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Financial Analysis Considering Distress Prediction Models of Telecommunications Companies Listed in Athens Stock Exchange: Hellenic Telecommunications Organization, Forthnet, Hellas Online

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Abstract: Within over a decade of liberalization of the Greek telecommunications market and given the current adverse conditions caused by the economic crisis, a limited number of companies managed to survive and relatively stabilize their market position. On one hand, this paper constitutes a comprehensive financial analysis of the Greek telecommunications companies that are currently listed in the Athens Stock Exchange. The respective companies are: Hellenic Telecommunications Organization (OTE), Forthnet, and Hellas Online (HOL). These companies' financial data over the past five years, from 2008 to 2012, are analysed using universally accepted methods. On the other hand, this work presents a relatively original approach of analysing companies' survivability, by combining the four widely accepted distress prediction models of Altman, Springate, Ohlson, and Zmijewski. In this manner, criticism on the credibility and applicability of these model on the specific field is also provided.

Keywords: financial analysis, telecommunication companies, Athens Stock Exchange, Greek economic crisis, distress prediction models

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1 Introduction

Telecommunications constitute an industry, which is probably more related with technology-oriented sectors than any other industry. It includes a wide variety of products and services, from traditional telephony to cutting edge wireless communications. Entertainment services are also provided by the related market. The relationship between telecommunications and the mass media has evolved lately, since the media extensively use the Internet as information provider, while telecommunications companies have started offering video streaming services (IPTV, Video on Demand, satellite TV). Of course, this trend was greatly attributed by the remarkable technology improvements in the field of data communications. High-speed Internet access has made possible the efficient transmission of high quality multimedia content over the IP network architecture, thus, enabling the evolvement of a new, dynamic market inside the business sector of telecommunications.

The global recession in the late 2000s affected the telecommunications industry as well, however, at a lower degree than other industries (Verizon, 2013). The worldwide market started growing again since 2009, boosted by the remarkable evolution of mobile, broadband, and video markets. The current estimation for year 2012 of the size of the whole ICT (Information and Communication Technologies) sector globally is $4.7 trillion (Plankett, 2012), including equipment and services. Moreover, the telecommunications industry is worldwide one of the largest providers of work, with working force of 865,300 in the U.S. Regarding the growth in the number of subscriptions, by the end of the year 2011 there were globally about 5.9 billion wireless subscriptions, whereas at the end of 2008 there were 4 billion and in 2003 just 1.41 billion. Apparently, many people have multiple subscriptions. Landlines, on the contrary, have stopped increasing and exhibit slight decrement. Specifically, at the end of 2011 the estimated number of landlines in the world was down to 1.16 billion, from 1.21 billion in 2009. It is obvious that the penetration of wireless services is much higher than the wired communications.

The purpose of this work is the detailed performance analysis of the telcos (telecommunications companies) listed in Athens Stock Exchange (A.S.E.) for a sufficient period that fully covers the Greek economic crisis. Specifically, the main objective is the comprehensive comparison of the financial position and practices of the analysed telcos, as well as the revelation of each company's financial trends year-by-year, from 2008 up to 2012. The ultimate aim is the estimation of their financial status and the provision of recommendations regarding their near-future activities, by utilizing multiple distress prediction models. In addition, historical data are used to study the applicability of the different models. The target audience of this work includes various groups that could find

the respective analysis useful. Firstly, A.S.E. is now attracting significant interest from international investors, who could find the presented results useful for their decision making process. Moreover, Greek telcos stakeholders could consider this analysis for planning future activities. Furthermore, researchers and analysts may be benefited by the findings of the comparative study of the financial distress prediction models. Summing up, the contribution of this work is twofold; on one hand an evaluation of the fiscal status and trends in the Greek telecommunications industry during the crisis is conducted, supporting decision making on future activities, whereas on the other hand it focuses on distress prediction models which are validated for the specific conditions.

The adopted methodology aims at the efficient analysis of the financial data in order to draw valuable conclusions regarding the status and trends of the firms. It includes detailed analysis of the most representative financial ratios that fall in the following well-known categories: profitability, activity, liquidity, capital structure, and investment. The main focus is on the application of four popular models that estimate distress: Altman, Springate, Ohlson, and Zmijewski. We decided to process data from 2008 to 2012, since the purpose of this study is to analyse the evolution of key telcos in the period beginning just before the start of the domestic economic crisis (which is placed in the late 2009 to the early 2010) to date. In this manner, it can be revealed how the specific field was affected by the economic crisis and in which way the companies adapted to the newly formed conditions. It is worth noting that the literature search revealed that there are not yet any extensive comparative studies regarding the specific companies' operation in the last years.

The rest of the paper is structured as follows: In Section 2, background issues related to this study are presented, focusing on the Greek telecommunications market and the theory behind distress prediction models. The next Section details the adopted methodology, whereas Section 4 presents the results of the conducted analysis. A brief comparison with EU telcos is presented in Section 5. Section 6 discusses the findings of this study and the paper is concluded in Section 7.

2   Background Issues

2.1   The Telecommunications Industry in Greece

The telecommunications industry in Greece has evolved significantly in the last two decades. OTE was until 1992 the unique public provider and was exclusively state-owned (Constantelou, 1993). An initial effort to privatize the 35% of the company was made by the government in 1991. Large international companies got interested, such as AT&T, NTT, and France Telecoms, but the project was abandoned, due to excessive protests (Constantinou and Lagoudakis, 1996). Greece was the last EU country to liberalize its fixed telecommunications market in 2001 (Moutafides and Economides, 2011) (Zambarloukou, 2010). After 2004, the competitive companies succeeded to acquire a notable market share from OTE. The respective business environment started becoming heavily competitive with the formation of international strategic alliances.

In Greece, the transformation from a state monopoly into a highly competitive market was quite challenging (Giokas and Pentzaropoulos, 2000). An efficient and well defined regulatory framework had to be established, while the mentality of employees and managers had to significantly change. The telecommunications companies now had to be flexible, focus on clients' needs, and provide high quality services at low prices (Caloghiro

and Constantelou, 1995). Moreover, their marketing strategies had to evolve and adapt to this new business environment of high competition and rapidly growing customers' demands (Papadimitriou and Kargas, 2012).

Regarding the mobile telecommunications, Greece was the first European country to award frequency licenses through sealed bid auction in 1992 (Gruber, 2005). Two licenses were initially awarded to Panafon and Telestet at the 900 MHz band for $160 million each. COSMOTE, the subsidiary of OTE, entered the market much later.

Nowadays, the telecommunications industry in Greece is considered to gradually reach a saturation point, since the penetration of the fixed and mobile telephony now exceeds 100% of the population. The broadband connections are still growing and there seems to be some space left for new subscriptions, however, business opportunities focus more on very high speed landline and especially mobile connections. The rapid growth led by the market liberalization is now slowing down and "over-supply" causes profitability constraints or even losses in some cases.

Generally speaking, the telecommunications market in Greece could be classified in fixed and mobile service provision. As far as fixed telecommunications are concerned, OTE has heavily invested on broadband networks and undoubtedly is the dominant player holding the largest market share. In the last years, the alternative providers have managed to acquire a significant market share (almost 24%) from OTE S.A. notably increasing their profitability margins. Regarding mobile telecommunications, the three network providers in Greece had in 2012 a total of 15,254,000 connections (i.e. 139% of the population).

In more detail, the impact of the financial crisis on the telecommunications market was significantly notable in year 2011, with the telcos suffering great decrements in their revenues (EETT, 2011). The intense competition between OTE and the "alternative" providers continued, with OTE losing approximately 5% of its fixed telephony market share. The mobile telephony suffered a 2% drop in subscriptions and 1.3% drop in active connections in 2011, however, there was an increase of 7% on Internet traffic. Regarding the interconnection rates between different networks, the rates for OTE's network dropped by 7% in 2011 and 21% from fixed to mobile networks. In the same year, 506,000 mobile numbers and 623,000 fixed numbers were ported, retaining this way competition at high levels. As far as the broadband lines are concerned, penetration kept growing in Greece reaching 22% of the population in 2011. In general, the latest trend in the telecommunications market in Greece considering financial data seems to be towards the drop in OTE's market share, due to the increased share of the surviving "alternative" operators, which are mainly represented by the two largest telecommunications companies in fixed telephony (following OTE), Forthnet and HOL.

2.2 Predicting Financial Distress

The economic crisis in Greece has set a harsh business environment leading a lot of firms to bankruptcy due to inability to meet their obligations. Turnover has significantly decreased with the reduction of demand, funding through bank loans is notably limited, while alternations in taxation has impacted profitability. In such difficult business conditions, it becomes necessary to assess the financial status of a firm and estimate distress probabilities. Hence, distress prediction models, also known as bankruptcy prediction models (the two expressions are used interchangeably in this study, since financial distress is considered directly related to the probability of bankruptcy (Hopwood, McKeown and Mutchler, 1994)), constitute a valuable tool in the hands of investors, managers, and

creditors who need to estimate the business risks (Reckers, 2003). Moreover, distress prediction is essential for auditors, too, when they try to conclude about the viability of a firm (Anandarajan, Anandarajan and Srinivasan, 2004).

Academics in the field of finance and accounting have studied distress prediction techniques for many decades. Toward this direction, models have been developed which calculate bankruptcy probability based on financial data. Some of the most popular approaches are based on data that can derive from financial statement analysis. These distress prediction models utilize historical data over multiple years for a large number of firms in order to decide on the factors/coefficients of some type of regression and conclude on a formula that classifies the firm according to its bankruptcy probability. Various studies have been contacted that evaluate the accuracy of the models and compare them on real data (Chava and Jarrow, 2004) (Kumar and Kumar, 2012). In this analysis, we utilize four of the most popular financial statements based bankruptcy prediction models, namely the Altman test, the Springate test, the Ohlson test, and the Zmijewski test, to estimate the probability of distress and acquire a clearer view of the financial status of the three telecommunications companies that are examined here.

In regards to any concerns about potential statistical problems arising from the use of the models over the 5yrs period, it should be clarified that each model uses only each fiscal year's current data and predicts the distress status approximately for the following two years. Hence, the adoption of distinct models for every different year of the specific period neither causes nor suffers from statistical problems. However, we highlight the fact that the models' predictions in the beginning of the considered period are criticized and in general are contradicted by the fiscal results of the following years.

Lastly, every interesting party needs to be aware that all distress prediction models have limitations regarding their reliability. Specifically, it is certain that the models do not provide credible results under all conditions. In (Nwogugu, 2006), the author presents a critique on this type of models. According to it, the bankruptcy models fail to take into account non-quantitative factors, such as market psychology, legal issues, and knowledge, hence, they lack accuracy especially when applied to businesses outside the U.S. and in emerging countries. In more detail, the findings of (Grice and Dugan, 2001), which focus on the Ohlson and Zmijewski models, reveal that the predictions are very sensitive to time periods. In other words, the authors note that when applying the models in different time periods than those considered when the models were developed, accuracy is significantly affected. Consequently, the models considered in this work are certainly widely accepted and extensively used, however, accuracy issues are justified by the fact that the application period is very different than the models' development period and by the current exceptional conditions of the Greek market.

3   Methodology

Regarding the data collection method, the original data were retrieved by the financial results published by the companies at their official websites, the A.S.E. official website, the Bloomberg database system, and by telephone contact with firms' representatives when needed.

3.1 Financial Analysis – Financial Ratios

Financial analysis is a very useful tool that significantly assists business decision making (Subramanyam and Wild, 2013). However, the financial data published by a firm do not always reveal its real current financial status. This may be related to tax reasons, the company's creditworthiness, and other business strategic reasons. Moreover, the arithmetic data that are extracted from the financial statements are not usually considered ready to lead to conclusions and being used in their raw form by the interesting parties.

It is evident that the financial data become useful when they are compared and they create logical connections which lead to relations that can be further analysed. These logical relations can then be examined for different companies or time periods so that valuable conclusions can be drawn. If the resulted information is efficiently exploited, it may lead to significant investing decisions. The financial statements are typically used by people who are not directly involved with the specific company, such as external analysts, investing firms, academics, and competitors. Apparently, every interesting party reforms the financial data according to its specific needs. In order to draw useful conclusions, the available information needs to be processed with the suitable tools.

Financial ratios constitute one of the most widely used tools for financial statement analysis (Bragg, 2012). The reason is that they can be easily determined and they can present a variety of information in a summative and compressive manner. Moreover, financial ratios can be used as means of predicting business failures as well. The calculation of these ratios is typically a simple mathematical operation, however, the determination of the type of ratio to use and its explanation is not always a straightforward procedure. It should be noted that financial ratios have no meaning as values on their own and are useful only when considered as means of comparison.

At this point, it is stressed out that except from the financial ratios analysis there are also other popular methods of financial analysis, such as the common size statement analysis. The specific method, which is also called "vertical analysis" (Eriotis, 2005), is usually applied on the income statement and involves the transformation of each absolute size in percentage of a reference value. In this manner, it is easier to compare companies of different type or size. However, this kind of analysis is not as detailed as the financial ratio analysis and it does not provide such sophisticated comparisons (Peavler, 2013). It is mostly suitable for quick and simple financial data analysis. The main reason is the fact that common statement analysis is classified as univariate analysis in contrast to the financial ratios analysis which is multivariate. The former is considered the most basic form of quantitative analysis, since it involves just one variable at a time, whereas the multivariate analysis is based on multiple variables and is considered much more sophisticated, since it considers interdependencies, relationships, and correlations (Tee, 2011). Hence, the multivariate financial ratios analysis provides more detailed explanations than the univariate common statement analysis and is considered a more suitable choice for this study. It is noted that the common size statement analysis actually involves two variables to compute the percentages, however, the one is always the same since it is the reference value, hence, it can be classified as univariate.

The following types of financial ratio analysis may be considered (Weil et al., 2012) (Warren and Reeve, 2003): i) Trend analysis. It involves the examination of financial ratios in different time periods, in order to determine the progress of the company's financial status. ii) Comparison of the corresponding ratios of competitive firms in the same time period. iii) Comparison of the average ratios of the corresponding sector and the under

examination firm in the same time period. This study considers the following classes of financial ratios (Eriotis, 2005): profitability, activity, liquidity, capital structure, and investment. The specific ratios used are commonly adopted in most similar studies and are presented in the following subsections.

Lastly, for examining the possible correlations among specific data through the five-year period, we have analyzed the corresponding data using Kendall's tau statistic, which is effective for modelling based on non-parametric hypothesis testing of small size samples (Prokhorov, 2002), a proper choice for this case.

3.2 Distress Prediction Models

3.2.1 Altman Distress Prediction Model

The Altman distress prediction model (Altman, 1968), also known as Z-score model or Altman test, is probably the most popular and most widely used bankruptcy prediction model. The corresponding formula was developed to predict the probability of financial distress in the next two years. One of the biggest advantages of the specific model is the fact that it is quite easy to calculate, just by utilizing data available in the balance sheet and the income statement. The computed Z-score constitutes a linear equation of four or five (depending on the case) financial factors. The coefficients of those factors were estimated by considering the financial status of the companies that eventually bankrupted, compared to healthy firms.

The data sample that was taken into account for the computation of the original formula involved 66 manufacturing firms. The original formula of the Z-score is the following:

$$Z_{OR} = 1.2T_1 + 1.4T_2 + 3.3T_3 + 0.6T_4 + 0.999T_5 \tag{1}$$

T_1 = Working Capital / Total Assets
T_2 = Retained Earnings / Total Assets
T_3 = EBIT / Total Assets
T_4 = Market Value of Equity / Total Liabilities
T_5 = Sales / Total Assets

The Working Capital results by subtracting Current Liabilities from Current Assets and EBIT represents Earnings Before Interests and Taxes. Based on the Z_{OR} value, the firm is classified to three zones corresponding to distress probability:

- $Z_{OR} \leq 1.81$ → Distress Zone
- $1.81 < Z_{OR} \leq 2.99$ → Grey Zone
- $2.99 < Z_{OR}$ → Safe Zone

One concern about the original Z-score was the fact that it was derived from data about the financial status of firms decades ago (it was published in 1968) and focusing on manufacturing companies of the public sector. For these reasons, the formula was revised and two new adapted versions based on new data were developed (Altman, 2000). The following is the Z-score formula that can be applied for predicting distress of private firms:

$$Z_{PR} = 0.717T_1 + 0.847T_2 + 3.107T_3 + 0.998T_5 + 0.42T_6 \tag{2}$$

T_6 = Book Value of Equity / Total Liabilities

- $Z_{PR} \leq 1.23$ → Distress Zone
- $1.23 < Z_{PR} \leq 2.9$ → Grey Zone
- $2.9 < Z_{PR}$ → Safe Zone

The adapted formula for non-manufacturer industrial and emerging markets is as follows:

$$Z_{NM} = 6.56T_1 + 3.26T_2 + 6.72T_3 + 1.05T_6 \qquad (3)$$

- $Z_{NM} \leq 1.1$ → Distress Zone
- $1.1 < Z_{NM} \leq 2.6$ → Grey Zone
- $2.6 < Z_{NM}$ → Safe Zone

The accuracy of the Altman Z-Score model was initially (prior to 1968) estimated to be 72% in predicting bankruptcy two years before it happens, with 6% false negatives. The revised formulae were found to predict bankruptcy one year before the event with 80%-90% accuracy and 15%-20% false negatives. The popularity and the confidence of the specific model become evident from the fact that it has been adopted in court cases and loan evaluations.

3.2.2 Springate Distress Prediction Model

The Spingate score is a bankruptcy prediction model which is built on Altman's model in an effort to develop it further (Springate, 1978). It was derived by a process similar to the one adopted by Altman, which eventually utilizes four popular financial ratios to distinguish between the firms that are financially healthy and those that are in distress. The model was developed based on the data of 40 firms initially exhibiting 92.5% accuracy. Later studies concluded on achieved accuracy of 83.3% (Sands, Springate and Var, 1983) and 88% (Botheras, 2000). The resulted formula along with the classification threshold is shown below:

$$S = 1.3U_1 + 3.07U_2 + 0.66U_3 + 0.4U_4 \qquad (4)$$

U_1 = Working Capital / Total Assets
U_2 = EBIT / Total Assets
U_3 = EBT / Current Liabilities
U_4 = Sales / Total Assets

- $S < 0.862$ → High Probability of Bankruptcy
- $0.862 \leq S$ → Low Probability of Bankruptcy

3.2.3 Ohlson Distress Prediction Model

The Ohlson O-score model is a popular bankruptcy prediction model which is also known as the residual income model, due to the fact that it estimates the company value considering the book value of assets and the present value of expected earnings on those assets (Ohlson, 1980). The model employs nine measures and was derived using logistic analysis of the financial data of 105 bankrupt and 2058 non-bankrupt industrial firms. The measured accuracy of the specific model greatly varies depending on the business environment (initially reported 96.4% overall accuracy). The resulted formula is the following:

$$O = -1.3 - 0.407V_1 + 6.03V_2 - 1.43V_3 + 0.0757V_4 - 2.37V_5 - 1.83V_6 + 0.285V_7 - 1.72V_8 - 0.521V_9 \qquad (5)$$

V_1 = log(Total Assets / Price-level index)
V_2 = Total Liabilities / Total Assets
V_3 = Working Capital / Total Assets
V_4 = Current Liabilities / Current Assets
V_5 = One if Total Liabilities exceed Total Assets, zero otherwise

V_6 = Net Income / Total Assets
V_7 = Funds provided by Operations / Total Liabilities
V_8 = One if Net Income was negative for the last two years, Zero otherwise
V_9 = Measure of change in Net Income

The Price-level index corresponds to the domestic price level normalized to the price level of a base year (which is scaled to 100). Moreover, the Measure of change in Net Income results from the following mathematical operation:

$$\frac{\left(\text{Net Income}\right)_{Current\_Year} - \left(\text{Net Income}\right)_{Previous\_Year}}{\left|\left(\text{Net Income}\right)_{Current\_Year}\right| + \left|\left(\text{Net Income}\right)_{Previous\_Year}\right|}$$

It is noted that the O-score can be converted to bankruptcy probability using the following expression (where O is the O-score):

$$\frac{e^O}{1+e^O}$$

3.2.4 Zmijewski Distress Prediction Model

The Zmijewski bankruptcy prediction model is a well-known model similar to Altman's (Zmijewski, 1984). The main advantage of it is considered to be its generalizability. It is based on probit analysis of 40 bankrupt and 800 non-bankrupt New York and American Stock Exchange companies. The originally reported accuracy of the model is 98.2%. The formula that calculates the corresponding score (called b* statistic) is the following:

$$b^* = -4.336 - 4.513W_1 + 5.679W_2 + 0.004W_3 \tag{6}$$

W_1 = Net Income / Total Assets
W_2 = Total Liabilities / Total Assets
W_3 = Current Assets / Current Liabilities

It is noted that the b* statistic can be converted to bankruptcy probability using the following expression:

$$\frac{1}{1+e^{-1.8138b^*}}$$

4   Analytical Results

4.1   Financial Ratios Analysis

Two of the most indicative financial ratios of the five well-known categories (Profitability, Activity, Liquidity, Capital Structure, Investment) are discussed here. The respective results concern the examined five-year period and a comparison among the three listed companies (OTE Group, Forthnet Group, HOL) is provided. All results computed in the context of this financial ratios analysis are presented in Table 1.

Starting with profitability ratios, the most indicative one is the Return on Total Assets. The fact that the companies exhibit losses during the last years results in negative Return on Total Assets with stabilization trends. Only OTE has really managed to increase the efficient use of its assets lately, by decreasing its total assets and enjoying earnings from its subsidiaries. Moreover, only OTE has achieved a positive Net Profit Margin of 11% in 2012, exhibiting increasing trends compared to the previous year results and stabilization

in the five-year period. Forthnet and HOL on the other hand continue suffering losses in 2012 resulting in negative values. However, it is noted that these two companies seem to be reaching a breakeven point with promising results for the near future.

The analysis of activity ratios shows that the efficiency of OTE in using its assets to produce sales is steadily in satisfactory levels, as the almost 60% Asset Turnover ratio implies. What is impressing, however, is the constant growth of the respective ratio for Forthnet and HOL. HOL in particular has succeeded improving its Asset Turnover ratio from 33% in 2008 to 80% in 2012. This tremendous growth is mainly attributed to the significant increase of revenue. A similar trend, but at lower rates, is observed for Forthnet, which reached 60% Asset Turnover ratio in 2012. The steady performance of OTE considering the efficiency in using its different types of assets is also confirmed by its Cash Turnover ratio, which is slightly varying around 5 in this five-year period. Forthnet managed to reach a value of 13 in 2012, demonstrating an increase of 10 points in five years. Lastly, HOL is the company with the most notable alternation of its Cash Turnover ratio, since it started with a value of 20 in 2008, reached 119 in 2011, and dropped back to 50 one year later. This behavior is justified by the variations in revenue and mostly by the remarkably low reported cash and cash equivalents in years 2010 and 2011.

As far as liquidity is concerned, the Current Ratio results find HOL steadily below the market threshold of 1 and actually below 0.5. In fact, the company has managed to lower its current liabilities during the last years, however, the simultaneous reduction of its current assets has kept current ratio to particularly low levels, indicating possible problems to meet current debts. The situation is no better for the Forthnet Group, which experiences current ratio reduction from right above the threshold of 1 in 2008 to the alarming value of 0.3 in 2012. The reason is a combination of declining current assets and increasing current liabilities. In 2011, OTE recorded a significant increase in current assets and a decrease in current liabilities, which resulted to a current ratio elevated over the threshold of 1. However, the current liabilities increment and current assets reduction of the following year pushed the ratio below this threshold. Probably the most representative ratio of liquidity examined here is the Cash ratio. The OTE Group enjoys the highest value of 0.38 in 2012, quite higher than the market threshold of 0.2. This is mainly due to the contribution of its subsidiaries to the increase of its cash and cash equivalents. Forthnet has experienced 86% reduction in its Cash ratio from 2008, resulting in the significantly low value of 0.06 in 2012. Finally, HOL seems to constantly have liquidity issues, with remarkably low Cash ratio (in the region of 0.02). However, it is noteworthy that the company managed to quintuple it in year 2012 compared to the previous year, recording Cash ratio of 0.05. This increment is mainly attributed to the substantial rise of its cash and cash equivalents.

A representative metric of the companies' capital structure is the Debt ratio. It becomes evident that OTE and HOL follow rather stable related policies, whereas Forthnet exhibits increasing Debt ratio throughout the five-year period. Specifically, the Forthnet Group has increased its Debt ratio by 40 percentage points since 2008, reaching 1.05 in 2012, significantly higher than the internationally acceptable upper limit of 0.7, due to decreasing Total Assets. HOL has steadily remarkably high Debt ratio, around the region of 1, notably higher than all other companies. OTE, on the other hand, enjoys the lowest values of the three companies, with a value of 0.76 in 2012. Regarding the ability to use the Current Assets to meet the Total Liabilities, the results reveal that the OTE Group has managed during the last four years to increase the corresponding ratio and exhibit the highest value of 0.38 in 2012, higher than the other companies. This has come as a result of the declining

liabilities policy. The worst position belongs to HOL, with Current Assets to Total
Liabilities ratio forming to 0.2 in 2011 and 0.21 in 2012.

Lastly, the fact that the telecommunications companies in Greece experienced losses
in the last years is obvious when examining the investment ratios. Specifically, the resulted
Earnings per Share reveal that Forthnet and HOL were not in position to pay dividends in
this five-year period, whereas OTE did not pay dividends only in 2012. OTE was the group
with the highest Earnings per Share in 2012, amounting to €1.02. The corresponding value
for HOL is constantly close to 0, while Forthnet exhibits notable variations after 2010.
Specifically, the company suffered great losses in 2011, whereas the number of shares was
significantly reduced in 2012. The last of the investment ratios and the last of all financial
ratios examined in this analysis is the Book Value per Share. From 2008 to 2012, the OTE
Group enjoys the highest value of almost €4 per share. HOL has steadily null Book Value
per Share, while the Forthnet Group started from €2.5 per share in 2008 and dropped to €-
2.75 in 2012. This trend was a result of the declining equity, due to retained losses, and the
decreased number of shares in 2012.

In the effort to further analyse the possible effect of the Greek financial crisis on the
domestic telecommunications industry, the correlation among the GDP and the industry's
major financial indicators is examined. Specifically, the considered variables for the five-
year period are: Greek GDP, Total Assets of the Greek telecommunications industry,
Turnover of the Greek telecommunications industry, and Turnover of OTE. The latter
indicator was opted due to the dominant position of OTE in the domestic market, making
the company the most representative of the sector. The corresponding data were analysed
using Kendall's tau statistic, one of the most valid options for the specific study, as it is
already explained. The computed results, presented in Table 2, reveal that GDP has a strong
positive correlation with the considered fiscal indicators at a significance level of 0.05.
Hence, it could be assumed that there is dependence of the fiscal performance of the
domestic telecommunications sector on the country's GDP. The latter is definitely a strong
indicator of the financial crisis, therefore, it could be concluded that the crisis indeed
affected the fiscal status of the Greek telcos.

4.2   Distress Prediction Analysis

4.2.1   Altman Distress Prediction Results

The Altman distress prediction model involves three different formulae for the computation
of the corresponding Z-scores. In Figure 1, we present the results using the original formula
for the fiscal years 2008 to 2012. It is obvious that all companies fall below the threshold
of 1.81, hence, they all fall in the distress zone for the whole five-year period. However,
the specific formula is now considered obsolete, since revised versions appeared, thus, the
results are not really representative of the companies' status.

The revised Altman's formula for private firms and the new thresholds are probably
more suitable to use for the examined three companies. In Figure 2, we can see that the
results do not greatly differ from those produced from the original formula, however, the
lower threshold for entering the distress zone is 1.23. All companies are in this zone, but
OTE is higher than the other two close to value 1. HOL experiences low values, but with a
growing trend (0.37 in 2012).

Altman's third formula is about non-manufacturer industrial and emerging markets. As it can be seen in Figure 3, the results are now quite different. The distress zone threshold is 1.1 and OTE manages to stay close to it. HOL has been in the distress zone for the whole period, while Forthnet is in this zone since 2010.

4.2.2 Springate Distress Prediction Results

The results of Springate's bankruptcy prediction formula are depicted in Figure 4. Values lower than the threshold of 0.862 indicate high bankruptcy probability. It is evident that OTE enjoys the highest values, however, all companies lie in the "high probability of bankruptcy" zone. The performance is similar to the one revealed by Altman's model, but it should be noted that so far the two models are proven too pessimistic, since none of the examined telcos has gone bankrupt, yet. Of course, one could argue that they are all in financial distress.

4.2.3 Ohlson Distress Prediction Results

The Ohlson's distress prediction model produces the O-score which can be converted to bankruptcy probability. The results are presented in Figure 5. OTE has achieved the lowest bankruptcy probability, whereas Forthnet exhibits increasing trends. The bankruptcy probability for the Forthnet Group has been rising, reaching the alarming value of 89% in 2012. The bankruptcy probability for HOL has been constantly high and close to 80%.

4.2.4 Zmijewski Distress Prediction Results

Similarly to Ohlson's model, Zmijewski's formula can also produce a bankruptcy probability. The depicted results in Figure 6 reveal that the prediction for HOL and the Forthnet Group are quite pessimistic. Specifically, the 2012 bankruptcy probability for HOL was 96% and for the Forthnet group 97%, higher than the previous years. On the contrary, OTE exhibits significantly lower bankruptcy probabilities, close to 37% in 2012. It is noteworthy that Ohlson's and Zmijewski's predictions were proven in some cases too pessimistic, since none of the three companies have actually gone bankrupt so far.

5 Brief Comparison with Foreign Telcos

In order to better assess the status and trends of the Greek telecommunications industry, it is interesting to compare against the performance of similar foreign telcos in the same time period. For this reason, a brief comparison between the major domestic player, OTE, and four EU telcos is provided in this section. The four considered companies are: Eircom (ERC) in Ireland, Telecom Italia (TIT) in Italy, British Telecom (BT) in UK, and TeliaSonera (TLSN) in Sweden. This set of companies involves countries from southern Europe that recently faced financial crisis as well as countries from northern Europe which did not suffer a major fiscal distress in the examined period.

In Figures 7 and 8, two of the most indicative financial ratios, Return on Total Assets and Debt Ratio, respectively, are graphically depicted. The former reveals the profitability of the five telcos for the five-year period. In particular, it is evident that two groups are eventually formed: one that includes BT and TLSN with superior performance regarding profitability and one that includes OTE, ERC, and TIT which are notably less efficient in

transforming assets into earnings. It is worth mentioning that OTE achieves Return on Total Assets almost identical to ERC, which could be possibly attributed to the similar financial conditions in Greece and Ireland. Regarding capital structure, according to Figure 8 the trend is analogous; OTE, ERC, and TIT suffer a higher debt ratio than BT and TLSN. The findings strengthen the argument that OTE, as the most representative Greek telecommunications company, is among the firms that were affected by the conditions formed in the national economy.

Taking a step further, we examine possible correlations between survivability estimations regarding OTE and each one of the four considered EU telcos. Our main objective is to reveal any dependencies among distress indicators for the examined period, which could contribute in concluding on potential relations among the companies' fiscal status. Moreover, the corresponding findings could lead to deductions regarding the validity of financial distress modelling, in case the correlation results contradict current experience and well-established knowledge. For this analysis, we consider the most representative and widely accepted relevant statistic, Altman's original Z-score. The respective data were analyzed using Kendall's tau statistic. The results, presented in Table 3, show that the only statistically significant finding (at 0.05 level) which could be used for drawing inference is the correlation between OTE's and BT's Z-score. Specifically, a negative correlation is deduced based on the -0.8 coefficient, which actually rejects the null hypothesis of independence of the two variables. Hence, it could be assumed that from 2008 to 2012 OTE and BT, operating in countries of different economic conditions, were inversely related regarding survivability. Nevertheless, the correlation of the Z-scores failed to lead to any conclusions as far as the relation of OTE with the other southern European (ERC, ITI) or northern European (TLSN) telcos is concerned.

6   Discussion

The conducted financial analysis reveals OTE Group's policy to systematically reduce its fixed assets by 33% from 2008 to 2012. This policy is in alignment with the reduction of its total liabilities by limiting the long-term borrowings. The same declining trend is followed by the reported revenues, as a result of the decrement of the company's market share and the effects of the ongoing economic crisis. However, OTE managed to recover profitability by exploiting the effectiveness of COSMOTE and the other subsidiaries. On the other hand, in this five-year period, Forthnet and HOL have recorded steady assets and rising revenues enjoying the increased market share, nevertheless, they have failed to produce net profit.

By analyzing the most representative financial ratios in five categories, detailed comparative results have been acquired regarding the three companies' financial status and time trends. First of all, it is obvious that the OTE Group exhibits the highest profitability, since it is actually the only one that did not suffer losses in 2012. However, Forthnet and HOL have achieved growing efficiency in using their assets, a promising fact for their future profitability. The standard procedures and policies in billing telecommunications services have assisted the three telcos in stabilizing their accounts collection period leading to more efficient scheduling of business operations. Meanwhile, OTE and HOL have managed limiting the time required to meet their liabilities, however, the capital needed by Forthnet to fund its investments, such as Pay-TV related activities, has pushed back liabilities' coverage. It is also evident that the economic crisis has greatly affected liquidity,

which is notably low for HOL and below the international thresholds. Forthnet suffers a significantly decreasing trend, whereas OTE is the only company which seems to have no particular problems in meeting its short-term debt, since the followed strategies, that also involve selling non-critical subsidiaries, such as HellasSat, have supported liquidity. The company that is definitely in the most critical position regarding its debt is HOL, which has financed its operations using borrowed funds in a timeless manner. As far as the investment metrics are concerned, the lack of net profits for Forthnet and HOL result in negative stock evaluations, whereas OTE exhibits promising earnings per share.

It should be made clear that the combination of the economic crisis and the high competitiveness of the telecommunications market has driven multiple related companies into financial distress or even bankruptcy. The conducted distress prediction analysis confirms the harsh financial position of the examined telcos. Indicatively, the four adopted models place HOL in the "under-distress" zone with estimated bankruptcy probability reaching even 100%. The main reason is the continuous lack of profitability and the increased debt. Forthnet is in a slightly better financial position, while OTE is the company with the lowest bankruptcy probability.

At this point, it needs to be highlighted that while the four distress prediction models have succeeded on revealing the existing financial distress, they have been proven wrong in the bankruptcy predictions. Specifically, none of the companies have gone bankrupt in this five-year period, despite the fact that predictions were extremely pessimistic even when considering the 2008 data. In a similar way, in most cases the telcos have failed to surpass the internationally accepted thresholds regarding the financial ratios' results. Thus, we could conclude that the current economic conditions and the specific industry are characterized by special features, which cannot be sufficiently interpreted by traditional models which consider typical past financial information.

7   Conclusions and Future Directions

This analysis of the last five fiscal years leads to some valuable conclusions regarding the status and the financial trends in the Greek telecommunications market. Telecommunications constitute a large domestic industry with great contribution to the national GDP. The respective market liberalization in 2001 had a major impact on the business environment with the appearance of the so-called alternative operators. The new telcos acquired a significant market share from the previously national operator, OTE, which however retained the resources and the customer base to remain the undisputable leader in the telecommunications market. Moreover, OTE managed to enforce its position by investing in the domestic mobile telecommunications market through COSMOTE, its main subsidiary, and in other Balkan countries. Furthermore, the acquisition of most of the public sector's share by Deutsche Telecom in 2010 seems to have boosted the company's internal restructuring. On the other hand, the two main alternative operators, Forthnet and HOL, have increased their share in the Greek telecommunications market and try to survive in the current harsh economic environment via strategic alliances of added value. The distress prediction models reveal that the largest telcos in Greece face major financial difficulties that could even lead to bankruptcy. However, the applicability of the specific models is proven questionable for the specific case, despite the fact that they have shown significant accuracy in the past and in different markets. In more detail, the pessimistic predictions of the models were not confirmed the previous years, in the terms that the

examined companies still survive. Hence, the current special conditions of the telecommunications industry in the context of the Greek crisis do not constitute a steady environment for applying such models. It is clarified that concluding on the applicability of the distress prediction models in the specific sector for this five-year period has been one of the initial objectives of this work and could not be taken as a given. Specifically, it is definitely expected that the financial crisis by forming special conditions in the domestic market affects every forecasting technique, however, its specific impact on the examined industry could be only verified after the conducted analysis.

Based on the reached conclusions, we attempt to estimate the current status and the future directions of the listed telecommunications companies and the related market in general. Starting with OTE, it is by far the largest player and the indisputable market leader. Despite the fact that it lost part of its market share by low-cost competitors, it managed to strengthen its position by exploiting the domestic highly dynamic mobile telecommunications market and utilizing its expertise and resources to invest to developing markets in Balkan. Moreover, OTE has adopted differentiation marketing strategies and used its large customer-base to penetrate other markets, such as Pay-TV services. Considering the internal company restructure and the rising share price with the positive investors' prediction, the future estimates are promising. Forthnet appears as the second player, especially since enforcing its position by acquiring the largest Pay-TV provider in Greece, Nova. It is highly relying on bundle-service offerings, however, the employed low-cost strategies have not allowed profitability. Investors' estimates are neutral and the exhibited efficiency in the following two years is expected to determine future progress. Lastly, HOL is classified as the third player in the telecommunications market and its sustainability will be determined by the company's ability to limit its dependence on debt. The strategic alliance with Vodafone offering bundle-services in combination with the provision of added-value services, such as IPTV and cloud computing, can strengthen its future position.

In overall, the current challenging economic conditions have created an imperative for innovative business solutions. The few surviving telecommunications companies ought to make efficient use of their own assets, exploit the opportunities that appear in highly developing markets abroad, and adjust the provided services to the arising new era in data communications. In more detail, regarding the approaches to follow in order to recover from financial distress, the telcos are actually required to increase revenue in an almost saturated market. Hence, apart from the effort to maintain and increase their customer base, while applying low-cost strategies, they need to be competitive by providing highly qualitative cutting edge services. It is crucial to be able to fully exploit their available resources and minimize operating expenses, in order to increase gross profit while limiting debt dependency. New business activities involving related fields, such as grid and mobile computing, may notably enhance operations and efficiency. As future research, it is expected to be of great interest to further analyze the contribution of the business activities related to state of the art telecommunications services, such as VDSL2 connections, High Definition / 3D Pay-TV subscriptions, cloud computing, and 4G mobile access, in telcos' financial results.

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Table 1 Financial Ratios Results

Ratio	Company	2008	2009	2010	2011	2012
Return on Total Assets	OTE	0.0523	0.0394	-0.0146	-0.0015	0.06
	Forthnet	-0.0397	-0.0379	-0.0852	-0.2461	-0.1516
	HOL	0.1231	-0.1035	-0.0862	-0.0599	-0.0535
Net Profit Margin	OTE	0.0933	0.0684	-0.0253	-0.0027	0.1071
	Forthnet	-0.193	-0.1108	-0.2149	-0.4833	-0.2505
	HOL	0.3758	-0.2576	-0.1645	-0.0885	-0.0672
Asset Turnover Ratio	OTE	0.5608	0.5773	0.5748	0.5542	0.5598
	Forthnet	0.2058	0.3429	0.3967	0.5093	0.6051
	HOL	0.3276	0.4019	0.5241	0.6763	0.7955
Cash Turnover Ratio	OTE	4.6698	5.1893	5.8542	5.9706	5.0735
	Forthnet	3.1225	4.6746	6.9674	12.7953	13.2988
	HOL	20.3626	27.0255	45.1628	119.2097	50.3507
Current Ratio	OTE	1.1248	1.2231	0.6159	1.0916	0.7776
	Forthnet	1.0808	0.9892	0.7049	0.3304	0.3065
	HOL	0.5158	0.4734	0.4348	0.4443	0.4422
Cash Ratio	OTE	0.4755	0.418	0.2558	0.2779	0.3793
	Forthnet	0.416	0.3676	0.1352	0.0494	0.0583
	HOL	0.0279	0.0338	0.0101	0.0111	0.0521
Debt Ratio	OTE	0.8098	0.8174	0.8267	0.8067	0.7591
	Forthnet	0.6219	0.6786	0.742	0.9197	1.0537
	HOL	1.0748	0.9545	1.0087	0.9909	1.042
Current Assets to Liabilities	OTE	0.365	0.3013	0.3067	0.3659	0.3752
	Forthnet	0.3229	0.291	0.2512	0.2502	0.245
	HOL	0.265	0.2501	0.2328	0.2027	0.2115
Earnings per Share	OTE	0.4696	0.6416	-0.4015	-0.0277	1.0234
	Forthnet	-0.2629	-0.2649	-0.5586	-1.2771	-7.761
	HOL	0.4251	-0.3404	-0.2121	-0.126	-0.0882
Book Value per Share	OTE	4.4337	3.8439	3.3716	3.5852	4.1085
	Forthnet	2.5018	2.2419	1.6908	0.4168	-2.7518
	HOL	-0.2584	0.1494	-0.0213	0.0192	-0.0693

Table 2 Non-parametric Correlation of Greek GDP and Greek Telecommunications Industry Financial Indicators

			Total Assets Telcos GR	Turnover Telcos GR	Turnover OTE
Kendall's tau_b	GDP GR	Correlation Coefficient	1.000	1.000	1.000
		Significance Level	.050	.050	.050
		N	5	5	5

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Table 3 Non-parametric Correlation of OTE and Four EU Telcos Original
Z-scores (Z_{OR})

			ERC Z_{OR}	TIT Z_{OR}	BT Z_{OR}	TLSN Z_{OR}
Kendall's tau_b	OTE Z_{OR}	Correlation Coefficient	.000	.200	-.800	.000
		Significance Level	1.000	.624	.050	1.000
		N	5	5	5	5
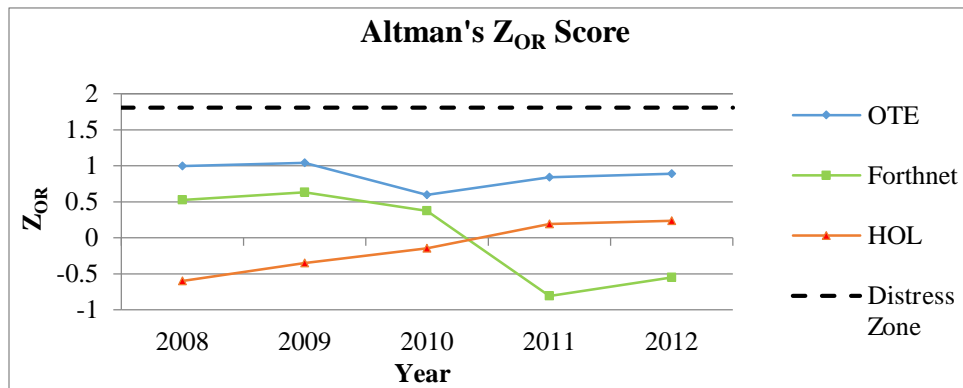
Figure 1. Altman's original score
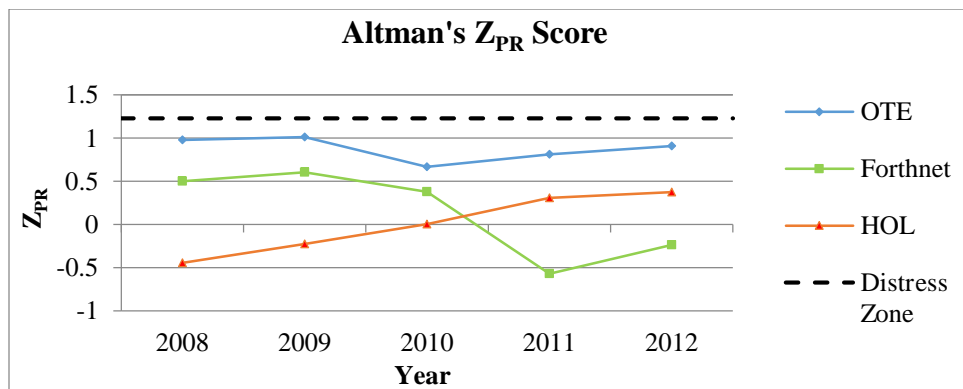
Figure 2. Altman's score for private firms
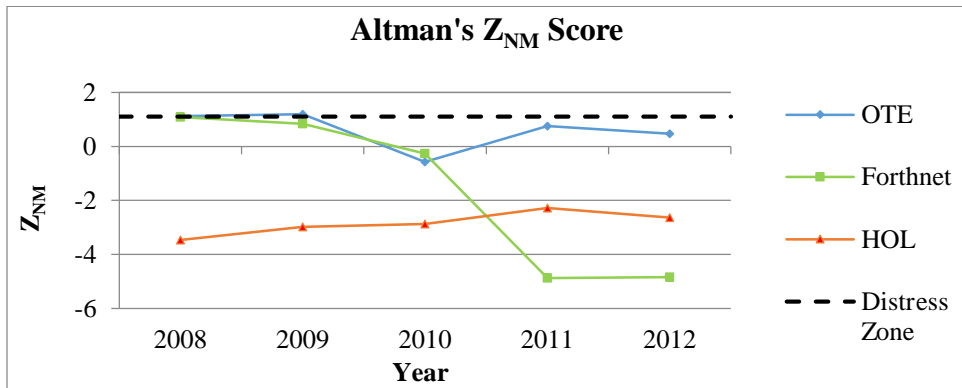
Figure 3. Altman's score for manufacturer industrials
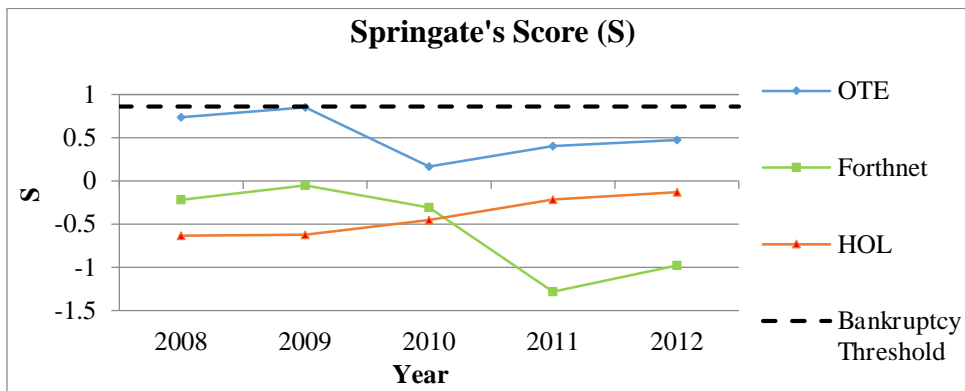
Figure 4. Springate's score (S)
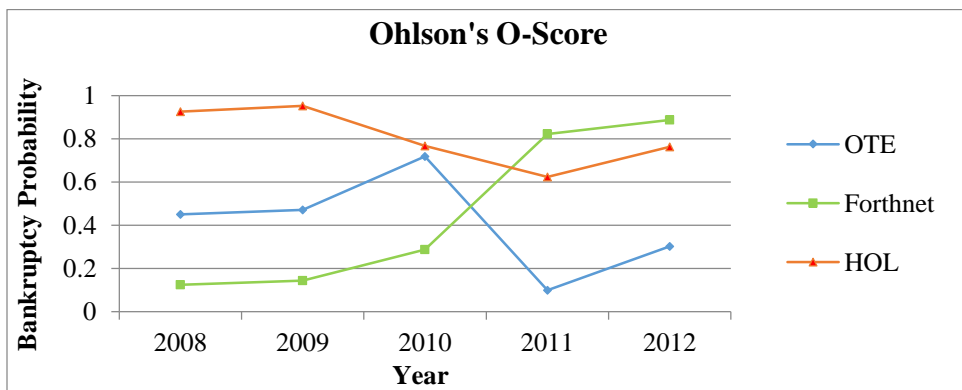
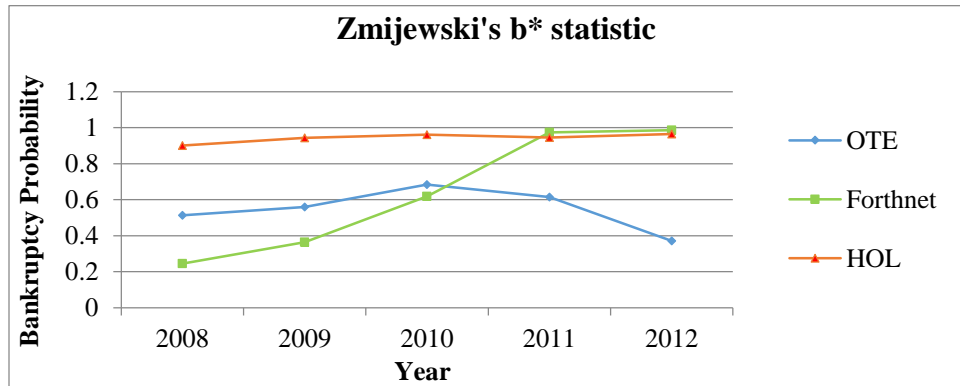Figure 5. Bankruptcy probability according to Ohlson's O-score

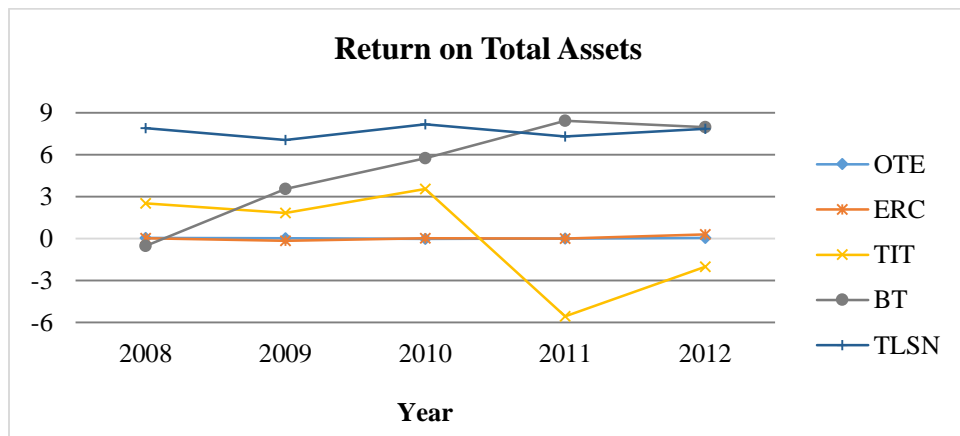Figure 6. Bankruptcy probability according to Zmijewski's b* statistic
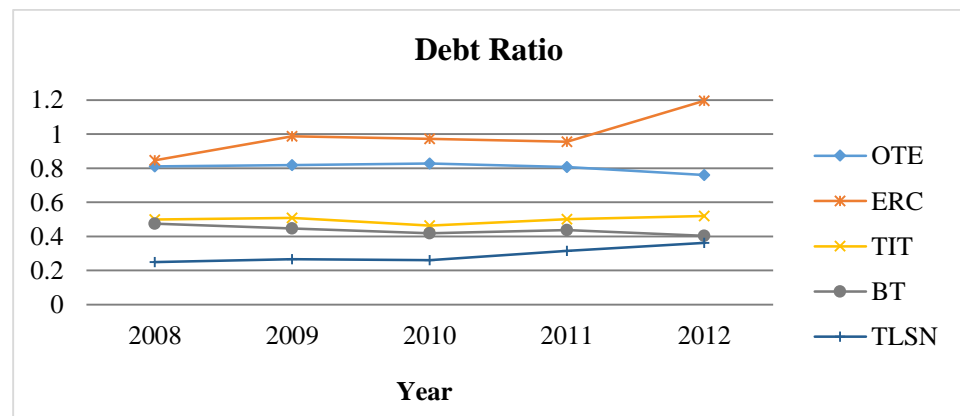

Figure 7. Return on Total Assets of five EU telcos

Figure 8. Debt Ratio of five EU telcos