



The Importance of Bankruptcy Prediction in the Advancement of Today's Businesses and Economies

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Abstract. The prediction of bankruptcy in companies is a problem that has concerned entrepreneurs, researchers and even governments for years, since detecting early signs that a company is going to enter bankruptcy involuntarily and being able to save it from that process, can help reduce the economic losses that bankruptcy entails, both in quantitative and qualitative terms. To try to avoid bankruptcy, it is very common to analyze the evolution of different financial ratios as it's been done in this article.

Keywords: Bankruptcy · Economic analysis · Company valuation

1 Introduction

The financial valuations of individual companies and companies grouped by sector have led to different studies on the valuation of investments at the government level and the geographical distribution of resources and companies, which have also been considered as factors to be analyzed [4], as well as territorial differences. Over the years, multiple methods have been and continue to be used to predict bankruptcy, as well as other calculations to maximize company profits [14]. As well as alternatives to succumbing to insolvency proceedings [6]. Numerous publications related to the prediction of financial behavior and evolution in companies have made use of econometric techniques [7], use of neural networks, discriminant analysis [1], or even machine learning techniques, the latter being the most recent and possible alluding to the large amount of data that companies are beginning to capture and store, which serve to develop economic models [8, 13]. In the study presented below, a series of financial variables have been established that show the situation of companies when they are active and when they are in competition, understanding companies that are in competition to be those that have entered the last year of activity available.

2 Methodology

The model set out below focuses on analyzing two financial ratios: the liquidity ratio and EBITDA (thousands of euros). These two parameters have been chosen because they are determining factors when it comes to understanding a company's solvency and

because they are parameters that allow us to visualize the most evident differences between companies with liquidity risks and those with low profits, allowing us to see which ones would be in a more delicate financial situation that could indicate the greater or lesser risk of going into insolvency. In order to carry out the study, a classification of companies by volume of operating income was made. Specifically, we have distinguished four groups according to operating income, taking the last available year as a reference:

Group (1) - Operating income from 0 to 1 million euro

Group (2) - Operating income from 1 to 5 million euros.

Group (3) - Operating income from 5 to 10 million euros.

Group (4) - Operating revenues of more than 10 million euros.

To select the companies, we used the SABI (Iberian Balance Sheet Analysis System) database, selected the range of operating income and generated a random sample. The number of companies chosen for each range is a total of one thousand companies per group. The sample of companies has been generated at random and therefore contains companies from all sectors. The data collected in the sample corresponds to the time period 2013–2018, calculating the annual average of each category of operating income. For the calculation of the average ratio values we have used a limited average function, choosing a percentage of 0.1, which means that we have eliminated the values of 10% from the top and 10% from the bottom. This has allowed us to eliminate extreme values or other values that could distort the sample. There is a sustained and gradual growth between 2013 and 2018 in all the ranges of companies' operating income, however, from an initial analysis of the data we perceive a difference in the period 2014–2015 in terms of the ratios and volumes of companies.

3 Method and Results

In the analysis carried out, it can be seen that companies, regardless of the volume of turnover, follow the same trend in terms of the growth of annual averages, something that could contradict Gibrat's law [5], a stochastic model proposed by the author in which the growth of companies is independent of size, but in our case it could not be fulfilled due to the elimination of extreme values. Therefore, the contribution of Singh A. and Whittington, in which they state that the decrease of the standard deviation with size is not as fast as if the companies were composed of subsidiary divisions that operate independently, could be assessed [12] (Tables 1 and 2).

Table 1. Operating income from 0 to 1 million euros. Source: own elaboration

Year	2013	2014	2015	2016	2017	2018
Liquidity ratio	1,96	2,02	2,16	2,26	2,41	2,56
EBITDA (thousand. Euros)	17,07	17,94	21,18	22,06	24,10	24,90

Table 2. Operating income from 1 to 5 million euros. Source: own elaboration

Year	2013	2014	2015	2016	2017	2018
Liquidity ratio	1,50	1,48	1,54	1,58	1,59	1,71
EBITDA (thousand. Euros)	93,04	109,48	129,39	143,48	156,19	166,85

In our study, companies with operating revenues of 0 to 1 million euros improved their liquidity ratio the most and companies with operating revenues above 10 million improved their EBITDA the most. This study [9] concluded the same results for companies in different sectors, where liquidity ratios were always higher on average than for smaller companies.

As can be seen in Fig. 1, the liquidity ratio is higher in companies with lower turnover. This is due to the fact that they are potentially growing companies and, coinciding with the recovery from the economic crisis, they have more facility to grow their business. On the other hand, consolidated companies have more stable liquidity ratios and hardly vary in the period studied. This is due to the fact that consolidated companies manage liquidity in a more stable manner, seeking similar values of liquidity each year, which allows them to develop their financial activity normally while adjusting the profitability of their business.

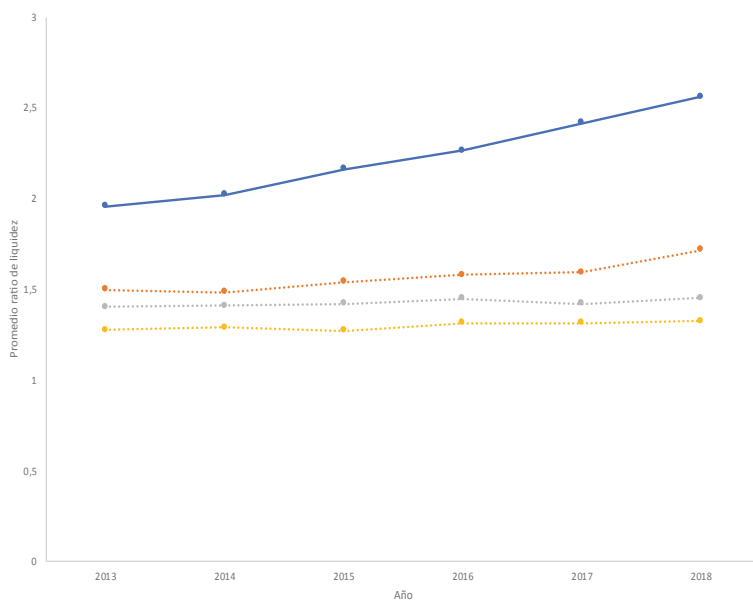
**Fig. 1.** Average liquidity ratio. Prepared by SABI. Source: own elaboration

Figure 2 shows the EBITDA for the different levels of operating income in the chosen period. It can be seen how the values of EBITDA follow a directly proportional relationship with the levels of operating income, with the higher operating income

having the highest EBITDA. If we analyze growth in relative terms, we can see that the type of companies that have increased their EBITDA most in the period studied are those with operating revenues of between 1 and 5 million euros. Specifically, their EBITDA has increased by 93.06% in that period.

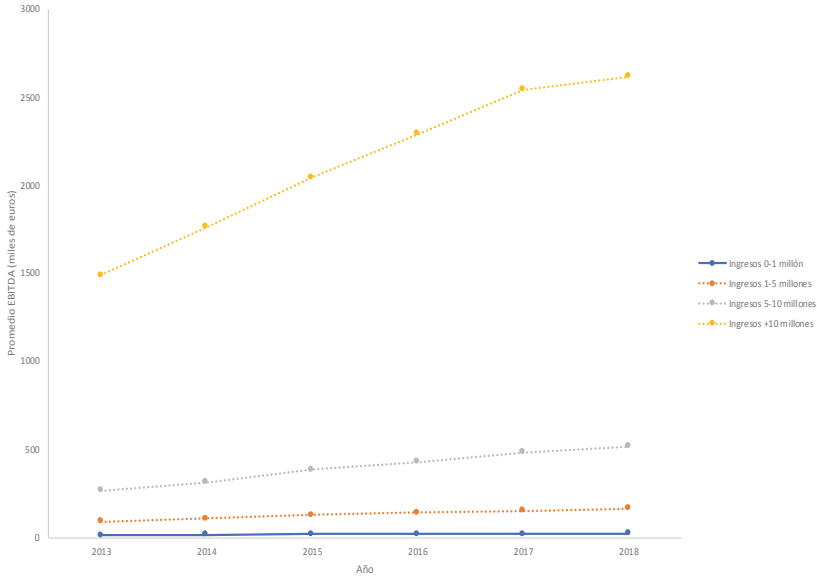


Fig. 2. Average EBITDA. Prepared by SABI Source: own elaboration

Figure 3 analyses the relationship between the liquidity ratio and EBITDA, distinguishing by level of operating income. It can be seen that the data are perfectly grouped by categories of operating income and each category has specific characteristics (Tables 3 and 4).

If we analyze it in terms of linear trends, we see how the trend changes from vertical in companies with an operating revenue volume between 0 and 1 million, to a horizontal trend in companies with an operating revenue volume over 10 million. There is a softening of the slope as operating revenues increase. This may indicate that there is a stabilization of the liquidity ratio as operating revenues and EBITDA increase, because companies with a higher volume of operating revenues and EBITDA are no longer looking so much for the company’s growth but for its financial stability.

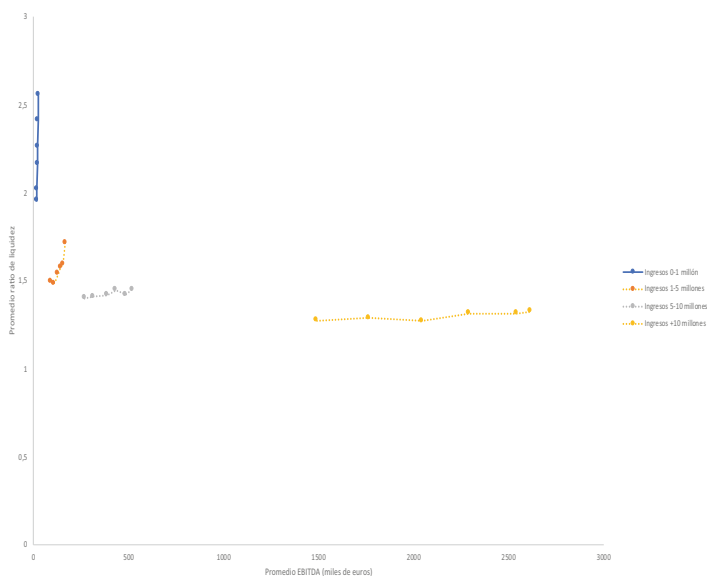


Fig. 3. Comparison of liquidity ratio vs. EBITDA Prepared by SABI. Source: own elaboration

Table 3. Operating income of 5 to 10 million euros. Source: own elaboration

Year	2013	2014	2015	2016	2017	2018
Liquidity ratio	1,40	1,41	1,42	1,45	1,42	1,45
EBITDA (thousand. Euros)	269,25	316,22	386,94	432,82	485,75	519,81

Table 4. Operating revenues in excess of 10 million euros. Source: own elaboration

Year	2013	2014	2015	2016	2017	2018
Liquidity ratio	1,27	1,29	1,27	1,31	1,31	1,33
EBITDA (thousand. Euros)	1489,54	1763,16	2046,04	2291,13	2542,43	2617,06

4 Conclusions

Once the results have been analyzed, we can draw the following conclusions in order of greatest to least importance:

As companies increase their EBITDA, there is a softening of the slope of the linear relationship between liquidity ratio and EBITDA. This is because as a company increases its EBITDA and is already in the maturity phase, it focuses on the financial stability of the company and on generating profits in a sustainable way.

- Analyzing the tables in Sect. 2 we have obtained that the greatest percentage change in EBITDA at all levels of operating income occurs either between 2013–2014 or between 2014–2015. After making a review we have associated this phenomenon to the fact that it is in these two periods when Spain manages for the first time since 2008 to achieve sustained growth in its economy. It was especially in these two periods that Spain achieved greater growth, and this allowed for the resumption of business activity and a more accelerated improvement in its economic situation. Subsequently, in the most recent years, the EBITDA of the companies continues to grow, but with a lower growth.
- - EBITDA is higher the higher the level of operating income of the companies. This relationship may be due to the fact that companies, as they increase their size and turnover, take advantage of economies of scale. This would allow them to lower production costs and increase their profits. On the other hand, the liquidity ratio is higher in companies with lower levels of operating income, since they are potentially growing companies and the conditions of the exit from the economic crisis from 2014 have facilitated the growth of their businesses.

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