Group Number

10

Team Optimization

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Final Project Proposal

Capital Budgeting Model

Introduction

The investment amount has to be drawn from the capital account during the first 3 years as after 3 years the net present value is predicted to be positive after 3 years among the six investment projects choose the one with the maximum return and the predicted capital for the investment available at the end of each year for 3 consecutive years is predicted to be 9.975, 7.875 and 9.50 million respectively.

Capital Budgeting: What Is It?

Compared to short-term decisions, long-term decisions often have longer time horizons, cost more money, and require a lot more data to be gathered for analysis. Capital budgeting, which involves investing money in capital or productive assets, satisfies all three of the aforementioned requirements and is therefore regarded as a long-term choice. Three crucial considerations for capital budgeting decisions are as follows:

1. A capital budgeting decision often involves a yes-or-no answer on a firm's facility, service, product, or activity. In other words, we either accept or reject the business proposition.
2. Reliable projections of the proposal's timing and volume of cash flow are necessary for a capital budgeting decision.
3. The capital budgeting model has a predetermined accept or reject criterion.

Why Capital Budgeting is Important?

Capital budgeting is important to Business health. The more company wants to be competitive, the more precisely it must capitalize on investment opportunities. It does so with extremely minimal margins of error.

The framework analyzes risks and rewards based not only on the present but also on the necessity of achieving future colors.

- New investment project searches
- Future Forecasting
- Expenditure Control

Payback Period

This approach merely seeks to establish the time frame during which an investment recoups its initial cost.

The investment would be permissible if the payback period was less than or equal to the cutoff period, and vice versa.

Its primary emphasis is therefore on cost recovery or liquidity. Three critical issues exist with the payback period method:

It disregards all cash flow following the recovery of the initial cash outflow.

The temporal worth of money is disregarded.

The risk of the cash flows is not taken into account.

Net Present Value (NPV)-

The NPV method is applied by discounting all the cash flows from a project back to time 0 using an appropriate discount rate.

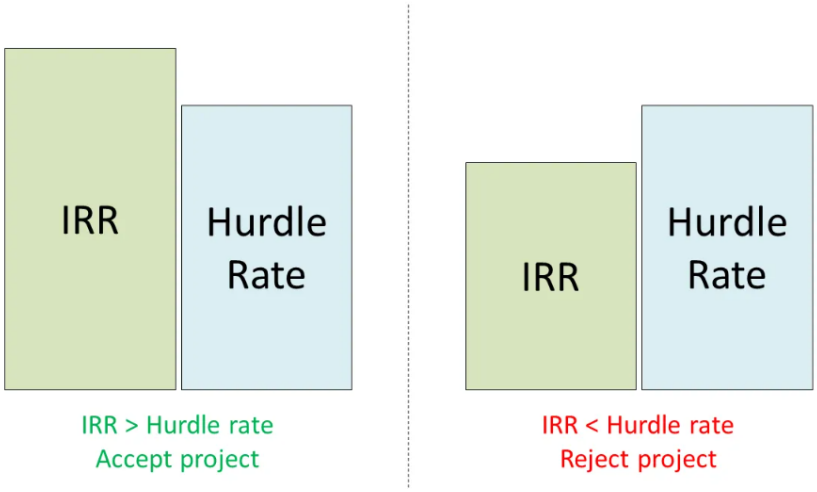
A positive NPV indicates that the project is adding value to the firm's bottom line; therefore, when comparing projects, the higher the NPV the better.

Internal Rate of Return

The Internal Rate of Return (IRR) is the discount rate that forces the sum of all the discounted cash flows from a project to equal 0.

The following would be the decision rule that would be used:

accept if IRR $>$ hurdle rate;
reject if IRR $<$ hurdle rate



The hurdle rate is the minimum acceptable rate of return (MARR) that a business needs on a capital project.

The calculated internal rate of return is compared to the hurdle rate, which is the minimum acceptable rate, set by the business.

If the project's internal rate of return is higher than the hurdle rate, the project should move forward, assuming there are no other limiting factors.

Problem Statement:

Parag Agarwal is deciding to invest in the new venture as he recently received a lump sum amount of severance packages after being removed from
a top position in a multi-billion company.

Now, we are looking for various investment opportunities as he has certain investment plans in his mind. With the help of the optimization model in excel, he is supposed to find out the investment to fulfill your objectives and your desired expansion goals, there is a certain way he could go through this decision-making process.

The investment amount has to be drawn from the capital account during the first 3 years.

After the long run, the net present value is predicted to be positive. After 3 years among the six investment projects, choose the one with the maximum return and the predicted capital for the investment available at the end of each year for 3 consecutive years is predicted to be 9.975, 7.875, and 9.50 million respectively.

From the above, these are the assumptions he and you are supposed to adhere to.

The assumptions are as below:

1. A combination of the investments is allowed, which ones should Parag Aggarwal make to maximize NPV?

2. Amount of capital available for investments in each of the next three years is predicted to be 9.975 million, 7.875 million, and 9.50 million, respectively.

3. Suppose that the expansion investments are mutually exclusive and only one of them can be made.

4. Each investment under consideration will draw on the capital account during each of its first three years.

5. Each is predicted to achieve net present value (NPV) in the long run.

The goal is to maximize or achieve the highest NPV from each opportunity.

Questions

a. Assuming that any combination of the investments is permitted, which ones should Parag make to maximize NPV?

b. What is the optimal NPV in the combination chosen in part (a)?

c. Suppose that California and Florida projects are mutually exclusive and only one of them can be made. How does this alter the solution in part (a)?

d. Suppose that the Texas project cannot be carried out without the Arizona Project. How does this alter the solution in (a)?

Inputs

	California	**Florida**	**Texas**	**Arizona**	**Nevada**	**Montana**
NPV	4410	7140	10080	4,620	9135	3675
Year 1 Capital	3150	2625	6300	2,100	5,250	1050

Year 2 Capital	1,050	3675	4,200	1,575	1050	525
Year 3 Capital	4,200	3675	5,250	1,890	4,200	945

Model

The Capital Budgeting Problem

Companies, committees, and even households often find themselves facing the problem of allocating a capital budget. As the problem arises in many firms, there is a specified budget for the year, to be invested in multi-year projects. There are also several proposed projects under consideration. Often, a high-level committee is responsible for reviewing the proposals and for deciding which projects to undertake. In modeling terms, the committee's job is to determine how to maximize the value of the projects selected, subject to the limitation on expenditures represented by the capital budget.

In the classic version of the **capital budgeting problem**, each project is described by two values: the expenditure required and the value of the project. As a project is typically a multi-year activity, its value is represented by its cash flows' net present value (NPV) over the project life. The expenditure, combined with the other selected projects cannot be more than the budget available.

Model Building

We can formulate this problem as an allocation model with three constraints. To construct an algebraic model, we let

Objective

Our Objective is to maximize the net present value to find the optimized capital budget for an individual, business, or company.

Objective Function:

P1 Implement the California Project.

P2 Implement the Florida Project.

P3 Implement the Texas Project.

P4 Implement the Nevada Project.

P5 Implement the Montana Project.

yj 1 if project *j* is accepted and 0 otherwise

The decision variables *yj* represent binary choice.

Maximize z = 4410y1 + 7140y2 + 10080y3 + 4620y4 + 9135y5 + 3675y6

Subject to

3150y1 + 2625y2 + 6300y3 + 2100y4 + 5250y5 + 1050y6 <=20475

1050y1 + 3675y2 + 4200y3 + 1575y4 + 1050y5 + 525y6 <=12075

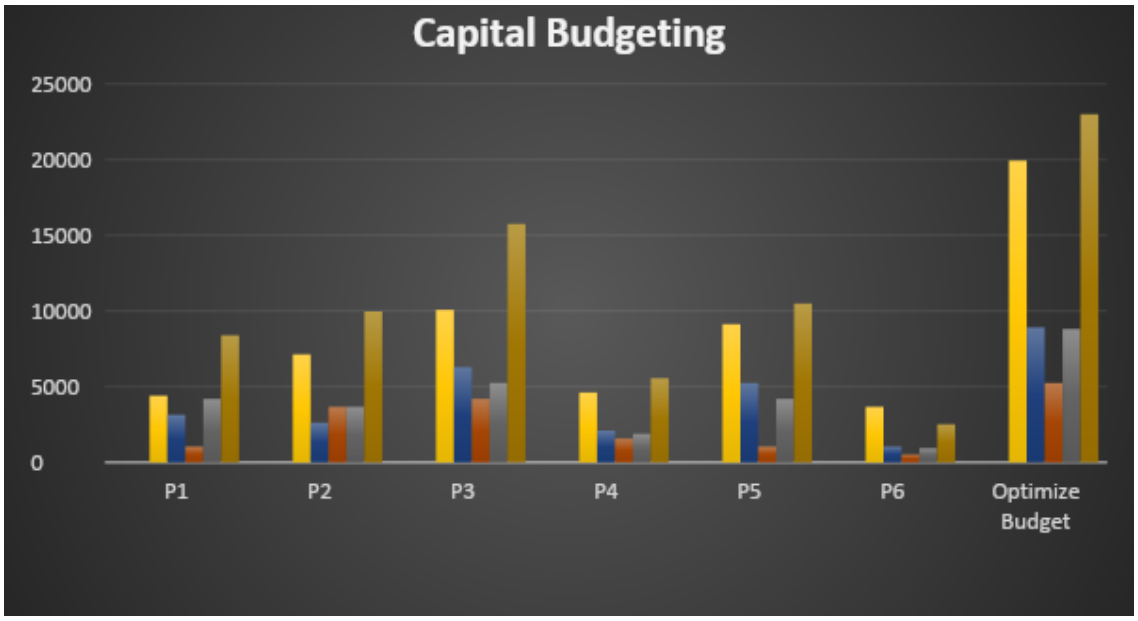
4200y1 + 3675y2 + 5250y3 + 1890y4 + 4200y5 + 945y6 <=20160

OPTIMIZATION MODEL:

Capital Budgeting									
Decisions									
	P1	P2	P3	P4	P5	P6			
1 for yes	0	1	0	0	1	1			
Objective	California	Florida	Texas	Arizona	Nevada	Montana			
NPV	4410	7140	10080	4620	9135	3675	19950		
Constraints									
Year 1 Capital	3150	2625	6300	2100	5250	1050	8925	<=	9975
Year 2 Capital	1050	3675	4200	1575	1050	525	5250	<=	7875
Year 3 Capital	4200	3675	5250	1890	4200	945	8820	<=	9500
	8400	9975	15750	5565	10500	2520	22995	<=	27350

Capital Budgeting									
Decisions									
	P1	P2	P3	P4	P5	P6			
1 for yes	0	0	1	1	0	1			
Objective	California	Florida	Texas	Arizona	Nevada	Montana			
NPV	4410	7140	10080	4620	9135	3675	18375		
Constraints									
Year 1 Capital	3150	2625	6300	2100	5250	1050	9450	<=	9975
Year 2 Capital	1050	3675	4200	1575	1050	525	6300	<=	7875
Year 3 Capital	4200	3675	5250	1890	4200	945	8085	<=	9500
	8400	9975	15750	5565	10500	2520	23835	<=	27350

Graph:



Result:

a) Parag makes the investment in Florida, Nevada, and Montana to maximize the NPV.

b) The optimal NPV of this combination is 19950.

c) This will not alter the solution in part(a).

d) If the Texas project cannot be carried out without the Arizona Project, this will alter the solution in part(a) in certain ways:

(i) NPV decreased from 19950 to 18375.

(ii) Investment amount increases from 22995 to 23835.

Conclusion:

Parag makes the investment in Florida, Nevada, and Montana to maximize the NPV. The optimal NPV of this combination is 19950.

This will alter the solution if the Texas project cannot be carried out without the Arizona Project. It decreases NPV from 19950 to 18375 and the investment amount increases from 22995 to 23835.

So, according to the problem, Parag should invest in Florida, Nevada, and Montana.

References:

1.

https://www.investopedia.com/ask/answers/032615/what-formula-calculating-net-present-value-npv. asp

2.https://www.extension.iastate.edu/agdm/wholefarm/html/c5-240.html

Appendix 1

This problem was chosen because we wanted to take into consideration the current event of the recession and the upcoming economic crisis where lots and lots of employees will be laid off and businesses will close. In those scenarios they will be looking for better investment opportunities to optimize their savings or new business ventures.

For this problem we took the example of a very prominent figure Parag Aggarwal who was fired from his CEO post in the recent turn of events at Twitter, since he is supposed to get a multi million severance package and he must be looking for better opportunities to continue in the market.

What we tried to achieve in this report is to put some conditions for receiving the capital and put a few conditions which he needs to fulfill for each type of business in order to find the best investment opportunity so he could utilize the maximum resources.