

FINANCIAL AND PRODUCTION PLANNING IN A MANUFACTURING FIRM:

DYNAMIC AND MULTI-ATTRIBUTE STRATEGIC ANALYSIS

by

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ABSTRACT

In this research we study the dynamic behavior of an industrial firm. Special emphasis is placed on the financing of manufacturing fixed capacity and working capital. Firstly, we construct a corporate model of a sample firm. Then the experimental firm is operated using following strategy groups: cash flow management strategies, depreciation strategies and retained earnings strategies.

Next, the emphasis is moved to the evaluation of the outcomes. At this stage, an analytical hierarchy process is used. We insist that the decision analyst should decompose the problem into a hierarchy of interrelated decision elements. At the top of the hierarchy lies the most general objective of the decision problem, i.e., the well-being of the firm. The lower levels of the hierarchy consist of various decision criteria. The lowest levels of the hierarchy consist of decision alternatives, i.e., strategy groups. Finally, the best strategy is reached.

1. INTRODUCTION

This study concerns itself with the financial expansion strategies of a growing firm. The first major aspect is that an industrial firm has several strategies, both internal and external for financing the required funds, working capital as well as production fixed capacity. In this study, special emphasis is placed on depreciation, retained earnings, cash management and gearing strategies.

The second major aspect of this study is that the effects of different strategies cannot be evaluated according to a single criterion; the strategic analysis concerning the whole firm must be performed according to multiple criteria. To meet this twofold end, we have combined a dynamic corporate model with a hierarchical evaluation procedure. Methodologically, the outcome is that a computerized tool for performing dynamic, strategic and financial analysis has been attained.

2. STRATEGIC ANALYSIS

Although the concepts and terms of strategic planning and strategic analysis are somewhat vague and indecisive, there prevails reasonable agreement that strategic planning and analysis concern the whole of a firm; that plans represent the highest planning level; and that results must ultimately be concretized in annual operating plans or budgets.

The uncertain future, as well as rapid and sudden changes in the environment have placed new demands on strategic planning and analysis. We must quickly and flexibly adapt to changing circumstances.

From the foregoing, it is apparent that only computerized dynamic planning and analysis can meet the requirements of modern strategic management.

3. COMPUTERIZED DYNAMIC PLANNING

For the illustrative purposes of this study, we have adopted a strategic planning model specified by Shehata (1976), see also Kivijärvi and Tuominen (1987).

The model is divided into three sectors: Production Fixed Capacity, Financial Aspects of Expansion in the Production Fixed Capacity, and Expansion in Working Capital.

For an industrial firm there are many internal and external strategies to finance the required funds. This experimental model is operated using the following strategies:

I. Momentum strategy

- 1. No changes to the existing policies**

II. Depreciation Strategy

- 2. Strategy based on the replacement prices of fixed capacity**

III. Retained Earnings Strategies

- 3. Conservative Retained Earnings Strategies**
- 4. Aggressive Retained Earnings Strategy**

IV. Cash Management Strategies

- 5. No control limits**

V. Gearing Strategies

- 6. Moderate Gearing Strategy**
- 7. Geared Up Strategy**

In the experiments of this study the following decision criteria are used to evaluate the impacts of strategies: Cash Balance, Net Profit After Taxes, Net Worth, Total Debts, Production Rate, and Inventory.

The dynamic model is operated with altered strategies for depreciation, retained earnings, cash management and gearing. The graphic results of the two strategies are presented, as an illustrative example, in Figure 1.

The most crucial question that arises is: What is the outcome of the previous strategy analysis? The answer is: Prevailing confusion! Because there is no such strategy superior to all other strategies, the final selection is not easy. We must be able to weigh; to give priorities to the goal variables.

4. HIERARCHY FOR STRATEGY SELECTION

We use the AHP and the respective software Expert Choice (see Saaty and Kearns, 1985) for selecting the best strategy. The AHP starts by decomposing a complex problem into a hierarchy. In Figure 2, a hierarchy for the selection of strategy is illustrated. At the top of the hierarchy lies the most general objective of the decision problem. The lower levels of the hierarchy contain criteria or attributes and the last level of the hierarchy contains decision alternatives.

The solution technique of the AHP takes as input the pairwise comparisons. Each pair is evaluated separately, by comparing the degree to which one

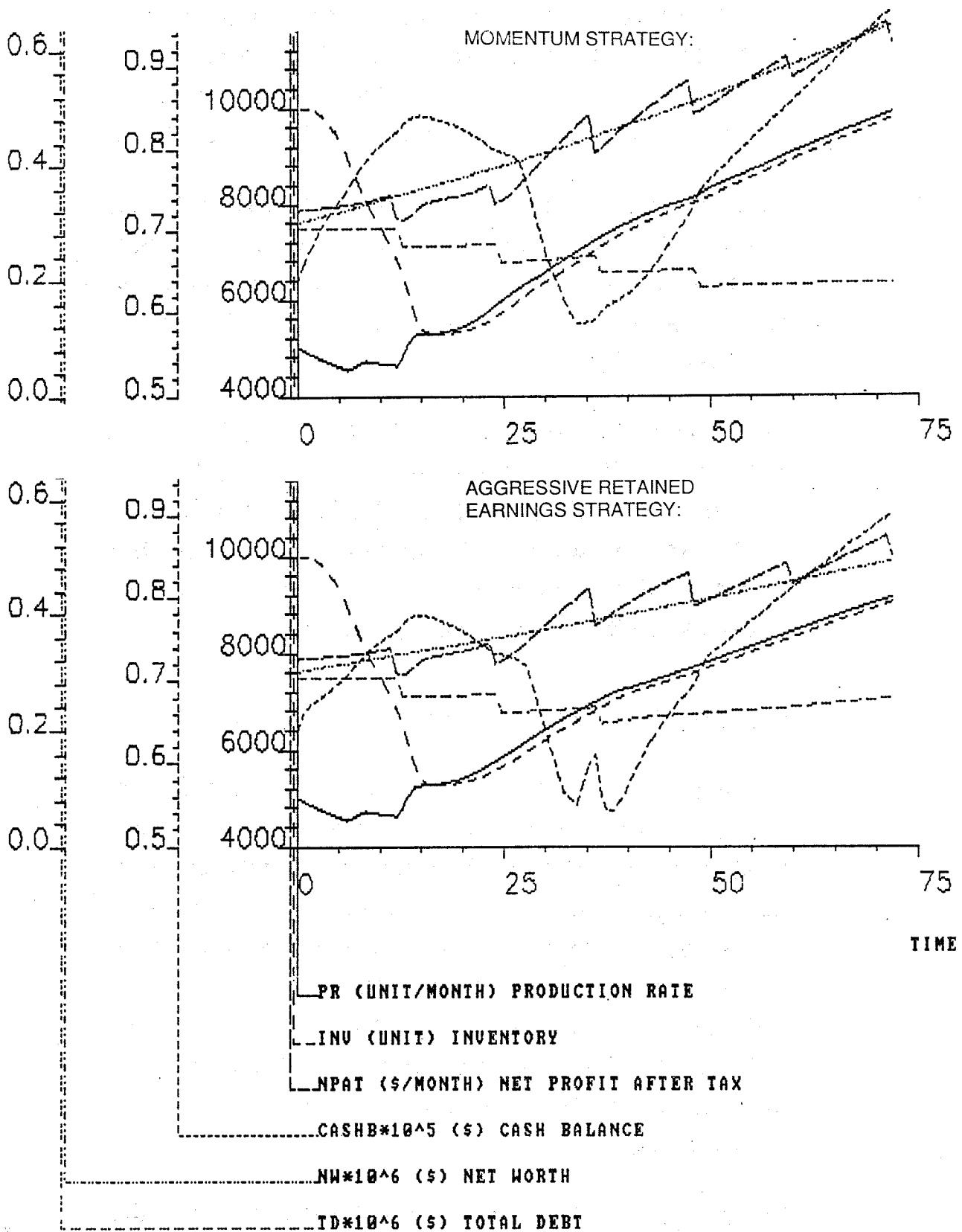


FIGURE 1. GRAPHIC RESULTS OF SOME STRATEGIES.

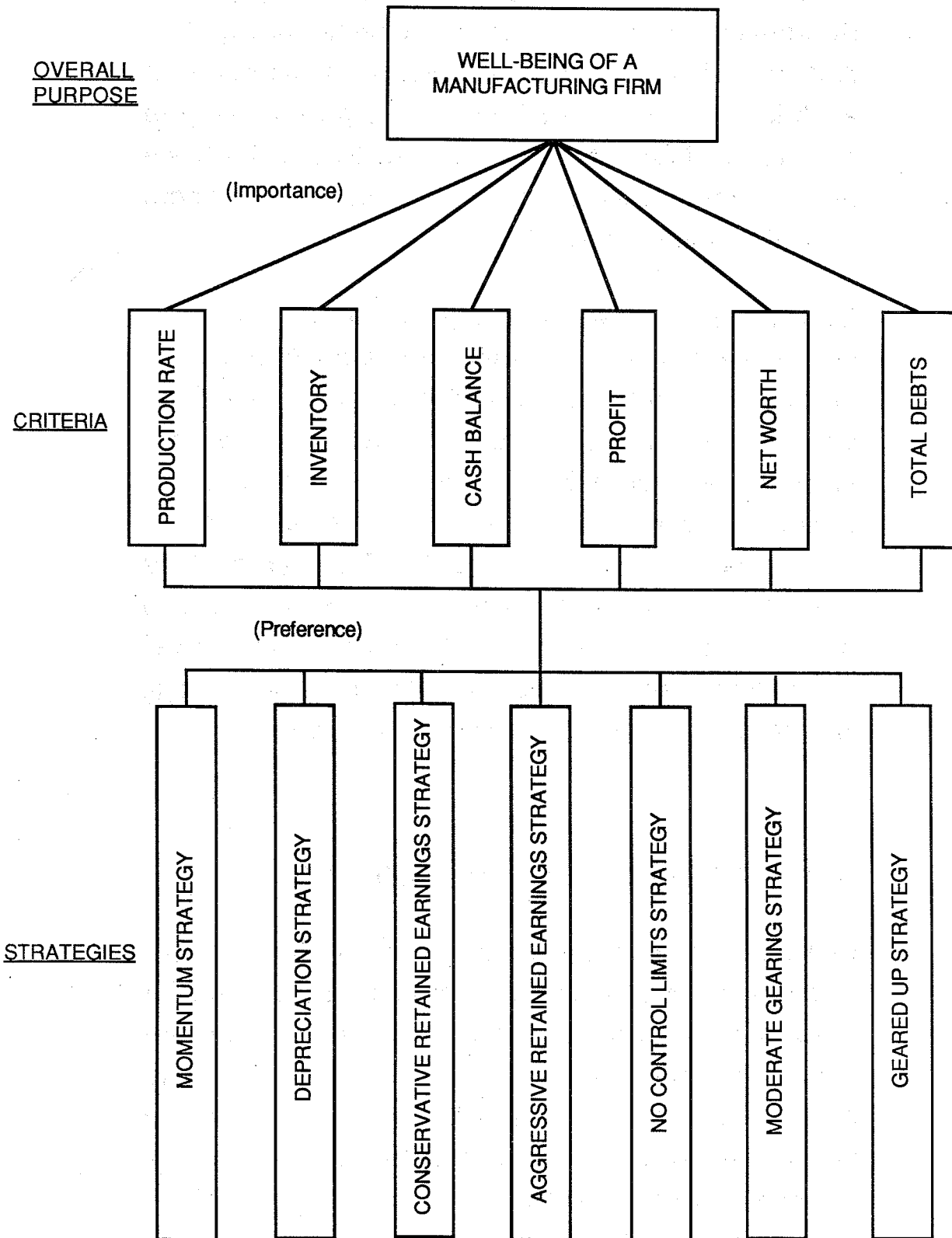


FIGURE 2. HIERARCHY FOR THE SELECTION OF STRATEGY

item of that pair dominates the other with respect to the elements from the next level in the hierarchy. The AHP produces the relative weights of elements at each level as output. In Figure 3 the priorities of the criteria are illustrated. According to the AHP, we judged profit to be the most important, and total debts to be the least important.

On the next level, we compare alternative strategies with respect to each criterion. By using Figure 4, we judge of which "conservative retained earnings strategy" or "aggressive retained earnings strategy" is more preferable with respect to net profit after tax criterion and how preferable is it? After all other similar pairwise comparisons, the AHP synthesizes the results. Then priorities of strategies are described in Figure 5. One observes that conservative retained earnings is the best strategy with respect to six criteria mentioned above.

5. SENSITIVITY ANALYSIS OF PROCESS

In the sensitivity analysis phase we study the rates of changes of alternative priorities as functions of criteria importance. Figures 6 and 7 describe sensitivity analysis for production and net worth, respectively. The conservative retained earnings strategy is not sensitive with respect to production. However, when net worth becomes more important, the priority of moderate gearing strategy increases and it would become the most preferable alternative strategy.

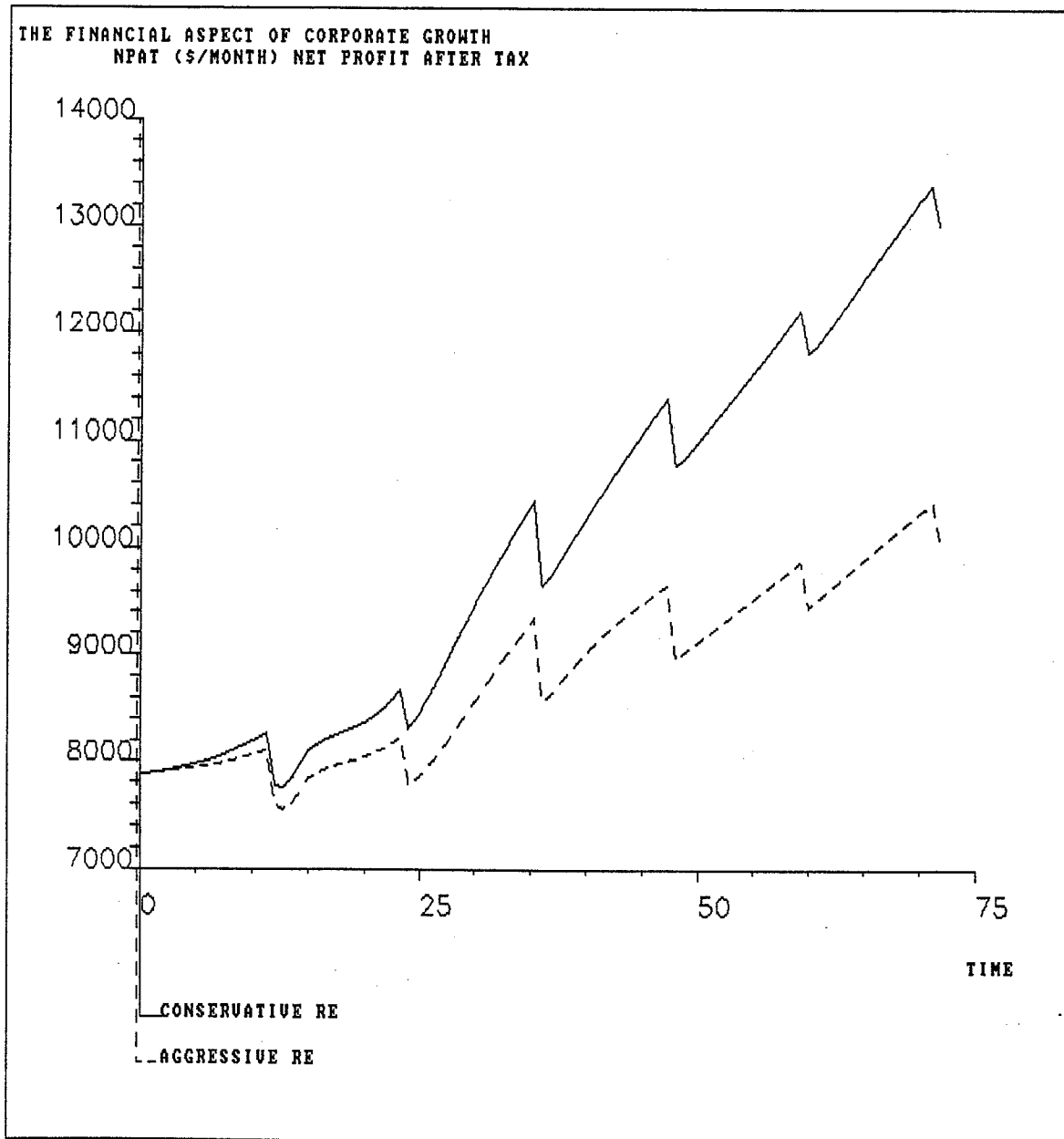


FIGURE 4. COMPARISON OF TWO STRATEGIES WITH RESPECT TO ONE CRITERION.

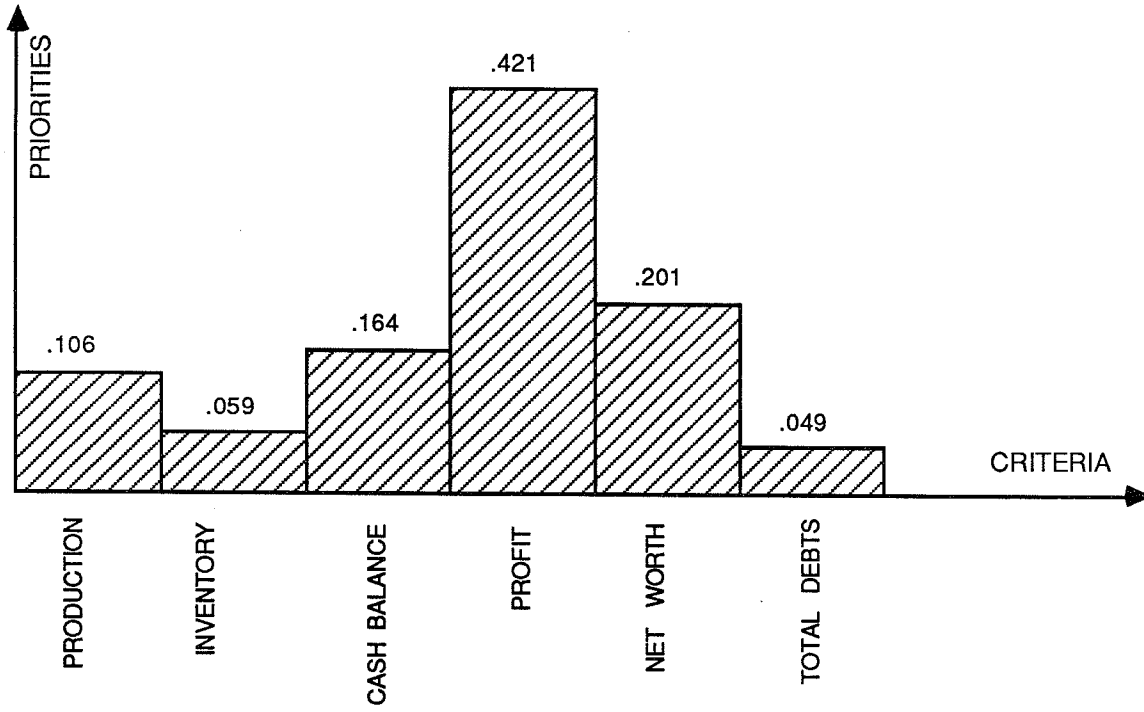


FIGURE 3. PRIORITIES OF CRITERIA.

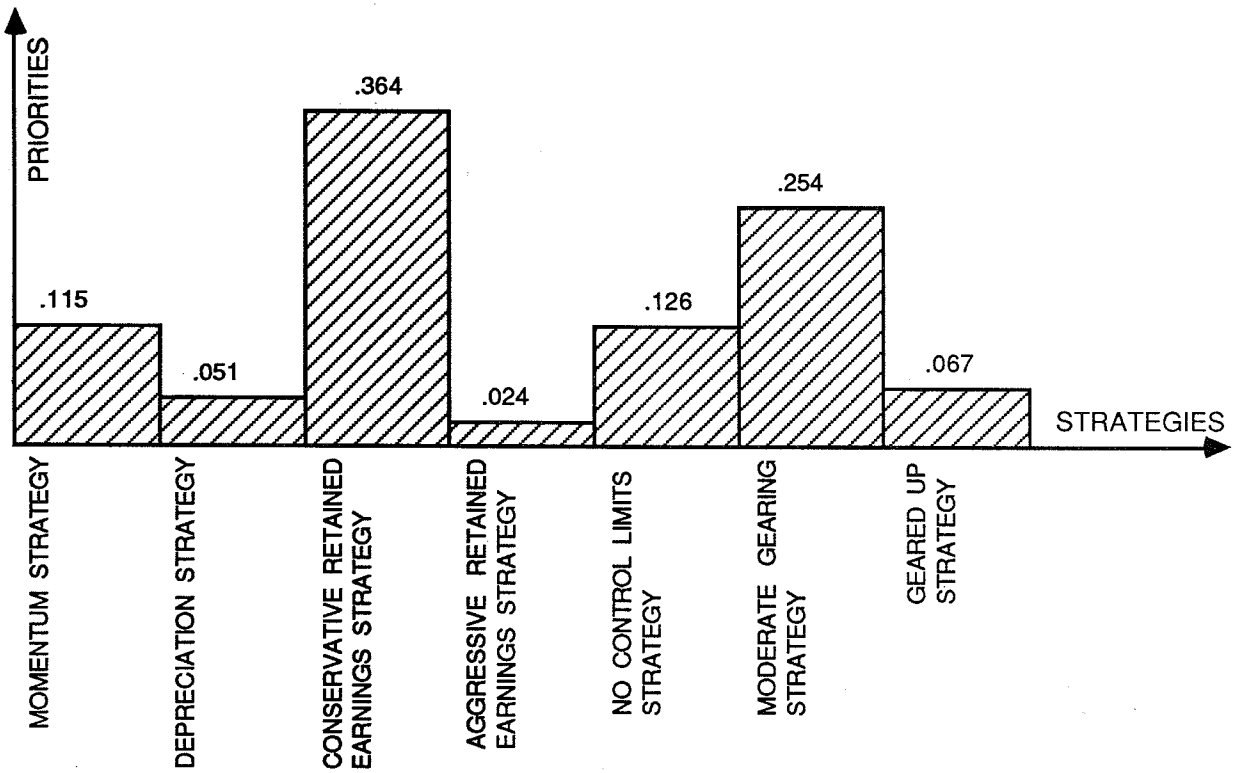


FIGURE 5. PRIORITIES OF STRATEGIES.

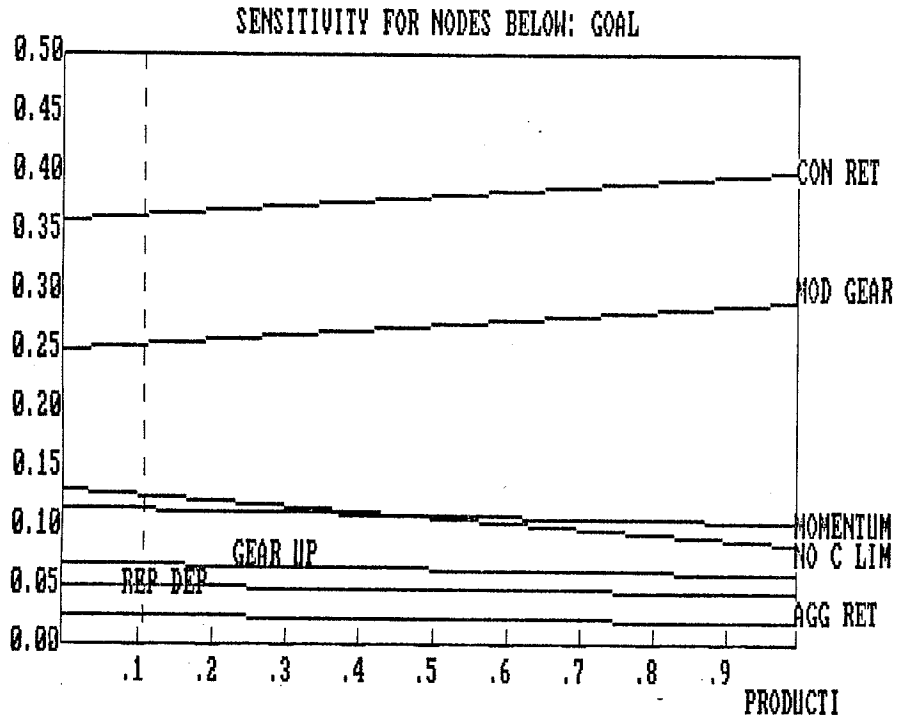


FIGURE 6. SENSITIVITY ANALYSIS FOR PRODUCTION.

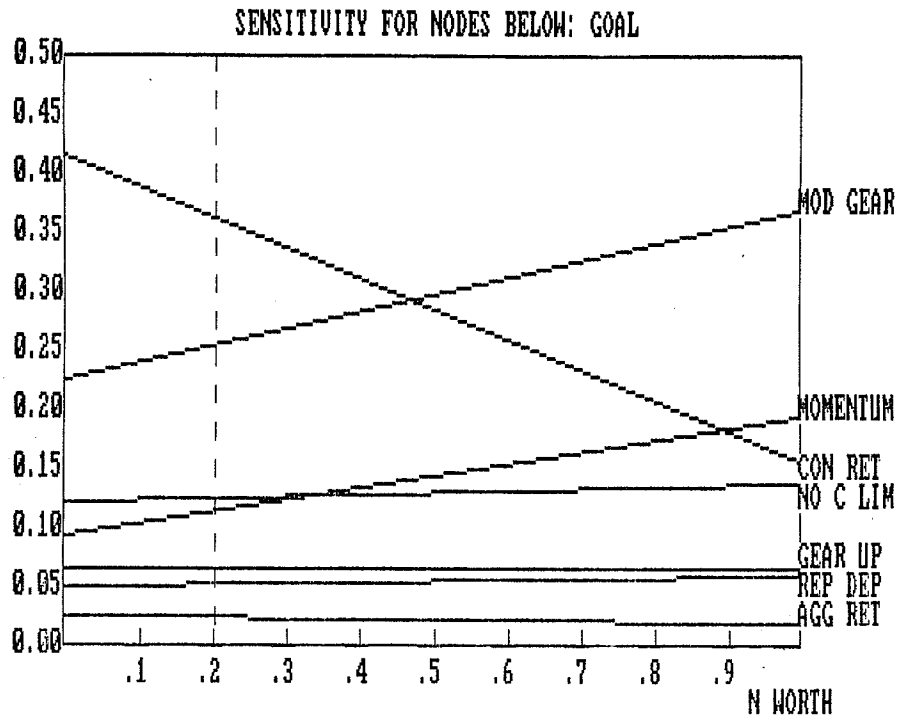


FIGURE 7. SENSITIVITY ANALYSIS FOR NET WORTH.

6. CONCLUSIONS

In this study, the financial strategies of a growing firm has been of interest. It was highlighted that an industrial firm has several internal and external strategies to finance the required funds, working capital as well as production fixed capacity. It was also emphasized that the financial and strategic analysis concerning the whole firm must be fulfilled under multiple criteria.

Methodologically, it was shown how the dynamic financial planning can be combined with a hierarchical evaluation procedure effectively. The evidence from the study is that the quality and quantity of information for corporate strategic decision making can be fundamentally extended by such a methodological integration.

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