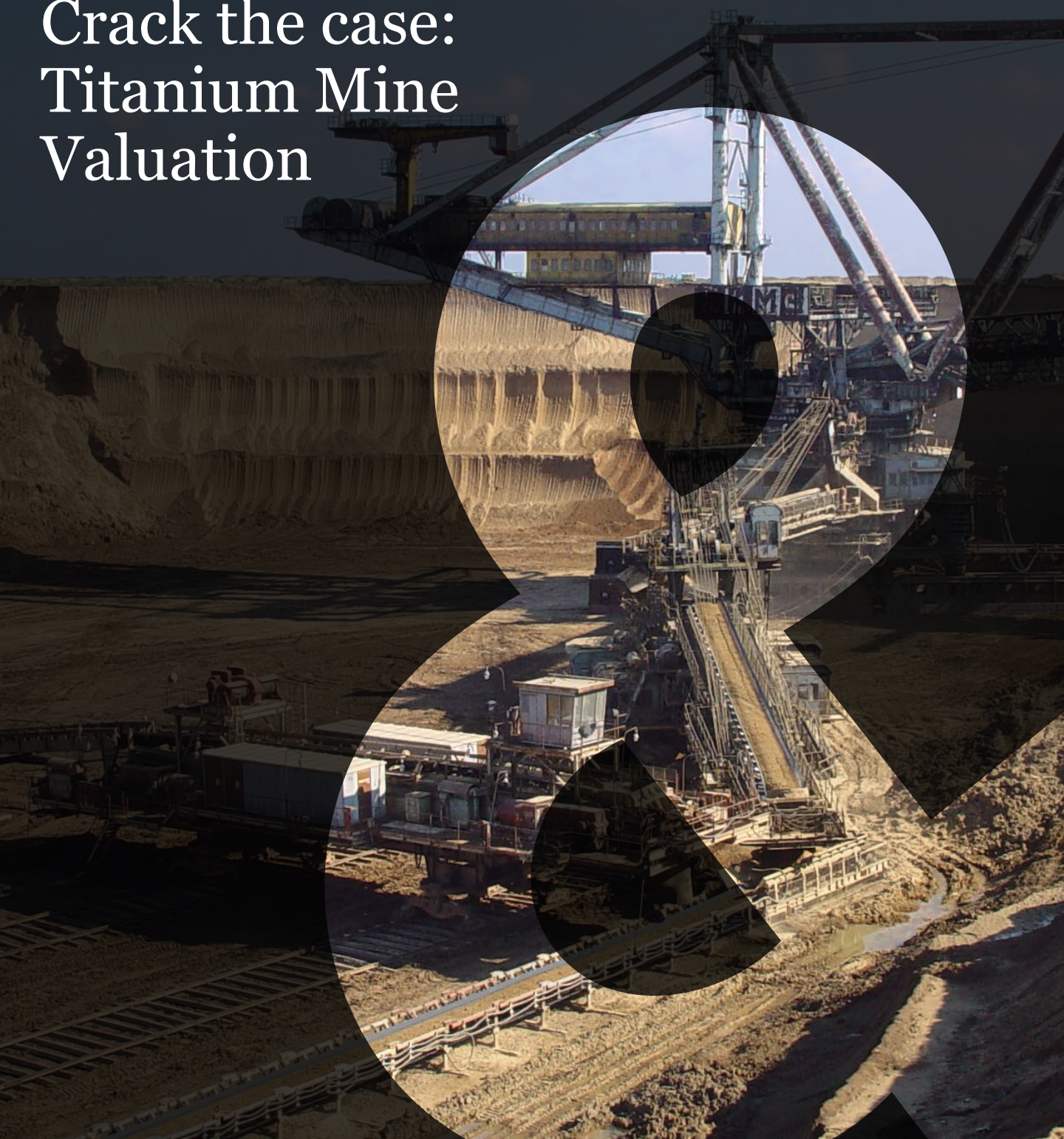
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Crack the case: Titanium Mine Valuation



The Problem/ask



Your client, a businessman, asked for your help to conduct a valuation of an asset he has recently come to own. His grandfather just died and left him a titanium mine. You have been hired to tell him what it is worth, in order for him to decide whether to invest or divest.

Case set-up

There are 3 types of titanium mines in the world: small, medium, and large. Within these three classes, each mine is identical to every other

The mine under valuation in this case is a medium one

Module 1: Framework/structure

1 Question: How would you go about the valuation of the mine?

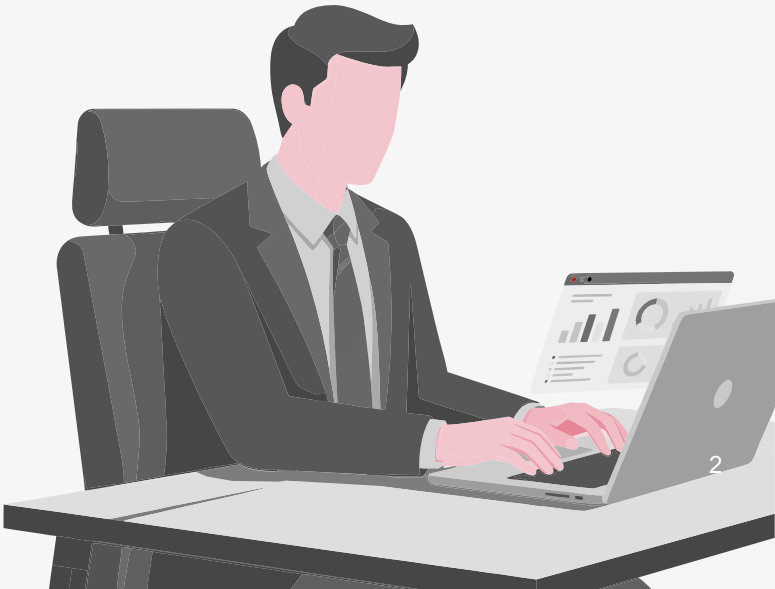
Suggested approach

A strong approach could include the following:

- Assess the mine's P&L and expected annual performance
- Use a discounted cash flow approach to estimate the current value of the mine
- Before initiating the valuation exercise, first understand how market supply and demand determine the titanium price, as titanium is a commodity and would be priced accordingly

Next Step

Translate this approach into the analysis required to determine the value of the mine.



Module 2: Analysis

2a Question: What would your first step be?

A strong first step would be to understand the titanium market before calculating the mine's financial performance. Consider:

Global titanium supply, including production capacity and extraction cost by type of mine.

Global titanium demand and how it is changing.
How supply and demand determine the market price of titanium.
Once the market price is established, calculate the mine's revenues and costs based on annual production, titanium price, and extraction cost.

Key consideration

Remember that titanium should be treated as a commodity. This means its market price is determined by supply and demand rather than set independently by an individual mine.
For the next stage of the analysis, assume the following supply and demand information is available:

Supply information

Supply	Small	Medium	Large
Number of Mines	100	150	200
Capacity (tons per year)	120	200	400
Cost ($ per ton)	$4,500	$4,000	$3,500



Demand information



Fixed demand for **80,000** tons per year



Transport costs are a negligible part of total cost structure, and demand is completely inelastic for purposes of this analysis

Illustrative solution: Determine the market price of titanium using marginal-cost pricing.

Start with the lowest-cost producers and assess how much capacity is required to meet total demand.

Supply	Small	Medium	Large
Number of Mines	100	150	200
Capacity (tons per year)	120	200	400
Total production	12,000	30,000	80,000
Cost ($ per ton)	$4,500	$4,000	$3,500

Because the **80,000-ton** demand can be fully supplied by the lowest-cost large mines, the marginal required producer has a cost of $3,500/ton, which therefore sets the market price.

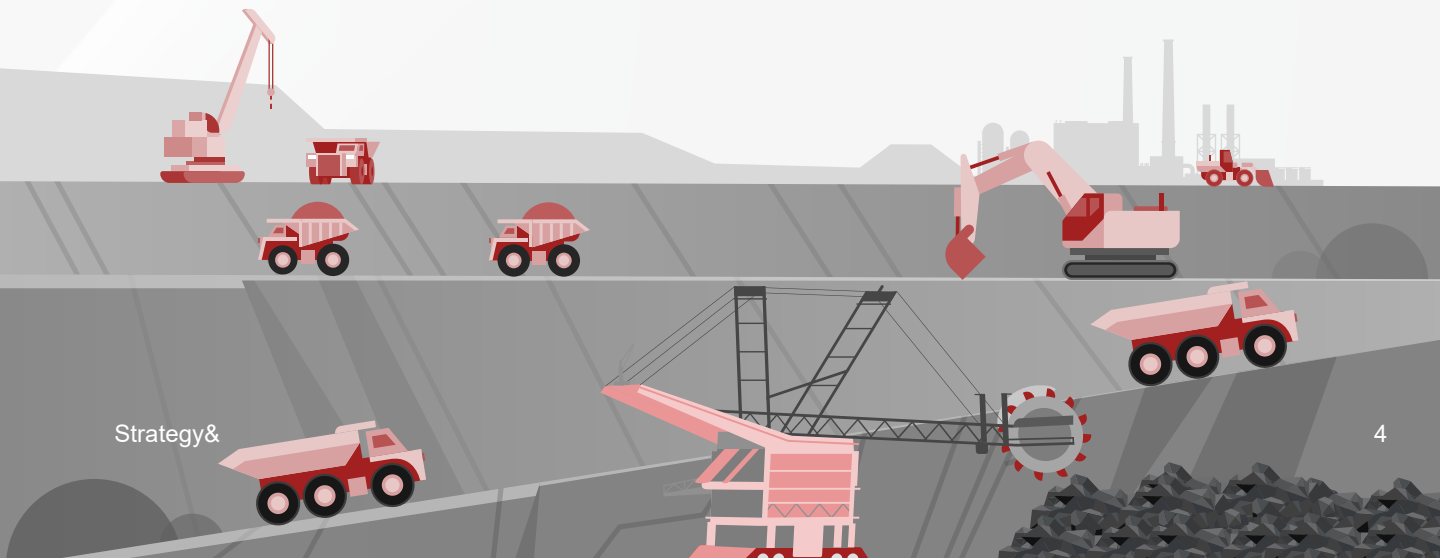
Market price = **$3,500/ton** (set by large mines)

If your client owns a medium mine:

Their cost = **$4,000/ton**

But market price = **$3,500/ton**

They would operate at a loss → No production → Valuation = $0



2b Curveball question: What would happen if we consider another scenario, where the fixed demand is for 120,000 tons per year.

Illustrative solution

Supply	Small	Medium	Large
Number of mines	100	150	200
Capacity (tons per year)	120	200	400
Total production	12,000	30,000	80,000
Cost ($ per ton)	$4,500	$4,000	$3,500

In this case, all 3 types of mines are needed to satisfy the demand and hence the price would be equal to **$4,500** per ton.

With the price equal to **$4,500** and the cost equal to **$4,000**, the valuation would then be positive **(>0).**

Taking the analysis one step further, the mine can then be valued as follows:

With the price equal to $4,500 per ton, and the medium mine capacity capped at 200 tons per year, the client would have:

- **$4,500 x 200 = $900,000** of annual revenues
- **$4,000 x 200 = $800,000** of annual costs
- **$900,000 - 800,000 = $100,000** of profits

For this illustrative solution, assume a discount rate of 10% has been provided:

With a discount rate of 10%, and given that demand is assumed to be inelastic and there is no growth, the annual profit can be treated as a perpetuity for this simplified valuation:

$100,000 / 10% = $1,000,000
value of the mine

Having assessed the mine under both demand scenarios, the next step is to determine what the client should do.



Module 3: Conclusion

3a Question: What would you advise your client to do under the first scenario we discussed? And under the second scenario?

A strong response should distinguish clearly between the two scenarios and then consider whether the mine creates additional strategic value for the client:

Scenario 1 – Consider selling the land and mine assets, as the mine is uneconomic at the prevailing titanium price.
Scenario 2 – Consider retaining the mine, as it generates a positive and potentially recurring profit stream if demand holds.
Broader strategic considerations – Assess whether the mine creates synergies with other assets in the client's portfolio, such as downstream manufacturing assets, or provides a natural hedge against other business exposures.

3b Question: In general, would you advise your client to go into the titanium mining business? Why or why not?

Illustrative recommendation:
Given the assumed outlook for weakening titanium demand, I would be cautious about entering the mining business unless the client has sufficient demand visibility, for example, through long-term contracts, or other strategic reasons for owning the asset.

A stronger recommendation would also consider the client's broader portfolio, including potential value-chain synergies and opportunities to hedge titanium-demand exposure.





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