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Portfolio Simulation: A Tool to Support Strategic Management[1]

by

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Abstract

The allocation of investment funds in multibusiness firms is considered in this article as a complex strategic decision making process. We show that a quantitative portfolio simulation model can be used effectively to support this strategic decision making process. The portfolio simulation model, which is formulated with a combined system dynamics and spiral loop approach, further allows us to show severe limitations of qualitative portfolio approaches, like the one of the Boston Consulting Group. The simulation experiments demonstrate that it can be extremely dangerous for diversified companies to follow the investment suggestions typically drawn from the Boston Consulting Group portfolio matrix, if competitors choose a course of action that is contradictory to normative situations. The simulation runs additionally show, that a more flexible positioning strategy can yield much better results than the fixed positioning strategy typically used by the Boston Consulting Group.

Introduction

The allocation of investment funds in multibusiness firms is considered in this article as a complex strategic decision making process which is located at the top management level of diversified companies (see also Simon 1981, 49). Qualitative portfolio approaches, like the portfolio concept of the Boston Consulting Group (BCG) were developed in order to support this strategic decision making process. However, qualitative portfolio concepts have severe limitations (see Hax, Majluf 1984, 145-150). We will show that a quantitative portfolio simulation model can overcome the methodological limitations which are typical for qualitative portfolio approaches. The quantitative portfolio simulation model, which has been developed with a combined sytem dynamics and spiral loop approach on the basis of the portfolio concept of the BCG, will be shown from three perspectives. First, we briefly describe the portfolio management process based on the concept of the BCG. Second, the generic formal structures of the portfolio simulation model are shown. Third, we will present selected simulation results of the model which show different evolutionary development patterns of diversified firms and additionally show some severe limitations of the BCG portfolio approach.

The Descriptive Model of Portfolio Management - The Boston Consulting Group Portfolio Concept

The portfolio management process is typically a complex strategic decision making process, which is determined on the company's side by the actual situation of the conglomerate and its business units, the goals of the conglomerate and the available financial funds for capital investment, and which further has to take into account the actual and expected strategies and potentials of the major competitors in the various markets as well as the general economic situations of the countries where the business units are located. To solve the funds allocation problem, diversified companies normally use some kind of heuristics. One qualitative heuristic, which is used worldwide to support the portfolio management process in multibusiness companies, is the portfolio concept of the Boston Consulting Group (BCG) (Henderson 1973, 1979).

The essence of the BCG approach is to present the firm in terms of a portfolio of businesses, each one offering an unique contribution with regard to growth and profitability. The firm is then viewed not just as a single monolithic entity, but as composed by many largely independent units whose strategic directions are to be distinctively addressed (Hax/ Majluf 1984, 127).

In order to visualize the particular role to be played by each strategic business unit (SBU), BCG developed the growth-share matrix, in which each business is plotted on a four-quadrant grid, like the one shown in figure 1. The horizontal axis corresponds to the relative market share enjoyed by a business, as a way of characterizing the strength of the firm in that business. A cut off point separates businesses of high and low internal strength. The vertical axis indicates market growth, representing the attractiveness of the market in which the business is positioned. A cut off point, defined by the company or its consultants, separates high growth from low growth businesses.

The SBUs of a company are positioned in the so-defined growth-share matrix, as shown with the circles in figure 1. The circles show the contribution of the SBU to the firm, which can be measured in terms of sales or earnings, and is represented by the area within the circles in the matrix.

There are several implications that emerge from this business categorization, the most important one being centered on the transfer of cash among businesses. The businesses in each quadrant have distinct characteristics with regard to cash flow (Hax/ Majluf 1984, 131-133):

1. The "Question Marks."
   These businesses correspond to major untapped opportunities, which appear as very attractive because of the high market-growth rate they enjoy. The firm however, has not achieved a significant presence (high market share) in the corresponding market. A decision is called for selectively identifying among them those SBUs that can be successfully promoted to a leading position. This is a key strategic decision in this planning approach that carries with it the assignment of large amounts of cash to a business, because reaching a leading position in a rapidly growing market requires commiting important cash resources.

2. The "Stars."
   They are highly attractive businesses (high market growth), in which the firm has established a strong competitive position (high relative market share). They generate large amounts of cash, because of their successful status, but at the same time, require a significant inflow of cash resources if the firm wants to sustain its competitive strength in that rapidly growing market. As a result, the final excess of cash contributed to or the deficit required from the overall organization is relatively modest.

3. The "Cash Cows."
   These businesses are the central sources of cash for the organization. Because of their extremely high competitive strength in a declining market, they generate more cash than they can wisely reinvest into themselves. Therefore, they represent a source of large positive cash that could be available to support the development of other businesses within the firm. Incidentally, this fact clearly corroborates that, ultimately, the resource allocation process has to be centralized at a higher managerial level in the organization. Otherwise, the manager of a "cash cow" will tend to reinvest the proceeds of its business in its own domain, suboptimizing the uses of its resources.

4. The "Poor Dogs."
   These businesses are clearly the great losers: unattractive and weak. They are normally regarded as "cash traps," because whatever little cash they generate is needed for maintaining their operations. If there is no legitimate reason to suspect a turnaround in the near future, the logical strategy to follow would be harvesting or divesting.

The primary objectives of the corporation, which are implicit in the conceptualization initially done by the BCG, are growth and profitability (Henderson and Zakon 1980). The argument is that the fundamental advantage that a multibusiness organization possesses is the ability to transfer cash from those businesses which are highly profitable, but have a limited potential for growth, to those which offer attractive expectations for a sustained future growth and profitability.

This philosophy leads to an integrative management of the portfolio that will make the whole larger than the sum of the parts. For this synergistic result to be obtained, a fairly centralized ressource allocation process would be required which would produce a balanced portfolio in terms of the generation and uses of cash.

Another contribution of the BCG, besides the balanced portfolio idea, resides in their selection of market share to express the desired strategy for each business. The strategy suggestions, which can be drawn out of the growth-share matrix are: selective offensive strategies for "question marks," offensive strategies for "stars," defensive strategies for "cash cows," divest or harvest strategies for "poor dogs."

The Formal Portfolio Simulation Model

The descriptive model of portfolio management is transferred into a formal simulation model by a combined system dynamics and spiral loop approach. The servomechanistic causal feedback loop concept of system dynamics is used to model the rule-fulfilling decentralized decision making processes of the SBUs (for an introduction to sytem dynamics see Forrester 1961 and Richardson/ Pugh 1981). The spiral loop concept with its logical loops and production rules is used to represent the rule-setting strategic decisions of the centralized portfolio management process (an introduction to the spiral loop methodology is given in Merten 1985 and Merten 1986). Spiral loops are always composed of three sets of rules, which sometimes may be interwoven:

1. A decision rule, which assigns when the critical load of a system is attained (rule of critical load).

2. A decision rule, saying what to do if the critical load of the system is attained (rule of strategy generation and strategy selection)

3. A decision rule describing how to implement the new strategy (rule of strategy implementation).

There are two kinds of spiral loops depending on the kind of structural change generated:

1. Spiral loops that add or delete system elements with their feedback connections (hypercycles).

2. Spiral loops that change feedback connections between existing system elements (recausalization loops).

Figure 2 shows how the system dynamics concept and the spiral loop methodology can be used in combination to represent the decision structures in companies.

The portfolio management process is formulated in the formal model as a meeting point - an "interface" - between an "inner" environment, the substance and organization of the diversified company itself, and an "outer" environment the surroundings in which it operates (see figure 3) (Simon 1981).

The *outer environment* of the portfolio management process is represented in the model by the following assumptions: The competitors of the company are aggregated in the model to one (duopoly situation) and are defined in the formal model with their planning system not with their resource system. The competitors generate their strategies using the growth share portfolio matrix of the BCG. We further assume, that the competitors generate their strategies without information about the strategies of the diversified company in question (Stackelberg dependence position). The development of the five markets, where the companies can have activities, is exogenously given in the model by the life cycles of the products. The marketing, production and R&D policies of the competing companies in the five markets can influence their market shares, but not the market growth generated exogenously by the product life cycles. On the

procurement market side the prices for the two competing diversified companies are exogenously given (polypol situation). The demand of the companies can be satisfied without limits in these markets.

The *inner environment* of the portfolio management process is represented in the formal model with the following assumptions: The rule-setting centralized portfolio mangement process is formulated with spiral loops on the basis of the portfolio heuristic of the BCG. The rule-fulfilling decentralized decision making processes and the resource systems of the SBUs are represented with positive and negative servomechanistic feedback loops which have a level-rate and policy substructure.

The DYNAMO equations 1 through 9 show how the portfolio management process, based on the concept of the BCG, can be formulated with spiral loops (an introduction to the simulation language DYNAMO is given in Richardson/ Pugh 1981; for the complete equations of the portfolio-simulation model see Merten 1985 and Löffler 1984).

The strategic positioning of the SBUs is represented in the model with four rules of critical load. An SBU is qualified by the first rule of critical load as a "poor dog" position (DOG(M)) if its market growth (MAWA(M)) is 10 per cent per year or less and its relative market share (MAAT(M)) is 1 or less. A minimum capital investment is necessary (KAPBIN>0) in "poor dog" positions for the positioning of SBUs.

```
DOG.K(M)=CLIP(1,0,CLIP(1,0,.1,MAWA.K(M))                    1, A
*CLIP(1,0,1,MAAT.K(M))*CLIP(0,1,0, KAPBIN.K(M)),1)
```

DOG	POOR DOG POSITION	(DL)
M	MARKET INDEX	(DL)
CLIP	DYNAMO MACRO (WHEN/IF DECISION FUNCTION)	(DL)
MAWA	MARKET GROWTH	(1/YEAR)
MAAT	RELATIVE MARKET SHARE	(DL)
KAPBIN	ACCUMULATED CAPITAL INVESTMENT	(DM)

SBUs with high market growth but a low relative market share are qualified by the second rule of critical load as "question mark" positions (QUE(M)), if the company already has investments in this business.

```
QUE.K(M)=CLIP(1,0,CLIP(0,1,.1,MAWA.K(M))                    2, A
*CLIP(1,0,1,MAAT.K(M))*CLIP(0,1,0,KAPBIN.K(M)),1)

   QUE          QUESTION MARK POSITION                      (DL)
```

SBUs are qualified as "star" positions (STA(M)) by the third rule of critical load, if their market growth and their relative market share are high.

```
STA.K(M)=CLIP(1,0,CLIP(0,1,.1,MAWA.K(M))                    3, A
*CLIP(0,1,1,MAAT.K(M)),1)

   STA          STAR POSITION                               (DL)
```

Finally, SBUs with a low market growth and a high relative market share are positionated by the fourth rule of critical load as "cash cow" positions (COW(M)).

```
COW.K(M)=CLIP(1,0,CLIP(1,0,.1,MAWA.K(M)                     4, A
*CLIP(0,1,1,MAAT.K(M)),1)

   COW          CASH COW POSITION                           (DL)
```

If an SBU is qualified by one of the four rules of critical load, than a norm-strategy (BCG strategy suggestion) becomes activated, which is defined for the specific problem. For each of the four strategic problems one norm-strategy is defined in the model. The norm-strategy generated for "poor dog" positions (MSTDOG(M)) is divestment (SFADOG(M)=.8); we invest in SBUs which are qualified as "question marks" (SFAQUE(M)=1.15); we also invest in "star" positions (SFASTA(M)=1.05) and we try to hold "cash cow" positions (SFACOW(M)=1). Instead of using one quantified multiplicator to represent each norm strategy, it is also possible to formulate for each strategic situation a different policy set (Löffler 1984). Equations 5 through 8 show how the four strategies are defined with strategic multiplicators (rules of strategy selection and strategy generation).

```
MSTDOG.K(M)=DOG.K(M)*SFADOG                                 5, A
SFADOG=.8                                                   5.1,C

   MSTDOG       POOR DOG NORM-STRATEGY                      (DL)
   SFADOG       POOR DOG STRATEGY FACTOR                    (DL)
```

```
MSTQUE.K(M)=QUE.K(M)*SFAQUE                                    6, A
SFAQUE=1.15                                                    6.1,C

   MSTQUE      QUESTION MARK NORM-STRATEGY                     (DL)
   SFAQUE      QUESTION MARK STRATEGY FACTOR                   (DL)


MSTSTA.K(M)=STA.K(M)*SFASTA                                    7, A
SFASTA=1.05                                                    7.1,C

   MSTSTA      STAR NORM-STRATEGY                              (DL)
   SFASTA      STAR STRATEGY FACTOR                            (DL)


MSTCOW.K(M)=COW.K(M)*SFACOW                                    8, A
SFACOW=1                                                       8.1,C

   MSTCOW      CASH COW NORM-STRATEGY                          (DL)
   SFACOW      CASH COW STRATEGY FACTOR                        (DL)
```

The top-down mangement factor (MAORFU(M)) takes the value of the norm strategy for an SBU with an information delay as shown in figure 9.

```
MAORFU.K(M)=DLINF3(MSTDOG.K(M)+MSTQUE.K(M)                     9, A
+MSTSTA.K(M)+MSTCOW.K(M),MPWZ)

   MAORFU      TOP-DOWN MANGAMENT FACTOR                       (DL)
   MPWZ        TIME TO CHANGE STRATEGY                         (YEARS)
```

The top-down management factor alters the bottom-up generated budgets and functional policies of the SBUs taking the financial constraints of the conglomerate into account (rule of strategy implementation). The bottom-up generated budgets are based on different kinds of information, like forecasts of the market development, information about competitors, and information about the company's costs and the capacities in the SBUs. The four spiral loops used to represent the portfolio management process are typically *recausalization loops*, because they can only change feedback connections within existing SBUs or between the portfolio mangagement and the SBUs.

The spiral loops used to represent the establishment of new businesses and the divestment of old businesses (*hypercycles*) are defined outside the portfolio matrix. The activation of new SBUs with high market growth, were we are presently not in (market share = 0) is dependent on the portfolio structure of the company. We invest in a new SBU with high

market growth, if the portfolio structure shows too many old SBUs and if we do not already have a new SBU ("question mark position"). We divest SBUs totally which are in "poor dog" positions, when their losses exceed a maximum acceptable level. We also divest "question mark" positions, when they generate losses and the financial situation of the company is critical. SBUs with low market growth where we are not yet in, or where we are out, are qualified as markets which are not interesting for the company. We do not invest in these markets.

Selected Results from the Portfolio Simulation Model

The formal portfolio simulation model helps us to explain the evolution of multibusiness firms in duopoly markets and it also can be used as a simulation game and a strategic decision support system. The results of two model test sets will be presented: (1) A competitive strategy test set; (2) a company strategy test set (for the complete results see Löffler 1984).

To show the qualitative and quantitative changes typical of the development of diversified firms, we present the results of the portfolio simulation model in three types of plots. The comparative dynamic portfolio plots show the development of the SBUs in the portfolio matrix over a 20 year (240 month) period in steps of four years. The sizes of the circles in these plots show us the percentage of earnings an SBU contributes to the total earnings of the conglomerate. The numbers used to draw the circles characterize the SBUs. The second type of plot shows us the evolutionary pathes of the SBUs in a portfolio matrix in a dynamic way. Besides these two new forms of plots, the DYNAMO plots are also available. The DYNAMO plots show the development of various variables of the SBUs and of the conglomerate over time.

Competitive Strategy Tests

The first model test set consists of two competitive strategy tests. The exogenously given product life cycles are assumed to be the same for both tests. We assume in the first competitive strategy test that the diversified company in question as well as its competitors generate their strategies according to the rules of the BCG portfolio heuristic. The only difference in the strategic behavior of the companies is to be seen in the fact that the diversified company in question anticipates the strategies of

the competitors (Stackelberg independence position), whereas the competitors do not anticipate (Stackelberg dependence position). The results of this model run are shown in figures 4 through 6.

As figure 4 shows the diversified company has four SBUs in the starting period. The SBUs are positioned in the portfolio matrix as follows: SBU 1 is in a "question mark" position; SBU 2 is a "star"; SBU 3 is qualified as a "cash cow"; and SBU 4 is in a "poor dog" position. The offensive strategy followed by SBU 1 increases its relative market share and leads to its positioning as a "star" after 4 years (period 48). The growth strategy of SBU 2 improves its "star" position in the first four years. The "cash cow" position of SBU 3 can be hold with a defensive strategy during the same period, and SBU 4 becomes divested as a "poor dog". After 8 years (period 96) the company consists of five SBUs, because a new SBU has been established in the fast growing fifth market. By period 144 the company has four SBUs again. SBU 4 has been totally divested. After 20 years (period 240) the company still has four SBUs: one is positionated as a "star" (SBU 5) and the other three SBUs are "cash cows". The size of the circles in figure 4 also indicates the shifts in the cash flow streams. In the first four years SBU 1 and SBU 2 need more financial funds than they can earn. These funds are provided by SBU 3 and SBU 4.

Figure 5 shows us the development of the SBUs in a dynamic view. This figure neatly visualizes the structural changes during the development of the company, which are generated by the hypercycles of the model. SBU 4 is divested and SBU 5 is newly established.

In figure 5 we can see the development of the turnover of the conglomerate (UMSATG), which is the result of the addition of the turnovers of the five SBUs (UMSATZ(1)-UMSATZ(5)). The importance of the turnovers of the different SBUs changes in the 20 year period. In the starting period SBU 3 has the highest turnover; later on SBU 1 and SBU 2 dominate; at the end of the simulation run the turnover of SBU 5 is highest.

In the second competitive strategy test we assume that the competitors act opposite to the investment suggestions typically derived from the portfolio matrix of the BCG. In this case the competitors divest "question mark" positions; they try to hold "star" positions; and they invest in "poor dog" and "cash cow" positions. The results of this competitive strategy test are shown in the figures 7 through 9.

Figure 7 shows that we have the same starting position as we had in the last test and that the development of the SBUs is also similar to the first test until period 96. The declining demand in the markets of SBU 1 and SBU 2, generated by the exogenous product life cycles, leads to a

repositioning of these two business units so that what were once "star" products become "cash cows" and, for the competitor, what were once "question marks" become "poor dogs." The atypical offensive strategies of the competitors in "poor dog" positions together with the companies defensive strategies in "cash cow" positions influence the development of the two business units and of the conglomerate from period 96 on in a negative way. The competitors win market shares in these two markets with their offensive strategies, which cause overcapacities by the company in question and a rise in its costs per unit and its prices. Because of the rise in price the company loses further market shares to its competitors which causes further cost and price increases. At the end of the simulation run SBU 1 is in a "poor dog" position and becomes divested. SBU 2 is still in a "cash cow" position but with a strong tendency towards a "poor dog" position. The portfolio atypical behavior of the competitors does not change the development of the "cash cow" position SBU 3 drastically. The development of SBU 5 over the twenty years period is slightly better, because the defensive strategies of the competitors make it easier for the company to establish this SBU in a "star" position.

Figure 8 is a dynamic representation of the development of the SBUs with the portfolio atypical behavior of the competitors.

In figure 9 we can see the influence of the atypical behavior of competitors on the total turnover of the conglomerate and on the turnover of the SBUs. The aggregated turnover of the company is 25 per cent less than in the first competitive strategy test. This decline is predominantly caused by the 70 per cent decline in the turnover of SBU 1 and the 40 per cent decline in the turnover of SBU 2. This decline in turnover can not be compensated with the 10 per cent increase in the accumulated turnover of SBU5. After 20 years (period 240) 55 per cent of the conglomerates turnover are generated in SBU 5: this is 20 per cent more than in the basic run. The high turnover percentage of SBU 5 indicates a high risk concentration within the conglomerate, which can cause severe difficulties in the company's future development.

If we now compare the results of the two competitive strategy tests (see figure 10), we can conclude, that it is very important for a diversified company to have the right expectations about the behavior of the competitors in duopoly markets. The simulations also show that it may be extremely dangerous for a company to follow the investment suggestions typically drawn from the Boston Consulting Group portfolio matrix, if the competitors choose a course of action that is contradictory to normative situations.

Company Strategy Tests

With the company strategy test set we examine the influence of different portfolio positioning strategies on the develoment of the diversified company. The exogenously given product life cycles are assumed to be the same for both tests and we also assume, that a depression of the whole economy negatively influences the market growth rates in all markets. In the first company strategy test we further assume that the company in question follows a fixed cut off point strategy, i.e. it classifies SBUs with a market growth rate higher than 10 per cent as "question marks" or "stars" and SBUs with a market growth rate lower than 10 per cent as poor dogs or cash cows. We assume additionally that the competitors follow a variable cut off point strategy, i.e. they reduce their cut off point in case of a depression. The reduction of the cut off point is oriented on the average growth rate of all markets. The results of this model run are shown in figures 11 through 13.

Figure 11 shows that the diversified company has four SBUs in the starting period, which are in the same position as they were in the first test set. The offensive strategy followed by SBU 1 increases its relative market share and leads to its poitioning as "star" after 4 years (period 48). The growth strategy of SBU 2 improves its relative market share in period 48. The decreasing market growth rate of SBU 2 leads to its positioning as "cash cow" in period 144.

The shift of SBU 1 and SBU 2 from "star" to "cash cow" positions is a result of the fixed cut off point strategy of the company and the decrease in the market growth rates of these two markets. The positioning of SBU 1 and SBU 2 as "cash cows" causes a change from growth strategies to defensive strategies for both businesses. The competitors, in opposite, reduce their cut off point because of the declining market growth rates and position SBU 1 and SBU 2 as "stars" in period 144. The competitors, therefore, follow offensive strategies in SBU 1 and SBU 2.

The competitors win market shares in these two markets with their offensive strategies, which cause overcapacities by the company in question and a rise in its cost per unit and its prices. Because of the rise in price the company loses further market shares to its competitors which causes further cost and price increases. After 20 years (period 240) SBU 1 and SBU 2 are therefore close to poor dog positions. SBU 4 is not existent any more because it was already divested in period 144. There are also no investments in SBU 5 because of its small market growth rate and the relatively high cut off point defined by the company. SBU 3 is after 20 years also in a poor dog position. After 20 years the company has only three

SBUs, two of them are poor dogs and one is on its way to become a poor dog.

Figure 12 is a dynamic representation of the development of the SBUs with the fixed cut off point strategy of the company.

In figure 13 we can see the influence of the fixed cut off point strategy on the total turnover of the conglomerate and on the turnover of the SBUs. The aggregated turnover of the company declines 35 per cent, if compared with the initial turnover in period 0. After 20 years we have a risk concentration on SBU 1. This SBU generates 50 per cent of the total turnover of the company.

We change only one assumption in the second company strategy test. The company in question now also follows a variable cut off point strategy. The results of this model run are shown in figures 14-16.

Figure 14 shows that we have the same starting point as we had in the other model tests. The offensive strategies followed by SBU 1 and SBU 2 increase their relative market shares. After 8 years (period 96) the company has in both businesses a dominant market position.

Because of the depression of the economy the market growth rates of SBU 1 and SBU 2 decline. The decline in the market growth rate causes, because of the variable cut off point strategy, a reduction of the cut off point of the company, which can be seen in figure 14 in the downward move of the cut off line. One consequence of the reduction of the cut off point is that SBU 1 and SBU 2 are positionated still as "stars". With the growth strategies generated by the model in "star" positions the company can defend its market shares in SBU 1 and SBU 2 until the end of the simulation run. A further implication of the reduced cut off point strategy of the company is that SBU 5 is identified as an attractive market in period 96 and is positionated in period 144. Between period 96 and period 144 SBU 5 generates costs but no turnover. The offensive strategy followed by SBU 5 increases its relative market share and leads to its positioning as a star in period 240.

SBU 4 is in a "poor dog" position" at the begin of the simulation run and is divested in period 144. SBU 3 can defend its "cash cow" position with defensive strategies. After 20 years (period 240) the company has four SBUs: SBU 5 is in a "star" position, SBU 1 and SBU 2 are on their way from "star" to "cash cow" positions; and SBU 3 has a tendency towards a "poor dog" but is still positionated as a "cash cow".

Figure 15 is a dynamic representation of the development of the SBUs with the variable cut off point strategy.

In figure 16 we can see the development of the turnover of the conglomerate (UMSATG) and the development of the turnover of the SBUs

over a 240 month period (20 years). The turnover of the conglomerate can be stabilized with the variable cut off point strategy nearly exactly on its initial level. In period 240 the total turnover of the company is 55 per cent higher than in the model run with a fixed cut off point strategy. The company risk, measured at the turnover percentages of the SBUs, is now distributed in period 240. SBU 2 contributes 40 per cent, SBU 1 contributes 36 per cent and SBU 3 and SBU5 each contribute 12 per cent to the total turnover of the conglomerate.

If we now compare the results of the two company strategy tests (see figure 17), we can conclude, that the decisions about the cut off points in the portfolio matrix are extremely important. The fixed cut off point strategy suggested by the BCG may create a disaster if a depression of the whole economy takes place. In this situation the fixed cut off point strategy could lead to "wrong" positioning of the SBUs. A variable cut off point strategy generates much better results in such a situation.

Conclusions

The two test sets of the portfolio simulation model show, that the portfolio simulation model can be an effective tool to support the portfolio management process of diversified firms. The simulations also show two severe limitations of the BCG portfolio approach:

1. The simulation experiments demonstrate that it can be extremely dangerous for diversified companies to follow the investment suggestions typically drawn from the Boston Consulting Group portfolio matrix, if competitors choose a course of action that is contradictory to normative situations.

2. The fixed cut off point strategy of the Boston Consulting Group portfolio matrix can create a disaster if a depression of the whole economy takes place. In this situation the fixed cut off point strategy could lead to "wrong" positioning of the strategic business units.

The portfolio simulation model further allows us to look at the "growth" of a firm not just in a quantitative but also in a qualitative way. The structural changes within the portfolio of multibusiness firms, shown explicitly with the portfolio simulation model, are typically a point of major concern in the strategic management process of diversified companie

Notes

(1) This paper summarizes the results of a research project presently undertaken at the Industrieseminar Mannheim University and the Institute for Marketing Mannheim University by Reiner Löffler, Peter Merten and Peter Wiedmann.

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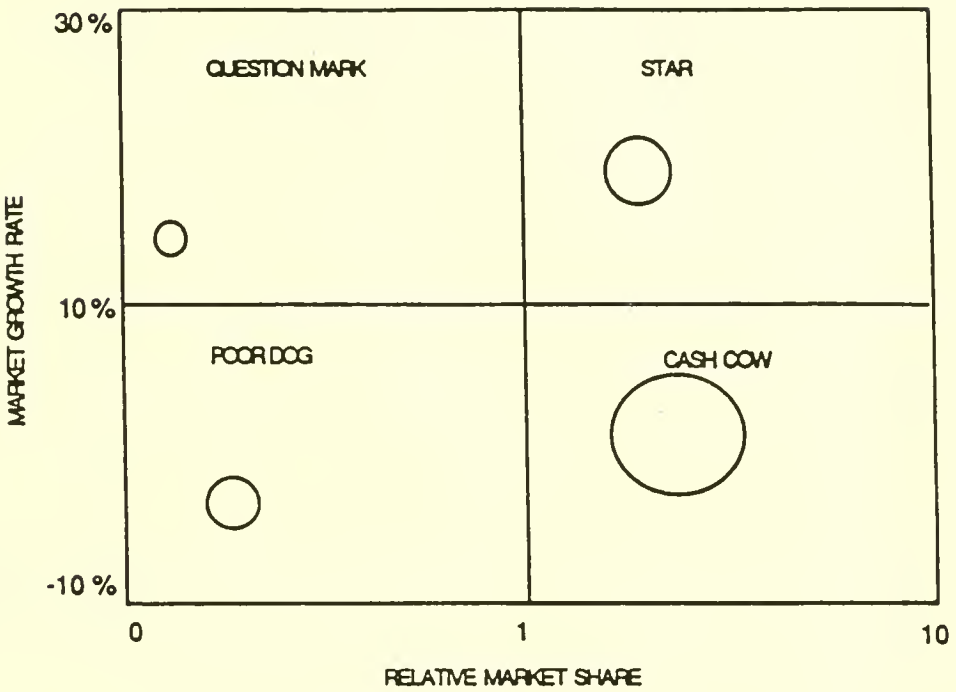

Figure 1: The growth-share portfolio matrix of a diversified company.

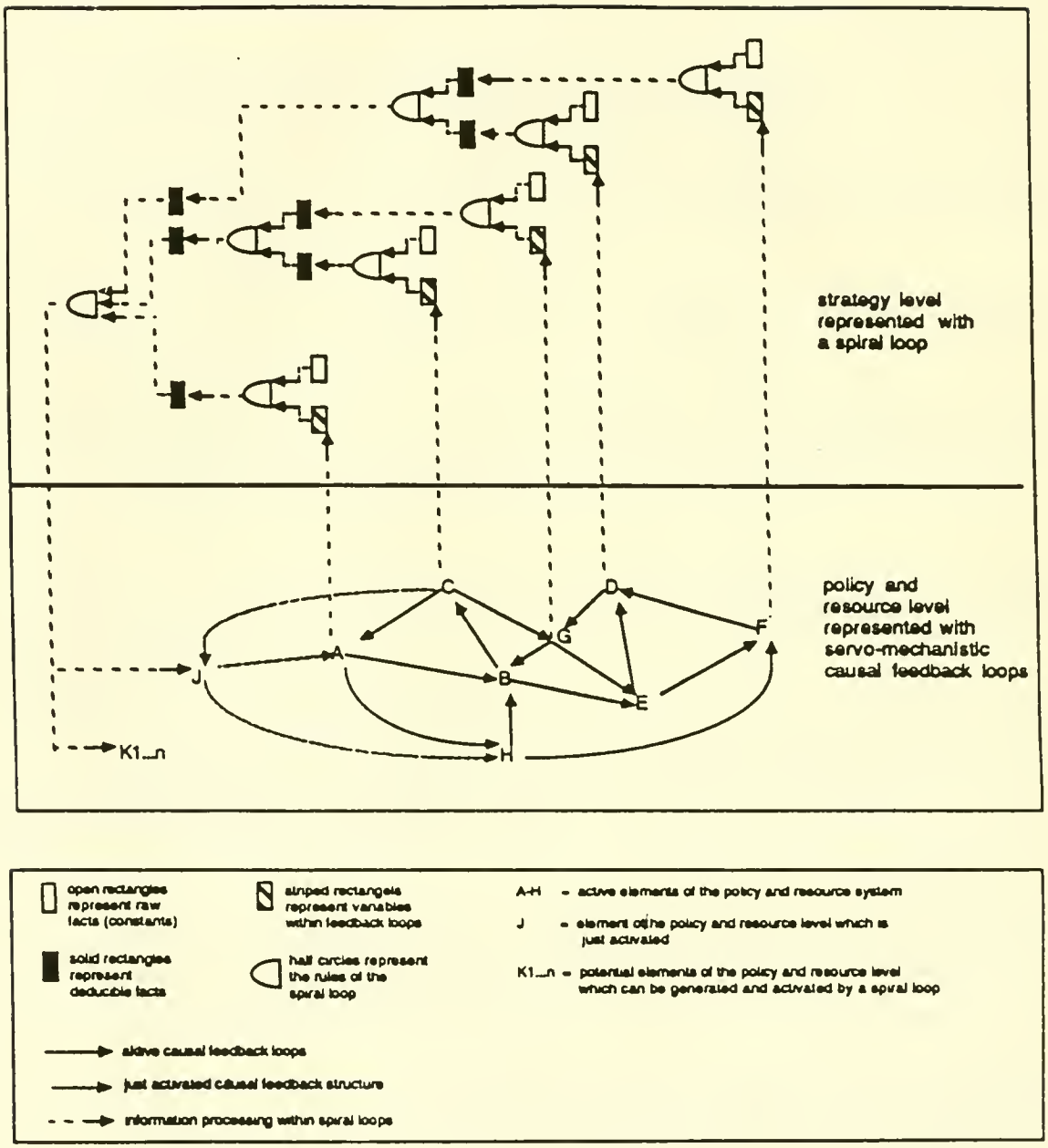

Figure 2: The representation of a company with spiral loops and servomechanistic causal feedback loops.

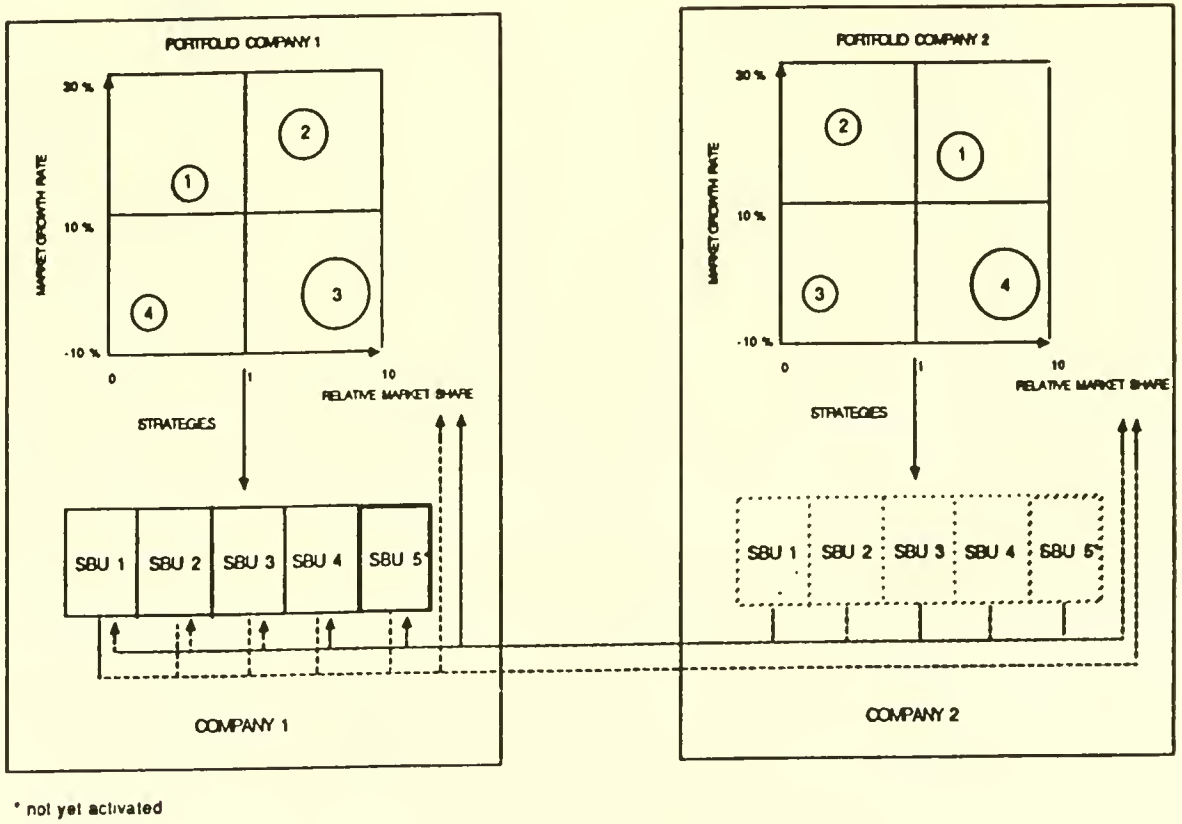

Figure 3: The generic structure of the portfolio simulation model.

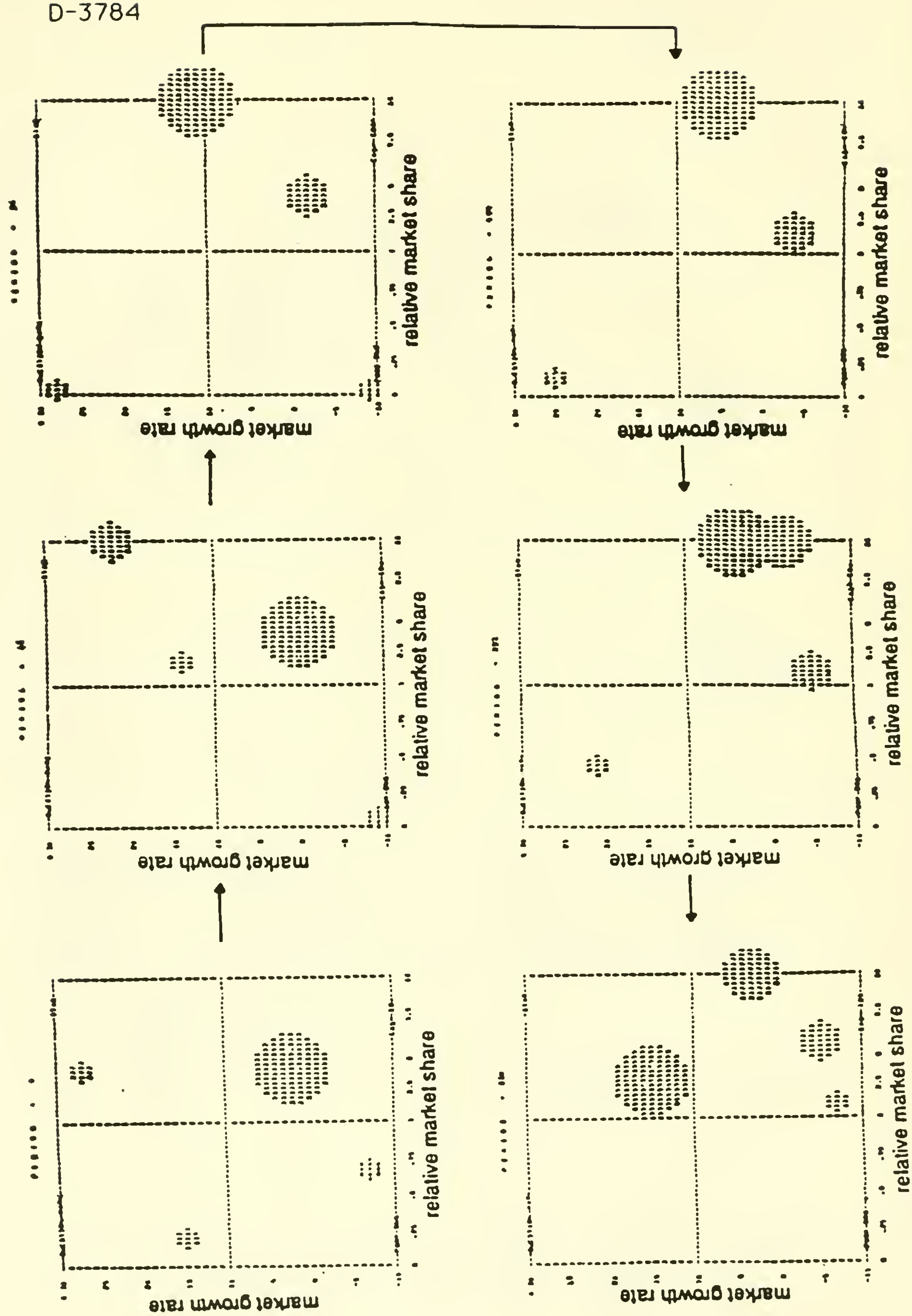

Figure 4: Portfolio development in the case of portfolio typical reactions of

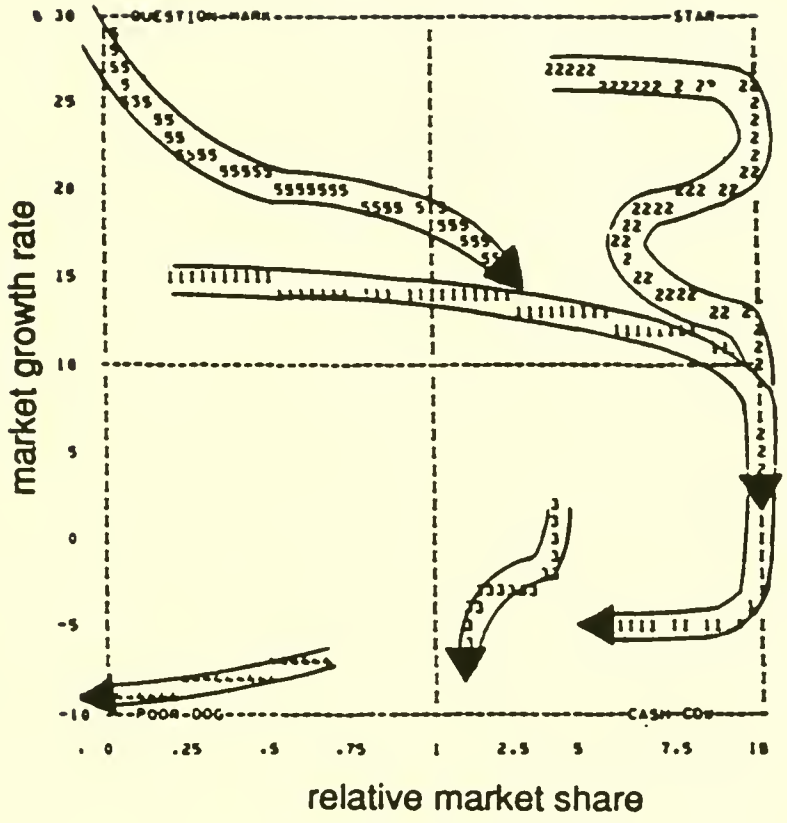

Figure 5: Portfolio development in the case of portfolio typical reactions of competitors (dynamic view).

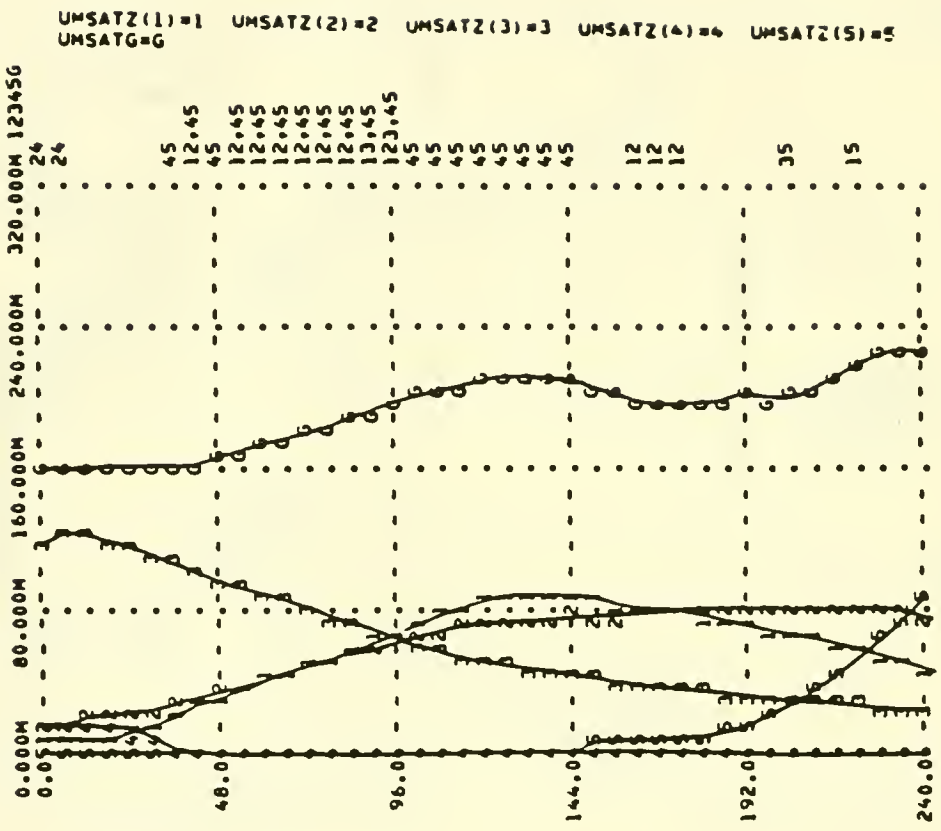

Figure 6: The development of the turnover of the conglomerate in the case of portfolio typical reactions of competitors.

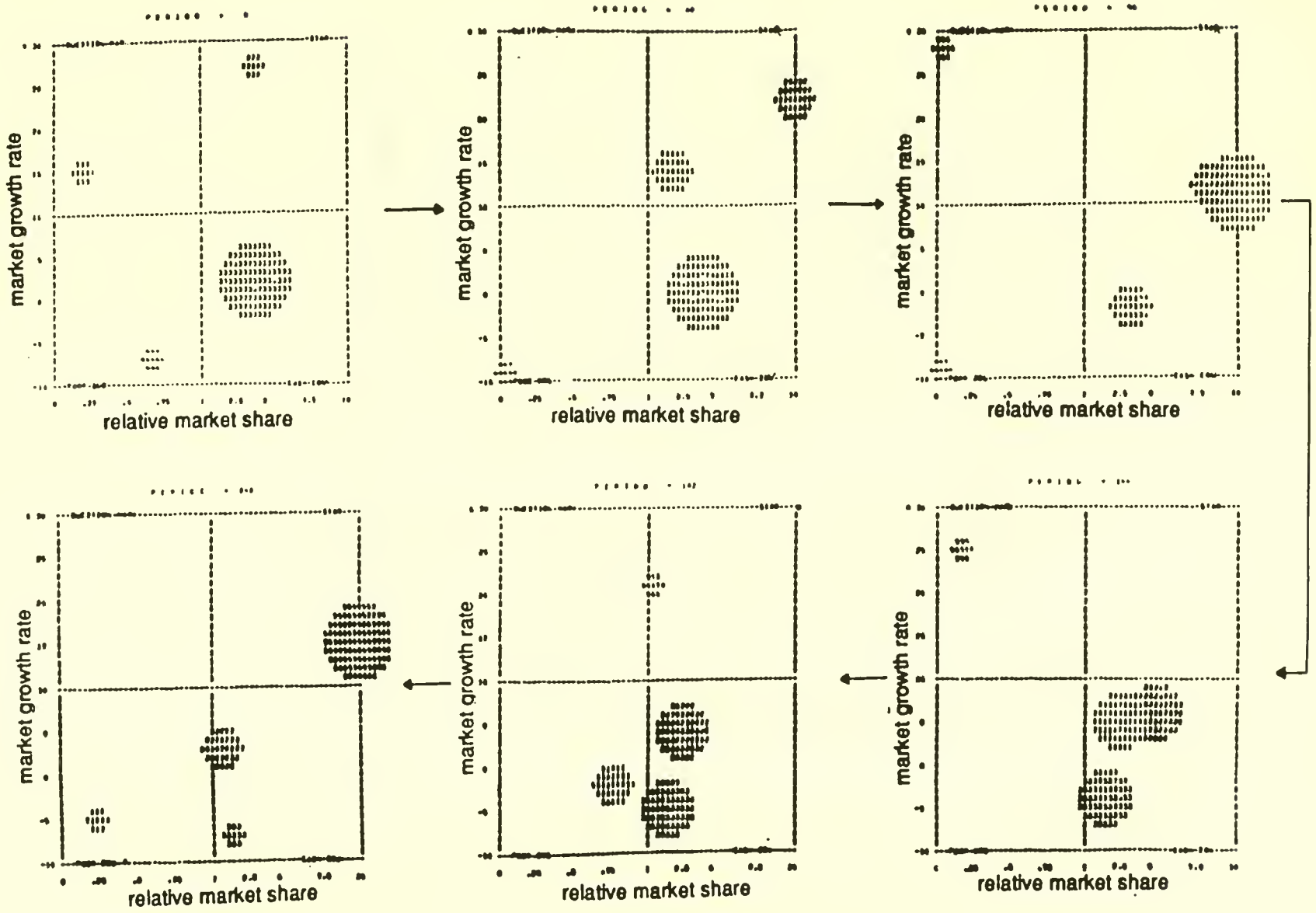

Figure 7: Portfolio development in the case of portfolio atypical reactions of competitors (comparative dynamic view).

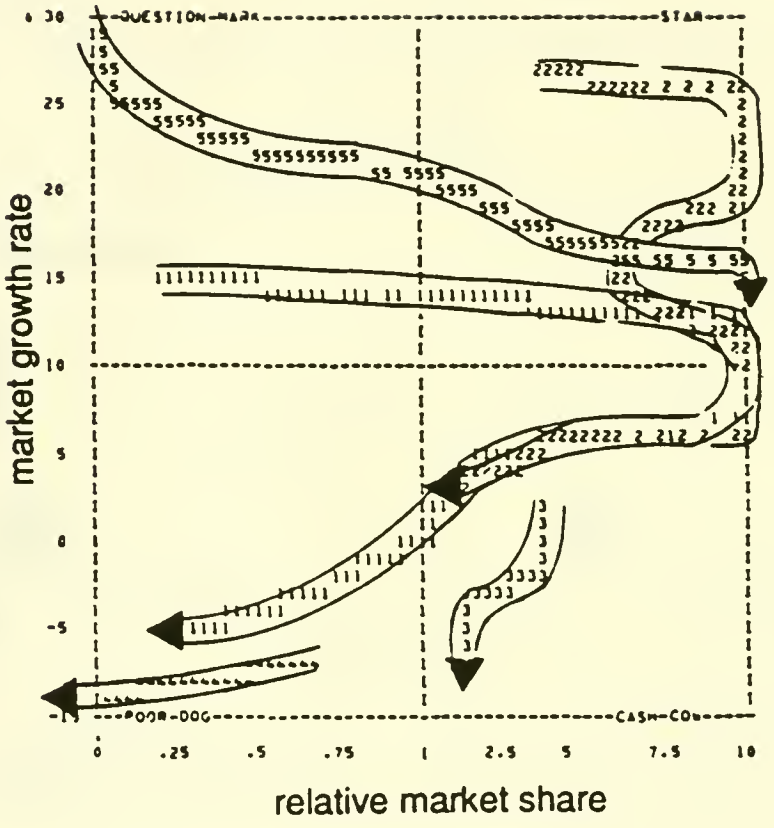

Figure 8: Portfolio development in the case of portfolio atypical reactions of competitors (dynamic view).

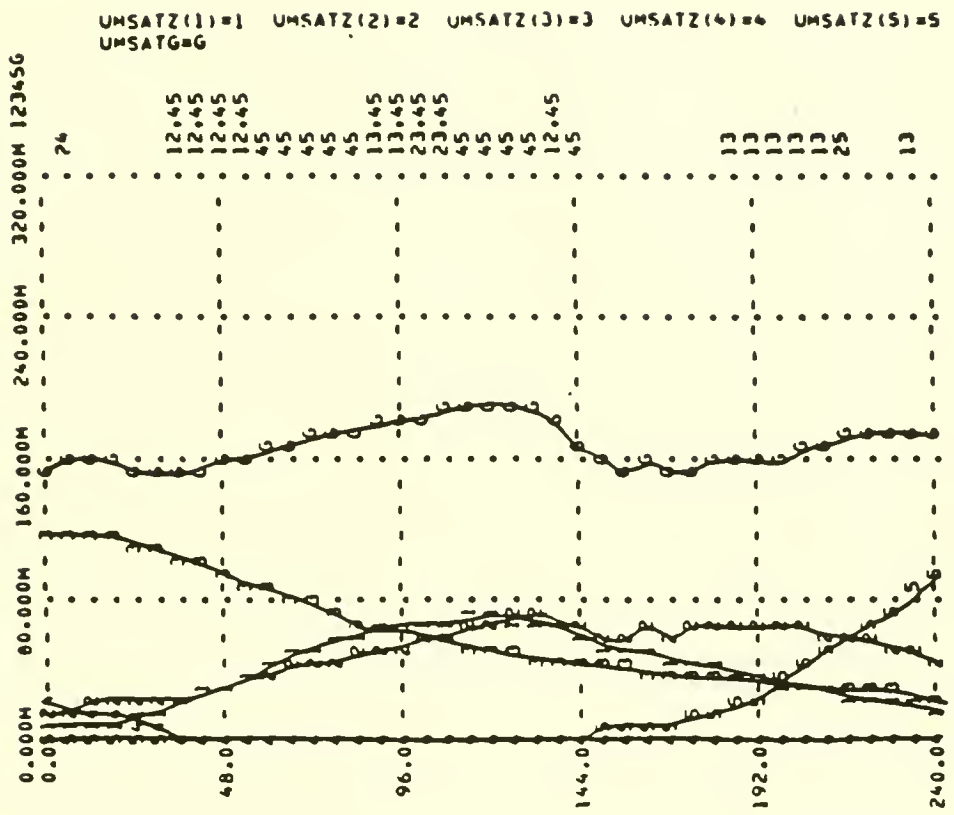

Figure 9: The development of the turnover of the conglomerate in the case of portfolio atypical reactions of competitors.

Behaviour of Competitors	
portfolio-typical	portfolio-atypical
Portfolio Structure Period=240	
sbu1,2 and 3 are in solid cash cow positions ; sbu5 is a star with good perspectives for a cash cow position, because the competitors retreat.	sbu1 is divested as a poor dog, and sbu2 tends to be a poor dog in the near future; sbu3 is a solid cash cow; sbu5 is a star position which competitors attack.
Indicators on Company Level Period=240	
Sales: 230 mln. DM/month	180 mln. DM/month, i.e 25% less.
Workers: 15 000 men	11500 men, i.e. 25% less.
Earnings: 24 mln DM/month	22 mln DM/month, i.e. 10% less.
Accumulate Earnings: 4.6 bln DM	3.6 bln DM, i.e. 25% less.
Company Risk Period=240	
Sales, earning and employment risk is divided between the sbu.	Risk concentration on sbu5: 55% of total sales, 53% of total workers, 90% of total earnings.

Figure 10: Comparison of the consequences of different competitive strategy tests.

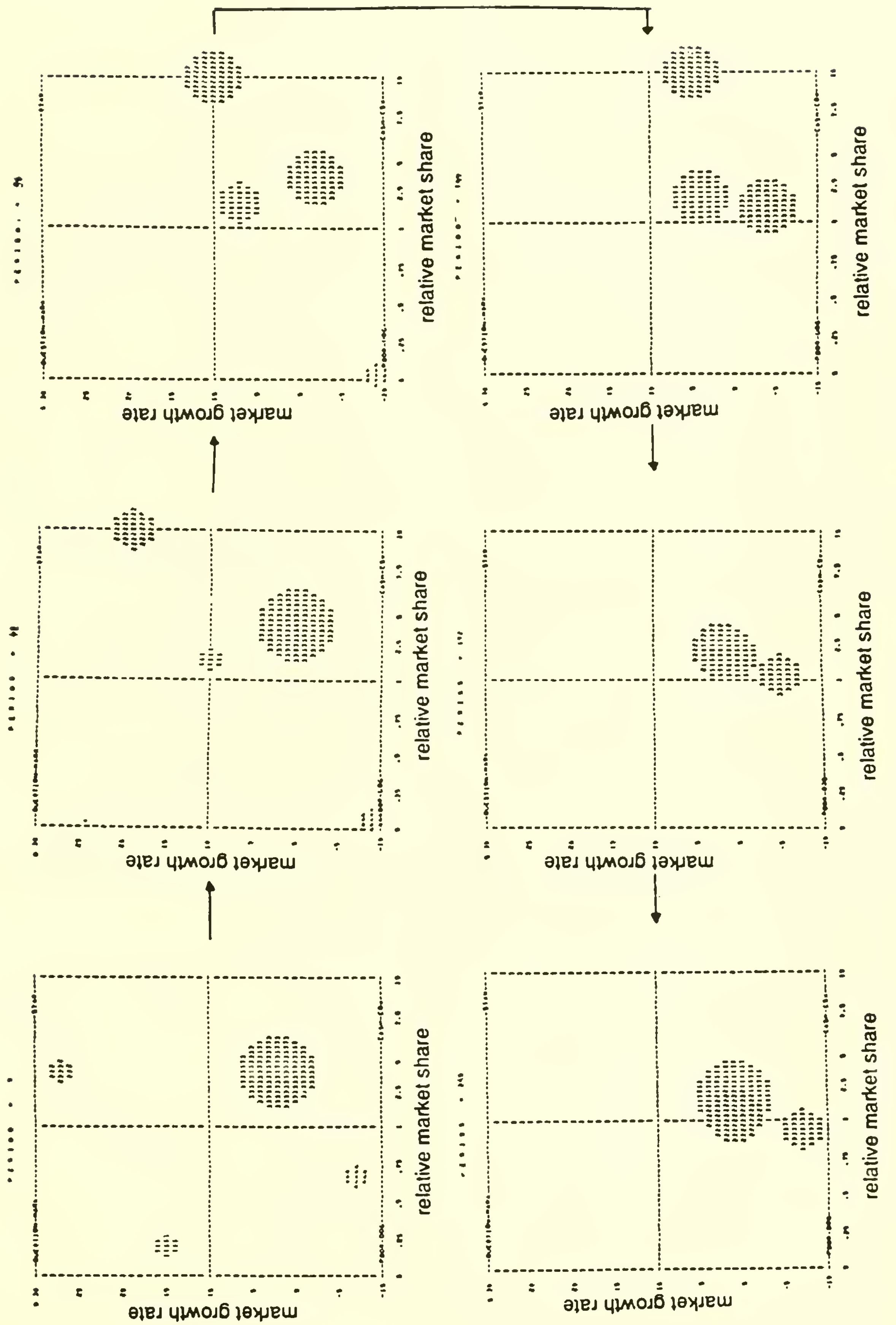

Figure 11: Portfolio development in the case of a fixed cut off point strategy (comparative dynamic view).

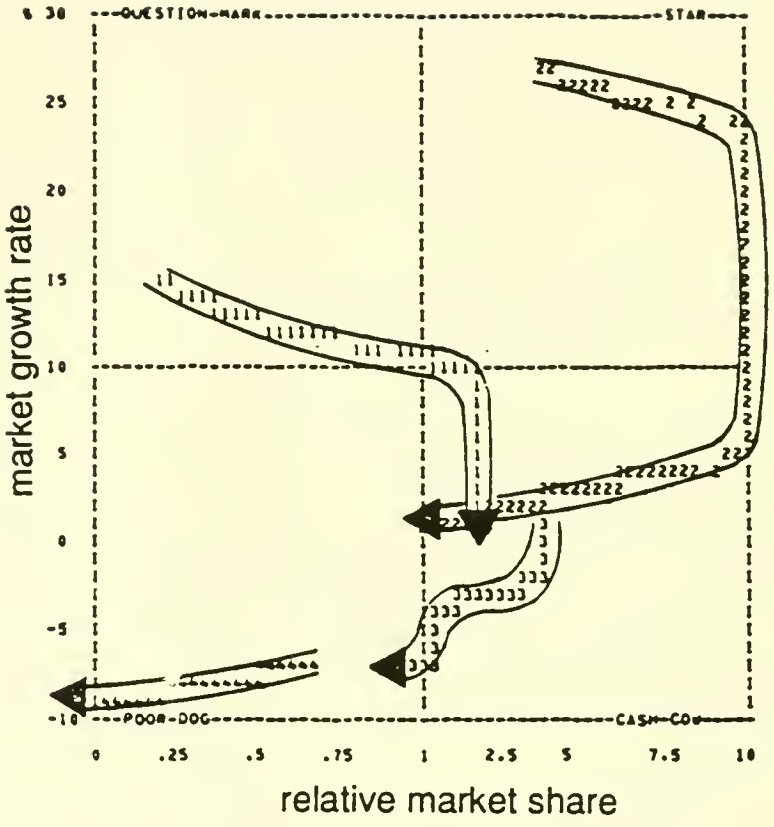

Figure 12: Portfolio development in the case of a fixed cut off point strategy (dynamic view).

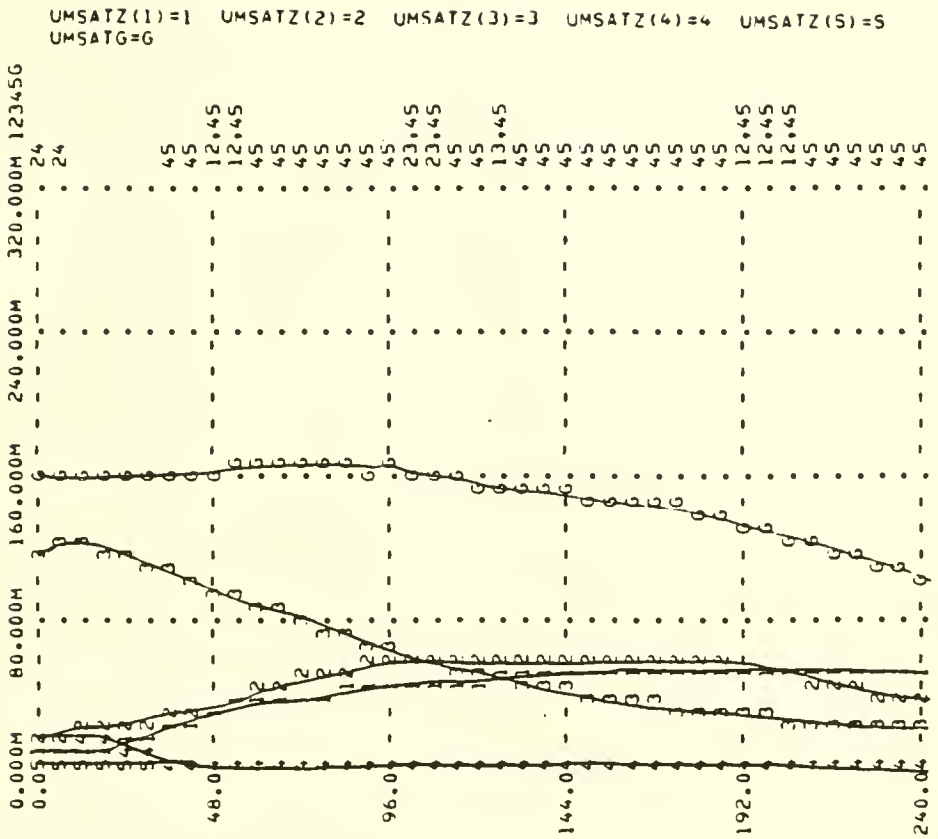

Figure 13: The development of the turnover of the conglomerate in the case of a fixed cut off point strategy.

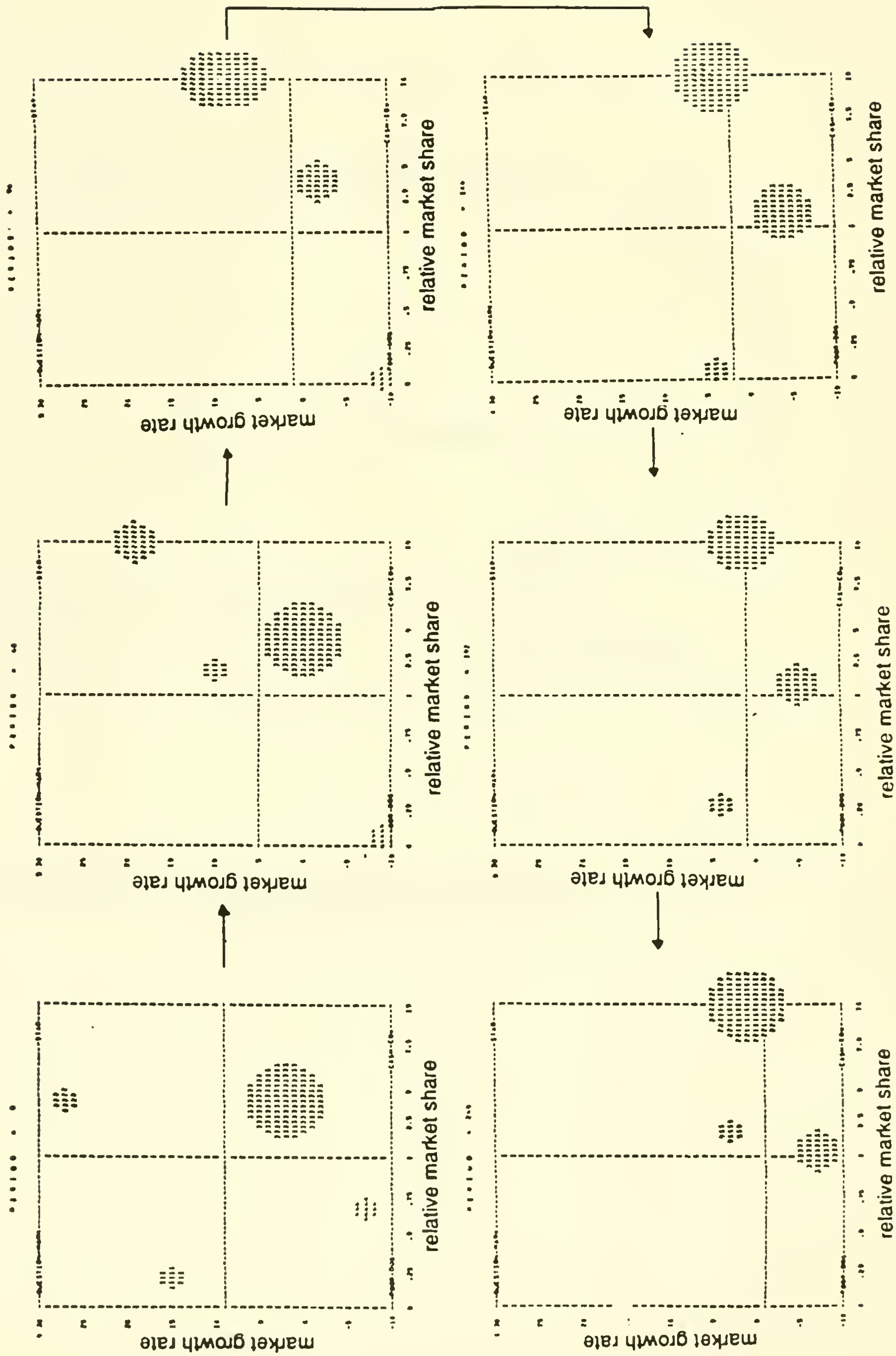

Figure 14: Portfolio development in the case of a variable cut off point

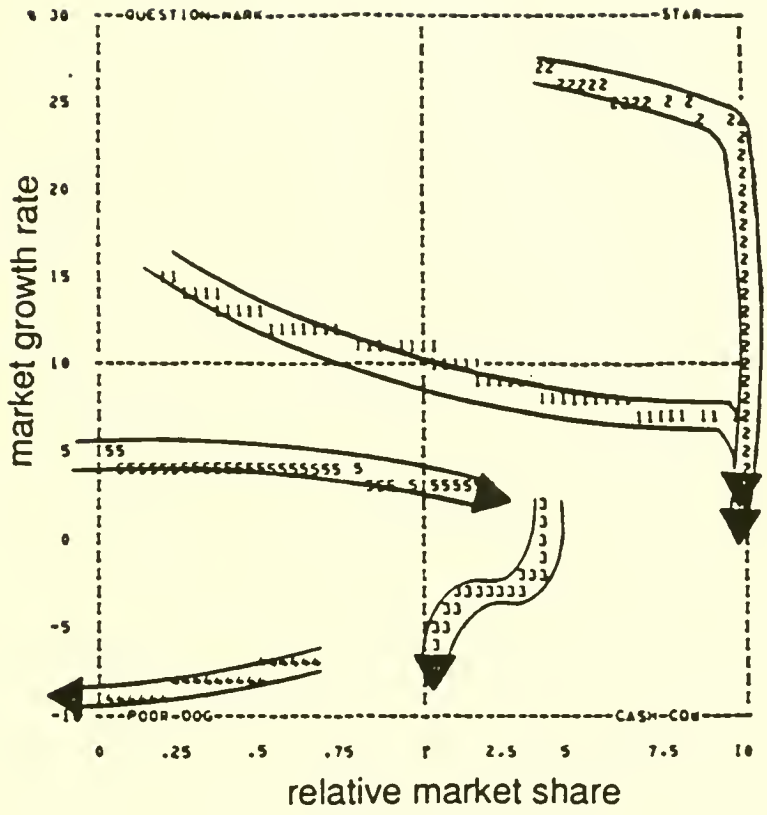

Figure 15: Portfolio development in the case of a variable cut off point strategy (dynamic view).

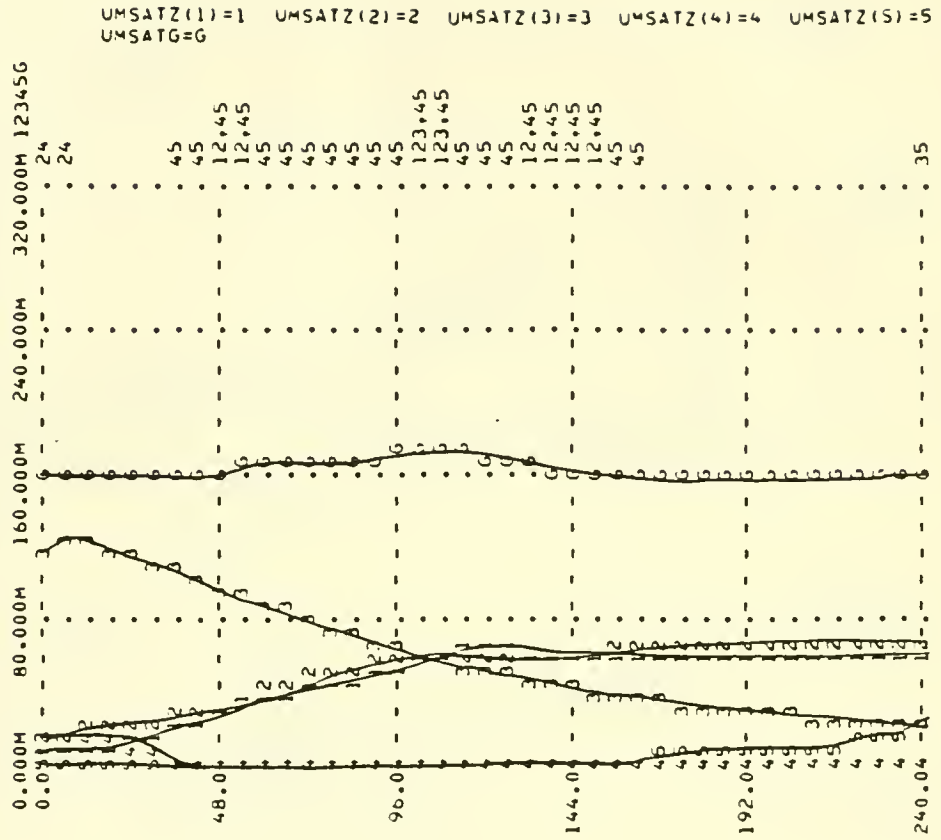

Figure 16: The development of the turnover of the conglomerate in the case of a variable cut off point strategy.

Company Strategy	
Fix Cut Off Point Strategy	Variable Cut Off Point Strategy
Portfolio Structure Period=240	
sbu1 is in a weak cash cow position; sbu2 is a solid cash cow developing into a poor dog	sbu1 and sbu2 are in strong star positions.
sbu3 is in a poor dog position	sbu3 is in a cash cow position. sbu5 is in a strong star position.
Indicators on Company Level Period=240	
Sales: 102 mln DM/month	159 mln DM/month, i.e. 55% increase.
Workers: 7500 men	11000 men, i.e. 50% increase.
Earnings: 5 mln DM/month	5.7 mln DM/month, i.e. 12% more.
Accumulate Earnings: 3.8bln DM	3.2bln DM, i.e. 15% less.
Company Risk Period=240	
Risk concentration on sbu1	Risk is divided between sbu1 and sbu2.

Figure 17: Comparison of the consequences of different company strategies.

Date Due