MANAGERIAL ECONOMICS

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1. What is managerial economics

The road ahead

We now proceed with the second part of our class: it will be way more "hands on" than the first part.

We start with an introduction in which we will put forward some basic notions and warm up for what will be coming.

In this section:

1. The responsibilities of management are explored.
2. Economic profit is defined, and the role of profits in allocating resources in a free enterprise system is examined.
3. The primary goal of the firm, namely, shareholder wealth maximization, is analyzed along with a discussion of how managerial decisions influence shareholder wealth.

Managerial economics defined

Let us start with a broad definition of Managerial Economics.

- Managerial economics is the application of microeconomics to problems faced by decision makers in their managerial decision processes.
- Managerial economics assists managers in efficiently allocating scarce resource planning corporate strategy, and executing effective tactics.

Managerial economics defined

Managerial economics extracts from microeconomic theory those concepts and techniques that enable managers to:

- select strategic direction
- allocate efficiently the resources available to the organization
- respond effectively to strategical issues.

Southern Company

We begin with a real life example: achieving sustainability.

- At the insistence of the prime minister of Canada during the Reagan Administration, the U.S. Congress enacted a bipartisan cap-and-trade bill to address smokestack emissions.
- In particular: Sulfur dioxide and nitrous oxide (SOX and NOX) emissions that precipitated as acid rain.
- The Clean Air Act (CAA) of 1990, amended in 1997 and 2003, granted tradable pollution allowances (TPAs) to known polluters.

Southern Company

- The CAA also authorized an auction for these TPA assets.
- The Environmental Protection Agency Web site (www.epa.gov) displays on a daily basis the equilibrium, market-clearing price of these new assets on the balance sheet (e.g. $250 per ton of soot).
- The cap-and-trade system literally identified for the first time a price for the use of what had previously been unpriced common property resources—namely, acid-free air and rainwater.

Southern Company

- As a result, large point-source polluters like power plants and steel mills now incur an actual cost per ton for the SOX- and NOX-laden soot by-products of burning lots of high-sulfur coal.
- These amounts were promptly placed in spreadsheets designed to find ways of minimizing operating costs.
- No less importantly, each polluter felt powerful incremental incentives to reduce compliance cost by abating pollution.

Southern Company

- Industries such as steel and electric power were given five years to comply with the regulated emissions requirements, and then, in 1997, the initial allowances were cut in half.
- Duke Power initially bought 19,146 allowances for Belews Creek at prices ranging from $131 to $480 per ton and then, in 2003, built two 30-story smokestack scrubbers that reduced NOX emissions by 75 percent.
- Another major electric utility, Southern Company, analyzed three compliance choices on a least-cost cash flow basis: (1) buying allowances, (2) installing smokestack scrubbers, or (3) adopting fuel-switching technology to burn low-sulfur coal or even cleaner natural gas.

Southern Company

- Southern Company found its huge Bowen plant in North Georgia would require a $657 million scrubber that, after tax deductions for capital equipment depreciation and further offsets from excess allowance revenue, cost $476 million.
- Alternatively, continuing to burn high-sulfur coal from the nearby Appalachian Mountain region and purchasing the requisite allowances in the cap-and-trade market was projected to cost $266 million.
- And finally, switching to low-sulfur coal while adopting fuel-switching technology was found to cost $176 million.
- All these analyses were performed on a present value basis with cost projections over 25 years.

Southern Company

- Southern Company's decision to switch to low-sulfur coal was hailed far and wide as environmentally sensitive and sustainable.
- The choice of fuel-switching technology to abate smokestack emissions was a shareholder-value-maximizing choice for Southern Company for two reasons:

1. First, switching to low-sulfur coal minimized their projected cash flow compliance costs under the CAA;
2. in addition, the fuel-switching technology created a strategic flexibility (a "real option"), and that in itself created additional shareholder value.

Resource-Allocation Decisions and Shareholder Wealth: Apple Computer

Another example: Apple.

In distributing iPad and iPhone, Apple considered three distribution channels:

1. copying Dell's direct-to-the-consumer approach would entail buying components from Motorola, AMD, Intel and then hiring third-party manufacturers to assemble what each customer ordered just-in-time to fulfill Internet or telephone sales.

Inventories and capital equipment costs would be very low indeed and almost all costs would be variable.

Resource-Allocation Decisions and Shareholder Wealth: Apple Computer

Alternatively,

2. Apple could enter into distribution agreements with an independent electronics retailer like ComputerTree or Radio Shack.

Some fixed costs, contracts, hold-up...???

Resource-Allocation Decisions and Shareholder Wealth: Apple Computer

Finally:

3. Apple could retail its own products in Apple Stores.

This third approach entails enormous capital investment and a higher proportion of fixed cost, especially if the retail chain sought high visibility locations and needed lots of space.

Resource-Allocation Decisions and Shareholder Wealth: Apple Computer

When Apple opened its 147th retail store on Fifth Avenue in New York City, the location left little doubt as to the allocation of company resources to this new distribution strategy:

- a sprawling subterranean space topped by a glass cube across from Central Park
- in-store theatres for workshop training on iMac pro- grams to record music or edit home movies
- numerous technical experts available for troubleshooting with no waiting time
- continuing investment in one of the world's most valuable brands.

Resource-Allocation Decisions and Shareholder Wealth: Apple Computer

Shortly after opening:

- Apple made $151 million in operating profits on $2.35 billion in sales at these Apple Stores
- a 6.4 percent profit margin relative to approximately a 2 percent profit margin company wide.

Operating profit = the profit generated from a company's core operations, before accounting for interest and taxes.

Operating Profit = Revenue - Operating Expenses

Terminology: projected cash flow

Projected cash flow: the estimate of an organization's future cash inflows and outflows, usually over a month, quarter, or year. In other words, it's a forecast of how much money will come in and go out of a business in the future.

Terminology: real options

A firm's embedded real options are strategic opportunities or flexibilities that a company possesses, which allow it to make future decisions in response to uncertainty.

These options are "embedded" in the firm's operations, investments, or projects and have value because they provide the ability to adapt, defer, expand, contract, or abandon initiatives depending on how future conditions unfold.

Terminology: real options

Rather than being explicit financial instruments, these are real opportunities tied to tangible assets or business strategies. Examples include:

- Expansion options: scale up production if demand increases.
- Abandonment options: ability to exit a project to cut losses.
- Timing options: ability to delay investment until more information is available.
- Switching options: ability to switch inputs, outputs, or technologies depending on market conditions.

These options increase the value of a firm's projects because they provide flexibility under uncertainty, allowing the firm to respond optimally to changing market, technological, or regulatory conditions.

What's this all about?

So, what did managers do at Southern Company and at Apple? And what do managers generally do?

- identify the alternatives,
- select the choice that accomplishes the objective(s) in the most efficient manner,
- taking into account the constraints,
- and the likely actions and reactions of rival decision makers.

2. Our main character: profits

Our main character: profits

1. Risk-Bearing Theory of Profit

- Economic profits arise in part to compensate the owners of the firm for the risk they assume when making their investments.
- Because a firm's shareholders are not entitled to a fixed rate of return on their investment—that is, they are claimants to the firm's residual cash flows after all other contractual payments have been made—they need to be compensated for this risk in the form of a higher rate of return.

Our main character: profits

2. Monopoly Theory of Profit

- In some industries, one firm is effectively able to dominate the market and persistently earn above-normal rates of return.
- This ability to dominate the market may arise from:
  1. economies of scale (a situation in which one large firm, such as Boeing, can produce additional units of 747 aircraft at a lower cost than can smaller firms);
  2. control of essential natural resources (crude oil);
  3. control of critical patents (biotech pharmaceutical firms);
  4. governmental restrictions that prohibit competition (cable franchise owners).

Our main character: profits

3. Innovation Theory of Profit

- The innovation theory of profit suggests that above-normal profits are the reward for successful innovations.
- Firms that develop high-quality products (such as Porsche) or successfully identify unique market opportunities (such as Apple) are rewarded with the potential for above-normal profits.
- Indeed, the patent system is designed to ensure that these above-normal return opportunities furnish strong incentives for continued innovation.

Our main character: profits

5. Managerial Efficiency Theory of Profit

- Above-normal profits can arise because of the exceptional managerial skills of well- managed firms.

Our main character: profits

No single theory of profit can explain the observed profit rates in each industry, nor are these theories necessarily mutually exclusive.

Profit performance is invariably the result of many factors, including differential risk, innovation, managerial skills, the existence of monopoly power, and chance occurrences.

In addition: the previous theories of simple profit maximization as an objective of management are insightful, but they ignore the timing and risk of profit streams.

Shareholder wealth maximization as an objective overcomes both these limitations.

3. Shareholders wealth maximization

The Shareholder Wealth-Maximization Model of the Firm

- Shareholder wealth is measured by the market value of a firm's common stock...
- ...which is equal to the present value of all expected future cash flows to equity owners ...
- ...discounted at the shareholders' required rate of return...
- ...plus a value for the firm's embedded real options.

Does this sound any familiar?

Have a definition of real option (in the next slide.)

The Shareholder Wealth-Maximization Model of the Firm

$$V_0 \times \text{SO} = \frac{\pi_1}{(1+k_e)^1} + \frac{\pi_2}{(1+k_e)^2} + \ldots + \frac{\pi_\infty}{(1+k_e)^\infty} + \text{Real Option Value}$$

$$V_0 \times \text{SO} = \sum_{t=1}^{\infty} \frac{\pi_t}{(1+k_e)^t} + \text{Real Option Value}$$

Where:

- SO = shares outstanding
- V_0 is the current value of a share of stock (the stock price)
- π_t represents the economic profits expected in each of the future periods (from period 1 to ∞)
- k, equals the required rate of return.

The Shareholder Wealth-Maximization Model of the Firm

Noteworthy:

- the previous equation does take into account the timing of future profits.
- By discounting all future profits at the required rate of return k_e it shows that a dollar received in the future is worth less than a dollar received immediately.

Does this sound any familiar?

The Shareholder Wealth-Maximization Model of the Firm

Noteworthy:

- our equation also provides a way to evaluate different levels of risk since the higher the risk the higher the required rate of return k, used to discount the future cash flows, and the lower the present value.
- In short, shareholder value is determined by the amount, timing, and risk of the firm's expected future profits.

Does this sound any familiar?

The Shareholder Wealth-Maximization Model of the Firm

Some factors (interest rates and economy-wide business cycles) influence the firm's stock price in ways that are beyond managerial control, but many factors are not.

Just an example:

- Real option value represents the cost savings or revenue expansions that arise from preserving flexibility in the business plans the managers adopt.
- For example, the Southern Company saved $90 million in complying with the Clean Air Act by adopting fuel-switching technology that allowed burning of alternative fuels (coal, fuel oil or natural gas) whenever the full cost of one input became cheaper than another.

The Shareholder Wealth-Maximization Model of the Firm

Some critics often allege that maximizing shareholder wealth focuses on short-term payoffs—sometimes to the detriment of long-term profits.

However, the evidence suggests just the opposite.

Short-term cash flows reflect only a small fraction of the firm's share price; the first 5 years of expected dividend payouts explain only 18 percent, and the first 10 years only 35 percent of the share prices of NYSE stocks.

The goal of shareholder wealth maximization requires a long-term focus.

The Shareholder Wealth-Maximization Model of the Firm

Value-maximizing managers must manage change — changes in competition, technology, revenue collection, regulation —but they must do so with an eye to the long-run sustainable profitability of the business.

In short, value-maximizing managers must anticipate change and make contingency plans.

Shareholder wealth maximization also reflects dynamic changes in the information available to the public about a company's expected future cash flows and foreseeable risks.

The last point is of utmost importance!!!

Net Present Value

As a matter of fact, stock price also reflects not only the firm's preexisting positive net present value investments, but also the firm's strategic investment opportunities (the "embedded real options") a management team develops.

Definition of NPV comes on the next slide...

Definition: Net Present Value

NPV = Present value of all future cash inflows - Initial investment

If NPV is:

Positive: the investment is expected to create value and is financially attractive.

Negative: the investment is expected to destroy value and is not recommended.

Zero: the investment breaks even.

Definition: Net Present Value

Example:

You invest \$1,000 today and expect to receive \$600 per year for 2 years with a discount rate = 8

$$NPV = \frac{600}{1+0.08} + \frac{600}{1+0.08}^{2} - 100$$

$$NPV = 556 + 515 - 1000 = 71$$

NPV is positive $\rightarrow$ the investment is expected to create value and is financially attractive.

Net Present Value and Embedded Options

In general, only about 85 percent of shareholder value can be explained by even 30 years of cash flows !

The remainder reflects the capitalized value of strategic flexibility to expand some profitable lines of business, to abandon others, and to retain but delay investment in still others until more information becomes available.

These additional sources of equity value are referred to as embedded real options.

Note: a previous (coarser) definition is on slide 11.

Net Present Value and Embedded Options

We need to address why NPV and embedded option value are additive concepts.

NPV was invented to value bonds where all the cash flows are known and guaranteed by contract.

As a result, the NPV analysis adjusts for timing and for risk but ignores the value of flexibility present in some capital budgeting projects but not others.

These so-called embedded options present the opportunity but not the obligation to take actions to maximize the upside or minimize the downside of a capital investment.

Net Present Value and Embedded Options

For example, investing in a fuel-switching technology in power plants allows Southern Company to burn fuel oil when that input is cheap and burn natural gas when it is cheaper.

Similarly, building two smaller assembly plants, one in Japan and another in the United States, allows Honda Camry production to be shifted as currency fluctuations cause costs to fall in one plant location relative to the other.

Net Present Value and Embedded Options

In general, a company can create flexibility in their capital budgeting by:

- facilitating follow-on projects through growth options
- exiting early without penalty through abandonment options
- staging investment over a learning period until better information is available through deferral options.

Example: Amgen Inc.

Amgen, a biotechnology company, had shareholder value of $42 million in 1983 despite no sales, no cash flow, no capital assets, no patents, and poorly protected trade secrets.

By 1993, Amgen had sales of over $1.4 billion and cash flow of $408 million annually. Amgen had developed and exercised enormously valuable strategic opportunitie

4. The principal-agent problem revisited

The principal-agent problem (revisited)

As sole proprietorships and closely held businesses grow into limited liability corporations, the owners (the principals) frequently delegate decision-making authority to professional managers (the agents).

Because manager usually have much less to lose than the owner, the agents often seek acceptable levels (rather than a maximum) of profit and shareholder wealth while pursuing their own self-interests.

Let us have a look at real world scenarios.

What happened at Berkshire Hathaway

Warren E. Buffett, chairman and CEO of Berkshire Hathaway, Inc., has described the long-term economic goal of Berkshire Hathaway as follows: "to maximize the average annual rate of gain in intrinsic business value on a per-share basis."

Berkshire's book value per share has increased from $19.46 in 1964, when Buffett acquired the firm, to $141,537 in 2013, a compound annual rate of growth of 20.3 percent.

The Standard and Poor's 500 companies experienced 9.6 percent growth over this same time period.

What happened at Berkshire Hathaway

Berkshire's directors are all major stockholders.

In addition, at least four of the directors have over 50 percent of their family's net worth invested in Berkshire.

Managers and directors own over 47 percent of the firm's stock.

Does this sound any familiar?

Definition: Book value per share

BVPS: a financial metric that represents the per-share value of a company's equity based on its balance sheet.

It indicates how much each share would be worth if the company were liquidated at its accounting value.

$$\text{BVPS} = \frac{\text{Total Shareholders' Equity} - \text{Preferred Equity}}{\text{Number of Outstanding Common Shares}}$$

Where:

- Total Shareholders' Equity = Assets - Liabilities
- Preferred Equity is subtracted because BVPS focuses on common shareholders
- Outstanding Common Shares is the number of shares currently held by investors

Note: BVPS is based on accounting values and may differ from the market price per share.

1. Exxon-Mobil

Smoothing out bonuses

As crude oil prices fluctuated wildly by 30 to 50 percent, Exxon-Mobil's managers once diversified the company into product lines like computer software: an area where Exxon-Mobil had little or no expertise or competitive advantage.

Managers were hoping that diversification would smooth out their executive bonuses tied to quarterly earnings, and it did!

However, the decision to diversify ended up causing an extended decline in the value of Exxon-Mobil's stock.

2. Kodak

Pursuing long-term job security.

In some instances this can motivate them to limit the amount of risk taken by the firm because an unfavorable outcome resulting from the risk could lead to their dismissal.

Kodak is a good example. In the early 2000s, Kodak's executives didn't want to risk developing immature digital photography products.

When the demand for digital camera products subsequently soared, Kodak was left with too few markets for its traditional film products. In 2012, Kodak filed for bankruptcy.

3. Nabisco

Diverting firm's resources to perks for managers.

In 1988, RJR Nabisco was bloated with corporate retreats in Florida, an extensive fleet of corporate air- planes and hangars and so on.

This left RJR Nabisco with substantially less value in the marketplace.

Kohlberg Kravis Roberts & Co. initiated a hostile takeover bid and acquired RJR Nabisco for $25 billion.

3. Nabisco

Diverting firm's resources to perks for managers.

The purchase price offered to common stockholders by KKR was \$109 per share, much better than the \$55 pre-takeover price.

The new owners moved quickly to sell many of RJR's poorly performing assets, and slash operating expenses.

Although the deal was heavily leveraged with a large amount of debt borrowed at high interest rates, a much-improved cash flow allowed KKR to pay down the debt within seven years, substantially ahead of schedule.

4. O.M. Scott & Sons

Agency costs and Corporate restructuring

The existence of high agency costs sometimes prompts firms to financially restructure themselves to achieve higher operating efficiencies.

The lawn and gardening products firm, O.M. Scott & Sons, was purchased by the Scott managers in a highly leveraged buyout.

A LBO is a financial transaction in which a company is acquired using a significant amount of debt to meet the cost of acquisition. The assets of the company being acquired are often used as collateral for the loans.

4. O.M. Scott & Sons

Agency costs and Corporate restructuring

The new owner-managers quickly put in place accounting controls and operating procedures designed to improve Scott's performance.

By monitoring inventory levels more closely and negotiating more aggressively with suppliers, the firm was able to reduce its average monthly working capital investment from an initial level of $75 million to $35 million.

At the same time, new incentive pay for the sales force caused revenue to increase from $160 million to a record $200 million.

Incentives: CEOs compensation

- Just prior to the Financial Crisis, CEOs of the 350 largest U.S. corporations were paid $6 million in 2005 in median total direct compensation.
- The 10 companies with the highest shareholder returns the previous five years paid $10.6 million in salary, bonus, and long-term incentives.
- The 10 companies with the lowest shareholder returns paid $1.6 million.

Executive Performance Pay: General Electric

General Electric CEO Jeff Immelt had in 2006 a salary of $3.2 million, a cash bonus of $5.9 million, and gains on long-term incentives that converted to stock options of $3.8 million.

GE distributes stock options to 45,000 of its 300,000 employees, but decided that one-half of CEO Jeff Immelt's 250,000 "performance share units" should only convert to stock options if GE cash flow grew at an average of 10 percent or more for five years . . .

. . . and the other one-half should convert only if GE shareholder return exceeded the five- year cumulative total return on the S&P 500 index.

Note well: by 2011 median CEO total compensation of $10.6 million had grown to 258 times the $41,000 salary of the average U.S. worker.