VALUATIONS OF RESOURCE-BASED ENTERPRISES  
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The resources industry is an area which places unique requirements on the skills of the valuer. Unlike companies in the manufacturing, distribution and service sectors, resource-based enterprises possess unique attributes which limit the applicability of traditional valuation techniques.

This article seeks to demonstrate that the discounted cash flow valuation method is the most appropriate means of determining the current value of a resource-based enterprise, to highlight the key factors which should be considered in such a valuation approach and to identify some of the innovative techniques taking place in such resource valuations.

INTRODUCTION

The ever-increasing reporting requirements of company law and the general public interest in Australia's resources sector have meant that valuations of resource-based enterprises are coming increasingly under the spotlight.

Legislative developments, such as the fair and reasonable expert's report required by the 1980 Share Acquisition Code, and general merger, divestment and reconstruction activity, such as the BHP led acquisition of Utah International from General Electric, are focusing increasing public attention on the quality of resource valuations and the underlying principles of valuation.

Furthermore, direct investment in resource projects by some of Australia's largest institutions has led to the requirement for regular revaluation of institutional resource portfolios so that fund members may buy and sell units in the funds at fair value.

VALUATION METHODS

Regardless of the nature of the business entity being valued, there are certain methods of valuation which valuers traditionally consider first. These traditional methods of valuation can be conveniently grouped into four categories as follows:

- Capitalisation of earnings in the form of P/E multiples and the capitalisation of maintainable profits or maintainable dividends.
- Assets-based valuations in the form of current values, going concern book values and notional liquidation values.
- Open-market values in the form of stock market capitalisations and market comparables.
- Industry yardsticks in the form of turnover multiples and other accepted industry formulae.

To these four traditional methods of valuation should be added a fifth method which is now gaining wider acceptance amongst professional valuers and the business community, namely:

- Net present value (NPV) based on the discounted cash flow (DCF) technique.

The NPV/DCF approach is demonstrating itself to be the most appropriate method for valuing resource-based enterprises, whether they are in the form of incorporated entities or joint ventures. To understand why NPV/DCF is so appropriate, it is necessary to consider those attributes which distinguish resource-based enterprises from other types of business.

ATTRIBUTES OF RESOURCE-BASED ENTERPRISES

There are certain attributes of resource-based enterprises which place limitations on the applicability of the four traditional valuation methods and emphasise the appropriateness of the NPV/DCF technique. These attributes are as follows:

- Finite nature of the resource and its significance to the project's life.
- Irregular cash flow pattern and the lack of correspondence with the project's profits stream.
- Cyclical swings in production, sales and prices over time.
- Global marketing structures and their influence on prices through international agreements and marketplaces.
- Volatility of share prices and P/E ratios of those resource-based companies which are listed on a stock exchange.
IMPACT ON TRADITIONAL VALUATION METHODS

Capitalisation of earnings has, typically, an historical focus and is insensitive to the unique cash flow pattern generated over the life of a resource project. Despite being the most common method of valuation, it has never really come to grips with the ubiquitous problem of inflation and the related problem of viewing historic earnings over periods which represent different levels of purchasing power.

Assets-based valuations fail, with the exception of new projects in an early exploration phase, to recognise the worth of the real asset in the resource project, the mineral deposit itself.

Open-market values have only limited applicability. Where the resource-based company is listed, it is common for its interests in resource projects to be sufficiently complex to prevent valuation of any single resource project of the listed company by this method.

Industry yardsticks also have limited applicability, typically to in situ deposits which are deemed to be proven.

APPROPRIATENESS OF THE NPV/DCF TECHNIQUE

In contrast to the traditional valuation methods, the NPV/DCF technique suffers none of the above disadvantages. The technique is:

- Prospective in focus, not historical.
- Sensitive, by definition, to cash flow patterns.
- Able to recognise both general inflation and real escalation in specific costs and prices.
- Based on recognising the worth of the real asset in the ground.
- Suitable for all minerals and all types of resource project, whether or not listed or incorporated.
- Suitable for complex resource portfolios, since it evaluates an enterprise on a project by project basis.
- Suitable for proven reserves as well as broader resource definitions.

Furthermore, the NPV/DCF technique has certain unique features not always shared by the traditional valuation methods, namely:

- Recognises the time value of money.
- Able to use real or nominal (money) dollars.
- Suitable for projects with a finite time horizon.
- Develops logically the relationships between key variables.
- Provides balance sheets, cash flow and profit and loss statements which can be compared with known historic trends.
- Facilitates sensitivity analysis and quantifies the effective range of the valuation.

NPV/DCF is not however a panacea. There are problems to be surmounted and pitfalls for the unwary. In fact, as great as are the advantages of NPV/DCF over the traditional methods of valuation, so too are the problems, especially the selection of the following key input variables in the NPV/DCF valuation model:

- Functional currency.
- Inflation and real escalation rates.
- Discount rates.
- Project life.
- Future prices.

Some light is shed on each of these key explanatory variables below.

FUNCTIONAL CURRENCY

Choice of the functional currency for the NPV/DCF valuation model determines the currency in which the outcome of the model is expressed. Where this choice is not the desired currency for the final valuation result, the valuer will have to consider the relationship of the relevant exchange rates over the project’s life.

The functional currency should not simply be chosen to correspond with the currency of the desired valuation result. The choice of functional currency in the valuation model is influenced by consideration of the currencies of denomination or influence of all the major cash flow items — revenues, operating costs, capital expenditure, finance and equity. In large resource projects, such cash flows are often of diverse origins and denominated in various currencies.

The economic stability of the chosen functional currency, its known links with other international currencies and the financial reporting currency of the resource project are further considerations which should not be ignored in selecting the appropriate functional currency for the valuation model. Ultimate choice of functional currency should be based on a rational consideration of the factors discussed above. Rarely does the choice stand out as obvious immediately. It must be carefully thought through and the issues given sufficient debate for the choice to become clear.

INFLATION AND REAL ESCALATION RATES

Since the same valuation result should be achieved whether the cash flows are expressed in nominal terms or in real terms, it is essential that inflation, as defined as changes in the purchasing power of money, and real escalation, as defined as real increases in prices and costs over time, are both treated consistently throughout the NPV/DCF model. This is often best accomplished by obtaining estimates of the cash flows over the project’s life in dollars of today and expressing expected real changes in prices and costs in terms of
real escalation (growth) rate percentages. It is then possible to apply a set of assumptions about inflation uniformly across the model to ensure that all the cash flow variables treat inflation consistently.

As Professor Officer of Monash University states in his 1982 Annual Research Lecture to the Australian Society of Accountants in Victoria, any inflation adjustment of real escalation rates to equivalent nominal rates should utilise the Fisher equation. The Fisher equation is defined as:

\[(1 + i) = (1 + r)(1 + i)
\]

where \(i\) is the growth rate in nominal terms (eg. nominal increase in capital expenditure), \(r\) is the escalation rate in real terms (eg. real increase in capital expenditure) and \(I\) is the inflation rate.

An example of the application of this relationship between real and nominal growth rates is as follows; say the inflation rate is 15 per cent and the real increase in capital expenditure is 10 per cent p.a., then the nominal increase in capital expenditure is 26.5 per cent p.a. based on the Fisher equation as follows:

\[(1.10)(1.15) = 1.265 \text{ i.e. 26.5 per cent.}
\]

It is a common error to calculate the nominal growth rate as the sum of the real rate and the inflation rate. In the above example the sum would be 25 per cent. This method is incorrect since it ignores the cross-multiple term \(rI\) which, in this example, is an additional 1.5 per cent.

**DISCOUNT RATES**

The discount rate used in the NPV/DCF model is the opportunity cost of capital which reflects the return which could be earned elsewhere from a similar investment of comparable risk to that under consideration. The definition of the appropriate discount rate, however, will vary according to the definition of the net cash flows. If the net cash flows are measured in real terms, then it follows that the appropriate discount rate is real, as opposed to nominal. If the net cash flows are after corporate tax, debt and interest, then the appropriate discount rate is an after-tax return on equity capital only. In each case, the definition of the discount rate is tailored to the definition of the cash flows.

Appropriate discount rates for calculating net present values are often arrived at by highly subjective means and, therefore, are open to question as a reliable benchmark. The Capital Asset Pricing Model (CAPM), described in most modern financial management textbooks, provides one of the more objective ways of determining a discount rate for DCF purposes.

The CAPM establishes the discount rate for equity capital in a stock market context as the expected rate of return for a particular stock market security. The model states that the expected return on a security is equivalent to the risk-free rate plus a premium for relative risk.

The risk-free rate is the percentage rate of return that equity holders require for an investment which has complete certainty as to return, where return is defined as both the dividend yield and the capital appreciation.

The risk premium is the additional average return that equity holders would typically seek from an investment which has the same risk as the stock market index of all securities. Risk is analogous here with uncertainty or variability of return from the investment.

The premium for relative risk is determined by multiplying the risk premium by an estimate of the relative risk of the equity concerned. Estimates of the relative risk (beta coefficient) for an investment are scaled so that the average market portfolio has a relative risk estimate of 1.0 and a risk-free investment has an estimate of 0.0. Hence a beta coefficient of less than 1.0, for example, implies that the investment has less-than-average risk and, in this sense, the estimated risk of an equity is ‘relative’ to the expected return on the market.

Such objective methodology is particularly adaptable to varying economic assumptions. There is a widely held belief in Australia at the current time that the high inflation rates presently being experienced will fall in the medium-term. This belief is supported by the recent fall in the rates of inflation of Australia’s major trading partners. Since a key element in the nominal discount rate is the implied rate of inflation, it is no longer appropriate in an expected regime of declining inflation rates to use a single nominal discount rate over the life of the project. This is particularly true of resource projects, where the cash flows vary considerably between years.

In the above scenario, multiple-tiered nominal discount rates, which vary from year to year, are necessary to reasonably estimate the NPV of the resource project’s cash flows. Higher nominal discount rates are required in the early years of the project, with lower rates thereafter. The multiple-tiered approach to nominal discount rates is an innovative way of recognising expected declining rates of inflation without changing the value of the underlying real discount rate. The number of ‘tiers’ in the nominal discount rate structure would depend on the predicted scenario for inflation. Where the inflation rate is forecast to decline to a lower constant level within the medium-term, two tiers of nominal discount rate may suffice to adequately reflect inflation in the valuation model.

**PROJECT LIFE**

The project’s estimated resource life should determine the appropriate time horizon of the DCF model. Where this project life is significantly long, as in the case of some of Australia’s major open-cut mining projects, it is not uncommon to shorten the DCF time-
frame to a shorter time-span which corresponds with other project investors’ planning horizons. There are no hard and fast rules for what is or is not an acceptably shorter time horizon, though twenty years is an often quoted statistic.

Nevertheless the first step is determining the project’s life by resource estimation. The resource estimation process serves the twin objectives of providing an estimate of both the quantum of mineral to be extracted and the quantum of material to be stripped, treated and concentrated. These estimates are the source in the DCF model of production and sales, as well as variable production costs and capital expenditure. The resource estimate is therefore at the heart of the DCF valuation of the resource-based enterprise.

Resource valuation implies a fair and reasonable estimate of the project’s worth. Where the amount of exploration drilling carried out is low, it may not be acceptable to base the resource estimate, and hence the valuation, on the geological reserve estimates alone. Fairness and reasonableness may require that less definite aspects of the resource deposit need to be quantified and included in the resource estimate. Examples of more tenuous categories of resource which may need to be included in the resource estimate are the ‘possible’ categories of deposit and reasonably assured extensions to those categories.

The valuer should also give consideration to estimating as part of the total mineral resource the additional resource potential which may exist in unexplored areas of the lease and in marginal areas outside the lease, as well as the potential associated with other ore bodies and other mining techniques.

Considerable judgement is called upon to identify, within the total estimated mineral resource, that proportion which is economically mineable. It is only this proportion which falls within the scope of the DCF valuation. Such factors of economics and engineering as cut-off grades, minimum economic deposit size and the overall ratio of overburden to be stripped would all influence the estimate of the mineable resource to be valued, as measured by the weight/volume of the ultimate mineral to be extracted and by the weight/volume of the material to be treated in the mining process.

**FUTURE PRICES**

The mineable resource estimate, the discount rate and future prices are often the three most sensitive variables in the resource valuation.

Approaches to forecasting prices vary from simple statistical regression analysis to the complex solution of econometric equations of supply and demand. With the exception of time series analysis, all the approaches require estimates of other explanatory variables on which the future mineral price depends. Estimation of these other variables can often be the weak link in an otherwise well analysed chain of relationships which forecast future prices.

However, rather than dwell on the merits or otherwise of the various techniques, readers should consider whether such long-term trend analysis produces appropriate price forecasts for the DCF valuation model. The approach intentionally ignores the cyclical pattern in the price movements of many minerals and, in times of recession such as the present, requires a starting price for the DCF model which, as an average regression trend price, is well above current market prices.

Where a definite cyclical price pattern is known to exist, it may be more appropriate to use a short-term cyclical approach to price forecasting in the valuation model. Such an approach will require predicting the length of the market cycle, the years when floor prices will prevail and the price relationships in years other than floors. These extra steps are clearly difficult, however the approach has the twin advantages of permitting current prices to be used as the starting price in the model and also providing the psychological comfort of generating a pattern of pricing which, although possibly no more accurate, conforms much more with reality. This comfort is often well demonstrated in the valuation where a graph of real historic prices is provided together with the real cyclical price forecasts pertaining to the DCF model. The convincing similarity in the pattern of past and future prices is often self-evident, where short-term cyclical price analysis is used.

**CONCENSUS AND TEAMWORK**

In conclusion, it should be said that resource valuations, based on DCF principles as discussed above, can no longer be handled by a single valuer. They call on a multi-disciplinary team of financial analysts, economists, geologists and mine engineers. Although the lead valuer will continue to have some of all the skills at his disposal, no longer is it essential for the valuer to be a specialist in all disciplines.

Significant roles are being played by sub-consultants in the fields of geology and mine engineering with the lead valuer co-ordinating the computer modelling and financial skills in conjunction with management of the sub-consultants’ work. Valuation of resource projects is being reached more and more through concensus and teamwork than at the hands of a single expert.

Resource valuations remain still very much more an art than a science. However, the above outline of the NPV/DCF technique and its key factors indicates how objective, sophisticated and innovative the art is becoming in an attempt to find a fair and reasonable valuation of the resource-based enterprise.