Data Analysis in Banks and Investment Institutions for Credit Allocation

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Abstract: Enhancing Efficiency in Financial Institutions for Economic Development

Improving the efficiency of financial institutions plays a pivotal role in fostering economic development. This article explores the potential of data analysis and a comprehensive understanding of global economic events to drive economic prosperity through informed credit allocation and crisis prevention, drawing lessons from past events like the 2008 financial crisis.

The article investigates various project pricing methods and applies Data Envelopment Analysis (DEA) as a linear programming approach. It further discusses the allocation of capital across different risk categories, balancing risk-averse and risk-taking investments while considering budgetary constraints.

In conclusion, this study sheds light on diverse credit types. By leveraging data analysis and pricing methodologies, banks can optimize their engagement in profitable ventures, enabling valuable business projects to access the necessary credit for their establishment and growth.

Keywords: Data Analysis, Data Envelopment Analysis (DEA), Credit Allocation, Pricing Methods

Introduction

Financial statements, comprising a collection of financial operations and investment activities, serve as the cornerstone of informed decision-making in the world of investments and credit allocation. These reports house invaluable data that guide investment choices and credit decisions alike. For investors, they offer a panoramic view of a company's economic health, while lenders rely on them to determine loan approvals and repayment terms.[1]

In the realm of fundamental analysis, financial ratios take center stage. These numerical values, extracted from financial statements—ranging from balance sheets to income statements and cash flow reports—serve as the quantitative bedrock for evaluating liquidity, profit margins, and overall profitability.[2]

[1] Khajavi et al., 2010
[2] Saghafi & Mortazavi, 2016

Yet, beneath the surface of seemingly straightforward ratios lies a complexity that often eludes even seasoned analysts. Financial ratios, though readily available, pose a conundrum: they can present conflicting narratives, each offering a distinct perspective on a company's financial health. No single ratio comprehensively encapsulates all facets of a company's performance[3]. It is within this context that this article ventures beyond traditional approaches to financial analysis, presenting alternative methods and their potential benefits to investors.

Among the proposed solutions, Data Envelopment Analysis (DEA) emerges as a transformative analytical technique. DEA assigns an "efficiency" score to each scrutinized company, amalgamating various ratios into a singular metric. This conversion enables investors to gauge performance and draw comparisons across a spectrum of companies.[4]

In this article, we delve into the intricacies of financial analysis and explore how methods like DEA can offer a fresh perspective and practical advantages for investors seeking a comprehensive understanding of their investment choices.

Financial Statement Analysis

Financial statement analysis is a crucial tool that helps managers identify financial opportunities and challenges within a company. These statements serve as a barometer of a company's financial health, enabling managers to assess its capacity to meet expenses, service debts, and invest in growth.[5]

The Importance of Credit Analysis

Among the various perspectives of financial statement analysis, credit analysis stands out, primarily utilized by banks and financial institutions. Credit analysis serves as a pivotal risk management tool for investment institutions, banks, and creditors. At its core lies the concept of credit risk, denoting the potential losses stemming from a borrower's inability to repay debts.[6]

In the wake of the 2008 financial crisis, credit risk management has assumed paramount significance. Inadequate management of credit risks can have severe repercussions on the stability of the banking system, as the crisis underscored the vulnerability of businesses, even those backed by government safeguards.[7]

Key Liquidity Ratios

Credit analysis primarily revolves around liquidity and a borrower's capability to meet short-term obligations. Two fundamental liquidity ratios come into play:

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[3] Khajavi et al., 2010
[4] Khajavii et al., 2010
[5] Safavi et al., 2009
[6] Safavi et al., 2009
[7] Arabsalehi et al., 2015

- **Current Ratio (CR)**: This ratio, derived from dividing current assets by current liabilities, gauges a company's capacity to repay short-term debts. A CR close to one signifies favorable liquidity. Significantly below one raises concerns about debt repayment, while excessively high CR may indicate poor cash management.[8]

- **Quick Ratio (QR)**: Calculated by dividing current assets (excluding inventory and prepayments) by current liabilities, the QR is a more conservative indicator of short-term debt repayment capability. A QR close to one signals stability, less than one raises concerns, and a high QR may suggest excess liquidity or inefficient cash management.[9]

These ratios offer valuable insights into a company's financial performance over time, with consistency indicating stability.[10]

In the subsequent sections, we will explore alternative methods, such as Data Envelopment Analysis (DEA), and discuss how they complement traditional credit analysis.

Data Envelopment Analysis (DEA)

Data Envelopment Analysis (DEA) is a powerful non-parametric method for assessing the efficiency and performance of organizations, developed by Charnes and his colleagues in 1978. DEA employs mathematical programming to evaluate the relative efficiency of decision-making units. Since its inception, numerous articles have been published on DEA and its applications, demonstrating its effectiveness and utility. In the DEA model, a set of homogeneous decision-making units is considered, and their performance is evaluated based on the concept of an efficient frontier, taking into account their input and output values. Units positioned on the efficient frontier are deemed efficient, while this model can also measure the efficiency of units that deviate from the efficient frontier.[11]

Two fundamental concepts underpin the assessment of efficiency in Data Envelopment Analysis:

1. DEA operates on the foundational assumption that if Unit A can produce more output than Unit B with the same level of input, Unit A is considered more efficient than Unit B.[12]
2. If Unit A can produce a specific level of output with a certain amount of input, it is expected that similar units can achieve similar output with the same input level.

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[8] Tabatabaei et al., 2014
[9] Tabatabaei et al., 2014
[10] Tabatabaei et al., 2014
[11] Khashooyi & Barati, 2013
[12] Khashooyi & Barati, 2013

Furthermore, if Unit B can produce a certain output with a specific input level, it is anticipated that other units can replicate this performance.[1] [3]

Using DEA Technique in Financial Statement Analysis

The DEA method is instrumental in determining the relative efficiency of companies by comparing them to performance standards set by efficient and inefficient companies. DEA assesses the target company against a group of efficient companies known as "best-performing companies." If the financial characteristics of the studied company closely align with those of the best-performing companies, it is classified as efficient; otherwise, it falls into the inefficient category.[1] [4]

For instance, a company with higher current and quick ratios has a better chance of being classified as efficient, while lower ratios increase the likelihood of inefficiency.

In the graph below, the results of a study involving 267 companies listed on the Tehran Stock Exchange are presented. Financial statement analysis of these companies reveals that out of the 267, only 32 are classified as efficient, with the remaining 235 falling into the inefficient category.[1] [5]

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[1] Khashooyi & Barati, 2013[3]

[1] Khajavi et al., 2013 [4]

[1] Khajavi et al., 2013 [5]

Figure 1: Sample Results of Data Envelopment Analysis (DEA) Implementation on Stock Market Companies

Company Code	Performance Score	Benchmark															
C1	0.14	0.01	C7	0.03	C49	0.11	C55	0.04	C166	0.32	C237	0.48	C254				
C2	1.00	1.00	C2														
C3	0.27	0.14	C2	0.03	C7	0.04	C49	0.13	C153	0.08	C166	0.55	C237	0.03	C254		
C4	0.30	0.09	C7	0.24	C55	0.21	C166	0.20	C237	0.25	C254						
C5	0.10	0.05	C7	0.05	C13	0.24	C166	0.59	C237	0.07	C246						
C6	0.41	0.02	C7	0.52	C13	0.01	C55	0.02	C166	0.06	C237	0.36	C246				
C7	1.00	1.00	C7														
C8	0.18	0.36	C2	0.03	C7	0.05	C13	0.09	C55	0.01	C97	0.05	C166	0.40	C237	0.01	C246
C9	0.38	0.32	C2	0.05	C7	0.20	C77	0.25	C153	0.17	C237	0.00	C243				
C10	0.28	0.16	C2	0.04	C7	0.20	C49	0.08	C55	0.02	C237	0.51	C254				
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C258	1.00	1.00	C258														
C259	0.24	0.25	C7	0.34	C49	0.23	C55	0.04	C93	0.14	C225						
C260	0.12	0.37	C2	0.05	C7	0.08	C49	0.01	C186	0.02	C225	0.47	C254				
C261	0.05	0.02	C7	0.01	C97	0.11	C166	0.15	C237	0.54	C246	0.16	C254				
C262	0.31	0.00	C49	0.10	C153	0.12	C166	0.55	C186	0.23	C246						
C263	0.50	0.02	C7	0.00	C49	0.03	C55	0.09	C166	0.28	C237	0.57	C254				
C264	0.40	0.39	C2	0.20	C13	0.41	C246										
C265	0.16	0.38	C2	0.07	C7	0.06	C55	0.12	C63	0.14	C166	0.24	C254				
C266	0.44	0.01	C2	0.03	C7	0.02	C49	0.01	C97	0.02	C237	0.37	C246	0.54	C254		
C267	0.07	0.01	C7	0.19	C13	0.05	C55	0.10	C166	0.36	C237	0.29	C246				

This approach facilitates a comparative assessment of a company's financial performance in relation to its peers, offering valuable insights for investors and analysts when making well-informed investment decisions.

Conclusion and Recommendations

In conclusion, this article has introduced an alternative approach to financial data analysis with the aim of facilitating efficient companies' access to the credit they require while mitigating repayment challenges. As discussed throughout the article, Data Envelopment Analysis (DEA) emerges as a valuable complement to traditional financial analysis methods. While conventional approaches often focus on individual financial ratios, none of them offer a comprehensive overview of a company's overall financial well-being.

DEA, in contrast, amalgamates various financial ratios into a unified metric known as "efficiency." By considering an array of ratios, including total debt to equity, cost of goods sold, fixed assets, current assets, net profit margin, return on equity, return on assets, inventory turnover, current ratio, and quick ratio as input and output variables, DEA provides a holistic assessment of a company's overall efficiency.

We strongly recommend the integration of DEA alongside traditional methods, such as financial statement analysis, to enhance the effectiveness of credit allocation. This combined approach provides a more comprehensive understanding of a company's financial health, thus enabling more informed decision-making.

Furthermore, we propose that banks and financial institutions adopt a strategy of categorizing their capital into distinct segments to manage risk effectively and ensure loan repayment. This prudent strategy allows for diversified investments in both established and emerging companies, fostering economic growth and benefiting financial institutions.

In closing, the synergy between traditional financial analysis methods and DEA not only enhances the evaluation of a company's financial performance but also streamlines credit allocation and contributes to overall economic growth. It is imperative for financial institutions to embrace this approach, diversify their investments, and actively support the development of both established and emerging businesses.

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