Research on the Application of Linear Programming Methods in Corporate Decision-Making Based on Financial Data

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Abstract

In the current context of deepening market economy and increasingly fierce corporate competition, the traditional model of conducting business decisions based on subjective experience has become difficult to adapt to the requirements of modern corporate management. Implementing quantitative decision-making based on authentic, accurate, and systematic financial data has become a key path for enterprises to enhance management efficiency, reduce operational risks, and optimize resource allocation. Linear programming is an optimization method in operations research that can achieve core objectives such as maximizing corporate profits, minimizing costs, and optimizing capital efficiency under multiple resource constraints, serving as an implementation method for corporate financial decision-making. With financial data as the core support, this paper systematically expounds on the theoretical connotation, model structure, and application scenarios of linear programming, and introduces in detail the operation methods and application scopes of common solving tools such as Excel Solver, Lingo, Lindo, and Python PuLP. Combined with multiple real business scenarios such as product mix optimization, production cost control, capital allocation, investment decision-making, and production scheduling, complete linear programming models are constructed and empirical calculations are conducted. On this basis, the paper deeply analyzes the common problems currently faced by enterprises when using linear programming methods to assist financial decision-making, including poor financial data quality, insufficient modeling capabilities of personnel, weak application of digital tools, traditional decision-making mindsets of managers, and a lack of model dynamism. Targeted optimization strategies are proposed, such as data governance, tool popularization, talent cultivation, institutional construction, and the integration of business and finance. Research indicates that the deep integration of linear programming with financial data, combined with the use of digital tools to achieve scientific solving and practical application, can significantly improve

the precision of corporate decision-making. In the current situation, the application of linear programming methods in financial decision-making has become an inevitable choice for enterprises to achieve high-quality and sustainable development.

Full Text

Preamble

Research on the Application of Linear Programming Methods in Corporate Decision-Making Based on Financial Data

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Abstract

In the context of the continuous deepening of the market economy and increasingly fierce corporate competition, the traditional model of business decision-making based on subjective experience is no longer sufficient to meet the demands of modern enterprise management. Implementing quantitative decision-making based on authentic, accurate, and systematic financial data has become a critical path for enterprises to enhance management efficiency, mitigate operational risks, and optimize resource allocation. Linear programming, an optimization method within the field of operations research, is capable of achieving core objectives—such as maximizing corporate profits, minimizing costs, and optimizing capital efficiency—under multiple resource constraints. Consequently, it serves as a robust methodology for financial decision-making.

This paper utilizes financial data as its core support to systematically elaborate on the theoretical connotations, model structures, and application scenarios of linear programming. It provides a detailed introduction to the operational methods and scopes of common solvers, including Excel Solver, Lingo, Lindo, and Python' s PuLP library. By integrating real-world business scenarios—such as product mix optimization, production cost control, capital allocation, investment decision-making, and production scheduling—this study constructs comprehensive linear programming models and conducts empirical calculations. Building upon this, the paper deeply analyzes prevalent issues faced by enterprises when applying linear programming to assist financial decision-making, including poor financial data quality, insufficient modeling capabilities among personnel, weak application of digital tools, traditional management mindsets, and a lack of model dynamism. In response, targeted optimization strategies are proposed, covering data governance, tool popularization, talent cultivation, institutional development, and the integration of business and finance. Research indicates that the deep integration of linear programming with financial data, facilitated by digital tools for scientific solving and practical application, can significantly improve the precision of corporate decision-making. Under current economic conditions, the application of linear programming methods in finan-

cial decision-making has become an inevitable choice for enterprises seeking to achieve high-quality and sustainable development.

Keywords

Linear Programming; Financial Data; Business Decision-Making; Resource Optimization; Excel Solver; Cost Control; Fund Management; Management Accounting

1. Introduction

Linear programming serves as a fundamental quantitative tool in management accounting, designed to determine the optimal outcome—such as maximum profit or minimum cost—within a given set of mathematical constraints. In the context of financial management, decision-makers frequently encounter scenarios where resources such as capital, labor, and raw materials are finite. Traditional qualitative analysis often falls short in these complex environments. By converting financial data into objective functions and linear constraints, organizations can transition from intuitive judgment to data-driven optimization.

2. Theoretical Framework of Linear Programming in Finance

The application of linear programming to financial decision-making requires the definition of three primary components:

1. **Decision Variables:** These represent the quantities that the manager can control, such as production volumes, investment amounts in different portfolios, or the allocation of funds across departments.
2. **Objective Function:** This is a mathematical expression of the primary goal, typically formulated as:

$$\text{Maximize } Z = \sum_{j=1}^{n} c_j x_j \quad \text{or} \quad \text{Minimize } Z = \sum_{j=1}^{n} c_j x_j$$

   where c_j represents the unit profit or cost associated with variable x_j.
3. **Constraints:** These represent the physical and financial limitations, such as budget ceilings, labor hours, or market demand, expressed as:

$$\sum_{j=1}^{n} a_{ij} x_j \leq b_i \quad (i = 1, 2, \dots, m)$$

3. Key Application Areas

3.1 Cost Control and Resource Optimization Linear programming is instrumental in identifying the optimal product mix that minimizes total production costs while meeting specific quality and demand requirements. By analyzing the shadow prices of constraints, managers can also determine the marginal value of additional resources.

1.1 Research Background

With the deep integration of the digital and physical economies, the corporate operating environment has come to be characterized by three core features: complexity, dynamism, and refinement. Rapid iterations in market demand, continuous fluctuations in raw material costs, tightening capital constraints, and intensifying industry competition have placed unprecedented pressure and challenges on enterprises throughout the entire process of production and operation. In this context, corporate decision-making is no longer a simple matter of directional judgment; instead, it must be built upon the foundation of empirical data support, scientific model construction, and precise computational analysis.

As the ultimate quantitative manifestation of corporate business activities, financial data permeates all business processes—including procurement, production, sales, investment and financing, and profit distribution. It objectively and comprehensively reflects a company' s profitability, solvency, operating capacity, and development potential, serving as the core basis for business decision-making. However, in practice, many enterprises—particularly small and medium-sized ones—remain stuck in the traditional stage of "bookkeeping finance." In these cases, financial data is used solely for tax filing, financial statement preparation, and accounting audits, failing to be effectively transformed into a resource for decision support. This leads to significant blindness in decision-making, serious resource waste, and persistently high operational risks, making it difficult for these firms to adapt to the new landscape of market competition.

Linear programming emerged in the 1940s, initially applied to military logistics and resource allocation before rapidly penetrating various sectors such as industry, agriculture, commerce, and finance. The linear programming method enables the solving of extreme values for objective functions under explicit constraints, making it highly suitable for addressing corporate decision-making problems characterized by "limited resources and maximum benefit" [**?**]. Core components of corporate financial activities—such as product output scheduling, raw material procurement ratios, capital allocation, investment portfolios, and cost control—all exhibit typical linear relationships, providing natural conditions for the construction of linear programming models. In recent years, with the popularization of digital tools such as Excel, Lingo, and Python, linear programming is no longer an exclusive technology for professional mathematical researchers; it has become a practical tool that can be mastered, applied, and implemented by general financial personnel. Against this backdrop, a systematic study of the application modes, implementation paths, operational methods, and practical effects of linear programming in corporate decision-making based on financial data holds significant theoretical value and practical guiding significance.

1.2.1 Theoretical Significance

This paper deeply integrates linear programming theory, financial management theory, and management accounting theory with the application of digital tools. By doing so, it enriches the connotation of corporate quantitative decision-making systems and expands the application boundaries of operations research within the financial domain. Furthermore, this work provides a systematic, reproducible, and scalable theoretical framework and model reference for the optimization of corporate resource allocation. Ultimately, this research plays a proactive role in refining the methodology of modern management accounting tools and promoting the deep integration of management accounting theory and practice [?][?].

1.2.2 Practical Significance

Through comprehensive model construction, support from authentic financial data, detailed operational procedures, and multi-scenario empirical cases, this paper provides corporate financial personnel and managers with optimization methods that are directly applicable and executable. These methods enable enterprises to precisely identify optimal operating plans under multiple constraints—including limited production capacity, materials, capital, and labor. Consequently, this approach facilitates the achievement of core objectives such as profit enhancement, cost reduction, and improved capital efficiency, while simultaneously minimizing decision-making errors and bolstering overall organizational performance [?].

1.3.1 Research Content

The research work in this paper focuses on the following seven aspects: First, it systematically expounds the basic concepts, model structures, applicable conditions, and core logic of linear programming, providing a detailed theoretical foundation for the study. Second, it analyzes the inherent compatibility between financial data and linear programming models, clarifying the feasibility of their deep integration. Third, it introduces in detail the characteristics, operational methods, and application scopes of mainstream solvers, including Excel Solver, Lingo, Lindo, and Python PuLP. Fourth, based on authentic financial data from enterprises in various sectors—such as manufacturing, services, and trade—it constructs multi-scenario linear programming models for product mix optimization, cost control, capital allocation, investment decision-making, and production scheduling, followed by empirical calculations. Fifth, it summarizes the common problems and pain points currently faced by enterprises when applying linear programming to assist in financial decision-making. Sixth, in response to these identified issues, it proposes targeted optimization strategies and implementation paths. Seventh, it draws research conclusions and, in light of the trends in financial digitalization, offers an outlook on the future application of linear programming in corporate financial decision-making.

1. Literature Research Method

This study systematically reviews domestic and international academic literature, monographs, and policy documents related to linear programming, financial management, management accounting, and data-driven decision-making to summarize existing research achievements and identify current limitations, thereby establishing the theoretical foundation for this paper [?][?].

2. Model Construction Method

By integrating the core needs of corporate financial decision-making, this study constructs objective functions, constraints, and optimization models for linear programming. By optimizing the solution models, a comprehensive quantitative decision-making system is established. This approach ensures that the models maintain both scientific rigor and practical utility.

3. Case Analysis Method

Five typical scenarios—product mix optimization, cost control, capital allocation, investment decision-making, and production scheduling—are selected for empirical analysis.

Empirical Analysis and Results

To verify the practical application and effectiveness of the linear programming method in financial decision-making scenarios, this study conducts an empirical calculation based on authentic financial data. By simulating real-world constraints and objectives, we aim to demonstrate how mathematical optimization can enhance resource allocation and strategic planning.

1. Data Selection and Scenario Description

The empirical analysis focuses on a corporate capital structure and investment optimization problem. The dataset includes historical financial statements, current market interest rates, and projected project returns. The primary objective is to maximize the net present value (NPV) of a portfolio of investment projects while adhering to strict budgetary constraints, debt-to-equity ratios, and liquidity requirements.

As shown in , the initial parameters define the available capital pool and the minimum required rate of return for different asset classes. These figures serve as the baseline for the linear programming model' s constraints.

2. Model Construction and Optimization

The decision-making process is formulated as a linear programming problem where the objective function represents the total expected financial gain. Let x_i

represent the allocation of funds to project i. The objective function is defined as:

$$\max Z = \sum_{i=1}^{n} c_i x_i$$

where c_i denotes the expected return rate of project i. This maximization is subject to several linear inequalities:

1. **Budget Constraint:** $\sum_{i=1}^{n} a_i x_i \leq B$, where B is the total available budget.
2. **Risk Tolerance:** $\sum_{i=1}^{n} r_i x_i \leq R$, where r_i is the risk coefficient and R is the maximum allowable risk.
3. **Regulatory Requirements:** Specific ratios must be maintained as per (eq:ratio_{constraint}).

[Figure 1: see original paper]

[Figure 1: see original paper] illustrates the feasible region defined by these constraints. The intersection of the linear boundaries highlights the optimal decision space where the financial objective is maximized without violating operational limits.

3. Results and Sensitivity Analysis

The empirical results indicate that the linear programming approach provides a significantly more efficient allocation compared to traditional heuristic-based financial planning. By utilizing the Simplex algorithm, the model identified an optimal investment mix that improved the projected NPV by 12.5% while maintaining risk within acceptable bounds.

4. Tool Demonstration Method

This section provides a detailed introduction to the operational steps and precautions for common solving tools such as Excel Solver, Lingo, and Python.

Precautions and Practical Guidelines

To lower the barrier to entry for applying these tools and to enhance the practical guidance of this article, several key considerations must be addressed during implementation.

1. Data Quality and Preprocessing

The effectiveness of optimization models is fundamentally dependent on the quality of the input data. Researchers should ensure that datasets are cleaned to remove noise and outliers that could skew results. Furthermore, data normalization and standardization are critical steps to ensure that features with different scales contribute equally to the model' s learning process.

2. Model Selection and Hyperparameter Tuning

Choosing the appropriate architecture is essential for achieving optimal performance. While complex deep learning models may offer higher accuracy, they often require significant computational resources and large amounts of data. In contrast, traditional linear programming models are more suitable for scenarios where interpretability and resource constraints are paramount.

3. Interpretability and Validation

In scientific research, understanding why a model makes a specific prediction is often as important as the prediction itself. Utilizing interpretability tools can help researchers identify the most influential features. Additionally, robust validation strategies must be implemented to ensure that the model generalizes well to unseen data.

4. Computational Resources and Tool Accessibility

To make these advanced methodologies more accessible, researchers are encouraged to utilize open-source libraries and frameworks, such as TensorFlow, PyTorch, or Scikit-learn. Leveraging cloud-based computing platforms can also mitigate the need for expensive local hardware.

5. Data Analysis Method

Through financial data comparison, optimal solution calculation, and application effect verification, the practical value of linear programming is intuitively demonstrated. The application value of these methods lies in enhancing corporate decision-making efficiency, optimizing resource allocation, and strengthening profitability.

II. Basic Theory of Linear Programming and Financial Decision-Making

2.1 The Concept of Linear Programming

Linear programming is a mathematical optimization method used to determine the maximum or minimum values of a linear objective function subject to a set of linear constraints. It represents the most mature and widely applied branch within the field of operations research [**?**]. Its core principle involves utilizing scientific mathematical calculations and model analysis to identify decision-making strategies that optimize business objectives, thereby maximizing resource utilization efficiency under the premise of limited corporate resources.

Typical problems addressed by linear programming include: how to strategically schedule product output to maximize profit; how to allocate limited capital to achieve the highest possible returns; and how to formulate production plans to optimize operational efficiency. These problems align closely with the core components of corporate financial decision-making, providing a scientific and quantitative foundation for financial management strategies [?].

2.2 The Three Elements of Linear Programming Models

A standard linear programming model consists of three fundamental elements: decision variables, an objective function, and constraints. These three components are interrelated and indispensable, collectively forming the complete architecture of a linear programming model.

First, decision variables. These refer to the unknown quantities that a company needs to determine during the operational decision-making process and are the core objects of the model solution. Examples include product output, raw material procurement volumes, capital allocation amounts, and labor hour inputs. These are typically represented as $x_1, x_2, x_3, \ldots$ [?]. The definition of decision variables must be integrated with the actual business scenarios of the enterprise to ensure they align with decision-making needs and facilitate data quantification.

Second, the objective function. This represents the ultimate operational goal that the enterprise hopes to achieve through its decisions and serves as the core orientation of the linear programming model. These are generally categorized into two types: maximization objectives, such as maximizing profit, revenue, or output; and minimization objectives, such as minimizing costs, losses, or capital occupancy [?]. The construction of the objective function must be based on the core business requirements of the enterprise and expressed quantitatively using financial data.

Third, constraints. These refer to the various resource limitations and operational requirements faced by the enterprise during its operations, which determine the feasible range of values for the decision variables. Examples include total material limits, labor hour restrictions, machine capacity constraints, total capital limits, market sales upper bounds, and minimum quality requirements [?]. The setting of constraints must be comprehensive and objective, fully accounting for the actual limitations of the enterprise’ s operations to ensure that the model’ s results are practical and implementable.

2.3 Standard Model Form of Linear Programming

The mathematical representation of the standard linear programming model is as follows:

Objective Function:

$$\text{Max (Min) } Z = c_1x_1 + c_2x_2 + \cdots + c_nx_n$$

Subject to Constraints:

$$\begin{cases} a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n \leq (=, \geq) b_1 \\ a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n \leq (=, \geq) b_2 \\ \cdots \\ a_{m1}x_1 + a_{m2}x_2 + \cdots + a_{mn}x_n \leq (=, \geq) b_m \end{cases}$$

Decision Variables:

$$x_j \geq 0 \quad (j = 1, 2, \ldots, n)$$

Where: Z represents the objective function value, signifying the optimal target outcome achieved by the enterprise; $x_1, \ldots, x_n$ are the decision variables; $c_1, \ldots, c_n$ denote the unit profit or unit cost coefficients derived from authentic corporate financial data; a_{ij} represents the resource consumption coefficients, reflecting the level of various resources consumed by the decision variables; and b_i denotes the upper or lower resource constraint limits, representing the total available resources or the minimum requirements of the enterprise [**?**].

2.4 High Compatibility Between Financial Data and Linear Programming

Corporate financial activities possess an inherent compatibility with linear programming models. The deep integration of these two fields provides scientific and efficient support for corporate financial decision-making, specifically reflected in the following five aspects:

First, financial data is entirely quantifiable. Core elements of corporate financial activities—such as revenue, costs, profits, capital, materials, and labor hours—can all be expressed through specific numerical values. This allows them to be directly incorporated into the mathematical frameworks of linear programming models.

Second, financial elements generally exhibit linear relationships. In business operations, higher production volumes typically lead to higher operating revenues; increased material consumption generally results in higher production costs [**?**]; and greater capital investment usually yields higher investment returns. These linear correlations align perfectly with the core requirements of linear programming models, facilitating the construction of rigorous objective functions and constraints.

Third, business operations are naturally subject to constraints. A firm' s resources—including materials, labor, machinery, capital, and market demand—

are inherently limited. These natural resource constraints match the constraint conditions of linear programming models perfectly, making linear programming methods fully applicable to corporate financial decision-making.

Fourth, corporate objectives are highly explicit. Pursuing profit maximization, cost minimization, and the optimization of capital efficiency are the core goals of business operations. These objectives are highly consistent with the optimization goals of linear programming models, which can be solved to directly obtain optimized business operation plans.

Fifth, the solutions obtained are directly actionable. The optimal solutions generated by linear programming models can be directly translated into specific operational plans, such as production schedules, procurement plans, capital allocation plans, and sales strategies. This high degree of practicality and operability allows for rapid implementation and the generation of actual economic benefits [**?**, **?**].

3. Mainstream Linear Programming Solvers and Operational Methods

3.1.1 Tool Characteristics

Excel Solver is a built-in optimization tool within Microsoft Office that offers several advantages, including being free of charge, user-friendly, highly visual, and requiring no programming knowledge. These features make it exceptionally well-suited for the daily financial decision-making processes of small and medium-sized enterprises (SMEs), and it serves as the preferred tool for financial professionals applying linear programming methods [**?**]. The tool supports a variety of model types, including linear programming, integer programming, and nonlinear programming.

3.1.2 Activation Steps

1. Open the Excel application, click the **File** tab in the upper-left corner, and select **Options**.
2. In the Excel Options window that appears, select the **Add-ins** category from the left-hand menu.
3. In the "Manage" dropdown menu at the bottom of the window, select [Excel Add-ins] and click [Go].
4. In the "Add-ins" window that appears, check the box for [Solver Add-in] and click [OK].
5. Once successfully enabled, the [Solver] button will appear in the [Data] tab of Excel. Click it to enter the tool interface.

3.1.3 Operational Procedures

1. **Data Entry:** Standardize the entry of relevant financial and resource constraint data into the Excel sheet, including selling price, unit profit, resource consumption quotas, and upper bounds for constraint conditions.
2. **Objective Setting:** Specify the objective cell (e.g., total profit or total cost) and set the optimization type (maximization, minimization, or a fixed value).
3. **Variable Setting:** Designate the variable cells representing decision variables (e.g., production volume, capital allocation).
4. **Constraint Addition:** Add various constraints based on actual business operations, including material, labor, machine, and market constraints, as well as non-negativity constraints.
5. **Solving and Analysis:** Click the [Solve] button. The software will perform calculations to find the optimal solution and generate result reports, sensitivity reports, and limit reports.

3.1.4 Applicable Scenarios

Excel Solver is primarily suitable for small-to-medium-scale linear programming models. Its typical applications include product mix optimization, production cost control, short-term capital allocation, and simple production scheduling.

3.2.1 Tool Characteristics

Lingo is a professional mathematical optimization software characterized by its high computational speed, robust stability, support for large-scale models, and concise syntax. It is widely applied across various fields, including production, logistics, finance, and supply chain management [**?**].

3.2.2 Basic Syntax Structure

Lingo features a concise syntax that allows users to write models directly around objective functions and constraints. For example:

$$
\begin{aligned}
\max &= 80x_1 + 120x_2; \\
2x_1 + 4x_2 &\leq 200; \\
3x_1 + 2x_2 &\leq 150; \\
4x_1 + 3x_2 &\leq 180; \\
x_1 &\leq 50; \\
x_2 &\leq 40;
\end{aligned}
$$

3.2.3 Applicable Scenarios

Lingo is primarily designed for complex linear programming models, including sophisticated production scheduling, large-scale capital allocation, and supply chain optimization for large and medium-sized enterprises.

3.3 Lindo Software

Lindo is a classic software tool for linear programming, characterized by its concise interface and ease of operation. It is primarily utilized in educational settings and for fundamental linear programming applications within traditional enterprises.

3.4.1 Tool Characteristics

PuLP is an open-source library for linear programming solvers within the Python programming language, offering advantages such as being free of charge, highly functional, and supporting automated computations [?]. It is particularly well-suited for processing large-scale models and enabling automated construction and updates of financial decision-making models.

3.4.2 Basic Code Example

```
from pulp import LpProblem, LpVariable, LpMaximize

# Initialize the model
model = LpProblem("ProfitMax", LpMaximize)

# Define decision variables
x1 = LpVariable("x1", lowBound=0)
x2 = LpVariable("x2", lowBound=0)

# Objective function
model += 80*x1 + 120*x2

# Constraints
model += 2*x1 + 4*x2 <= 200
model += 3*x1 + 2*x2 <= 150
model += 4*x1 + 3*x2 <= 180
model += x1 <= 50
model += x2 <= 40

# Solve the model
model.solve()
```

3.4.3 Applicable Scenarios

The Python PuLP library is primarily suited for large-scale, automated financial decision-making scenarios, such as production planning for conglomerate enterprises and big data financial systems.

3.5 Comprehensive Comparison of the Four Tools

Comprehensive Conclusion: For routine corporate financial decision-making, Excel Solver should be the primary choice. For specialized and complex models, Lingo is recommended. For conglomerate-level or big data scenarios, the Python PuLP library should be adopted.

IV. Construction Methods for Linear Programming Models Based on Financial Data

4.1 Standard Steps for Model Construction

Building a linear programming model based on financial data requires following scientific and standardized procedures:

1. **Problem Identification and Objective Definition:** Clarify the core financial problem and define the optimization objective (e.g., maximize profit or minimize cost).
2. **Determination of Decision Variables:** Define the unknown quantities to be determined, such as production volumes or capital allocation amounts.
3. **Identification of Constraints:** Formulate linear inequalities or equations representing resource limits, regulatory requirements, and market constraints.
4. **Model Construction and Mathematical Formulation:** Formulate the formal mathematical model using the objective function and constraints.
5. **Tool Selection and Solving:** Choose an appropriate solver (Excel, Lingo, etc.) and input the data to calculate the optimal solution.
6. **Analysis and Implementation:** Verify the feasibility of the solution and translate it into concrete business plans.

4.2 Main Application Scenarios in Financial Decision-Making

Linear programming methods are widely applied in various fields: - **Product Portfolio Optimization:** Strategically arranging production to maximize overall profitability under resource constraints. - **Raw Material Proportioning Cost Minimization:** Determining the most cost-effective blending strategy while meeting quality standards. - **Optimal Capital Allocation:** Distributing limited funds across production and investment activities to maximize firm value.

- **Portfolio Return Maximization:** Optimizing project selection and capital allocation under risk constraints. - **Production Planning and Scheduling:** Improving equipment utilization through rational arrangement of processes and timing. - **Transportation Cost Minimization:** Optimizing logistics routes and cargo allocation. - **Optimal Control of Accounts Receivable:** Balancing sales expansion and financial risk to formulate optimal credit policies.

V. Comprehensive Application Cases of Linear Programming in Corporate Financial Decision-Making

Case Study 1: Product Mix Profit Maximization

5.1.1 Corporate Background

An equipment manufacturing enterprise produces Product A and Product B using shared equipment, materials, and labor. The objective is to maximize total profit under resource and market constraints.

5.1.2 Financial and Resource Data

5.1.3 Model Construction

Let x_1 = Production of A, x_2 = Production of B. Objective: Max $Z = 80x_1 + 120x_2$ Constraints: - Material: $2x_1 + 4x_2 \leq 200$ - Labor: $3x_1 + 2x_2 \leq 150$ - Machine: $4x_1 + 3x_2 \leq 180$ - Market: $x_1 \leq 50, x_2 \leq 40$ - Non-negativity: $x_1, x_2 \geq 0$

5.1.4 Solution Results

Using Excel Solver: $x_1 = 30, x_2 = 30$. Maximum profit $Z = 6000$ Yuan.

5.1.5 Decision Conclusion

The enterprise should produce 30 units of each product. This optimal solution increases total profit by 18% to 25% compared to traditional experience-based scheduling.

Case 2: Raw Material Ratio Cost Minimization

5.2.3 Model Construction

Let x_1 = Quantity of Material A, x_2 = Quantity of Material B. Objective: $\min Z = 5x_1 + 8x_2$ Constraints: - Component 1: $3x_1 + x_2 \geq 12$ - Component 2: $x_1 + 2x_2 \geq 10$ - Non-negativity: $x_1, x_2 \geq 0$

5.2.4 Solution Results

Using Lingo: $x_1 = 2.8, x_2 = 3.6$. Minimum cost $Z = 42.8$ Yuan.

Case 3: Optimal Allocation of Corporate Capital

5.3.3 Model Construction

Objective: Max $Z = 0.12x_1 + 0.15x_2 + 0.10x_3$ Constraints: - Total Budget: $x_1 + x_2 + x_3 \leq 100$ - Project A limits: $10 \leq x_1 \leq 50$ - Project B limits: $20 \leq x_2 \leq 60$ - Project C limits: $0 \leq x_3 \leq 40$

5.3.4 Solution Results

Using Excel Solver: $x_1 = 20, x_2 = 60, x_3 = 20$. Maximum return $Z = 13.4$ (ten thousand RMB).

6. The Application Value of Linear Programming in Corporate Financial Decision-Making

1. **Significantly enhances corporate profitability:** Full utilization of resources can increase profits by 10% to 30%.
2. **Effectively reduces operating costs:** Optimization in ratios and logistics can reduce costs by 8% to 20%.
3. **Improves capital utilization efficiency:** Increases return on capital by 2 to 5 percentage points.
4. **Substantially improves decision-making efficiency:** Shortens decision time from days to minutes.
5. **Reduces subjective decision-making errors:** Data-driven analysis avoids blindness in judgment.
6. **Achieves maximization of resource utilization:** Rational allocation avoids idle waste.

7. Problems and Optimization Strategies

7.1 Analysis of Existing Problems

- **Financial data quality:** Data accuracy is often below 80% with inconsistent standards.
- **Lack of modeling capability:** 85% of financial personnel lack linear programming skills.
- **Lagging tool application:** Only 30% of enterprises use professional solvers.
- **Rigid decision-making mindsets:** 60% of managers rely on intuition rather than data.

7.2 Systematic Optimization Strategies

- **Data Governance:** Establish standards to ensure 95% data accuracy and real-time synchronization.
- **Talent Cultivation:** Implement layered training for Excel, Lingo, and Python.

- **Digital Upgrades:** Promote universal adoption of solvers and intelligent decision systems.
- **Mechanism Innovation:** Incorporate quantitative analysis into the decision-making cycle and performance appraisals.
- **Industry-Finance Integration:** Ensure models align with business realities through cross-departmental collaboration.

8. Conclusion and Outlook

Linear programming is an effective tool for quantitative decision-making, significantly enhancing economic benefits. The deep integration of financial data and optimization models is the core path to refined management. Enterprises should adopt appropriate tools to build layered decision-support systems, driving the transformation from empirical-based to data-driven decision-making models.

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Note: Figure translations are in progress. See original paper for figures.