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Fuzzy logic and financial risk. A proposed classification of financial risk to the cooperative sector

Lógica difusa y el riesgo financiero. Una propuesta de clasificación de riesgo financiero al sector cooperativo

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Abstract

Applying fuzzy logic to financial indicators is not a well disseminated proposal in the accounting field. This methodology allows observing the results of financial ratios with a broader perspective, showing neither completely true nor completely false results, since they can take an undetermined truthfulness value within a set of values, applying the fuzzy logic theory. The objective of this work is to introduce the reader to the application of fuzzy logic on financial risk indicators, using the ratios of one of the sector one cooperatives of Ecuador, and thus validate the level of relevance of this indicator when compared to the standardized objective of the CAMEL model and its risk rating. To apply this theory, linguistic variables were used, the ranges of which were evaluated in 0–1 scales. It was determined that the fuzzy methodology, applied to financial risks, presents a greater level of relevance toward a good credit rating, ensuring a low level of risk and a very good solvency. However, in periods of low economic activity it would stagnate in this level due to the increased risk.
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JEL classification: C15; C44; C65
Keywords: Fuzzy logic; Financial indicators; Xfuzzy environment; Risk rating

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Resumen

Aplicar la lógica difusa en indicadores financieros es una propuesta poco difundida en el ámbito contable. Esta metodología permite observar los resultados de ratios financieros con una perspectiva más amplia, mostrando resultados no totalmente ciertos ni totalmente falsos, ya que pueden tomar un valor indeterminado de veracidad dentro de un conjunto de valores, aplicando la teoría de lógica difusa. El objetivo de este trabajo es presentar al lector la aplicación de la lógica difusa en indicadores de riesgo financieros, utilizando los ratios de una de las cooperativas del segmento uno del Ecuador, y de esta manera, validar el nivel de pertinencia que tiene este indicador al compararlo con la meta estandarizada del modelo CAMEL y sus calificaciones de riesgo. Para aplicar esta teoría se utilizaron variables lingüísticas, cuyos rangos se valoraron en escalas de 0 a 1. Se determina que la metodóloga difusa aplicado a los riesgos financieros presenta un nivel de pertenencia mayor hacia la calificación crediticia buena asegurando un nivel de riesgo escaso y una muy buena solvencia. Sin embargo, en periodos de actividad económica baja se estancaría en este nivel por el aumento del riesgo.
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Códigos JEL: C15; C44; C65
Palabras clave: Lógica difusa; Indicadores Financieros; Entorno Xfuzzy; Calificación de Riesgo

Introduction

Fuzzy logic possesses a broad utility in different fields of knowledge. The objective of this study is to categorize the status of a creditor entity from the interpretation of the financial risk indicators. To this end, fuzzy logic is used; and through the use of linguistic variables, a better interpretation of the traditional financial indicators can be achieved (Benito & Duran, 2009).

According to the report of the Superintendent of Popular and Supportive Economy corresponding to 5 years of management, the Ecuadorian cooperative financial sector registers a total of 696 credit unions, including a central fund, as of May 2017. These are categorized into 5 segments, with assets totaling 9978 million dollars as of March 2017, and 5,977,169 members according to data as of May of the same year. This shows great growth in recent years, with segment 1 conferring 66% of the microcredit (SEPS, 2017). Said growth is accompanied by the sudden closure of institutions of the cooperative sector that did not manage to comply with the operating rules determined by the control organisms. This sector was taken as a referent for our study because these institutions are evaluated through the financial risk indicators to determine their level of solvency.

By interpreting the financial risk indicators with emphasis on fuzzy logic, a more flexible environment is obtained in the interpretation of the financial information. The context used by the fuzzy methodology in the decision-making process allows the decision maker to graphically observe the membership levels to each of the credit ratings proposed. This study uses the objectives of the CAMEL financial analysis model (Capital, Asset, Management, Earning, and Liquidity) as reference, given that it is one of the most commonly used methodologies in the measurement of financial risk at the international level (Benito & Duran, 2009).

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