

Traps in mining valuations

The mining industry is not without risk. However, as **WAYNE LONERGAN** shows, billions of dollars have been lost not because the resource played out, but because the industry continues to use inappropriate accounting practices.

In applying financial modelling techniques in mining valuations (in particular, discounted cash flow analysis) the following key factors need to be considered:

- metal (or oil) prices
- operating costs
- the USD / AUD exchange rates (this is necessary as most resources are priced in the world markets in USD)
- production volumes
- capital expenditure.

In the case of longer life mines or projects, some people may perform an assessment of the reasonableness of the discounted cash flow valuation by reference to industry rules of thumb.

That such rules of thumb are notoriously unreliable does not appear to have discouraged their use or at least reference to them. Such rules of thumb include market value of a company's shares to reserve ounces (or tonnes), market value per barrel of oil equivalent, capital value per million tonnes (ounces) of annual production etc.

A CAUTIONARY OVERVIEW

Investors, companies and even some experts need to be constantly reminded of the potential for bias and the potential for value distortion that can arise as a result of the failure to remember or constantly revisit the fundamentals of DCF models and their underlying assumptions.

The key issues are:

- (a) treatment of risk;
- (b) the key assumptions;
- (c) financial instruments;
- (d) foreign exchange (FX) rates.

RISK

There are many risks associated with mining projects. The issue is how risk should be reflected in the valuation.

One approach is to weight the cash flows to allow for the probability of success. The valuation is then calculated by placing a probability on each of the likely possible "expected" cash flow projections.

Many DCF valuations are undertaken using a single estimate of the future cash flows. Typically, this is referred to (not strictly accurately) as a "best estimate" or "most likely" scenario (often referred to as a base case).

However, the dispersion of possible cash flows around the "most likely" case is seldom perfectly symmetrical. Often there is more scope for downside outcomes than there is for high side outcomes (i.e. cash flows are optimistic and upside potential is also usually constrained by competitive forces such as new discoveries and/or market resistance at the commodity use level).

Probability-adjusted NPV techniques

The theoretically correct approach to determining value is the discounted cash flow value based on the range of "expected" cash flows where the expected cash flows are, conceptually, the probability-weighted average of all likely scenarios. This approach is often referred to as the probability-adjusted net present value (NPV) technique.

The basic proposition underlying this approach can be demonstrated in Table 1. In this example, the expected value (taking into account the likelihood of each outcome) is lower than the "base case" value of \$60 million. Consequently, the correct market value is only \$42 million, not \$60 million.

In mining valuations, the consideration of a range of likely outcomes is important because there is at least some probability that the

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TABLE 1 PROBABILITY-ADJUSTED NET PRESENT VALUE (NPV) TECHNIQUE

Outcome (1)	NPV of outcome \$m	Probability of occurrence %	Expected value \$m
High case	80	10	8
Base case	60	50	30
Low case	10	40	4
Fair market value			42

Note:
 1 In theory all possible NPV outcomes should be determined and assigned probabilities.
 2 This probability distribution highlights the fundamental deficiency in many valuations which only consider the NPV of the "base case" (and sometimes only the high case) outcome (in this table, \$60 million to which they apply a 100% probability), rather than the value of the probability of the likely outcomes or the probability-adjusted range of outcomes which derive the market value (in this table, \$42 million).

project will not be a technical or commercial success.

Furthermore, if commodity prices fall significantly or if the \$A/\$US FX rate improves significantly, the project may have a negative value. In such circumstances the "expected" value of the project might be as shown in Table 2.

It is important to note that it is not appropriate to discount at a risk free rate of return where probability-weighted cash flows are used for the purposes of determining value. This is because the cash flows being discounted, although probability adjusted, are still not certain and riskless cash flows but rather are only, at best, an estimate of the "expected" cash flows.

For mining valuations, the forecast cash flows may exhibit a significant variability both as to quantum and timing to those originally expected, increasing the risk and reducing the present value. This is compounded if the forecasts are optimistic (and in particular, if commodity price forecasts are optimistic) which the probabilities do not take into account.

Accordingly, a discount rate substantially greater than the risk free rate, or 10 year Commonwealth Government bond yield, should be used. However, the discount rate used should be lower than that appropriate where cash flows are not weighted to allow for the probability of success, discussed as follows.

Adjusting the discount rate

The problem with the probability-adjusted NPV approach in practice is that it is not possible to determine all possible scenarios, nor is it possible to determine precise probabilities.

In assessing projects where cash flow forecasts are optimistic and/or highly uncertain, a reasonable assessment of the "expected" cash flow projections can be materially different from the "most likely" estimate, especially if the promoters, or others with a financial interest in the project or the value being derived, provide this. Consequently, risks must be incorporated into the valuation to:

- allow for differences between the expected and actual cash flows (i.e. normal projection errors);
- as a reward for risk taking (i.e. a normal risk margin); plus
- a further allowance for the difference between the cash flows

forecast and the best estimate of expected cash flows that would be prepared by a willing but not anxious, fully informed and objective investor (i.e. to eliminate preparer bias in the forecasts).

In practice therefore, many investors, analysts and others adopt an alternative approach of "loading up" the discount rate in such circumstances to reflect:

- normal estimation errors;
- normal risk;
- the optimistic nature of the cash flow projections.

Under this approach, it is therefore appropriate to use a higher discount rate than if the probability-adjusted net present value technique was applied. However, from a technical perspective, the "loading up" is difficult to defend other than on the basis that "others do it".

KEY ASSUMPTIONS

There are two basic approaches as to what commodity prices, FX rates, etc assumptions should be incorporated in the DCF model. They are either:

- based on prevailing commodity prices and prevailing exchange rates; or
- based on (generally) historical average commodity prices and (generally) on historical average FX rates.

Prevailing prices and rates

The following (self evident) reasons are put forward to support the use of prevailing commodity prices and prevailing FX rates:

- prevailing prices and rates are factual and current;
- the value of an asset is the value on the valuation date, not the value that the buyer or seller would like it to be or project it to be;

TABLE 2 EXPECTED MARKET VALUE OF PROJECT

Outcome	NPV of outcome \$m	Probability of occurrence %	Expected value \$m
Unexpected mining or metallurgical problems	-20	50	-10
No mining or metallurgical problems but commodity prices fall	-50	30	-15
No mining or metallurgical problems and commodity prices as expected	200	20	40
Market value			15

RESOURCES

(c) there is generally a range of valuation parameters (traditionally a high case, low case and most likely or base case) within which range transactions occur, and this range normally encompasses both prevailing prices and rates and (objectively assessed) likely longer term rates and prices;

(d) there is a long term (but by no means precise) relationship between the value of the Australian dollar and the general level of commodity prices (at a common sense level, if commodity prices generally rise then more foreign currency proceeds flow to Australia and the SA currency strengthens);

(e) larger mining companies, and their bankers are able to lock in FX rates and commodity prices (the latter is more difficult other than for gold) and could thus make substantial arbitrage profits on the differential between prevailing commodity prices and FX rates and the average commodity prices and rates used in the valuation model.

Average rates

Proponents of the use of average commodity prices and FX rates cite the following reasons:

- (a) the volatility of commodity prices and FX rates means that values change virtually daily;
- (b) prevailing prices and rates may have been affected by temporary influences or aberrations;
- (c) two of the inputs into the CAPM discount rate are typically measured using long term historical inputs (being beta and the market risk premium);
- (d) a body of studies have shown that market microstructural effects (volume, number of dealers, time zone, bid-ask spread) have a significant impact on short term exchange rate volatility;
- (e) the use of a long term (expected) exchange rate is consistent with the long term nature of the investment.

Proponents of the average approach believe that the departure of actual prices and rates from expected prices and rates are (usually) caused by random events. Hence, by averaging actual prices and rates over a sufficiently long period of time, all the random effects cancel out and the average provides what is said to be

(but often is not) an unbiased estimate of the expected commodity price and exchange rate which is relevant to valuations.

Underpinning this rationale is the assumption that the expected commodity price exchange rate is consistent with the period over which the average is taken.

This approach is only theoretically valid if the averaging period is chosen in such a way that the fundamentals (commodity supply and demand balance of payments, trade accounts, budget deficit etc) dictating the level of long term (expected) commodity prices and exchange rates remain valid over the forecast period.

The important point of logic that is often overlooked is the need to ensure that, if there was justification for using some form of historical or average rates (as opposed to reflecting them in the probabilities), all relevant assumptions are logically consistent e.g. not just metal prices and FX rates but also the discount rate applied.

A downward trending historical interest rate, commodity price or FX rate might have the same long term average as an upwards trending one. However, the implications for future cash flows, and hence value are opposite.

Simply put, the use of long term average prices (etc) is, at best, very dangerous.

Scope for distortion

The following simplified example demonstrates how the application of "long term" prices and rates can produce a materially different result to that produced by the application of current prices and rates.

A long term FX rate of 60¢ and a gold price of US\$300 may produce an NPV of:

	Present value SA million
Revenue	500
Costs	400
Project value	100

By way of comparison, the application of the prevailing current exchange rate of around 50¢ produces a massively different project value:

	Present value SA million
Revenue	600
Costs	400
Project value	200

The scope for value distortion is both obvious and potentially very significant.

FINANCIAL INSTRUMENTS

In the case of many projects (and particularly in the gold industry), significant valuation distortions can occur unless proper allowance is made for the "true impact" of financial instruments. Whilst this proposition is easily stated, full information regarding the nature and the extent of use of financial instruments is not always readily available.

The valuation of a mining project is normally based upon the net present value of its future cash flows. There are three key components of value:

- (a) cash flows generated from the basic mining operation unaffected by the use of financial instruments (being the core mining operations, valued at their net present value);
- (b) cash flows generated from the use of financial instruments (these need to be valued at their current market value i.e. marked to market);
- (c) the value of potential further discoveries.

Valuation distortions may result unless the correct discount rates are applied to the correct cash flows, that is:

- (a) mining cash flows should be discounted at a weighted average cost of capital appropriate to the mining venture;
- (b) financial instrument cash flows should be discounted at the true interest cost of financial instruments (which carry an implicit interest charge at a different rate of interest to the WACC discount rate).

Future developments (in time)

Accounting standard setters around the world are presently contemplating a recommended new financial instruments standard that:

- (a) would require mark to market accounting of all financial instruments

through the profit and loss account; and

(b) would put an end to traditional hedge accounting reporting practices (but not an end to sensible hedging).

These proposals will continue to be bitterly (and not always rationally) opposed by the business community. However, the outcome of the debate, while it may be delayed, is inevitable. Mark to market accounting of financial instruments will eventually become mandatory.

Why use financial instruments?

Gold mining companies, in particular, use financial instruments as a means of increasing certainty with regard to future cash flows, to manage risks and to “lock in” a minimum cash flow and income stream for producers (i.e. stay in business money) and their lenders.

While the desire to lock in is understandable from a lender's viewpoint, and is prudent from a producer's view point, it is very important to lock in the right thing and to lock it in the right way.

FOREIGN EXCHANGE RATES

The major Australian mining houses (with the notable exception of Rio, who does not forward sell as a matter of policy) have lost more than \$10 billion (yes billion!) on their forward sales programs. The combined loss, if the smaller mining companies are included, is substantially higher.

The fundamental reason why so much money has been lost is that many mining companies forward sold the wrong thing!

In fairness to those miners who forward sold US dollars, at the time these contracts were entered into, the Australian dollar was expected to strengthen significantly.

In 1987, for example, SA expectations were in the low to mid 80¢ range. As it transpired the SA has fallen to around 50¢.

Thus a miner who had forward sold US dollars at say 70¢ is today faced with significant losses as follows:

Forward sold US\$7m at AS70¢ \$10,000,000

Cost of cover today at AS50¢ \$14,000,000

Loss from forward sale \$4,000,000

To make matters worse, if the underlying commodity being mined has declined in price, there might be insufficient commodity sale proceeds to cover the short position.

In Pasmenco's case, zinc fell from US\$1,081 a tonne to around US\$780 currently. This fall, a major problem in its own right, was compounded because Pasmenco sold put options at around 65¢ and has been forced to cover those contracts at around 52¢. The net result of FX losses caused the collapse of Pasmenco.

The risk of commodity price falls can be reduced through forward sales of the commodity. If hedges are properly put in place, a profit can be assured as a sales price can be locked in that is greater than the company's total cost of production.

However, the key point is to forward sell the right thing, i.e. the commodity, not just the US dollars.

It appears that the high level of losses of some miners is attributable not only to their failure to hedge commodity price risk, but also to the way in which their currency exposure was hedged.

This may be attributable to the fact that some bankers have promoted so-called “costless” option strategies whereby the purchase of call options is financed by the sale of put options at little or no immediate cash cost to the company.

As always in commercial life there are no free lunches. The commercial reality of these strategies when the SA fell is that the calls expired worthless and massive losses were incurred on the puts.

Why companies should mark to market

It is likely that future AASB accounting standards (following the IASC proposed Financial Instruments Standard) will mandate that all financial instruments

be marked to market. This will mean much more disclosure of information about the value of financial instruments, and will cause significant changes in both hedge accounting practices and their reporting.

In the case of Pasmenco, it is (at least) doubtful that many of the FX contracts entered into would ever have occurred in a mark to market world. Even if they had, the recognition in the reported results due to the SA decline would have forced Pasmenco to cover their position much quicker than it did.

For example, in 2000 Pasmenco reported a profit of \$25 million. Had Pasmenco marked to market its financial instruments, it would have recorded a loss of some \$400 million in the 2000 year. It is reasonable to expect that a reported loss of this magnitude would have promoted immediate remedial action. If, for example, Pasmenco's FX exposure had been covered around June 2000 when the FX rate was around 60¢, the company would have been saved.

CONCLUSIONS

Conceptual errors continue to arise in mining valuations. Often their impact is massive. Despite widespread corporate opposition to market value accounting of financial instruments, such accounting would have saved the Australian mining industry many billions of dollars.

It is ironic that many companies who have been badly hurt by their hedging activities will cease to hedge at the low point of the SA recent trading range. The simple reality is that many companies hedged the wrong thing.

The mixture of bad accounting practices (albeit those presently mandated by the AASB), conceptually indefensible hedge accounting practice (albeit “generally accepted” accounting practice) and hedging the wrong thing have badly damaged the Australian mining industry.

These losses could be avoided, or at least significantly reduced, in a mark to market reporting regime. Sadly, many miners will continue to oppose desirable accounting reforms and more billions will be lost.