Case

Blue Mountain Coffee • ADBUDG



1. Before beginning any case, students should familiarize themselves with the model being used. Marketing Engineering for Excel comes with tutorials that demonstrate the capability of each model. The tutorial can be found under each model within the ME►XL menu after starting Excel. These tutorials are designed to work with our OfficeStar examples which are located in the My Marketing Engineering directory, usually installed in My Documents during software installation.
2. The spreadsheet is located in the **My Marketing Engineering** directory (usually located within My Documents):

   Blue Mountain Coffee Data (ADBUDG).xls

Overview

ADBUDG is an advertising sales response model developed by Little (1970) that uses judgmental inputs about market responses to determine the best level and timing of advertising expenditures. This implementation of ADBUDG is designed to accompany the Blue Mountain Coffee case.

Background

Blue Mountain's share of the coffee market slipped badly during past decades, though its brand share recently has stabilized. The advertising manager was concerned because the increased advertising budget he had obtained the previous year was cut back in midyear because top management was dissatisfied with the results. In addition, he thought it was vital to increase Blue Mountain's share so it would not lose distributors.

The advertising manager faced the problem of preparing and justifying an advertising budget for the coming fiscal year. He was considering using the ADBUDG model to help him.

In May 1994, Reginald Van Tassle, advertising manager for the Blue Mountain Coffee Company, tugged at his red mustache and contemplated the latest market share report. It was a dismal moment. "Blimey," he muttered, "I've got to do something to turn this darned market around before it's too late for Blue Mountain and for me. But I can't afford another mistake like last year's." Van Tassle had been hired by James Anthoney, vice president of marketing for Blue Mountain, in the summer of 1992. Prior to that time, he had worked for companies in the Netherlands and Singapore, gaining a reputation as a sharp and effective advertising executive. Now, in the spring of 1994, he was fighting to reverse a long-term downward trend in Blue Mountain's market position.

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Lucinda Pogue (the president and a major stockholder of the Blue Mountain Company) also had been dismayed to hear that Blue Mountain Coffee's share of the market was dropping back toward 5.4 percent, where it had been a year before. She remarked, rather pointedly, to Reggie that if market share and profitability did not improve during the next fiscal year, she might have to take "some rather drastic actions," murmuring something about "a ticket back to Singapore."

Blue Mountain's market position

Blue Mountain Coffee was an old, established company in the coffee business, with headquarters in Squirrel Hill, Pennsylvania. Its market area included the East Coast and Southern regions of the United States, as well as a fairly large portion of the Midwest. During its "good old days" in the 1950s, the company had enjoyed as much as 15 percent of the market in these regions. The brand had been strong and growing, and the company sponsored such popular radio and TV programs as "The Blue Mountain Comedy Hour" and "Blue Mountain Capers."

Blue Mountain began to experience difficulties in the 1960s: TV production and time costs rose, and competition stiffened as giant marketers like General Foods and Proctor & Gamble absorbed many other regional, old-line companies. Furthermore, the advent of freeze-dried products and the increasing promotion and popularity of instant coffee put additional pressure on Blue Mountain, which stuck with its traditionally ground, vacuum-packed coffee as its only line.

Nonetheless, Blue Mountain's troubles had only started. American coffee consumption dropped steadily in the 1970s and 1980s after peaking in 1962, when 74 percent of Americans drank about three cups per day. By the end of the 1980s, only about half of all Americans drank coffee, and they were drinking only an average of 1.7 cups per day. At the same time, the coffee market became more oligopolistic, and the "Big Three"—Procter & Gamble (Folgers), Kraft General Foods (Maxwell House), and Nestle (Nescafe)—together controlled more than three-quarters of the national market. Coffee was considered a commodity, and competition centered mainly on price. In these circumstances, Blue Mountain's share slipped from 12 percent at the beginning of the 1980s to about 5.5 percent at the end of the decade.

Since then, however, its share has been fairly stable. Management attributed this stability to a hard-core group of loyal buyers combined with an active (and expensive) program of consumer promotions and price-off deals to the trade. Jim Anthoney, vice president of marketing, believed that they had halted the erosion of share just in time. A little more slippage, he said, and Blue Mountain would begin to lose distributors, which would mark the beginning of the end for this venerable company.

Operation Breakout

When Lucinda Pogue became president in 1990, her main objective was to halt the decline in market position and, if possible, bring about a turnaround. She had succeeded in the first objective. However, she and Anthoney agreed that the strategy they were using—intensive consumer and trade promotions—would not win back much of the lost market share.

They both thought that they needed to increase consumer awareness of the Blue Mountain brand and develop more favorable attitudes about it to improve its market position. They could do so only through advertising. Because the company produced a quality product (noticeably richer and more aromatic than many competing coffees), they believed a strategy of increasing advertising weight might succeed. They therefore initiated a search for a new advertising manager and eventually hired Reginald Van Tassle.

DUXBURY PRESS

After a period of familiarizing himself with the Blue Mountain Company, the American coffee market, and the advertising scene, Van Tassle began developing a plan to revitalize Blue Mountain's advertising program. The first step was to release the company's current advertising agency and request proposals from a number of others interested in obtaining the account. Although he told them that the amount of advertising might increase somewhat, he emphasized that he was most concerned with the copy's appeal and execution. The company and the various agencies agreed that nearly all the advertising budget should go to spot television. Network sponsorship was difficult because of the regional character of Blue Mountain's markets, and no other medium could match the impact of TV for a product like coffee.

The team from Aardvark Associates, Inc., won the competition with an advertising program built around the theme "Blue Mountain Pure." Aardvark recommended a 30 percent increase in the quarterly advertising budget to give the new program a fair trial. After considerable negotiation with Pogue and Anthoney and further discussion with the agency, Van Tassle compromised on a 20 percent increase. The new campaign was to start in the autumn of 1993, the second quarter of the company's 1994 fiscal year (the fiscal year started July 1, 1993, and would end June 30, 1994). It was dubbed "Operation Breakout."

Blue Mountain had been advertising at an average rate of $2 million per quarter for the last several years, seemingly enough to maintain its current market share of approximately 5.4 percent. Neither Van Tassle nor Anthoney anticipated that competitors' expenditures would change much during the next few years, regardless of any increase in Blue Mountain's advertising.

One basis for the 1994 plans was the expectation that the quarterly spending level of $2 million (ignoring several variations) would be enough to maintain market share at its current 5.4 percent level. Van Tassle believed increasing advertising by 20 percent would increase market share to 6 percent.

This projected result sounded pretty good to Pogue, especially after she had consulted the company's controller. The controller wrote her a memorandum about the advertising budget increase and its results (Exhibit 1).

Van Tassle had, of course, warned that the hoped-for 6 percent share was not a sure thing and, in any case, it might take more than one quarter before the company saw the full effects of the new advertising program.

The new advertising campaign broke as scheduled on October 1, 1993, the first day of the second quarter of the fiscal year. Van Tassle was a bit disappointed with Aardvark's commercials and a little worried by early reports from the field. Nevertheless, he thought that, given a little time, things would work out, and the campaign would eventually reach its objective.

The October, November, and December market share report came through in mid-January. Blue Mountain's share of the market: 5.6 percent. On January 21, 1994, Van Tassle received a carbon copy of a memorandum to Pogue from I. Figure (Exhibit 2).

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CONFIDENTIAL MEMO

To: Lucinda Pogue, President

From: I. Figure, Controller

Subject: Proposed 20 percent increase in advertising

I think that Reggie's proposal to increase advertising by 20 percent (from a quarterly rate of $2.0 million to one of $2.4 million) is a good idea. He predicts that we will achieve a market share of six percent, compared to our current 5.4 percent. I can't comment about the feasibility of this assumption: that's Reggie's business, and I assume he knows what he's doing. I can tell you, however, that such a result would be highly profitable.

As you know, the wholesale price of coffee has been running about $17.20 per 12-pound case. Deducting our average retail advertising and promotional allowance of $1.60 per case and our variable costs of production and distribution of $11.10 per case leaves an average gross contribution to fixed costs and profit of $4.50 per case.

Figuring a total market of about 22 million cases per quarter and a share change from 0.054 to 0.060 (a 0.006 increase), we would have the following increase in gross contribution:

Change in gross contribution = $4.50 x 22 million × .006

= $0.60 million

By subtracting the amount of the increase in advertising expense due to the new program and then dividing by this same quantity, we get the advertising payout rate:

Advertising payout rate = change in gross contribution

– change in ad expense

Change in ad expense = $0.10 million/ $0.20 million

= 0.50

That is, we can expect to make $.50 in net contribution for each extra dollar spent on advertising. You can see that as long as this quantity is greater than zero (at which point the extra gross contribution just pays for the extra advertising), increasing our advertising is a good deal.

I think Reggie has a good thing going here, and my recommendation is to go ahead. Incidentally, the extra funds we should generate in net contribution (after advertising expense is deducted) should help to relieve the cash flow bind that I mentioned last week. Perhaps we will be able to maintain the quarterly dividend after all.

EXHIBIT 1: Memo from I. Figure to L. Pogue, 1 August 1993.

MEMO

To: Lucinda Pogue, President

From: I. Figure, Controller

Cc: R.J. Anthoney, R. Van Tassle

Subject: Failure of advertising program

I am most alarmed at our failure to achieve the market-share target projected by Reginald Van Tassle. The 0.2 point increase in market share we achieved in October–December is not sufficient to return the cost of the increased advertising. Ignoring the month of October, which obviously represents a start-up period, a 0.2 point increase in share generates only $200,000 in extra gross contribution per quarter. This must be compared to the $400,000 we have expended in extra advertising. The advertising payout rate is thus only 0.50—much less than the breakeven point.

I know Mr. Van Tassle expects shares to increase again next quarter, but he has not been able to say by how much. The new program projects an advertising expenditure increase per quarter of $400,000 over last year's winter-quarter level. I don't see how we can continue to make these expenditures without a better prospect of return on our investment.

EXHIBIT 2: Memo from I. Figure to L. Pogue, 20 January 1994.

On Monday, January 24, Anthoney telephoned Van Tassle to say that Pogue wanted to review the new advertising program immediately. Later that week, after several rounds of discussion, during which Van Tassle failed to convince either Pogue or Anthoney that the program would eventually be successful, they decided to return to fiscal 1993 advertising levels. Van Tassle renegotiated the TV spot contracts and, by the middle of February, had cut advertising back toward the $2 million per quarter rate. Aardvark Associates complained that the efficiency of their media buy suffered during February and March because of Blue Mountain's abrupt reduction in advertising expenditures. However, they were unable to say by how much. Blue Mountain also set the spring 1994 rate at the normal level of $2.0 million. Market share for the quarter beginning in January turned out to be slightly over 5.6 percent, whereas for the one starting in April, it was approximately 5.5 percent.

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Planning for fiscal year 1995

In mid-May of 1994, Reginald Van Tassle faced the problem of recommending an advertising budget for the four quarters of fiscal 1995. He was already very late in dealing with this assignment; the company would have to up its media buys soon if it was to affect any substantial increase in weight during the summer quarter of 1994. Alternatively, it would have to act fast to reduce advertising expenditures below its tentatively budgeted "normal" level of $2.0 million.

During the past month, Van Tassle had spent a lot of time reviewing the difficulties of fiscal 1994. He remained convinced that a 20 percent increase in advertising should produce somewhere around a 6 percent market share level. He based this prediction partly on his hunch and partly on studies performed by academic and business market researchers.

One lesson he had learned from his unfortunate experience the previous year was that presenting too optimistic a picture to top management was unwise. However, if he had made a more conservative estimate, he might not have obtained approval for the program. In addition, he still believed that the effect of advertising on share was greater than implied by the company's performance in the autumn of 1993. This judgment should be a part of the top managers' information set when they evaluated his proposal. Alternatively, if they doubted his judgment and had good reasons to do so, he wanted to know about them. After all, Lucinda Pogue and Jim Anthoney had been in the coffee business a lot longer than he had, and they were pretty savvy.

Perhaps the problem lay in his assessment of the speed with which the new program would take hold. He had felt it would take a little time but had not tried to pin it down further. That's pretty hard, after all. He had said nothing very precise about this problem to management. Could he blame Figure for adopting the time horizon he did?

As a final complicating factor, Van Tassle had just received a report from Aardvark Associates about the quality of the advertising copy and the appeals used the previous autumn and winter. Contrary to expectations, these ads rated only about 0.95 on a scale that rated an "average ad" at 1.0. These tests were based on the so-called theater technique, in which the agency inserted various spots into a filmed "entertainment" program and determined their effects on the subjects' choices in a lottery designed to simulate purchasing behavior. Fortunately, the ads currently being shown rated about 1.0 on the same scale. A new series of ads scheduled for showing during the autumn, winter, and spring of 1995 appeared to be much better. The agency could not undertake theater testing until it completed production during the summer, but experts in the agency were convinced that the new ads would rate at least 1.15. Reggie was impressed with these ads, but he knew that such predictions were often optimistic. In the meantime, he had to submit a budget request for all four quarters of fiscal 1995 to management within the next week.

To help him with this problem, Reggie decided to use a marketing planning model, an adaptation of Little's (1970) ADBUDG model.

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ADBUDG calibration and managerial estimates

After some thought, Van Tassle concluded that if his advertising budget were reduced to zero, he would lose perhaps half his market share in the next year or about one-eighth of it in the next quarter. He settled on the figure of 4.7 percent as the market share at the end of the first quarter with no advertising. Similarly, he arrived at figures of 6.3 percent for a saturation advertising program and 5.7 percent for a 20 percent increase in advertising (figuring it would take him about three quarters of this 20 percent increase to reach a 6 percent share).

He then began experimenting with different values for his market share estimate and media, as well as ad copy effectiveness estimates. He was hoping he could use the results of his analysis to explain past results and help prepare his 1995 plan. He constructed Exhibit 3—a table of events—to help him recall the history of the program.

ADBUDG Period	Month	Yr	Fiscal Year 94/95	AD Budget	Copy and Media	Market Share	Events
0						5.4 %	
1	July	93	1st qtr	$2.00	1.00	5.4 %	
1	Aug.	93	(FY 94)				
1	Sept.	93					
2	Oct.	93	2nd qtr	$2.40	0.95	5.6 %	Operation "Breakout"
2	Nov.	93					
2	Dec.	93					
3	Jan.	94	3rd qtr	$2.10	0.95	5.6 %	Budget cut
3	Feb.	94					
3	Mar.	94					
4	Apr.	94	4th qtr	$2.00	1.00	5.5 %	Copy effectiveness up
4	May	94				5.4 %	Now!
4	June	94					
1	July	94			1.00		
2	Oct.	94			>1.00		

EXHIBIT 3: Blue Mountain table of events.

Recent developments: The U.S. coffee market in transition

Even though advertising budgeting was preoccupying her, Pogue kept thinking that, in light of recent trends, more could be done to help Blue Mountain's long-term position in the coffee market. What for a long time seemed to be a rather static market was now undergoing profound structural changes. In recent years, the coffee bean had begun a renaissance as consumption in the United States slowly climbed after more than two decades of decrease—but Blue Mountain, along with other traditional roasters such as Procter & Gamble, Philip Morris, and Nestlé, had been unable to capitalize on this trend. The growth was primarily due to specialty brews and the expansion of coffee and coffee accessory chains such as Starbucks Coffee Company of Seattle. Pogue was wary that specialty coffees, growing at about 20 percent annually,

continued to grab market share at the expense of supermarket ground coffee sales. In fact, according to the latest figures, Starbucks, other regional cafes, and gourmet whole-bean roasters had obtained nearly one-quarter of the multibillion-dollar coffee market.

Pogue was wondering how to respond to these changes and worried that Blue Mountain might already have missed the tide. It did not seem that the price-cutting and couponing approach of her major competitors in the ground coffee market was the answer. Pogue had been carefully following the development of Starbucks, which was holding on to its premier position in the specialty coffee business despite the increasing level of competition and imitation it encountered. Its business design differed significantly from Blue Mountain's, in that Starbucks also operated a national mail order program to complement its hundreds of corporate-owned stores and its collaboration with Barnes & Noble bookstores, Nordstrom's, and fine restaurants. According to a study Pogue came across, consumers of gourmet coffees were college-educated, 25- to 45-year-olds who earned more than $35,000 a year. They drank gourmet coffee for its prestige as well as its taste. Gourmet coffee with price tags 80–100 percent higher than canned coffee was viewed as an affordable luxury. What could be a successful business model for Blue Mountain? Pogue still heard the warning of an industry analyst in her ear: "It's just like cars. Generation Xers wouldn't be caught in their fathers' Oldsmobiles, and they're not going to drink their parents' coffee brands."

"The traditional marketers have to come up with new appeals; the same old grind isn't going to make it."

Questions



Question 1. State precisely what you think the objectives of Blue Mountain's 1994 advertising plan should have been. Were these Van Tassle's objectives? Lucinda Pogue's? I. Figure's?



Question 2. Evaluate the results obtained from the 1994 (FY) advertising funds. What do you think the results would have been if the 20 percent increase had been continued for the entire year?



Question 3. What should Van Tassle propose as an advertising budget for 1995? How should he justify this budget to top management?



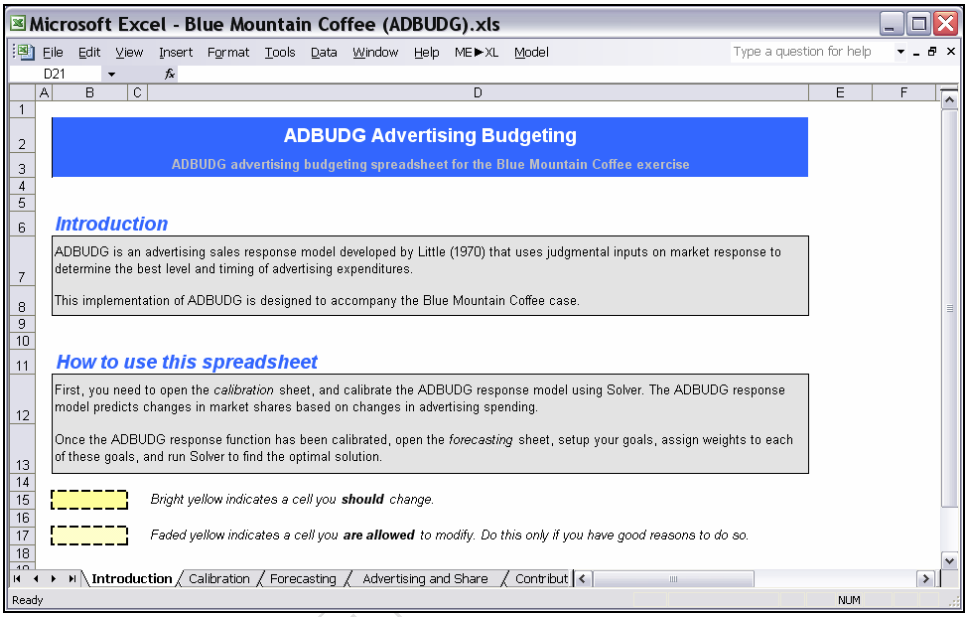
Question 4. How should Van Tassle deal with the issues of seasonality and copy quality?



Question 5. Comment on the uses and limitations of the ADBUDG model as a decision aid for this case and, more generally, as an advertising budgeting decision aid.

Getting Started

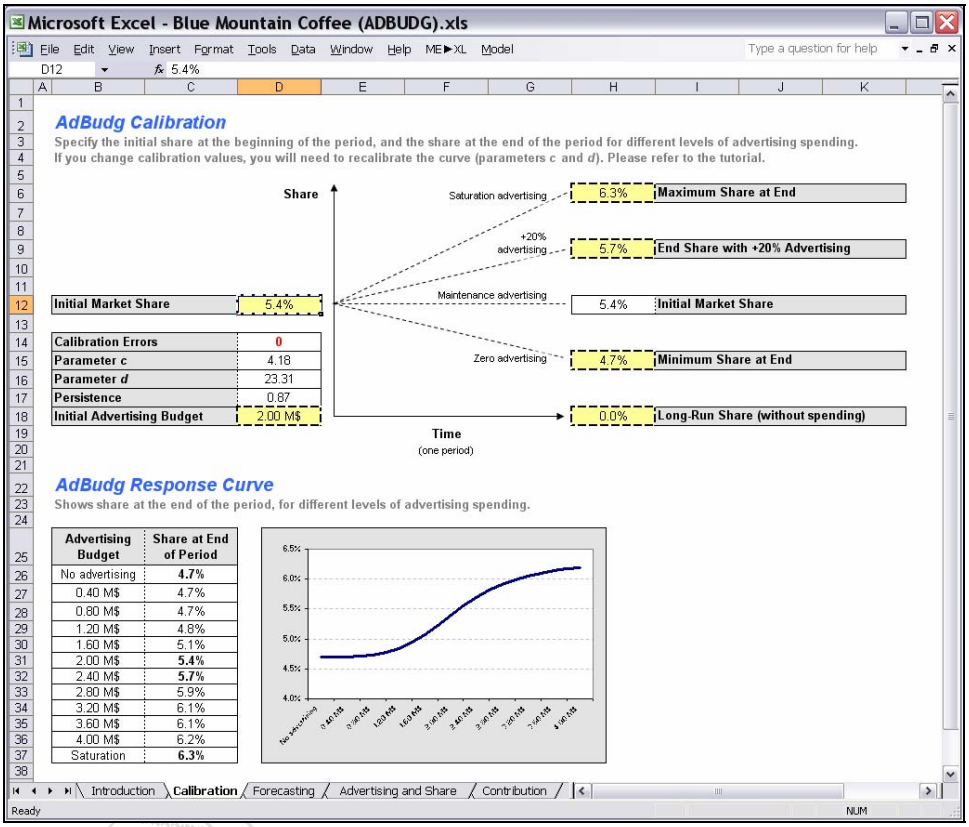
Open the file "*Blue Mountain Coffee (ADBUDG).xls*" in "*My Documents/My Marketing Engineering/*."



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Step 1 Calibrating the ADBUDG response function

In Excel, click on the *calibration* sheet. This sheet will allow you to calibrate the ADBUDG response function to managerial inputs.



Entering managerial input

You will need to provide the six input values to calibrate the response model.

Following this analysis, the default values entered in the spreadsheet will be as follows:

- Market share at **start** of period (5.4%)
- **Maintenance advertising** per period ($2,000,000)
- Managerial estimations for market share at period end with:
  - **Saturation** advertising (6.3%)
  - **+20 percent** increase in advertising (5.7%)
  - **No advertising** (4.7%)
- Market share in **long run** with no advertising (0.0%)

DRAFT

Calibrating response curve using Excel Solver

If you decide to modify managerial inputs, you must recalibrate the ADBUDG response curve, that is, find the optimal values for the *c* and *d* parameters that make the ADBUDG response curve fit managerial estimations as closely as possible.

With Solver (see last section of this tutorial), minimize cell D14 (calibration errors) by changing the values of parameters *c* and *d* of the ADBUDG response function; you will find these parameters in cells D15 and D16.

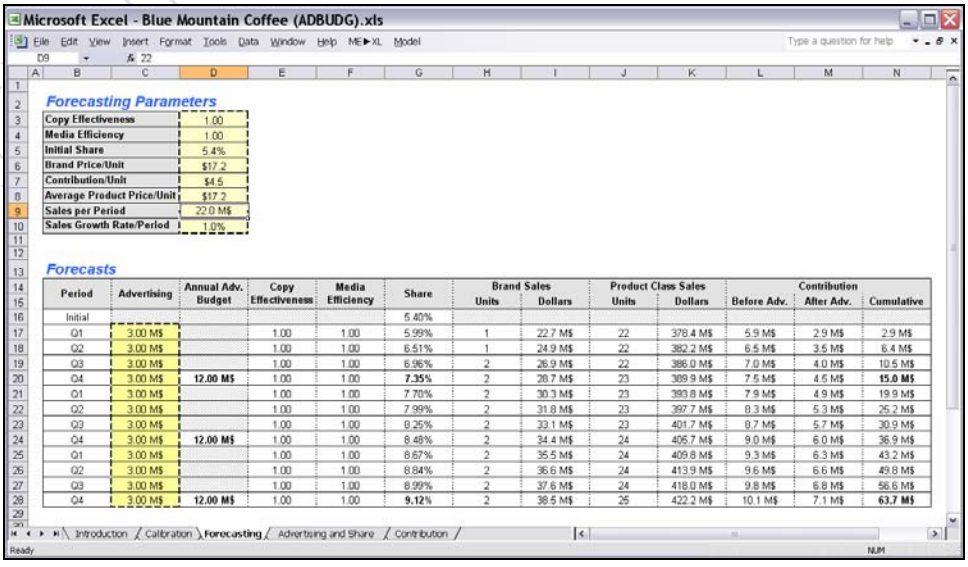




If you modify managerial inputs from their default values, the *ADBUDG* response function needs to be recalibrated. If you fail to do so, modifications made in managerial inputs will not be taken into account.

Step 2 Understanding the forecasting model

In Excel, click on the *forecasting* sheet. This sheet uses the calibrated ADBUDG response function to forecast market shares, revenues, and profits.



The top of the sheet contains basic figures required to run simulations:

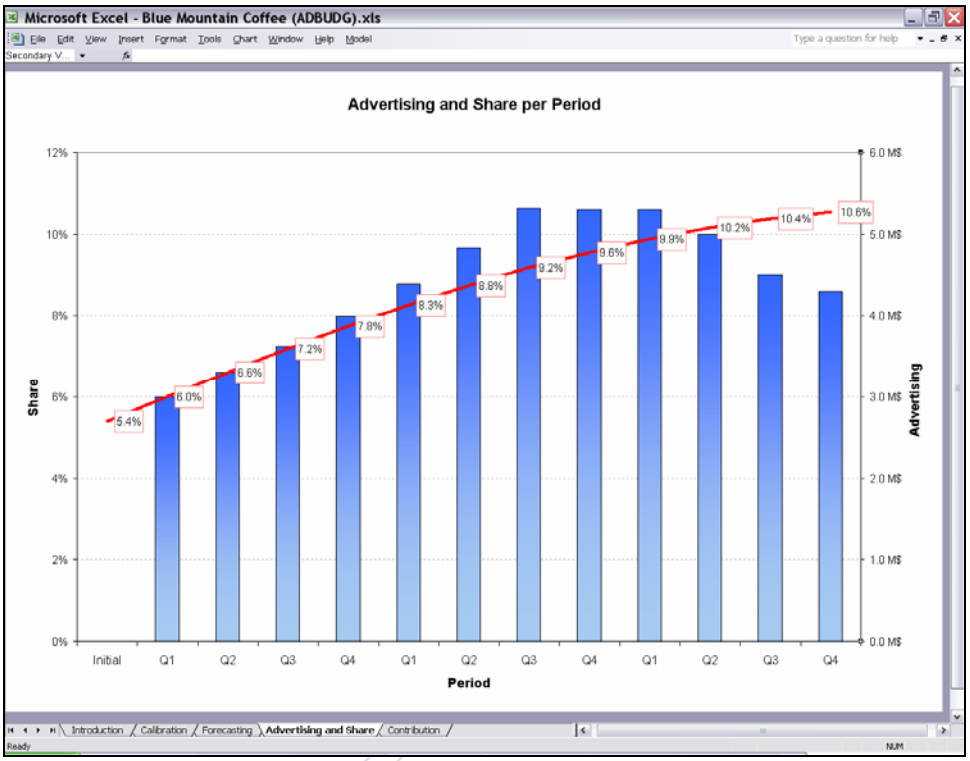
- Copy effectiveness (1.0)
- Media efficiency (1.0)
- Previous period market share (5.4%)
- Brand price ($17.20/unit)
- Contribution ($4.50/unit)
- Average product price ($17.20/unit)
- Product sales per period (22,000,000 cases)
- Product sales growth rate per period (1.0%)

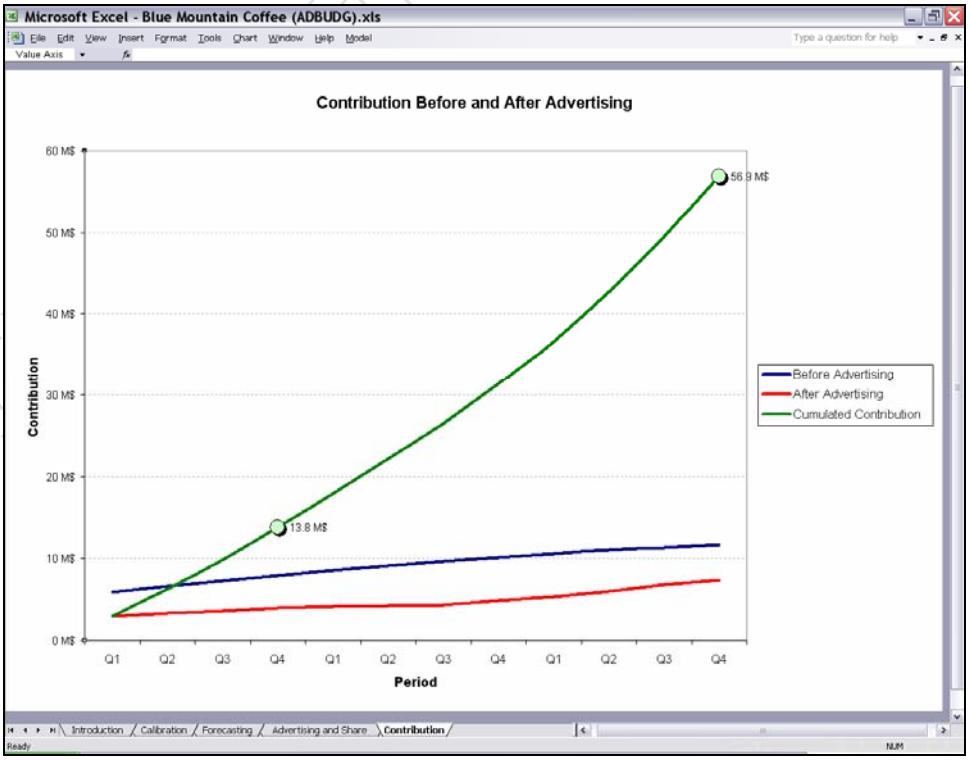
The second part of the sheet contains the simulations. In particular:

- Column C, **advertising**, is the key column of the model, where you will enter different scenarios for advertising budgets. These are also the cells you will need to optimize using Solver.
- Cells D20, D24, and D28 are formulas that compute the **annual advertising budget** for the next three years. If you face spending limits, note those constraints in this area.
- Column G outputs the **predicted market shares**, based on the calibrated ADBUDG response curve and the advertising budgets entered in column C. Cell C20 is the predicted market share achieved after a year; cell C28 contains the predicted market share achieved after three years.
- Column N contains the **cumulative contribution** (margins). Cell N20 reports the one-year, short-term cumulative contribution; cell N28 reports the same figure after three years.

The next two sheets graph the key columns of this table.

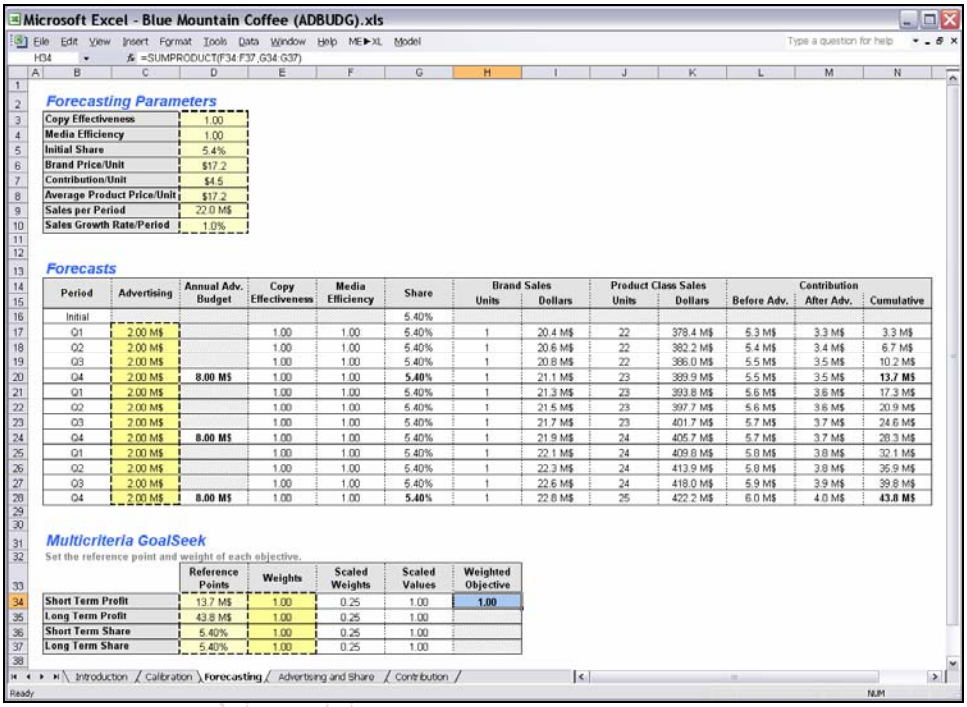
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Microsoft Excel - Blue Mountain Coffee (ADBUDG).xls
Advertising and Share per Period
Share
Advertising
Period
Initial
Q1
Q2
Q3
Q4
5.4%
6.0%
6.6%
7.2%
7.8%
8.3%
8.8%
9.2%
9.6%
9.9%
10.2%
10.4%
10.6%
Introduction
Calibration
Forecasting
Advertising and Share
Contribution
Ready


Microsoft Excel - Blue Mountain Coffee (ADBUDG).xls
Contribution Before and After Advertising
Contribution
Period
56.9 M$
13.8 M$
Before Advertising
After Advertising
Cumulated Contribution
Introduction
Calibration
Forecasting
Advertising and Share
Contribution
Ready

Step 3 Optimizing advertising budget and planning

Built into the ADBUDG spreadsheet is a Multicriteria Goalseek feature, which can help you use Excel's Solver tool to determine the advertising budget for each period.



Microsoft Excel - Blue Mountain Coffee (ADBUDG).xls

File Edit View Insert Format Tools Data Window Help ME►XL Model

H34 =SUMPRODUCT(F34:F37,G34:G37)

Forecasting Parameters

Copy Effectiveness	1.00
Media Efficiency	1.00
Initial Share	5.4%
Brand Price/Unit	$17.2
Contribution/Unit	$4.5
Average Product Price/Unit	$17.2
Sales per Period	22.0 M$
Sales Growth Rate/Period	1.0%

Forecasts

Period	Advertising	Annual Adv. Budget	Copy Effectiveness	Media Efficiency	Share	Brand Sales Units	Brand Sales Dollars	Product Class Sales Units	Product Class Sales Dollars	Contribution Before Adv.	Contribution After Adv.	Contribution Cumulative
Initial					5.40%							
Q1	2.00 M$		1.00	1.00	5.40%	1	20.4 M$	22	378.4 M$	5.3 M$	3.3 M$	3.3 M$
Q2	2.00 M$		1.00	1.00	5.40%	1	20.6 M$	22	382.2 M$	5.4 M$	3.4 M$	6.7 M$
Q3	2.00 M$		1.00	1.00	5.40%	1	20.8 M$	22	386.0 M$	5.5 M$	3.5 M$	10.2 M$
Q4	2.00 M$	**8.00 M$**	1.00	1.00	**5.40%**	1	21.1 M$	23	389.9 M$	5.5 M$	3.5 M$	**13.7 M$**
Q1	2.00 M$		1.00	1.00	5.40%	1	21.3 M$	23	393.8 M$	5.6 M$	3.6 M$	17.3 M$
Q2	2.00 M$		1.00	1.00	5.40%	1	21.5 M$	23	397.7 M$	5.6 M$	3.6 M$	20.9 M$
Q3	2.00 M$		1.00	1.00	5.40%	1	21.7 M$	23	401.7 M$	5.7 M$	3.7 M$	24.6 M$
Q4	2.00 M$	**8.00 M$**	1.00	1.00	5.40%	1	21.9 M$	24	405.7 M$	5.7 M$	3.7 M$	28.3 M$
Q1	2.00 M$		1.00	1.00	5.40%	1	22.1 M$	24	409.8 M$	5.8 M$	3.8 M$	32.1 M$
Q2	2.00 M$		1.00	1.00	5.40%	1	22.3 M$	24	413.9 M$	5.8 M$	3.8 M$	35.9 M$
Q3	2.00 M$		1.00	1.00	5.40%	1	22.6 M$	24	418.0 M$	5.9 M$	3.9 M$	39.8 M$
Q4	2.00 M$	**8.00 M$**	1.00	1.00	**5.40%**	1	22.8 M$	25	422.2 M$	6.0 M$	4.0 M$	**43.8 M$**

Multicriteria GoalSeek

Set the reference point and weight of each objective.

	Reference Points	Weights	Scaled Weights	Scaled Values	Weighted Objective
Short Term Profit	13.7 M$	1.00	0.25	1.00	1.00
Long Term Profit	43.8 M$	1.00	0.25	1.00	
Short Term Share	5.40%	1.00	0.25	1.00	
Long Term Share	5.40%	1.00	0.25	1.00	

Introduction / Calibration / Forecasting / Advertising and Share / Contribution /

Ready NUM

Setting decision weights

You can set the goal criterion by providing **decision weights** for the short-term (four periods) and long-term (twelve periods) market share and cumulative profit. The spreadsheet computes a **weighted objective**, which Solver tries to maximize by optimizing the advertising budget, subject to the constraints you have imposed on the yearly budgets.

Weights can be any value. Their relative values are what count. You can assign a weight of 0 to objectives that are irrelevant in a specific decision situation.

Using Solver

In Excel, select the menu option TOOLS → SOLVER. The Solver dialog box appears. If the Solver option does not exist, please refer to the last section of this tutorial to learn how to install it.



Notice the Solver Parameters that are selected by default:

- The **target cell** is cell H34, which tries to optimize the weighted objective.
- The objective is to **maximize** the content of that cell.
- Maximizing the content requires **changing cells** C17–C28, the 12 cells that contain the quarterly advertising budgets.
- The **constraint** states that quarterly advertising budgets must be positive (you cannot spend less than zero). In this case, you also have stated that annual advertising budget (cells D20, D24, and D28) cannot exceed $10M.

Click Solve. The software will recommend a solution that maximizes the weighted objective.

Sometimes the optimization procedure produces an apparently suboptimal solution for allocating the advertising budget over time, in which case Solver may have settled on a local maximum. In other cases, running Solver may not lead to convergence at all. You might obtain a (better) new result by providing different starting values for the advertising expenditures in each period.

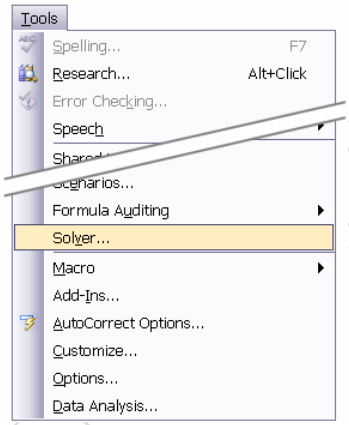
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Installing Excel's Solver

Microsoft Excel provides *Solver*, a tool that allows users to find automatically the best values to plug into certain cells to optimize (e.g., maximize or minimize) the content of a target cell in a spreadsheet.

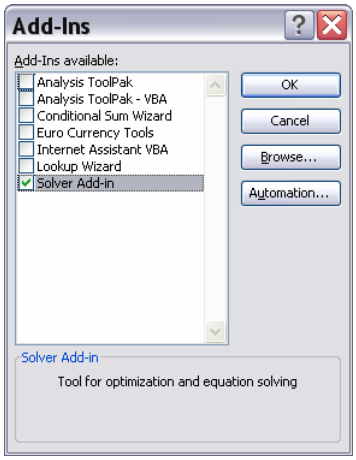
Checking that Solver is installed

Solver is shipped with all versions of Excel but might not be installed by default. Verify that Solver is installed by opening the *Tools* menu in Excel. If Solver appears as one of the options, skip the next step.



Installing Solver

In Excel, select the menu option TOOLS → ADD-INS. A dialog box appears. Check the Solver option, and click OK. Solver will install automatically.



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