results are strengthened by Krasker (1986).

There are two main approaches explaining pecking order (Halov, Heider, 2005). The first refers to transaction costs of external financing, while the second one is based to asymmetric information theory. According to the approach of transaction costs, the type of funds that will be preferred depends on the costs of the issue. According the asymmetric information theory, debt is preferred to equity, because taking a loan is a positive sign for investors who are not as well informed as the management. If a company undertakes a loan, investors will assume that the management believes that the company's common stock is undervalued. Pecking order hypothesis is better supported by empirical investigations, in comparison to trade – off theory.

A disadvantage of pecking order hypothesis (Myers, 2001) is the fact that managers act in favor of the current shareholders, maximizing the value of existing stocks. But it does not refer motivation of the managers.

Benito (2003) examined the capital structure decisions, and more specifically trade-off theory and pecking order hypothesis. He used data from two different economies, the Spanish and the English one. The results support pecking order hypothesis, as debt ratios are negatively related to cash flows and earnings, and positively with investments. This negative relation with the earnings of the company does not agree with trade off theory. But, in general, equity issues seem to be more common than the strict description that the pecking order would propose.

Dittmar (2004) examined the way firms choose the initial capital structure of their subsidiaries. The positive feature of subsidiaries is that through them, we can analyze the capital structure of the whole corporation. When the subsidiary is no longer financed by the corporation, the corporation chooses the capital structure of the new firm. The new firm initially had neither external debt, nor the control over its capital structure. The sample used consisted of 155 corporations between 1983 and 1995. The results of this research seem to agree with trade off theory. More specifically, growth is related negatively, while the value of the mortgages is related positively with the choice of debt.

The free cash flow theory suggests that too high levels of debt will increase the value, despite the increased possibility of bankruptcy, when the cash flows of the firm are more than the chances of positive investments. The free cash flow theory was mainly developed for mature firms that often proceed to over-investments.

Managerial opportunism hypothesis states that capital structure is the cumulative result of the managers' actions (Baker, Wurgler, 2001). Managers issue stocks when the company's stock is overvalued, and repurchase them, when the stocks are undervalued. Managers' aim is to be synchronized with the market, so as to take profits for the current investors. This theory has common points with pecking order hypothesis, as they both act for the current investors' benefit, and with signaling theory, as they both believe that the company issues stocks when their price is overvalued.

According to Graham and Harvey (2001), managers of the firms are affected by the stock price when they intend to raise equity. The approach of timing with the market suggests that capital structure is the result of former actions in order to synchronize with the market. According to this approach, there is no optimal capital structure. The theory of timing itself seems to be the explanation.

According to Leland E. Hayne (1998), two main theories determined the development of capital structure theories, the Modigliani and Miller theory (1958, 1963) and Jensen and Meckling theory (1976). A great number of theoretical and empirical papers were based on these two theories. But prior research seemed to have two disadvantages. It was not complete and it did not give quantitative answers. Leland (1998) is trying to have element from both Modigliani and Miller theory and Jensen and Meckling theory about the optimal capital structure.

Ronald W. Masulis (1983) examined the effect of a change in the levels of debt in the firm value. He used two types of change, issuer exchange offers and recapitalizations. The results showed that the stock prices and the values of the firms' were positively related to these capital structure changes.

Odean (1998) examined the psychology of investors and how it affects their actions. His research concludes that the volume of transactions increases when internal users seem to be very confident.

Hovakimian Armen, Opler Tim and Titman Sheridan (2001) found that although pecking order hypothesis affects debt ratios in the short-term period of time, but companies tend to try to reach ratios – targets, which is in agreement with trade-off theory. The findings also agree with agency theory and asymmetric information, as managers are unwilling to issue stocks in low prices or to increase their leverage when the stock prices are too low.

In general, we can conclude that Modigliani and Miller theory agrees with the trade off theory, while pecking order hypothesis is consistent with the asymmetric information theory and signaling theory. Despite the research, there is no thorough explanation for the optimal capital structure of firms (Haris, Raviv, 1991).

Myers (2001), in his article for trade off, pecking order and free cash flow theory, states that none of these theories gives general explanations for financial strategies, as they were not designed to be general. These capital structure theories are valid under conditions. Each one emphasizes in certain costs and advantages of different financing strategies. Every researcher can find statistical results that agree with more than one theory, because each theory is valid for parts of the sample.

## 2.2    Signaling theory

At the end of the 70's, Ross (1977), and other writers developed the capital structure signalling theory based upon the problems of the asymmetrical information between managers and investors. These models are based upon the idea that the top executives of the firm that have inner information, have a motive to transfer this knowledge to the external investors, so that the stock price will rise. However, managers cannot simply announce the good news to the investors, since they will face it with suspicion.

One solution to this problem (for the underestimated firms) is to send to the investors a signal containing this information, by adopting a financial policy. This strategy is forbidden from the aspect of cost for a firm of less value. The signal is a costly action for the firm, in order to convince the investors and other external users that it contains reliable information. To the external users what makes the signal credible is its cost. Bhattacharya and Dittmar (2004) argued about costless and costly signals. Managers would not announce the good news that they have, because all companies could do this without being valid. Instead of this, the administration increases the leverage of the firm. This capital structure is a commitment for the firm, which, a firm of mediocre prospects would not dare to undertake. The firms that want to send the

signal that they have good prospects, increase their leverage. In contrast, the overestimated firms are not willing to undertake the burden of lending because in this way they face the risk of bankruptcy. Furthermore, the precision of the signal is significant as well (Veronesi, 2000).

Thus, finally, managers many times use the changes in capital structure, in order to transfer some information for the profitability and the risk of the firm, to the external users. Signaling theory is founded upon the idea that the internal users know more things than the external users. Moreover, the wages and the privileges that managers have, are sometimes dependent on the market value of the company. This gives the firm the motive to provide the information to the investors that the firm is underestimated. The increased leverage indicates greater possibilities of bankruptcy. It signals positive evolutions, since the request for a loan means that the administration believes that the good progress of the firm will allow it pay off.

The information will be credible only if the cost of the false revelation is high enough to force the firm to reveal the truth. The leverage increase is an effective signal. The loan contracts force the firm to have stable cash flows during the loan period and if the firm does not have it, it will face serious consequences, such as bankruptcy. On the contrary, in the case of equities, things are more flexible. Stockholders wait typically for, some cash payments, but in this case the administration has the aptitude to reduce or omit them during financial recessions. For this reason, taking a new loan is a credible signal for the future cash flows to fulfil its obligations.

The economist who first dealt with the asymmetric information was Akerlof with his Lemons Problem, which concerned the car market. Michael Spence continues Akerlof's idea, in his article (1973), in which he introduces the notion of the signaling theory in the labor market. In 2001, Akerlof, Spence and Stiglitz were nominated with the Nobel Prize for their research on the asymmetrical information during the 70's. This is a sign of the importance of the financial asymmetric information.

According to a group of theories, for example Ross (1977) and Leland and Pyle (1977), the choice of the capital structure of the firm is a signal for the external users. According to Noe, the quality of the firms that raise loans tends to be better than this of the firms that issue stocks. Thus, Noe's model predicts a negative reaction of the stock price in the announcement of the stocks' issue.

Ross believes that capital structure functions as a signaling mechanism in the market. One of the best-known signals is the undertaking of debt. This action increases the possibilities and the costs of financial distress for a firm. The investors know that, and when they notice that a firm increases its debt they interpret it as a sign that the managers await in the future such cash flows that will avoid recession.

Other financial signals are:
- Dividends
- Leverage
- Stock repurchase
- Announcement of a merger or acquisition
- Announcement of a tender offer
- Announcement of a spin off
- Announcement of poison pill

The changes in capital structure can alter the conception of the market for the firm's value. The above writers argue that stock issue affects negatively the stock price. To sum up, we see that Ross (1977), Noe (1988) and Narayanan (1988) predict a positive reaction of the stock price to the debt increase, while Myers and Majluf predict that the stock price will not be affected by the undertaking of a risk free loan. Lucas and McDonald (1990) find that the stock price falls after the announcement of an equity raise, but after a small period of time it rises. According to Krasker (1986), the stock price is negatively correlated with the issue size. Finally, according to Barclay, Smith and Watts (1995) the empirical support to signalling theory is statistically significant, but economically insignificant. The companies of high quality use more debt, but the differences in leverage are very small.

## 2.3    Results of other empirical researches

The importance of signaling theory has been the object of many researches. Suggestively, the following will be mentioned.
Johnson's (1988) research indicates that signaling theory is in force in the USA during 1970-1988. The excessive returns of the common stocks were negatively connected with the reductions of the loan's pay-

off and the flexibility of the dividends' distribution. The refunding of the debts can alter the common stocks' prices, if the exchange offer reveals new information about the firm's prospects. Thirty occasions of exchange offers were examined.

The research of Pugh and Jahera (1990) ends up in accordance with signaling theory in the USA, although it examines the theory from the aspect of the stocks' repurchase, while it adds that the stock prices of the firms of greater capitalization are less affected. The excessive returns related with the repurchase announcements, are usually considered reaction to the statement of the managers that the firm's stock is underestimated. This signal from the behalf of the administration provides new information that improves the market value of the firm. Two dependent variables were used, the adjusted to risk excessive returns for the days before and after the announcement and the premium offered by the administration. One of the independent variables is the debt ratio before and after the repurchase. The method used in this research was the least squares method, and the periods of time of 40 days and 10 days.

Signaling theory seems to be valid to the Middle East enterprises as well, according to a research that took place in 1994-1996 (Du, Dai, 2005). The sample comprised of enterprises of nine Asian economies, while the time period stops before the Asian crisis, which would alter the result. Dependent variables were the leverage in historical prices and leverage in market prices.

Finally, the research of Antoniou, Gunay and Paudyal (2006) in France, Germany and the United Kingdom supports signaling theory, examining the debts' maturity from 1983, 1987 and 1969 for each country, to 2000. The debts' maturity is used as the dependent variable, while among the assumptions checked is the validity of signaling theory, which is expressed with the use of four factors, leverage, liquidity, variability and the quality of the firm.

In Egypt, the theory does not seem to be in effect, it is valid only for high risk enterprises (Eldomiaty, 2004). This research examines the dynamic relations between the changes in the capital structure of the enterprises and their effect on the market price, under different levels of systematic risk. The market price, or capitalization, of the firm is used as the dependent variable, while the debt ratio is used as the independent variable. The enterprises included in the sample are divided in 3 categories with high, medium and low beta ratio respectively. The results confirm to some degree the signaling theory, especially for the high-risk enterprises.

## III. Empirical research of signalling theory for the greek stock market firms

### 3.1 General information

The alterations caused to the capital structure of a firm from the administration, are expected to have as a consequence some variations to the stock price of the firm. Thus, according to signaling theory, the equity raise of a firm, should have as an effect a fall of its stock price. This statement is the core of empirical research of the Greek stock market.

We should mention that the Greek Stock Exchange had a great rise at the end of the 90s due to the entrance of the Greek economy in the European Monetary Union. But under the pressure of speculatory forces, there was a fall in 2000. This financial crisis affected the whole Greek society. We tried to see how investors reacted to the announcement of equity raises, a few years after the crisis. Moreover, very few researches concern the Greek Stock Exchange, the same period of time the Greek economy was trying to become a mature financial market. The case of the Greek Stock Exchange is not a usual one, as at the period we examine, the Greek economy was trying to come out of a financial crisis, and at the same time become a full member of the European Monetary Union.

The research begins with an introductory reference to the notion of the equity raise and how this can be achieved, and the procedure followed. Next, we refer to the choice of the sample used, the methodology followed and the statistic analysis. The third unit ends with the conclusions of this statistic analysis.

### 3.2 Equity raise

The stock markets are known as capital markets, since they are the fundamental way for the enterprises to find capitals. The enterprises either issue new stocks, or, if they have already issued stocks, they move to equity raise.

The equity raise can be achieved in two ways, either with capitalization of the retained earnings or with extra cash payment. In the first case, the firm moves to financial inscriptions that transfer the retained

earnings to the equity. Analogous to the capitalized earnings, new stocks are issued with equal name value, as the existing ones and are distributed free of charge to the investors. There might also occur a capitalization of the obligations or capitalization of the result coming from the readjustment of the financial assets, according to which, the book value of the assets is adjusted with their approximate market value. In the second case of the cash payment, the equity raise leads to new capitals for the enterprise. This actually means that the firm wants to find new capitals from the investors, either the old ones, or new. But if new investors buy the new stocks, the old stockholders will have to face a reduction of their ownership percentage. In order for this not to happen, there is a preference right for the old investors – in fact with better conditions than the official price of the stocks' issue.

The procedure followed for an equity raise consists of:

1. the Stockholders General Assembly for an equity raise
2. the approval of the Informative Report by the  Greek Capital Market Committee
3. the publication of the Informative Report
4. issue of the Preference Rights
5. negotiation and use of the Preference Rights
6. end of negotiation of the Preference Rights
7. end of use of the Preference Rights
8. announcement concerning the coverage of the issue and the disposal of the rest of the stocks
9. start of negotiation of the negotiation of the new stocks that come from the equity raise

The equity raises are sometimes faced with suspicion. Especially after the financial crisis in 2000, many enterprises faced serious problems, and the equity raise was the only solution to improve their financial situation. Some of them, however, did not manage to cover the equity raise.

The failure of an equity raise causes nasty comments to the market, having as a result a negative effect upon the stock. Therefore, it is a common practice, for the basic investors, who may either have to cover the part that is not disposed. This fact also changes in many cases the, after the equity raise, stockholders composition.

It is worth mentioning here that the announcement of  an equity raise has a direct effect on the stock of the firm, besides the fact that from the moment the General Assembly decides its materialization until it is approved by the stock market, a long period of time intermediates. So, we realize that the investors are reluctant to participate to the capital increases of firms, since some of them do not have adequate liquidity. Moreover, some of the firms do not have investing interest with long-term prospects, while, at the same time, include the risk for devaluation of the titles.

Systematic abstinence of the investors is noticed mainly in the equity raises of small companies, something that points out the reduced trust of the investors to these companies. On the other hand, companies of great capitalization do not face this problem.

## 3.3 Sample

We investigate cases of equity raise that occurred in the Greek Stock Exchange between 2004 and 2006. This period of time was chosen, because investors needed some time after the financial crisis of 2000 in order to start acting normally again. Under these circumstances, the results may not be correct, because investors are still suspicious against any announcement of firms. We have chosen companies that proceeded in equity raise, but not as a consequence of a merger or acquisition. The third factor that we took into consideration was the availability of the data.

Finally, the sample consists of 13 cases of equity raise that are shown in the following table (TABLE 1).

TABLE- 1:Sample of the research

| Company | Issue of new stocks with preference right | Ratio of issue of new to old stocks | Total capital | Percentage of coverage | Publication date of the Informative Report |
|---------|---------|---------|---------|---------|---------|
| LANNET | 14.761.076 | 4:10 | 15.351.519,04 | | 8-11-2005 |
| ETE | 135.707.764 | 4:10 | 3.000.498.662,04 | 100,00 | 9-6-2006 |

| | | | | | |
|---|---|---|---|---|---|
| LAZARIDIS | 1.436.800 | 1:10 | 3.448.320,00 | 100,00 | 20-2-2004 |
| MARFIN | 25.000.000 | | 400.000.000 | 190,00 | 19-12-2005 |
| ATE | 624.444.444 | 20:09 | 1.248.888.888,00 | 100,00 | 27-5-2005 |
| EMPORIKI | 26.478.294 | 5:20 | 397.174.410 | 100,00 | 10-11-2005 |
| GENIKI | 14.857.143 | - | 89.142.858,00 | 100,00 | 27-2-2004 |
| LESVOS | - | - | - | - | 16-11-2005 |
| DIAS | 25.110.000 | 1:01 | | | 26-5-2006 |
| PLIAS | 63.908.001 | 1,9:1 | 18.238.997 | | 19-6-2006 |
| ALPHA BANK | 97.271,00 | | 437.709,77 | | 24-11-2004 |
| FORTHNET | 21.411.490 | 5:04 | 119.904.344 | 100,00 | 25-4-2006 |
| KERANIS | 11.459.490 | 1:03 | 6.548.282,50 | 100,00 | 21-10-2004 |

We should note that the firm PLIAS was by that time under surveillance, something that may have affected its price and the investors' reactions to its announcements.

The sample is quite small, due to the fact that the firms at that period tended to raise their equity only when they proceeded to a merger or acquisition. But the announcement of a merger or acquisition is a positive signal for the investors, so the results if we included these cases of equity raises, would be confused, as we would use a positive signal and a negative signal at the same time.

## 3.4 Methodology

The data used in this paper is extracted from many sources. The data related to the stock prices are from the site of the Greek Stock Exchange. The details for each equity raise were extracted from the annual reports of the firms, the press, and the Internet. The data covers three years 2004-2006. The statistical analysis was done, with the use of the stock prices of the firms two months before and two months after the announcement of the equity raise. As announcement day, we consider the day when the Informative Report was published. We assume that, in order for signaling theory to be valid, the equity raise should have a negative effect on the stock price, in comparison with the time before the announcement.

## 3.5 Statistical analysis

The software that was used is SPSS. In the first case, we examine the returns of the stock 30 days before and 30 days after the publication of the Informative Report. We examine the logarithmic returns in two periods. The first period of time ends the day before the announcement, while the second one, contains all the rest. The names of the stocks of the first period have the abbreviation " _b(efore)" , while the ones of the second period have the abbreviation " _a(fter)".

1$^{st}$ test

We test whether the average returns of the two periods equal to zero. This actually means that we test whether the returns belong to a distribution, which has average equal to zero, something that we theoretically expect to happen.

Test hypotheses:

$H_0$: the average equals to zero ($\mu=0$)

$H_1$: the average is not equal to zero

The results are shown in the Table below (Table 2):

TABLE- 2: One Sample Test

| | Test Value = 0 | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|
| | T | df | Sig. (2-tailed) | Mean Difference | Lower | Upper |
| Lannet_b | ,342 | 29 | ,735 | ,0023167 | -,011538 | ,016171 |
| ETE_b | -1,497 | 29 | ,145 | -,0090667 | -,021457 | ,003324 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| Laz_b | -1,688 | 29 | ,102 | -,0056233 | -,012439 | ,001192 |
| Marfin_b | ,683 | 29 | ,500 | ,0021200 | -,004232 | ,008472 |
| ATE_b | -1,090 | 29 | ,285 | -,0074300 | -,021368 | ,006508 |
| Emporiki_b | ,871 | 29 | ,391 | ,0023700 | -,003193 | ,007933 |
| Geniki_b | 1,129 | 29 | ,268 | ,0054933 | -,004462 | ,015449 |
| Lesvos_b | -,427 | 29 | ,673 | -,0021533 | -,012476 | ,008169 |
| Dias_b | -,799 | 29 | ,431 | -,0035400 | -,012599 | ,005519 |
| Plias_b | -,352 | 29 | ,728 | -,0041767 | -,028460 | ,020107 |
| Alpha_b | ,306 | 29 | ,762 | ,0010733 | -,006112 | ,008259 |
| Forth_b | 1,653 | 29 | ,109 | ,0114200 | -,002714 | ,025554 |
| Keranis_b | -,323 | 29 | ,749 | -,0014167 | -,010388 | ,007554 |
| Lannet_a | ,715 | 38 | ,479 | ,00524 | -,0096 | ,0201 |
| ETE_a | ,493 | 38 | ,625 | ,00242 | -,0075 | ,0123 |
| Laz_a | ,781 | 38 | ,440 | ,00259 | -,0041 | ,0093 |
| Marfin_a | 1,390 | 38 | ,173 | ,00639 | -,0029 | ,0157 |
| ATE_a | -,703 | 38 | ,487 | -,00839 | -,0326 | ,0158 |
| Emporiki_a | 2,077 | 38 | ,045 | ,00543 | ,0001 | ,0107 |
| Geniki_a | ,796 | 38 | ,431 | ,00252 | -,0039 | ,0089 |
| Lesvos_a | 1,506 | 38 | ,140 | ,01983 | -,0068 | ,0465 |
| Dias_a | -,591 | 38 | ,558 | -,00178 | -,0079 | ,0043 |
| Plias_a | ,630 | 38 | ,532 | ,00468 | -,0103 | ,0197 |
| Alpha_a | 1,711 | 38 | ,095 | ,00321 | -,0006 | ,0070 |
| Forth_a | -,766 | 38 | ,448 | -,00568 | -,0207 | ,0093 |
| Keranis_a | ,286 | 38 | ,776 | ,00179 | -,0109 | ,0145 |

With the use of One-Sample Test, we accept the $H_0$ for all the companies, because the possibility that appears in column Sig is greater than 0.05. Moreover, the level of significance is 95% (columns lower/upper). Within it, there is price zero (the smallest price is negative, while the biggest price is positive). As an exception, we should mention Emporiki after the announcement of the equity raise, for which the expected price is greater than zero.

$2^{nd}$ test:

We test whether the prices follow the Normal Distribution.

Test hypotheses:

$H_0$: the returns follow the Normal Distribution

$H_1$: the returns do not follow the Normal Distribution

In this case, we use One Sample Kolmogorof Test, which is used in quantitative variables and examines whether the cumulative frequency of a variable in the sample looks like the the one that would theoretically appear if it followed the Normal Distribution. In order to accept the $H_0$ hypothesis, the possibility in line Asymp.Sig. should be greater than the level of significance that is chosen (Table 3 & Table 4).

TABLE- 3: One-Sample Kolmogorov-Smirnov Test

| | Lannet_b | ETE_b | Laz_b | Marfin_b | ATE_b | Emporiki_b | Geniki_b | Lesvos_b | Dias_b | Plias_b | Alpha_b | Forth_b | Keranis_b |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Normal Parameters(a,b) Mean | ,002317 | -,009067 | -,005623 | ,002120 | -,007430 | ,002370 | ,005493 | -,002153 | -,003540 | -,004177 | ,001073 | ,011420 | -,001417 |

|  |  | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Std. Deviation | ,0371036 | ,0331827 | ,0182516 | ,0170102 | ,0373263 | ,0148982 | ,0266613 | ,0276446 | ,0242601 | ,0650316 | ,0192423 | ,0378508 | ,0240251 |
| Most Extreme Differences | Absolute | ,125 | ,122 | ,179 | ,111 | ,193 | ,122 | ,166 | ,236 | ,194 | ,157 | ,076 | ,304 | ,243 |
| | Positive | ,125 | ,097 | ,179 | ,111 | ,143 | ,122 | ,166 | ,236 | ,175 | ,157 | ,076 | ,304 | ,243 |
| | Negative | -,112 | -,122 | -,138 | -,093 | -,193 | -,097 | -,160 | -,231 | -,194 | -,130 | -,067 | -,187 | -,190 |
| Kolmogorov-Smirnov Z | | ,684 | ,668 | ,980 | ,610 | 1,055 | ,667 | ,910 | 1,291 | 1,062 | ,861 | ,419 | 1,665 | 1,332 |
| Asymp. Sig. (2-tailed) | | ,738 | ,764 | ,292 | ,850 | ,216 | ,765 | ,379 | ,072 | ,209 | ,449 | ,995 | ,008 | ,058 |

TABLE – 4: One-Sample Kolmogorov-Smirnov Test

| | | Lannet_a | ETE_a | Laz_a | Marfin_a | ATE_a | Emporiki_a | Geniki_a | Lesvos_a | Dias_a | Plias_a | Alpha_a | Forth_a | Keranis_a |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 |
| Normal Parameters(a,b) | Mean | ,0052 | ,0024 | ,0026 | ,0064 | -,0084 | ,0054 | ,0025 | ,0198 | -,0018 | ,0047 | ,0032 | -,0057 | ,0018 |
| | Std. Deviation | ,04583 | ,03059 | ,02073 | ,02871 | ,07457 | ,01632 | ,01980 | ,08220 | ,01885 | ,04633 | ,01172 | ,04627 | ,03909 |
| Most Extreme Differences | Absolute | ,158 | ,122 | ,119 | ,175 | ,162 | ,103 | ,124 | ,185 | ,146 | ,207 | ,063 | ,143 | ,160 |
| | Positive | ,158 | ,122 | ,080 | ,175 | ,139 | ,103 | ,124 | ,185 | ,146 | ,207 | ,062 | ,143 | ,160 |
| | Negative | -,097 | -,049 | -,119 | -,112 | -,162 | -,060 | -,063 | -,087 | -,138 | -,178 | -,063 | -,092 | -,126 |
| Kolmogorov-Smirnov Z | | ,988 | ,760 | ,746 | 1,090 | 1,011 | ,641 | ,774 | 1,156 | ,913 | 1,292 | ,391 | ,896 | ,997 |
| Asymp. Sig. (2-tailed) | | ,283 | ,611 | ,634 | ,185 | ,258 | ,806 | ,586 | ,138 | ,375 | ,071 | ,998 | ,398 | ,273 |

For the two periods of time, we accept the basic hypothesis, that the variables follow the Normal Distribution. Forthnet is an exception before the announcement, as the price of Sig is 0,008, which is less than 0,05.

3rd test:

We examined whether there is a difference between the averages of the two periods for each company. This test is used in dependent samples in two different periods of time. The test hypotheses that we made are the following:

$H_0$: the averages are equal ($\mu_1 - \mu_2 = 0$)
$H_1$: the averages are different
The results are shown in the Table below (Table 5)

TABLE- 5: Paired Samples Test

| | | 95% Confidence Interval of the Difference | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| | | Lower | Upper | | | |
| Pair 1 | Lannet_b - Lannet_a | -,0144922 | ,0185655 | ,252 | 29 | ,803 |
| Pair 2 | ETE_b - ETE_a | -,0296508 | ,0100508 | -1,010 | 29 | ,321 |
| Pair 3 | Laz_b - Laz_a | -,0150050 | ,0040250 | -1,180 | 29 | ,248 |
| Pair 4 | Marfin_b - Marfin_a | -,0169565 | ,0075299 | -,787 | 29 | ,437 |
| Pair 5 | ATE_b - ATE_a | -,0216434 | ,0432901 | ,682 | 29 | ,501 |
| Pair 6 | Emporiki_b - Emporiki_a | -,0076267 | ,0049267 | -,440 | 29 | ,663 |
| Pair 7 | Geniki_b - Geniki_a | -,0084905 | ,0118772 | ,340 | 29 | ,736 |
| Pair 8 | Lesvos_b - Lesvos_a | -,0614780 | ,0026113 | -1,879 | 29 | ,070 |
| Pair 9 | Dias_b - Dias_a | -,0099922 | ,0075522 | -,284 | 29 | ,778 |
| Pair 10 | Plias_b - Plias_a | -,0387386 | ,0201052 | -,648 | 29 | ,522 |
| Pair 11 | Alpha_b - Alpha_a | -,0127356 | ,0055823 | -,799 | 29 | ,431 |
| Pair 12 | Forth_b - Forth_a | -,0024441 | ,0411907 | 1,816 | 29 | ,080 |
| Pair 13 | Keranis_b - Keranis_a | -,0186437 | ,0197970 | ,061 | 29 | ,951 |

We used the Paired Samples Test, where u=0. In the columns Lower/upper, zero is included, so, with the fault possibility of 0,05, there is no difference in the average returns before and after the announcement. We also see that, in a significance level of 10%, the stock of LESVOS has a negative t=-1,879, which means that the average returns of the stock were lower than the ones after the equity raise. This result is in contrary with the signaling theory that predicts a fall in the stock price after the announcement. On the other hand, the stock of FORTHNET has a positive statistic t=1,816, so its average returns are lower after the announcement, confirming signaling theory.

4th test
The last test is about the variances before and after the equity raise.
$H_0$: the variances before and after the announcement are equal
$H_1$: the variances are different
We can see the results of this test in Table 6.
TABLE- 6: Test of Homogeneity of Variances

| | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|
| Lannet | ,185 | 1 | 67 | ,668 |
| ETE | ,062 | 1 | 67 | ,804 |
| Laz | 1,601 | 1 | 67 | ,210 |
| Marfin | 1,153 | 1 | 67 | ,287 |
| ATE | 4,883 | 1 | 67 | ,031 |

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| | | | | |
|---|---|---|---|---|
| Emporiki | ,887 | 1 | 67 | ,350 |
| Geniki | 1,481 | 1 | 67 | ,228 |
| Lesvos | 22,466 | 1 | 67 | ,000 |
| Dias | ,095 | 1 | 67 | ,758 |
| Plias | 4,226 | 1 | 67 | ,044 |
| Alpha | 7,291 | 1 | 67 | ,009 |
| Forth | 1,739 | 1 | 67 | ,192 |
| Keranis | 3,475 | 1 | 67 | ,067 |

Using the Test of Homogeneity of Variances, we found that the variances remained the same. In order to accept the basic hypothesis, the possibility in column Sig should be greater than the significance level. Exceptions are the prices of the companies ATE, LESVOS, PLIAS, ALPHA and KERANIS. In all these cases, the variance of the second period is greater.

Finally, using the Paired Samples Correlations, we find that in all the companies (except for DIAS and GENIKI that have a significant positive correlation) do not have a strong linear correlation between the prices of the two periods (Table 7).

TABLE- 7: Paired Samples Correlations

| | | N | Correlation | Sig. |
|---|---|---|---|---|
| Pair 1 | Lannet_b & Lannet_a | 30 | ,298 | ,110 |
| Pair 2 | ETE_b & ETE_a | 30 | -,239 | ,204 |
| Pair 3 | Laz_b & Laz_a | 30 | ,157 | ,408 |
| Pair 4 | Marfin_b & Marfin_a | 30 | ,123 | ,519 |
| Pair 5 | ATE_b & ATE_a | 30 | ,033 | ,862 |
| Pair 6 | Emporiki_b & Emporiki_a | 30 | ,347 | ,060 |
| Pair 7 | Geniki_b & Geniki_a | 30 | ,374 | ,042 |
| Pair 8 | Lesvos_b & Lesvos_a | 30 | ,133 | ,483 |
| Pair 9 | Dias_b & Dias_a | 30 | ,441 | ,015 |
| Pair 10 | Plias_b & Plias_a | 30 | -,059 | ,756 |
| Pair 11 | Alpha_b & Alpha_a | 30 | -,216 | ,251 |
| Pair 12 | Forth_b & Forth_a | 30 | ,101 | ,597 |
| Pair 13 | Keranis_b & Keranis_a | 30 | -,121 | ,526 |

Second round of tests for a period of time 14 days before and 14 days after the announcement

In this second round of tests, we used the same tests, altering the periods of time. We created a period comprising of the 15 days before the announcement and 14 days after the announcement. The names of the variables are followed by _p (before the announcement) and _k (after the announcement).
We present the results of the second round of tests.

1st test
TABLE- 8: One-Sample Test

| | Test Value = 0 | | | | 95% Confidence Interval of the Difference | |
|---|---|---|---|---|---|---|
| | T | df | Sig. (2-tailed) | Mean Difference | Lower | Upper |
| Lannet_k | ,565 | 38 | ,575 | ,0040615 | -,010491 | ,018614 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| ETE_k | **-,207** | 38 | **,837** | -,0007590 | **-,008172** | **,006655** |
| Laz_k | **,996** | 38 | **,326** | ,0032000 | **-,003305** | **,009705** |
| Marfin_k | **1,652** | 38 | **,107** | ,0039795 | **-,000897** | **,008856** |
| ATE_k | **-,115** | 38 | **,909** | -,0007359 | **-,013661** | **,012189** |
| Emporiki_k | **1,689** | 38 | **,099** | ,0046128 | **-,000916** | **,010141** |
| Geniki_k | **1,305** | 38 | **,200** | ,0056154 | **-,003097** | **,014328** |
| Lesvos_k | **1,252** | 38 | **,218** | ,0158000 | **-,009752** | **,041352** |
| Dias_k | **-,327** | 38 | **,746** | -,0008769 | **-,006313** | **,004559** |
| Plias_k | **,433** | 38 | **,668** | ,0037615 | **-,013835** | **,021358** |
| Alpha_k | **,830** | 38 | **,411** | ,0015744 | **-,002263** | **,005412** |
| Forth_k | **-1,724** | 38 | **,093** | -,0084205 | **-,018308** | **,001467** |
| Keranis_k | **,149** | 38 | **,882** | ,0007026 | **-,008839** | **,010245** |
| Lannet_p | **,546** | 29 | **,589** | ,0038533 | **-,010575** | **,018282** |
| ETE_p | **-,655** | 29 | **,518** | -,0049400 | **-,020375** | **,010495** |
| Laz_p | **-1,867** | 29 | **,072** | -,0064133 | **-,013440** | **,000613** |
| Marfin_p | **,875** | 29 | **,389** | ,0052567 | **-,007032** | **,017545** |
| ATE_p | **-1,187** | 29 | **,245** | -,0173800 | **-,047333** | **,012573** |
| Emporiki_p | **1,347** | 29 | **,188** | ,0034300 | **-,001777** | **,008637** |
| Geniki_p | **,488** | 29 | **,629** | ,0014733 | **-,004700** | **,007646** |
| Lesvos_p | **,414** | 29 | **,682** | ,0030800 | **-,012148** | **,018308** |
| Dias_p | **-,992** | 29 | **,329** | -,0047200 | **-,014450** | **,005010** |
| Plias_p | **-,289** | 29 | **,774** | -,0029867 | **-,024108** | **,018135** |
| Alpha_p | **,914** | 29 | **,368** | ,0032000 | **-,003960** | **,010360** |
| Forth_p | **1,532** | 29 | **,136** | ,0149867 | **-,005015** | **,034988** |
| Keranis_p | **,000** | 29 | **1,000** | ,0000000 | **-,014216** | **,014216** |

The 1$^{st}$ test (Table 8) shows again that the average price equals to zero. But, in the significance level of 10%, the average price of EMPORIKI and FORTHNET before the announcement, and LAZARIDIS after the announcement, are smaller than zero.


2$^{nd}$ test

TABLE- 9: One-Sample Kolmogorov-Smirnov Test

| | | Lannet_k | ETE_k | Laz_k | Marfin_k | ATE_k | Emporiki_k | Geniki_k | Lesvos_k | Dias_k | Plias_k | Alpha_k | Forth_k | Keranis_k |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 |
| Normal Parameters(a,b) | Mean | ,004062 | -,000759 | ,003200 | ,003979 | -,000736 | ,004613 | ,005615 | ,015800 | -,000877 | ,003762 | ,001574 | -,008421 | ,000703 |
| | Std. Deviation | ,0448913 | ,0228697 | ,0200672 | ,0150434 | ,0398732 | ,0170544 | ,0268780 | ,0788253 | ,0167705 | ,0542831 | ,0118392 | ,0305016 | ,0294359 |
| Most Extreme Differences | Absolute | ,171 | ,108 | ,153 | ,106 | ,120 | ,113 | ,155 | ,144 | ,142 | ,169 | ,094 | ,188 | ,253 |
| | Positive | ,171 | ,108 | ,153 | ,074 | ,108 | ,113 | ,155 | ,144 | ,142 | ,169 | ,047 | ,136 | ,253 |
| | Negative | -,077 | -,071 | -,103 | -,106 | -,120 | -,086 | -,088 | -,092 | -,128 | -,154 | -,094 | -,188 | -,165 |
| Kolmogorov-Smirnov Z | | 1,068 | ,676 | ,956 | ,664 | ,752 | ,708 | ,966 | ,896 | ,889 | 1,053 | ,588 | 1,173 | 1,581 |
| **Asymp. Sig. (2-tailed)** | | **,204** | **,750** | **,320** | **,769** | **,624** | **,698** | **,309** | **,398** | **,408** | **,217** | **,880** | **,128** | **,014** |


| Lannet | ETE_p | Laz_ | Marfin_ | ATE | Emp | Geni | Lesv | Dias | Plias | Alph | Forth | Keranis |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

| _p | | p | p | _p | oriki_p | ki_p | os_p | _p | _p | a_p | _p | _p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| ,003853 | -,004940 | -,006413 | ,005257 | -,017380 | ,003430 | ,001473 | ,003080 | -,004720 | -,002987 | ,003200 | ,014987 | ,000000 |
| ,0386403 | ,0413357 | ,0188165 | ,0329085 | ,0802146 | ,0139439 | ,0165315 | ,0407807 | ,0260574 | ,0565638 | ,0191746 | ,0535654 | ,0380719 |
| ,140 | ,085 | ,113 | ,151 | ,199 | ,118 | ,123 | ,330 | ,228 | ,146 | ,099 | ,210 | ,173 |
| ,140 | ,085 | ,072 | ,151 | ,167 | ,099 | ,123 | ,330 | ,228 | ,146 | ,099 | ,210 | ,173 |
| -,091 | -,048 | -,113 | -,122 | -,199 | -,118 | -,080 | -,170 | -,190 | -,105 | -,075 | -,167 | -,136 |
| ,765 | ,467 | ,622 | ,828 | 1,088 | ,645 | ,672 | 1,808 | 1,250 | ,798 | ,543 | 1,151 | ,950 |
| **,602** | **,981** | **,834** | **,499** | **,188** | **,800** | **,757** | **,003** | **,088** | **,548** | **,930** | **,141** | **,328** |

a  Test distribution is Normal.
b  Calculated from data

In the 2<sup>nd</sup> test (Table 9), most of the companies keep following the Normal Distribution. Exceptions in this case are, KERANIS before the announcement, and NAYTILIAKI LESVOU, after the announcement.

3<sup>rd</sup> test

TABLE- 10: Paired Samples Test

| | | 95% Confidence Interval of the Difference | | t | Df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|
| | | Lower | Upper | | | |
| Pair 1 | Lannet_k - Lannet_p | -,0274151 | ,0171951 | -,469 | 29 | ,643 |
| Pair 2 | ETE_k - ETE_p | -,0153516 | ,0184450 | ,187 | 29 | ,853 |
| Pair 3 | Laz_k - Laz_p | -,0012083 | ,0153483 | 1,747 | 29 | ,091 |
| Pair 4 | Marfin_k - Marfin_p | -,0160576 | ,0129376 | -,220 | 29 | ,827 |
| Pair 5 | ATE_k - ATE_p | -,0243758 | ,0425291 | ,555 | 29 | ,583 |
| Pair 6 | Emporiki_k - Emporiki_p | -,0099037 | ,0083637 | -,172 | 29 | ,864 |
| Pair 7 | Geniki_k - Geniki_p | -,0079702 | ,0206635 | ,907 | 29 | ,372 |
| Pair 8 | Lesvos_k - Lesvos_p | -,0151426 | ,0530760 | 1,137 | 29 | ,265 |
| Pair 9 | Dias_k - Dias_p | -,0086839 | ,0158439 | ,597 | 29 | ,555 |
| Pair 10 | Plias_k - Plias_p | -,0234777 | ,0373510 | ,466 | 29 | ,644 |
| Pair 11 | Alpha_k - Alpha_p | -,0096286 | ,0082752 | -,155 | 29 | ,878 |
| Pair 12 | Forth_k - Forth_p | -,0491950 | -,0038183 | -2,389 | 29 | ,024 |
| Pair 13 | Keranis_k - Keranis_p | -,0224623 | ,0156423 | -,366 | 29 | ,717 |

In the 3<sup>rd</sup> test (Table 10), all companies have the same average returns before and after the announcement, apart from LAZARIDIS and FORTHNET. FORTHNET has a statistic t=-2,389, so we conclude that the average returns after the announcement is higher, opposing to the signaling theory. This result is also in

contrast with the first round of tests, when the same company confirmed signaling theory. LAZARIDIS confirms signaling theory, with a statistic t=1,747.

4th test
TABLE- 11: Test of Homogeneity of Variances

|  | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|
| Lannet | 1,346 | 1 | 67 | ,250 |
| ETE | 7,085 | 1 | 67 | ,010 |
| Laz | ,228 | 1 | 67 | ,635 |
| Marfin | 8,144 | 1 | 67 | ,006 |
| ATE | 3,052 | 1 | 67 | ,085 |
| Emporiki | 1,948 | 1 | 67 | ,167 |
| Geniki | ,782 | 1 | 67 | ,380 |
| Lesvos | 5,772 | 1 | 67 | ,019 |
| Dias | ,122 | 1 | 67 | ,728 |
| Plias | ,030 | 1 | 67 | ,863 |
| Alpha | 1,598 | 1 | 67 | ,211 |
| Forth | 10,987 | 1 | 67 | ,001 |
| Keranis | 1,874 | 1 | 67 | ,176 |

In the 4th test, we see that ETE, MARFIN, ATE, LESVOS and FORTHNET have a diversification in variances before and after the announcement. Furthermore, all the companies, in this 28-day period, have higher variances than in the first case. Finally, in the test about the correlation coefficients, only MARFIN and EMPORIKI have a significant negative correlation of their returns before and after the announcement. Finally, about the correlation coefficients, we found in Table 12:

TABLE- 12: Paired Samples Correlations

|  |  | N | Correlation | Sig. |
|---|---|---|---|---|
| Pair 1 | Lannet_k & Lannet_p | 30 | -,284 | ,128 |
| Pair 2 | ETE_k & ETE_p | 30 | ,137 | ,470 |
| Pair 3 | Laz_k & Laz_p | 30 | ,353 | ,056 |
| Pair 4 | Marfin_k & Marfin_p | 30 | -,397 | ,030 |
| Pair 5 | ATE_k & ATE_p | 30 | -,043 | ,823 |
| Pair 6 | Emporiki_k & Emporiki_p | 30 | -,382 | ,037 |
| Pair 7 | Geniki_k & Geniki_p | 30 | -,323 | ,082 |
| Pair 8 | Lesvos_k & Lesvos_p | 30 | -,014 | ,942 |
| Pair 9 | Dias_k & Dias_p | 30 | -,131 | ,491 |
| Pair 10 | Plias_k & Plias_p | 30 | -,122 | ,520 |
| Pair 11 | Alpha_k & Alpha_p | 30 | -,138 | ,468 |
| Pair 12 | Forth_k & Forth_p | 30 | -,027 | ,889 |
| Pair 13 | Keranis_k & Keranis_p | 30 | -,088 | ,642 |

We see that only in the cases of MARFIN and EMPORIKI, their returns have a strong negative correlation before and after the announcement.

## IV. Conclusions

The results of the empirical analysis do not confirm signalling theory in the Greek Stock Exchange. Among the 13 cases of equity raise of the sample, only FORTHNET and LAZARIDIS had a fall in the stock returns after the publication of the Informative Report, while in 5 cases we had a raise in their variance after the publication. In the first round of tests, we examined the stock prices 30 days before and 30 days after the announcement of the equity raise, while in the second round of tests we used a period of time of 14 days before and 14 days after the announcement.
The fact that signalling theory does not seem to be valid in this sample could be due to a number of factors:
The Greek Stock Exchange, during the period of time we examined, was coming out of a crisis, so the results may not be representative. Moreover, the Greek Stock Market is in effort to become one of the mature markets. The result could also be affected by the fact that some of the companies may have a small number of investors holding their stocks.
The data was for a small number of companies and for a small period of time. In the sample was also a company under surveillance.
Furthermore, many of the companies were banks and, in general, companies of great capitalization, so the investors have significant trust in them. The announcement of the equity raise was not viewed as a bad signal, as signaling theory predicted, because the investor did not worry about the quality of the companies and the reasons they proceeded in the equity raise.

## V. Final thoughts and suggestions for further discussion

Capital structure is one of the most argued subjects in finance. A great number of theories have tried to explain the difference between the debt ratios of companies. These theories suggest that companies determine their capital structure, depending on the costs and advantages that relate to each type of finance. This paper examines signaling theory and whether it is valid in the Greek Stock Exchange. According to signaling theory, investors view the equity raise as a signal of risk, so we would expect a price fall after the announcement of the equity raise. But this does not seem to happen, according to the investigation. From the 13 firms of the sample, only two had a fall of their stock price.
The same investigation could be done using a larger and more representative sample, or using another signal, like for example the announcement of a merger or acquisition or the announcement of a stock repurchase.

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