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PROJECT SELECTION UNDER CAPITAL RATIONING

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CAPITAL RATIONING

Capital rationing occurs when a firm cannot undertake all profitable projects due to limited available funds. In an ideal market scenario, a firm could raise any amount of capital needed at the market interest rate. However, in reality, market imperfections mean that raising capital often comes at increasing interest rates, reaching a point where borrowing is no longer possible. This situation is known as external capital rationing. Additionally, firms may internally decide to limit investments to what can be financed from retained earnings or within a specific budget, leading to internal capital rationing. These constraints can be categorized into 'hard' and 'soft' views of capital rationing:

Soft Capital Rationing: This occurs when a company has a limited amount of funds available for investment but can still borrow more funds at a cost (e.g., interest on loans). In this scenario, the company has some flexibility to raise additional capital, albeit at a higher cost.

Hard Capital Rationing: This occurs when a company has a strict limit on the amount of funds available for investment and cannot borrow more funds at any cost. In this scenario, the company has no flexibility to raise additional capital, and must make do with the limited funds available.

Due to these limitations, it is essential that selected projects not only cover their cost of capital but also maximize returns on the limited available funds. This necessitates a ranking system for project selection.

Under capital rationing, the usual decision rule to accept all projects with a positive NPV is not sufficient. The objective changes to maximizing returns from a batch of projects within the capital limitations. This transforms the decision-making process into a ranking problem. Different approaches are required based on whether the projects are divisible or indivisible, and whether the capital rationing is single-period or multi-period.

Divisible Projects: These are projects that can be scaled up or down depending on the amount of capital available. For example, a marketing campaign can be reduced in scope or expanded depending on the budget. Divisible projects can be partially funded and still generate returns proportional to the amount invested.

Indivisible Projects: These are projects that require a specific minimum investment to be viable and cannot be scaled down. For example, building a new factory or launching a new product often requires a fixed minimum investment to be feasible. Indivisible projects require a lump sum investment and cannot be partially funded.

SINGLE-PERIOD CAPITAL RATIONING

Single-period capital rationing occurs when a company has limited funds for projects with positive NPV in a single period. To maximize returns, projects must be ranked using the Profitability Index (PI) instead of NPV, as NPV favors larger projects.

Single Period Capital Rationing with Divisible Projects

This situation is the simplest. Projects are ranked by their PI, which is the NPV per unit of outlay. Projects, or fractions of them, are selected until the available capital is exhausted.

☑   **EXAMPLE 16.1**

China Company has a cost of capital of 15% and a limit of $2500 available for investment. The investment required and the NPV at 15% are shown below:

Project	Outlay ($)	NPV @ 15% ($)
I	500	200
II	1,000	700
III	850	950
IV	1,300	800
V	370	90
VI	1,100	-120

What projects should be initiated?

SOLUTION tips

Compute PI:

$$\text{Profitability Index} = \frac{\text{NPV}}{\text{Investment Outlay}}$$

Compute PI:

Project	Outlay ($)	NPV @ 15% ($)	PI
I	500	200	0.400
II	1,000	700	0.700
III	850	950	1.118
IV	1,300	800	0.615
V	400	100	0.243
VI	1,100	-120	-0.109

Rank Projects Based on PI:

Project	PI
III	1.118
II	0.700
IV	0.615
I	0.400
V	0.243
VI	-0.109

NOTE: Project VI has a negative NPV, it is inadvisable to invest in it, as it may not generate the desired returns or may even lead to financial losses.

Optimal investment plan:

Project	Fraction undertaken	Investment	NPV
III	1	850	950
II	1	1,000	700
IV	0.5	650	400
		2,500	2,050

China Company should initiate Projects III, II, and IV, yielding the maximum total NPV of $2,050 within the $2,500 budget.

NOTE: This solution method applies the management accounting principle of maximizing return per unit of the limiting factor (NPV per $ of capital) to optimize

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