Chapter 2

"The greatest of all gifts is the power to estimate things at their true worth"
--LaRockefoucauld

1. Making Choices

1) Our national goal is to accumulate/increase capital, to enable us to improve our standard of living. It is estimated that, between the late 1980s and late 1990s', more capital investment dollars in the U.S. than were spent cumulatively in the past 200 years of U.S. history, in new & replacement just to maintain present standard of living ($4 – 5 trillion).

2) But because each nation's (or individual company's) available resources are almost always limited, we have to find the most effective way to spend money.:
   - to learn some methods, and they are not intended to be all-inclusive
   - to have better feeling for all relative risks

   To make choices among several available alternatives

3) Business decisions usually involve several different economic patterns, e.g. lower income with longer life vs. higher income with shorter life; different levels of mechanization cost vs. labor costs; etc. ==> choose the best alternative out of several courses of action that will best economic use of limited resources.

4) Economic evaluation techniques are used to enhance our ability to make correct investment decisions from economic viewpoint. Techniques are based on premise that profit maximization is the objective, i.e. maximization of future worth of available investment dollars.

5) We must apply formal, systematic, quantitative methods to compare & evaluate investment alternatives, and to be successful in the long run. Otherwise, bad decisions will be made.

6) Because of various sources of uncertainty, levels of risks, lack of data, etc. the techniques do not guarantee success with every decision. However, chances for error are reduced and you will make a much higher & more consistent percentage of correct decisions.

2. Factors Considered in Making Investment Decisions

1) **Economic Analysis:** evaluation of the relative merits of investment situations from a profit and cost viewpoint.

2) **Financial Analysis:** financing techniques; funding sources.

3) **Intangible Analysis:** consideration of factors that affect investments but which cannot be quantified easily in economic terms (legal and safety considerations; public opinion or goodwill; political considerations in foreign ventures; ecological and environmental factors; uncertain regulatory or tax law considerations).

   Often an alternatives that looks best economically be rejected for financial or intangible reasons.
4) Factors directly employed in the production of goods and services == land, labor, capital and entrepreneurship, and other constraints:
   a) **Land**: all naturally-occurring substances that are useful for mankind, which includes all surface and subsurface products and minerals (timber, fish, and energy fuels).
   b) **Labor** (human resources): includes available manpower and the skill and expertise the workers can offer.
   c) **Capital**: man-made assets, such as equipment, machinery, and buildings that are being utilized in the production process; usually quantified by its monetary value (i.e., the total investment in capital assets).
   d) **Entrepreneurship** (management skills): a factor, composed of both labor and capital, used to combine all other inputs, in the appropriate ratios and at the proper time and location, to make the production process feasible.
   e) **Interrelationship & Constraints**: for example, a clear distinction among the various components of land (renewable vs. non-renewable natural resources) and their specific technical and economic characteristics, the interaction of land with all other production factors, etc.

3. Making Decisions

1) Peter Drucker decision-making steps:
   a) Define the problem
   b) Analyze the problem
   c) Develop alternate solutions
   d) Decide on the best solution
   e) Implement the decision

2) Re-analysis & evaluation techniques

a) **Discount Cash Flow** : Techniques (ROR, PW, AW, FW, or various breakeven analysis) used to handle the time value of money with a compound interest.
   - Discount: "Present worth", to reduce the value of assets or dollars.
   - Cash flow: the net inflow or outflow of money that occurs during a specified operating period.
   (several modifications) is by far the most widely used method
b) **Minimum Rate of Return/Opportunity Cost of Capital**: the rate of return that represents other opportunities in which to invest available capital with a reasonable level of risk. It is rarely the current cost of borrowed money -- unless there is an unlimited supply of money available for investment in all alternatives.

c) **Net Present Value** analysis probably is next most widely used method
d) Other systems may be valid or not valid, depending on situation. In working with others, be sure that terms have the same meaning to all parties:

- Return on Investment (ROI) - on initial, average, or other
- Return on Assets (ROA) - generally base on undepreciated assets
- Accounting Rate of Return - asset value
- Return on Equity (ROE) - on stockholder equity, capital
- Return on Sales (ROS) - not an investment rate
- Compound interest Rate of Return (ROR) - before tax
Discounted Cash Flow Rate of Return (DCFROR) - after tax The rate that makes project costs and revenues equivalent at a given point in time or on a compounding period basis

3) Economic analysis must,
   a) be on an after-tax basis to be meaningful
   b) always consider the effect of inflation (the average annual percentage increase in the prices of goods and services that make up the consumer price index or a similar index)
   c) consider the effect of escalation (changes in prices of specific goods and services related to a particular analysis).

4. Purpose of Valuation Studies

Regardless of the specific purpose, the ultimate objective of the study is to arrive at a monetary value or worth for the property. Some of the specific reasons are as follows:

1) Planning: it is essential to know what you have for planning purpose.
2) Taxation:
   the difficulty -- a single value is required.
   most states use formula or other mechanism to approximate mineral property value ==> resulting in discrepancies between the appraised value for tax purposes and the value perceived in the marketplace.
3) Financing:
   this aspect is becoming increasingly important due to the popularity of international joint ventures. it is used as a means of spreading risks.
   fundamental concern ==> if the project will generate enough cash flow to service the debt as opposed to if the specific ROR is met, a shift in concern.
4) Acquisition:
   estimated value must reflect both (i) the potential of the mineral deposit and (ii) the relative risks associated with these assets.
   things to be assessed by both parties: alternative buyouts provisions; royalty arrangements; bonus payments; production payments advanced royalties, etc.
   perceived value of the property
5) Regulatory Requirements:
   Federal Coal Leasing Amendments Act (FCLAA) of 1976: federal lands offered for coal leasing must be sold via competitive bidding and "no bid shall be accepted which is less than the fair market value, as determined by the Secretary of the Interior, of the in situ coal subject to the lease." ==> the receipt of fair market value is legal requirement in federal coal leasing.
   federal government must determine a value for coal lease prior to competitive bidding in order to assure that bonus bids and royalty provisions represent fair market value and are acceptable.

5. Role of the Engineer

1) Decisions involve alternatives. Even a single investment opportunity requires acceptance or rejection.
2) Decisions among alternatives can be made from the viewpoint of an engineer in the midst of design, or a manager acting upon a number of investment opportunities and alternatives within each opportunity.
3) Our nation’s productive facilities change in response to the affluence of people and to the technology of innovators. As productive facilities evolve from a dependence upon manual effort to a reliance upon mechanized, automated, computer-controlled systems, the responsibility of the engineer/manager changes from a person-oriented to a machine-oriented role.

4) In spite of operating constraints, which vary for exploration groups throughout the mining industry and which are imposed by external forces, investment techniques in this course can be used effectively in:

   validating geological concepts
   monitoring the exploration program
   negotiating property acquisition
   negotiating joint venture agreements
   new project design
   budget allocation
   risk analysis of exploration projects
   risk analysis of development projects

6. Concept of Risk

1) Risk and Uncertainty —

   Risk ==> a situation where in the possible future outcomes of a present decision are plural; however, the dimensions and probabilities of these outcomes are known in advance.
   Uncertainty ==> a situation wherein the possible future outcomes are also plural; however, their dimensions and/or the probabilities cannot be objectively specified in advance.

   ==> Risk simply refers to a situation in which the uncertainties are probabilistically quantified. The magnitude of the risk is undefined.

2) A mineral valuation is essentially an endeavor to predict the financial outcome of a potential mine. This prediction is uncertain because the future behavior of the determinant parameters is uncertain.

3) It is possible to quantify this uncertainty in terms of a probability distribution (by means of the Monte Carlo simulation techniques). While a high level of precision is often unrealistic at early stages in the exploration program, establishment of a realistic framework is important as it may be used to provide guidelines for best use of funds during the exploration and early development efforts.

4) This course deals with the concepts, principles, techniques, and reasoning applicable to the systematical evaluation of the relative profit potential or effects of investment alternatives.

5) Focusing on the determination of economic acceptability of mine projects rather than on financing techniques. Economic acceptability are defined on the basis of total project return in relation to total investment - assuming that once an economically acceptable project has been identified the question of financing will be handled by upper level corporate management and will not be a direct concern of the project managers.