

# Financial Leverage and Operational Efficiency: An Empirical Study on the Survival Performance of Mongolian Small and Medium-Sized Mining Enterprises

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**Abstract:** The structure and development of financial leverage for Mongolian small and medium-sized mining enterprises are restricted by resource conditions and the financing environment, and there are considerable differences among the different industries. The three indices in this study are the attributes of capital structure, transmission channels and relation with survival performance; together, they will show the effect of financial leverage on operating efficiency. Therefore, based on the above analysis, the endowment of mineral resources affects the debt-financing structure, fluctuations in the extraction cycle lead to asymmetric changes in capital costs, and thus, changes in leverage have an impact on financial flexibility through the free cash flow channel. Interest expense will continue to decrease the marginal profit, the asset turnover ratio will fluctuate, and together with fixed costs and financial leverage, it will have an amplifying effect. The debt repayment ability will shorten the company's operating cycle; financing flexibility and operational agility are substitutes for one another, and there will be a small margin for the leverage buffer in the face of external price changes. Based on the above research, financial leverage has an upper bound; if it exceeds this upper limit, it will increase the risk of the company. In other words, the choice of leverage is how flexibly and safely one uses funds.

**Keywords:** Financial leverage, operating efficiency, ability to survive, capital structure, Mongolian small and medium-sized mining enterprises.

## Introduction

Small and medium-sized mining enterprises have been essential to the development of mineral resources in Mongolia, and their existence is constantly under the influence of financing conditions and financial decisions. Mining development is capital-intensive, has a long cycle and irregular cash flows. It will provide funds for expansion, but there will also be fixed-interest expenses on debt. Given that there are few external sources of funds and high-interest debt, we will investigate the effect of leverage on operating efficiency and determine whether the company can continue to operate normally. Most of the previous studies have focused on large mining enterprises and have not systematically investigated the leverage characteristics and threshold effects of small and medium-sized enterprises with limited resources. Based on the problem above, this paper will explore the attributes of capital structure, analyze the transmission path of leverage, and investigate the nonlinear relationship between leverage thresholds and survival performance. It hopes to find the particular logic of leverage utilisation in resource-based small and medium-sized enterprises, provide an industry-specific analytical framework for mining financial decisions, and contribute to the existing theoretical system.

## 1. Analysis of the Capital Structure and Leverage Level Characteristics of Mongolian Mining Enterprises

### 1.1 Debt Financing Structure under the Constraints of Mineral Resource Endowments

The Distribution of mineral resources in Mongolia is uneven across different areas. The kind of mineral, its grade and distribution in nature, directly affect the funds available and debt structure of

small and medium-sized mining enterprises. Different types of minerals, such as coal, copper and fluorite, have different extraction values and capital recovery cycles, so financial institutions have employed various credit rationing strategies. Companies in good mining areas can generally obtain more collateralised loans and have a relatively high proportion of long-term loans in their debt financing. Enterprises in the low-grade or associated mineral industry are subject to stricter credit policies and need to be more dependent on short-term loans and trade finance. Clearly define the ownership of mining rights and standardise the verification of resource reserves so that external creditors can better assess the security of the company's assets and adjust debt maturity and financing costs accordingly. Given that they do not have external funds, the debt-financing structure of Mongolian small and medium-sized mining enterprises is largely determined by the potential economic value and liquidity of the resources under their control, and therefore exhibits various capital-structure characteristics according to the distribution of resources.

### ***1.2 Asymmetric Relationship between the Extraction Cycle and the Cost of Capital***

The cycle of mining development is exploration, construction, exploitation and mine closure and reclamation. The intensity of capital demand and the level of risk are different at different times, so the cost of capital will also change unevenly. In the exploration stage, there is high geological uncertainty, and enterprises usually find it difficult to obtain low-cost debt capital; thus, equity financing accounts for most of the funds, and the implicit cost of capital remains high. With the increase in investment in mine infrastructure during the construction period of this project, so too have the costs of equipment procurement and underground engineering risen, thus increasing the initial capital demand. Debt financing has begun to be used at this time, but the risk-assessment premium is still much higher than that in the established extraction period. Cash flow is relatively stable in the extraction stage, the debt repayment ability of enterprises improves, and thus the cost of capital falls. Small and medium-sized mining enterprises in Mongolia often find it difficult to overcome the high-cost capital stage in the early days, and the cyclical fluctuations of the cost of capital continue to pose a problem for the accumulation of financial leverage. There is a time lag in the high cost of capital at the beginning of the extraction cycle and the relatively abundant cash flow at the end; thus, enterprises face an intertemporal balancing problem in the use of debt. An increase in the cost of capital will limit the long-term use of debt funds<sup>[1]</sup>.

### ***1.3 Impact of Leverage Ratio Fluctuations on the Free Cash Flow of Mining Enterprises***

The leverage ratio of small and medium-sized mining enterprises in Mongolia is not fixed; rather, it will change considerably due to changes in resource development, fluctuations in the prices of mineral products and alterations to the refinancing system. At the beginning of the rise in the leverage ratio, adding debt funds has helped to expand the scale of extraction and upgrade equipment and thus increase the capacity for operating cash flow generation. As the leverage ratio continues to rise, so too will the amount of fixed interest expenses. When the price of mineral products falls and extraction costs rise, the company will be in a bad financial position. On the one hand, the prepayment of debt principal and interest reduces the capital reserve for maintenance capital expenditures and exploration and development. At the same time, due to the higher financial risk of high debt, suppliers have raised their own credit terms and extended payment periods. Fluctuations in the leverage ratio will affect the stability of free cash flow by changing the financing flexibility and capital utilisation efficiency of the company. When the leverage ratio exceeds the range that the profit volatility of a company can tolerate, its free cash flow will change from positive to negative; thus, the financial cushion for dealing with changes in extraction conditions and market shocks will be reduced, and a negative feedback loop will be formed between the leverage ratio and cash flow.

## **2. Transmission Mechanism of Financial Leverage on Operational Efficiency**

### ***2.1 Erosion Effect of Interest Expenses on the Marginal Profits of Mining Enterprises***

The first indicator of the operating efficiency of small and medium-sized mining enterprises in Mongolia is the amount of additional profit per unit of output. Interest expense is a fixed contractual cost of debt financing, and therefore it will be deducted in advance during the profit-forming period. The marginal profit structure of a mining enterprise is determined by the joint action of the sales price of mineral products, the variable cost of extraction and fixed financial expenses. Interest expenses are

independent of the level of current production but continuously reduce the amount of profit distributed to shareholders and narrow the margin for conversion from earnings before interest and taxes to retained earnings. As the amount of debt financing increases, the proportion of interest expense in the total cost of the enterprise gradually rises. Even if the extraction scale and selling price are kept the same, the net profit margin will still decline; at the same time, due to the financial burden, the marginal profit curve will be shifted to the left. The basic reason for this reduction in erosion is that interest expenses are not directly related to the output efficiency of a company's production and operation; however, they still precede capital accumulation and reinvestment in the sequence of profit distribution, thus weakening the ability of net earnings to be retained per unit of resource output.

The financing conditions for small and medium-sized mining enterprises in Mongolia are relatively poor, and as a result, they have a high proportion of interest expenses in their profits. Due to the limited variety of financing channels and the lack of credit ratings, these enterprises usually have to borrow money at a higher risk premium, and their debt interest rates are relatively high compared to the average in the market; thus, the profit leakage per unit of debt burden is also relatively severe. When the price of mineral products is rising, the price dividend can still cover the interest erosion, and there is a hidden feature in the contraction of marginal profit. However, if the price falls to a certain extent or the extraction cost increases significantly due to deeper mining, then the proportion of interest expense in the profit structure will gradually rise, and the erosion effect will be more pronounced. More seriously, a long-term compression of the marginal profit by interest expense will reduce the internal capital accumulation ability of the enterprise and make it difficult to obtain funds for expansion of exploration and development, equipment renovation and safety investment. Therefore, the capital-input capacity of the next extraction period will be reduced, and the operating ability will continue to decline due to financial pressure<sup>[2]</sup>.

## ***2.2 Dynamic Changes in Asset Turnover Ratio under the Adjustment of Leverage***

As one of the basic indicators for measuring the operating efficiency of mining enterprises, the asset turnover ratio shows how well the unit of assets can generate operating income. Financial leverage is used to change the structure of assets and how quickly money can be turned over; thus, turnover efficiency will change. Debt capital is generally used to fund long-term asset projects of the company after being introduced by debt, such as the purchase of extraction equipment, development of underground engineering, construction of ore stockpiles, etc. The immobilisation of non-current assets in this way needs to be gradually released through the extraction cycle before they can be turned into operating income. In the first period of leveraged capital introduction, the scale of assets increased faster than the release of production capacity, and as a result, the growth in operating revenue did not keep up with the rise in assets; thus, the asset turnover ratio showed a gradual decline. At a certain time, production capacity will be released and ore sales will begin to rise. Operating income will then be close to the amount of asset investment, and the turnover ratio will rise. However, the size and speed of recovery will be affected by changes in the geology of the mine and how well the extraction plan is implemented.

Due to the high difficulty of the extraction conditions and the uneven distribution of ore bodies for small and medium-sized mining enterprises in Mongolia, there is often a delay in the release of production capacity; thus, the time lag between asset investment and output is artificially extended, and as a result, the recovery period of the turnover ratio after leverage adjustment is also extended. A more indirect way is that when the leverage is high, the company may reduce the speed of replacing old production assets to ensure that it can still pay off its debt, but as a result, the equipment will be older and less productive. An extended service life for the equipment and the lag in the development of engineering have reduced the revenue-generating ability of the unit assets, and thus, the asset turnover ratio has been performing at a low level under debt. In addition, the asset-pledge clauses in the debt contracts may restrict the company's free use of assets, and if these assets are not realised within a reasonable period, it will further harm the overall efficiency of asset utilisation. Change in the direction of asset allocation can affect how quickly production capacity is released, and changes in the capacity for asset renewal also indirectly affect the fluctuation path of the asset turnover ratio; thus, financial leverage has an impact on the continuity and stability of operating efficiency.

## ***2.3 Synergistic Effect of the Fixed Cost Ratio and Financial Leverage***

The cost structure of small and medium-sized mining enterprises in Mongolia is determined by the technical and economic features of mine development. Amortisation of mining rights, depreciation of

underground engineering and maintenance expenses are all relatively fixed costs that do not change proportionally with the scale of production, so they constitute an internal source of operating leverage. Operating leverage magnifies the effect of a change in the volume of production on earnings before interest and taxes; that is, a small fluctuation in output will result in a relatively significant rise or fall in profit. After adding debt interest through financial leverage, financial expenses are further increased in the cost composition of the company, and this part of the expenditure is also rigid. Together, the two kinds of leverage are used to extend the scope of cost amplification. A higher proportion of fixed costs in a company will make it more vulnerable to changes in the scale of operation according to the effect of operating leverage. Adding a relatively large amount of debt makes the profits more volatile; thus, the rise and fall in profits will be more pronounced and frequent. Therefore, the stability of operating efficiency will be under the double leverage of<sup>[3]</sup>.

Given the geological conditions of a small-scale mining enterprise in Mongolia, which have a small-scale mining operation and an irregular distribution of ore bodies, it is difficult to reduce fixed costs; thus, the operating leverage will be relatively high. If the financial leverage is also high at this time, the two types of leverage will work together to amplify the fluctuations in profit caused by a small change in extraction volume. The first stage of the synergistic effect is the expansion of the scale of extraction. At this time, the dilution effect of fixed costs and the interest coverage capacity are improved together, and the profit growth rate exceeds that of revenue growth; thus, there is a small increase in operational efficiency. However, at the time of scale contraction or price decline, the rigidity of fixed costs and the fixed nature of interest expense will increase the speed at which profits fall and pose problems for operating efficiency. The degree of synergy between the two kinds of leverage determines the sensitivity of a company's profitability to changes in extraction scale. At the high end of the synergy, even a small change in output will lead to a large fluctuation in profit and a drop in the stability of operating efficiency. Together, these factors affect how well the company can respond to changes in the market over time and therefore determine whether it will be successful.

### **3. Analysis of the Relationship between Leverage Thresholds and Corporate Survival Performance**

#### ***3.1 Sensitivity Constraint of Debt Repayment Capacity on the Survival Period of Mining Enterprises***

The lives of small and medium-sized mining enterprises in Mongolia are directly related to the development stage of resources, and their debt repayment ability, a sign of financial health, is one of the problems these enterprises face at all times during the extraction process. The natural cycle of mine development is exploration, construction, stable production, declining production and finally mine closure; therefore, the cash flow generation capacity in each stage will be different. When the cash flow is large in the stable production period, the debt-repayment-ability indicators are relatively high, and financial risks may not be obvious at first glance due to good profitability. When the company is in a period of declining production, both the extraction grade and extraction costs have fallen; therefore, its operating cash flow has been squeezed, and the ability to repay debt has weakened. If the principal and interest of the debt in the previous period have not been fully paid off by now, the company will be in a liquidity crunch and unable to refinance.

Sensitivity of debt repayment capacity to the survival period is shown by the fact that, at certain nodes in the extraction cycle, even a small decline in the interest coverage ratio and the current ratio can lead to credit contraction and hasten the exit of a company. Due to the scale of resource endowment, small and medium-sized mining enterprises in Mongolia have a relatively short stable production life, and the slope of debt repayment capacity from peak to trough is steeper. Any unforeseen change in extraction conditions may push a company to the brink of debt repayment, and thus its life will be cut short by financial difficulties. A decrease in the company's debt-repayment ability will lead its suppliers to extend the credit period for accounts receivable, slow down the recovery of funds for the company, reduce its working capital, and thus enter a vicious cycle of deteriorating financial indicators and shortened operating cycles. Finally, the company will be shut down before the end of the life of its assets<sup>[4]</sup>.

#### ***3.2 The Substitution Relationship between Financing Flexibility Space and Operating Flexibility***

Although a company can obtain some funds from debt financing, it will lose the flexibility of future funds. Operational flexibility refers to a company's capacity to alter the speed of production and the

direction of capital utilisation independently in light of changes in extraction circumstances. Small and medium-sized mining enterprises in Mongolia have production features of uncertain continuity of ore bodies and dynamic changes in extraction difficulty, so they need to maintain a certain level of operational flexibility to deal with the unpredictability of underground conditions. The fixed repayment obligations and asset collateral lock-in of debt financing reduce the autonomy of enterprises to reduce the scale of extraction, delay investment or change extraction plans. A reduction in the space for financing flexibility means that the buffer of cash flow risk for the company will be smaller. If the extraction conditions are unfavourable, the company will be unable to raise funds for working capital or reduce losses promptly, and thus its high debt level has limited operating flexibility.

The basic reason for this substitution is that the present debt capital is exchanged for an extension of the free period for decision-making. Given the scarcity of funds and instability in the mining area, small and medium-sized mining enterprises in Mongolia must balance the availability of funds with the requirements for operation. In fact, the choice of the leverage level is an exchange between the two kinds of resource allocation flexibility. A High-Leverage Environment will have a relatively large Substitution Effect. To comply with the debt covenant, the company has been forced to carry out the original development plan despite the fact that geological conditions have changed and adjustments are now needed. Therefore, the operating decisions are path-dependent under financial constraints, and the margin of manoeuvre has been reduced to a very small amount<sup>[5]</sup>.

### ***3.3 Leverage Buffer Capacity Under External Commodity Price Shocks***

Small and medium-sized mining enterprises in Mongolia are price takers in the international market for mineral products and are thus subject to frequent changes in external commodity prices. The Buffer Capacity of financial leverage at this time will affect the survival stability of these enterprises. When mineral product prices are rising, cash flow is high, so there is less pressure to repay the principal and interest of debt, and thus the negative impact of debt financing is reduced. The company will increase debt financing for the purpose of expansion. As prices fall, the profit margin will be reduced; however, if the interest expense remains stable, the buffer capacity of the leverage will be used up. A relatively low debt level will reduce the amount of taxable income and therefore lower tax payments, leaving more funds for operating expenses at the company level. High leverage has reduced the safety margin of the company; as a result, interest expenses have depleted funds available for investment, and therefore the amount of funds for extraction has been reduced, further harming revenue growth.

The boundary of the leverage buffer capacity is determined by the sensitivity of corporate profitability to changes in prices and the extent of alignment with the debt maturity structure. The extraction costs of the small and medium-sized mining enterprises in Mongolia are relatively fixed; thus, any rise in prices will immediately reduce their profits. The buffer effect of leverage usually shows up briefly at the beginning of a price drop and then rapidly fades away; thus, the survival of these companies will be directly affected by fluctuations in external commodity markets. The critical point at which the buffer capacity of funds will be exhausted is when the cash-flow deficit caused by the price drop exceeds the limit of debt-rollover capacity and the scope of cost reduction. At this time, leverage will no longer reduce the shock but will instead increase the transmission speed of the financial crisis, and the survival ability of enterprises will face a concentrated test at the bottom of the price cycle.

## **Conclusion**

The Application of Debt by Mongolian Small and Medium-sized Mining Enterprises is Strongly Linked to Resource Endowment. Debt financing is determined by the intrinsic value and liquidity of mineral resources, and there is a time lag in the high cost of capital at the beginning of the extraction cycle and the abundant cash flow at the end. Fluctuations in the leverage ratio will affect the stability of free cash flow by changing financing flexibility and capital turnover. Contractual rigidity will reduce marginal profits due to interest expenses, cause asymmetric adjustments in the asset turnover ratio under leverage regulation, and result in high sensitivity of operational efficiency to changes in the scale of extraction due to the synergistic amplification effect of the fixed-cost ratio and financial leverage. Debt repayment ability imposes an upper limit on the operating life of mining enterprises, there is a structural substitution relationship between the space of financing flexibility and operational flexibility, and the leverage buffer capacity under external commodity price fluctuations is limited by the sensitivity of profitability and the matching degree of debt maturity. Research shows that the level of

financial leverage of Mongolian small and medium-sized mining enterprises is too high. Below the threshold, leverage can expand resources and improve efficiency; above this limit, it is no longer a safeguard but a source of risk that may increase the severity of this risk; if the leverage ratio reaches a certain level, the company will be in serious danger of death. The deficiency of this study is that it does not present particular comparisons among various kinds of minerals and their extraction stages. Further research in the future can investigate the different levels of leverage thresholds for various types of mining enterprises and examine how changes in the external financing environment affect the adjustment of a company's leverage.

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