

Analysis of Mining Companies - Does Mine Optimisation Lead to Better Investment Decision Making ?

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Introduction

Over the past decade, enormous progress has been made in mine optimisation. It is particularly pleasing that a significant proportion of that development has occurred here in Australia, and even more pleasing that Jeff Whittle and his associates have been at the forefront of this development over the past ten years.

Papers presented at this, and previous conferences, will give numerous examples of how mine optimisation studies have substantially improved profitability and helped to increase the Net Present Worth of companies. References to optimisation studies, and particularly to the Whittle suite of programmes, are commonly found in company reports, and visits to most open pit mining operations in Australia confirm the effective use of these programmes on site. It is therefore both very disappointing and somewhat disturbing that the ultimate results of these optimisation studies are rarely made public, and the optimised mining schedules, on which both the company and the professional investor base their valuations, are not made available to shareholders.

Because of the low level of information disclosure relating to discounted cash flow analysis, it is often necessary to use alternative valuation techniques to determine the relative valuation of mining companies. This paper examines some of these techniques, including their strengths and weaknesses, and then looks at what is generally believed to be the best valuation tool, discounted cash flow analysis. The discussion is based largely on the gold mining industry, although there is no reason why it cannot be applied to other sectors of the mining industry. The difficulties in securing adequate/reliable information are discussed, with a final comment on the benefits that would flow

through to the professional investor if the results of optimisation studied were reported to shareholders.

Market capitalisation per ounce of reserve and resource

One of the simplest yardsticks for comparing gold companies is the market capitalisation per ounce of reserve or resource. Since the adoption of The AUSIMM Code of reporting on Reserves and Resources by all listed Australian gold companies, the quality of disclosure has improved to such an extent that this comparative tool can now be taken seriously. It is widely used in the USA.

The major advantage of market capitalisation per ounce is its simplicity. It is calculated by dividing the market capitalisation of the company (the share price multiplied by the number of shares on issue) by the number of contained ounces of gold in either reserves or resources. Expressed slightly differently, market capitalisation per ounce is the "in ground" cost of a reserve or resource ounce being purchased by the investor. It is directly comparable for all Australian gold companies and although there are some differences in the reporting of resources and reserves on an international basis, it can be used (preferably in conjunction with other measures) for international comparisons. It is particularly useful as an early filter in comparative studies.

Market capitalisation per ounce should however, never be used in isolation as a comparative tool, as there are several problems associated with its use.

The calculation of market capitalisation per ounce of resource takes no account of metallurgical recovery. A company whose sole operating mine was an alluvial deposit with a recovery of 40% would therefore look more attractive than a similar one-mine company with a conventional carbon-in-pulp treatment plant with recoveries in excess of 95%.

No account is taken of the operating cost. Company A, with a market capitalisation per ounce of reserve of \$100, may appear cheap compared to company B at \$200, but if the cost of production of Company A is \$400 per ounce and that of Company B is \$200 per ounce, then Company A may not be the cheaper of the two after all.

Another major factor is that no account is taken of capital expenditure. A company with totally undeveloped resources should be trading at a very low market capitalisation per ounce of reserve or resource, as it could require tens or even hundreds of millions of dollars before the company becomes a producer. It is therefore essential to check the operating status of the company's operations before making any investment decisions.

The locality of the projects can also be a major factor. Sovereign and or political risk means that investors will, for example, pay only very low market capitalisation per ounce in Russia and South Africa, while paying a premium for companies with operations in the USA and Canada. Legislation specific to countries or states is becoming increasingly important; for example, unless Native Title Legislation and procedural claims are clarified soon, investors will probably apply a discount to companies operating in most parts of Australia.

One of the most important factors, and probably the most overlooked, is the quality of reserves and the ability to convert resources to reserves at both operating mines and undeveloped projects. The critical factor is to determine whether resources are so classified because they are totally uneconomic, because they are currently the subject of a feasibility study or because they simply require additional drilling or development to be converted to reserves. This can often be the case in underground mines, where the continuity of the ore body is never under question, but the development and drilling costs associated with conversion of resources to reserves can be extremely high, and would only be carried out to prove up reserves a few years ahead. A good example is Central Norseman's operation at Norseman, which has been operating continuously for more than sixty years yet the ore reserves have only been sufficient to support a six year mine life. By contrast, a company such as Dominion Mining, prior to the sale or closure of its gold operations, always had an abundance of resources yet failed to convert the bulk to reserves as they were simply uneconomic.

Another problem associated with market capitalisation per ounce is that modifications to the reserve/resource base are necessary if the deposits contain minerals other than gold (e.g. copper and silver) or if, in addition to gold mines, the company has projects which contain other metals. In such cases, the gold equivalent is calculated, based on long term price projections for both gold and the other metals concerned. This can introduce sources of error into what is otherwise an uncomplicated calculation. Gold equivalent can furthermore only be calculated when a recognised pricing mechanism for the other metals exist, e.g. the quoted price on the London Metals Exchange. In the case of such commodities as industrial minerals (Normandy Mining is a good example), where price is dependent on quality, the equivalent value cannot be calculated.

Market capitalisation per ounce, in its simplest form, does not take into account the level of debt or cash surplus in the company, though this can be added or subtracted from the basic market capitalisation.

Price/earnings and price/cash flow multiples

Price/earnings and price/cash flow multiples are probably still the most widely used ratios in comparative analysis, not only for mining companies, but also for industrial companies. They are, in fact, far more suited to industrial company analysis, which does not suffer to the same extent from commodity price swings and lumpy capital expenditure as new projects are brought into production.

In order to calculate these ratios, it is first necessary to calculate the prospective earnings, or profit after tax, for each of the companies. These profits correspond to those reported by companies in their Profit and Loss Statements, although it is common practice to exclude abnormal items from these profits. The "cash flow" is actually gross cash flow, achieved by adding back all non-cash items such as amortisation and depreciation and exploration write-downs to the pre-tax profit, from which is deducted income tax paid. (Some analysts simply use after tax profit plus non cash items.)

Once the profit and gross cash flow have been determined, they are divided by the number of shares on issue (and appropriately diluted for other forms of equity such as options) to arrive at the earnings per share (EPS) or cash flow per share

(CFPS). The current share price is then divided by the EPS and CFPS to achieve price/earnings multiples and cash flow multiples (or ratios as they are sometimes referred to), respectively. These multiples are normally calculated for the current year, the year immediately past and for the next two to three years ahead.

The process is a lot more complicated than computing market capitalisation per ounce of reserve or resource. A production profile for each of the company's mines is established in order to determine the total gold production. Generally, all gold produced is assumed to be sold in the year it is produced; this does not actually happen, but is one of the assumptions that is made when forecasting sales volumes two to three years ahead. Until the early to mid nineteen eighties, this gold was assumed to be sold at the forecast spot price. Today, however, most gold companies sell a proportion of their gold production forward, either through hedging or through put and call options. The transactions can be extremely complex, and there are significant differences in the level of disclosure of companies' hedge books. Nevertheless, the analyst is required to use the information available to project the mixture of spot and hedged prices and volumes in order to calculate the sales revenue for the period. The same methodology applies to the production of other metals, although the sales revenue is generally expressed net of treatment and refining charges and transport costs.

Today, most companies disclose unit operating costs (usually on a dollar per ounce basis) and some also disclose total costs, the difference generally being amortisation and depreciation charges. Unless the company discloses budgeted costs, the historic data is generally used in determining forward estimates of operating costs.

Other revenue usually consists largely of interest income. This and interest expense is forecast using the company's current and projected debt and cash positions as a base. Only a few companies disclose administration and overhead charges; historic numbers are taken into account when making future projections. The other major cost item, exploration write-down, is not known in advance by the mining company itself; analysts' estimates are generally done in consultation with the company, based on budgeted exploration expenditure. It should be noted that although few companies disclose production and cost estimates, most would assist

professional analysts in this respect. This is also true in providing assistance to analysts on other factors such as taxation and capital expenditure.

Naturally, there are also drawbacks to price/earnings and price/cashflow multiples, the most important being short-termism. Because these ratios are only calculated for the next two to three years, they do not accurately reflect the company's ore reserve and mineral resource position and the prospective mine life of the operations. Another drawback is that the cash flow is calculated on a gross basis, and therefore does not take any account of capital expenditure or any other costs which are not reflected in the profit and loss statement.

Discounted cash flow/net present value

There can be little doubt that discounted cash flow analysis, providing a net present value for each of a company's mining operations, is the most useful effective valuation method as it combines both the short term parameters and the effective or projected mine life.

In order to compute the Net Present Value, certain fundamental information is essential. The barest minimum of data required is gold production, unit operating costs and capital costs on an annual basis. An amortisation/depreciation schedule and the effective tax rate, are also essential. A detailed production schedule, including material moved, ore treated and metallurgical recovery is highly desirable. A projected spot gold price, appropriate exchange rates and a suitable discount factor would then be the only major variables. Sensitivity analysis can be used to provide a range of valuations.

The biggest problem, from an investment perspective, is that this information is very rarely available to the professional investor through normal company reporting procedures. Whilst all mining companies are required to comply with accepted accounting standards, and more recently, reserves and resources as defined by the Australasian Institute of Mining and Metallurgy, companies are under no obligation to disclose budgeted production and costs even one year ahead, let alone for the life of a mine.

The exception to the norm is for prospectuses (usually when a company applies for official listing on the Australian Stock Exchange) and documentation associated with mergers and takeovers. This has, in recent times, provided

budgeted production and cost data that would not normally have been disclosed. Additional information on Normandy Mining, North Flinders Mines, Mt Leyshon Gold Mines, Sons of Gwalia, Goldfields, Highland Gold, Acacia Resources, Lihir Gold and others has become available through various information memoranda. With the exception of Lihir Gold, not one of those companies making up the ASX Gold Index provided life-of-mine forecasts for any of their operations. Only a handful gave some indication of the budgeted gold production for the following year.

The Lihir Gold Ltd prospectus provided a detailed mining and production schedule for the first fifteen years of the operation as well as production costs (mining, processing and general and administration costs on a per tonne basis) and refining charges and management fees. Sensitivity studies for net income and cash flow were provided for various combinations of gold price, interest rates, operating costs, mill feed grade and metallurgical recovery. Unfortunately, this is probably the only time this production and cost profile will ever be published; once the mine is in operation, there is little likelihood that the life of mine production and cost schedules will ever again be published.

When life-of-mine plans are not provided, the only alternative for investment analysts is to assume that the reserve grade will be equal to the head grade for each year. This assumption can lead to gross distortions in production projections and cash flows for a number of reasons:

- where flexibility in mine design and production scheduling permits, project economics are invariably enhanced by adopting a declining cut-off grade, and hence head grade. This is probably less prevalent in the case of Australian gold miners, where ore is often sourced from a number of different deposits and the mine life is generally short. It is however, a consideration in the high tonnage, lower grade deposits, such as gold/copper porphyries, provided higher grade zones exist;
- additional reserves are very often delineated by on-going exploration. If these are higher grade and are readily accessible, the mining schedule could be changed to mine and treat the higher grade ore;
- the more likely case, however, is that substantial tonnages of lower grade ore will be discovered,

which can either extend the mine life but is more likely to result in the expansion of the treatment capacity;

- once the mine is in operation, head grades frequently fail to live up to expectations. In a study carried out by the author in the late nineteen eighties, only two new gold mining operations out of thirty six achieved forecast head grades in the first full year of production.

In addition to the Net Present Value of the company's operations, several other factors need to be taken into account in order to arrive at the ultimate valuation. A value must be placed on the hedge book, preferably marked to market at an appropriate discount rate. Net cash surplus or outstanding debt must also be taken into account. If the company has accumulated tax losses, or if tax paid is expected to differ markedly from tax expensed (for example, through higher tax depreciation rates), these should be included in the final valuation. Advanced projects, which have an ore reserve, would be treated in the same manner as operating mines. For prospects without reserves, but with an existing resource base, a valuation based on market capitalisation per ounce of resource for similar properties may be utilised.

Perhaps one of the most controversial areas in company valuation is the value that is attributed to exploration properties without reported resources. Previous accumulated expenditure on exploration tenements can be used but can be a fairly poor guide, as only a small proportion of exploration prospects ever develop into mines. Another method is to use transaction prices achieved where exploration properties in the same area have recently changed hands. The course of action favoured by the author is to place no value at all on these exploration areas; in this way, investors can compare the value per share achieved with the current share price and make up their own minds if they are prepared to pay the effective premium for exploration upside or "blue sky" as it is often referred to.

Conclusion

It can be clearly seen from the above that despite the large number of uncertainties associated with mining, professional investors, and ultimately shareholders, would be able to make more informed decisions provided more information was provided. This is particularly the case in calculating Net Present Values, where production and cost profiles generated from optimisation studies are very rarely available to the investment public. This is even more frustrating to the professional investor who is fully aware that optimisation studies have been carried out, often significantly improving project economics, but are not made available. Reporting standards for reserves and resources, to name but one area, have improved remarkably since the AUSIMM Code was adopted. There should be no reason why the results of optimisation studies and ultimately life-of-mine production and cost profiles should not become freely available to shareholders. This would clearly demonstrate the critical role that optimisation studies play in the overall valuation of companies. It is essential that mining professionals engaged in optimisation and planning must seek to persuade management just how important the flow of information is, while professional investors and executive management of the mining companies must make every effort to produce a standard of disclosure that will allow fully informed decisions to be made.

The answer to the question "does mine optimisation lead to better investment decision making?" is therefore fairly simple: definitely "yes", provided the information generated from the optimisation studies is made available to those who are making the decisions.



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