

Key factors in determining investment in mining

- To consider financing of a mining project, investors must analyze
 - The current state of fundamentals in the mining industry (i.e., supply, demand and price factors),
 - These fundamentals in the supply side include cost profile, operating efficiency, technology, labour factors, access to raw materials, reserve replacement strategy, contingency and emergency planning, safety and environmental record, management, and
 - the country where the project will be located (political risk).
 - All these aspects are important as mining projects can experience various difficulties.
- <http://www.silvercrestmines.tv/>

Long-term strategy : Majors

- I. Typically, long-term strategy focuses on creating and preserving long-term shareholder value through the discovery, acquisition, development and marketing of natural resources.
- II. Invest in and operate long-life, low-cost, expandable operations in the most attractive industry segments.
- III. Maximise opportunities by exploring for and evaluating deposits in new geographies.
- IV. Explore the orbits of current operations.
- V. Build on orebody knowledge that allows to find value-enhancing ways of developing own resources and producing at full capacity throughout the economic cycle
- VI. Maintain geological expertise that enable to keep hunting for the most elusive discoveries, and have the ability to develop and apply innovative technologies to resolve specific exploration challenges.

Types of costs in the mining sector

- All the costs faced by companies can be broken into two main categories: fixed costs and variable costs.

Fixed costs:

- Mining like any other business must incur costs that do not vary with the level of output.
 - These are expenses that have to be paid by a company, independent of any mining production.

Variable costs :

- These are costs that change with the level of output . Typically as output increases , so does the need for labour, transportation, storage and so on .



The role of time

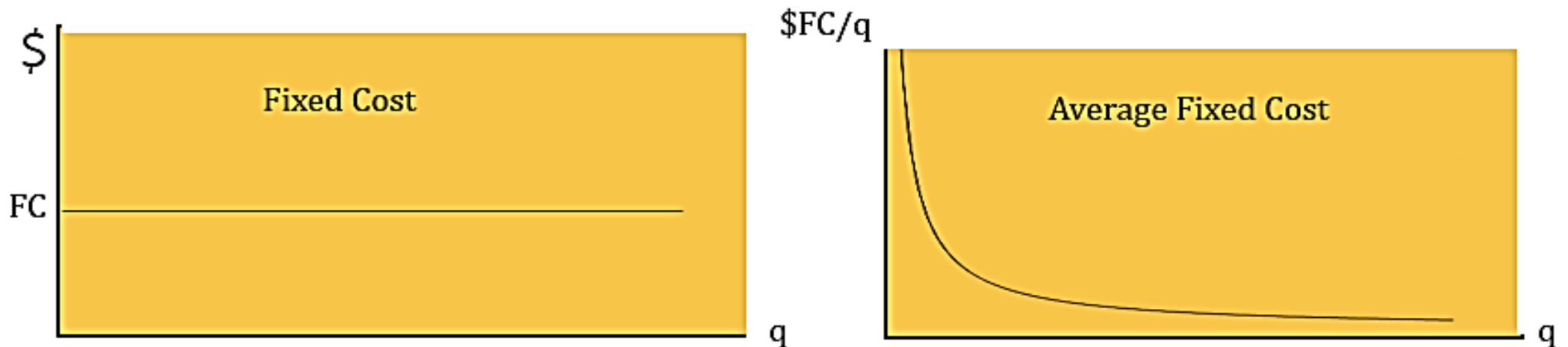
- Whether a cost is fixed or variable depends upon the time horizon within which a decision is made.
- In the long run all costs are variable.
- Typically, fixed costs pertain to the short run, as it is difficult to alter capacity in the short term.

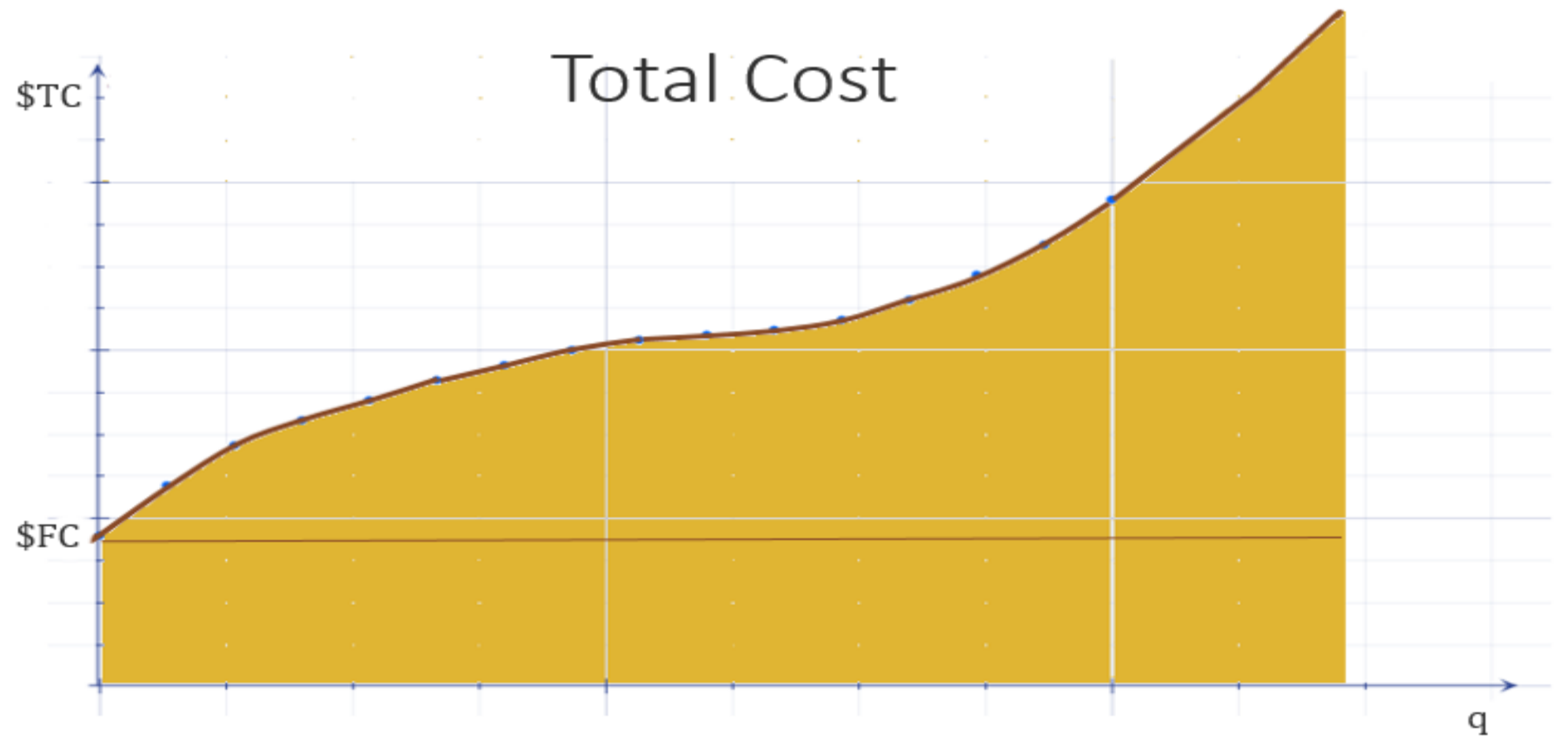
Economies of scale

In economics, a mine can achieve economies of scale when it produces enough output to spread fixed costs over larger amount of output.

For example, a \$40 million exploration drilling expenditures spread out over 5 million ton production potential of copper means that each ton carries with it \$8 in fixed costs.

If the mine potential increase to 80 million ton, the fixed cost per ton drops to \$0.50.







Fixed costs and greenfield logistics

- Mining projects that can be tied to the least fixed cost Greenfield logistics solution in terms of “per ton transported” will have the advantage of becoming first movers.
- Since economies of scale play a crucial role in lowering per ton transported cost, the larger projects will have the best chance to achieve competitive “pit to port” transport tariffs.
- In turn, these projects should be able to establish a logistic infrastructure that will be usable by smaller mines to ensure an adequate infrastructure access.

Sunk cost

- Since economic decisions are based on the marginal cost and the marginal benefit of a proposed project, the primary characteristic of fixed costs is that their marginal cost is zero, regardless of the level of fixed costs. Thus, they are considered sunk costs.
- Given that in the short-run many variable costs will be similar to fixed cost they are also sunk costs with respect to future.
- Sunk costs are financial resources that has been irretrievably spent.
- Logically, a business should ignore sunk costs when making a decision about future.

Sunk Costs & Loss Aversion

- When making a strategic investment decisions, mining companies typically look at the future costs that they may incur, by following a certain strategy.
- However, loss aversion may entice managers to worry about sunk costs, and this could results in wrong decisions.
- A company that has spent \$40 million on exploration drilling and field expenditures that is not yet complete, has to consider the \$40 million sunk, since it cannot retrieve the money.
- The company must decide whether to continue exploration to complete the project that would help the company to regain the sunk cost, or whether it should abandon the project.

Examples of Sunk Costs in Mining

- I. Expenditures on administration and general overhead *in the field* (such items as office rental and support costs, secretarial services, miscellaneous transportation and accommodation, general supplies and equipment, vehicle expenses (repair and maintenance), storage and so on.
- II. Exploration drilling and field expenditures such as airborne, surface and underground exploration expenditures, including the costs of staking, aerial surveys, assessment, as well as geological, geophysical, and geochemical work, trenching and other surface work, exploration shafts, and other underground exploration work.
- III. Mine-site development mineral lease rental and other land costs, that are incurred from all work done to outline, block-out and gain access to ore and prepare it for production, and include field expenditures on physical work, mineral lease and other land costs and the costs associated with stripping, shafts, cross-cuts, drifts, ramps, rises, various services such as hoisting and ventilating, as well as licensing & leasing application and renewal fees & rentals; costs of permits; legal fees pertaining to land or claims and other fees.

Sunk costs and loss aversion



Fixed costs

- The very long underground bulk-material conveyors are a key fixed cost for ore conveyance in a safe and economically efficient way.
- Selection of the right electrical, instrumentation and automation equipment directly impacts the performance, flexibility of operation, efficiency, reliability and total life cycle cost of the conveyor system.



Exercise

- The mining company ABC has incurred \$40 million exploration and deposit appraisal costs on its copper-nickel-zinc property in Latin America over the past five years, and the project appears promising. ABC's indicated resource base of 40 million tons with inferred resources of about 20 million tons. Based on geoscience model there is a 60 per cent probability that the company will hit a proven reserve of about 20 million in near future, relative to a 50 per cent chance of a proven reserve of about 30 million ton in an alternative site.
- Meanwhile, having recently completed an 825-metre shaft, the company's main rival American Triple A mine is deferring a second phase of mine expansion and slashing capital investment and exploration spending to approximately \$30 million and \$4 million, respectively. The ABC's accounting policy requires the company to allocate \$40 million across proven reserves. However, when these costs are included in the assessment of the alternative project the project fails to meet the company's criterion for investment return.
 - a) How should ABC treat the \$40 million exploration and deposit appraisal costs?
 - b) If the ABC company sells the property for \$30 million. How much would be the sunk costs?

Opportunity cost

- To avoid loss aversion bias investment decision on a project must be based a careful measurement of costs .
- A mining company must evaluate the opportunity cost of investing in the proposed project versus investing in the next best investment possibility.

Exercise

- A mining company is considering to spend \$2 million on a leach processing procedure that can process 400 tonnes of copper per year with a recovery rate of 75 per cent at a cost \$100 per ton. Two alternative flotation processes are available to the company, (i). one with a recovery rate of 80 per cent, at a cost of \$600 per tonne and (ii), the other with a 85 per cent recovery rate at a cost of \$700 per tonne. The company expects the LME copper price to stabilise at the time of sales at \$5,500 per tonne.
 - a) What is the opportunity cost if the company choose the leach processing?
 - b) What is the opportunity cost if the company uses the first flotation option.?

Profit prospects

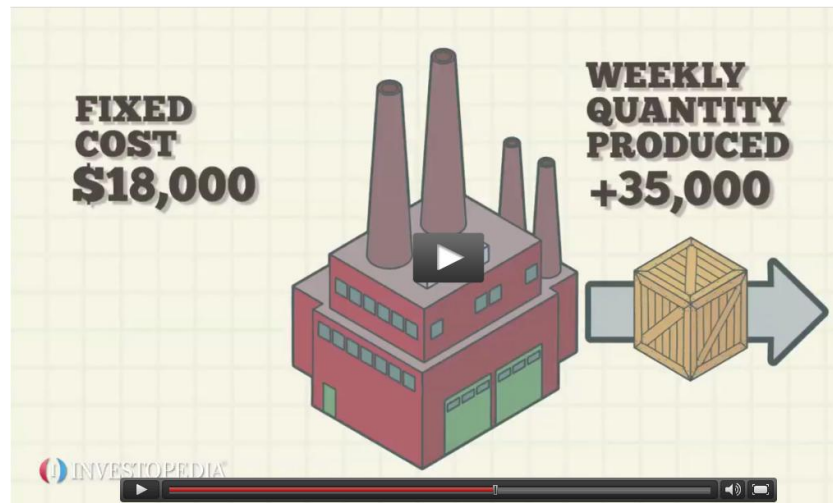
- Capital markets commit funds into a mine development only when there are prospects of an excess of revenue to cover:
 - I. variable or operating costs
 - II. the depreciation of plant and equipment, and
 - III. a fair return to the investors at the going rate of profit for such investments.

Variable costs

- Variable costs are those operating costs that vary depending on a company's production volume; they rise as production increases and fall as production decreases.
- Variable costs of mining activity include:
 - wages,
 - materials,
 - fuel and electricity required to mine ore,
 - Hoisting material to the surface,
 - processing costs and,
 - the costs of transportation and storage.

Marginal Cost of Production and Law of Diminishing Marginal Returns

Marginal Cost of Production



Law of Diminishing Marginal Returns



ModernDy Gold Mining

