Key words: cost-based valuation techniques; mining assets; valuation

The valuation of in-situ plant and machinery

The use of conventional cost-based valuation techniques can significantly understate in-situ plant and machinery values in fixed asset intensive businesses, especially in mining related assets. There are also important potential flow-on consequences to other valuations where a top-down valuation methodology is used. Before undertaking fixed asset valuations, the appropriateness or otherwise of the conceptual framework from which the numbers are derived and their context should be carefully considered.

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Conceptual framework differences

It is not widely understood that the conceptual framework upon which capital market decisions are made, and within which financial reports are prepared, differ from each other and also differ from the approach taken by a large proportion of property and fixed asset valuers.

The reasons for this, and why it should not be the case, are the subject of a major thesis in its own right. In very broad terms, however:

- capital market participants adopt a concept of market value based on a discounted future cash flow approach (refer below);
- financial reporting adopts an untidy mixed model of historic cost and (supposedly) market value with a gradual (arguably glacial) shift to the latter; and
- real estate and fixed asset valuers, although generally reporting on market value, fall into three broad camps, viz. market values based on:
  (i) discounted future cash flows (i.e. capital markets approach);
  (ii) comparable sales/running yields (real estate); and
  (iii) depreciated replacement/indexed cost (plant and machinery valuers and specialised building valuers).

Theoretically, contemporaneous truly comparable sales are reflective of market values. However, underlying this simple proposition are a number of (generally) implicit assumptions concerning true homogeneity (rare in practice), market depth and transaction frequency. These characteristics are generally present in the stock market where daily turnover approximates $2 billion to $4 billion per day and relatively high standards of disclosure are required.

True comparability is less common even in residential real estate. However, differences are often relatively immaterial or can generally be specifically and readily allowed for.

In the case of larger idiosyncratic assets e.g. refineries, smelters, mines (and large city buildings, large hotels etc.) there are often no real comparable, (let alone contemporaneous comparable) sales to use as a reference point. Even where there are transactions, they are often relatively infrequent and/or there may be significant difficulties in determining all the factual circumstances and contractual conditions of the actual transaction.

It is easy to see why capital market participants that are the source of capital for the purchase and sale of larger assets, and whose decision making is grounded in terms of present value of future cash flows, prefer valuations based on the same conceptual framework. Alternatively, they need to be fully aware of the impact of any conceptual differences in the valuation prepared by specialist valuers e.g. property and fixed asset valuers if their conceptual approach differs.[1]

Fixed asset valuations in practice

Conventional fixed asset valuations essentially look backwards and analyse:

- the historic cost of the assets;
- an estimate of what they would cost today; and
- an estimate of how much they have been used up.

By way of contrast, DCF-based valuations look forward and analyse:

- what cash flows are expected to be generated from the asset in the future; and
- what is the present value of those cash flows at the valuation date.

In the case of mobile fixed assets such as vehicles and bulldozers, there is generally a relatively active, liquid market and sufficient transaction frequency from which reliable current market value data can be readily obtained.

However, in the case of larger more complex fixed assets, from a cost and timeliness perspective, it is easy to see why fixed asset valuers favour methods of valuation based on depreciated historic cost (DHC) or depreciated indexed replacement cost (DIRC).

In some cases, and for some purposes, these depreciated cost-based values may be an acceptable surrogate for market value. However, in the case of high-value complex and integrated fixed assets such as refineries, smelters and complex plant, large valuation errors can arise if cost-based valuation techniques are used. Valuation errors arise, in particular, if:

- the cash generating ability of the asset in situ (i.e. its true value in use) materially exceeds depreciated indexed or depreciated historic cost; and/or
- there is a failure to recognise all indirect costs that would need to be incurred, particularly for older assets, to put the asset in place; and/or
- inappropriate depreciation rates are used.

While these concepts are hardly rocket science, it is surprising how often valuation errors occur in practice.

Depreciating assets

The basic principle of value being a function of future cash flows is not just a capital markets/equity valuation perspective. It also applies to the acquisition of depleting assets, i.e. assets that deplete in value over time such that, at some point in the future, the asset will have a nil value (in that their economic benefits have expired). Such assets are acquired by businesses because, although they diminish in value over time, the present value of future cash flows that the asset can generate over that period via use and ultimate disposal is expected to exceed the initial outlay.

However, at any point in time subsequent to the acquisition of the asset and prior to its effective life ceasing, the price a notional purchaser of the asset will pay for the asset will only be paid if the present value of the future cash flows that the asset can generate from that time onwards exceeds the price paid.

For long life assets, particularly where significant expansion phases have occurred, the use of diminishing value depreciation methods may be particularly inappropriate. This is because the diminishing value depreciation artificially reduces the assessed value even when the equipment has many years of productive life left.

Depreciation rates

Depreciation is generally calculated by fixed asset valuers on a straight line or on a diminishing value basis. For long life assets, particularly where significant expansion phases have occurred, the use of diminishing value depreciation methods may be particularly inappropriate. This is because the diminishing value depreciation artificially reduces the assessed value even when the equipment has many years of productive life left.

In the case of many fixed assets, it may be more economically realistic to base depreciation on the units of production to avoid understating the economic (i.e. the market) value of the plant and machinery. This is especially so in industries with long-life fixed assets, initially underutilised assets and circumstances of significant brown-field capacity expansion.

However, consideration of the most realistic depreciation rate to apply should not be allowed to overshadow the fundamental consideration of the correct measure of the market value of the fixed assets employed. In theory, at least, this should be determined by reference to the future cash flows that the fixed assets can generate, not to an accounting or tax type measure based on depreciated historical or depreciated indexed historical cost.

Fully depreciated assets

An asset can have the ability to generate cash flows even though it may be fully depreciated for accounting and tax purposes. In such circumstances, it is highly unlikely that a rational buyer or seller of the asset would consider that it had 'no value'.

Changes in time-based depreciation and the use of constant annual depreciation charges, difficulties in forecasting useful life and the impact on economic life of repairs and maintenance all contribute to the likelihood that depreciation rates used to determine book or tax values may result in a value that is significantly different from the asset's market value.

Impact of fluctuating output prices

The likelihood that depreciated fixed asset values will not accurately reflect fair market value is exacerbated in circumstances where the price of the product that the plant and machinery produces fluctuates in accordance with basic demand and supply for that product, and where the producing asset is not easily replaced.

This circumstance is particularly prevalent in the case of commodity products, whose values can fluctuate widely. This has important implications for the valuation of mining, refinery and smelter fixed assets. In circumstances where commodity prices fluctuate, fluctuations in the price of the end product would, at least until such time as new equipment could be ordered, delivered and installed (assuming that it is possible and practical to do so), be reflected in the assessment of the value of ore reserves and resources. However, fluctuations may also affect the cash flows that the plant and machinery or refinery can generate. In turn, it is a matter of both economics and common sense that in such cases end-product price fluctuations will impact on the in-situ value of the fixed assets that produce them.

The 2003–2008 significant cost blowouts of equipment in the mining industry have demonstrated that reference to (depreciated) historic costs and previously forecast costs can very significantly understate value. It naturally follows that the real in-situ value of existing fixed assets may be significantly greater than depreciated historic cost, or even depreciated indexed cost, especially in cases of long lead and construction timeframes and large and/or complex refinery and smelter operations.

Intangible assets, ore reserves and goodwill

The most important areas where the different conceptual approaches of capital market participants, financial reporting and fixed asset valuations arise are where the valuation of assets is derived on a top-down methodology using different conceptual inputs. In such cases, errors in valuing in-situ fixed assets not only produce an incorrect value for those fixed assets but they also have an impact on other asset valuations.

This situation arises, for example, in financial reporting, where goodwill is calculated as the residual after deducting the value of net tangible assets from the market value of the entity. It may also arise where the top-down methodology is used to value other assets such as ore reserves and intellectual property.

Conventional calculations of asset values on a top-down residual basis, and conclusions as to the value of residual assets such as 'intangible' assets and goodwill, are frequently flawed because they start out with a conceptual error. This error arises because the amount of the intangible value of goodwill or ore reserves etc. is calculated by deducting from a valuation of the whole entity (which technically should be assessed on a DCF basis, but capitalised earnings surrogates are widely used) either the depreciated historic cost, depreciated replacement cost, or depreciated indexed replacement cost of the fixed assets and the value of other tangible assets.[2]

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The fault in the traditional approach is that it compares the present value of the total future cash flows that can be generated by all the assets employed, i.e. entity value, with what is really a variation of the accounting concept of depreciated (replacement) cost. Even DRC and DIRC may not reflect market value, but rather reflect only the expenditure that would be incurred to replace the asset, reduced by a factor based (usually) on the age and working life of the fixed assets to reflect their partly worn-out state. In simple terms, DRC, DHC, and DIRC are replacement cost concepts (as the name implies) not, as they should be, strict valuation concepts.

A deduction of DHC, DRC or DIRC from DCF values has no real meaning in valuation terms unless it can be said with assurance that the DHC, DRC or DIRC amount approximates the DCF value of the asset. In the case, for example, of a mine, refinery or smelter, that cannot be said if plant values are calculated (as they frequently are) by indexing historical costs of the assets and recalculating the same depreciation rates on the higher cost indexed starting point.

Even when an independently measured replacement value of a comparable asset[3] is taken as the starting point for a DRC value, DRC may not be comparable with, and should not meaningfully be deducted from, an entity value arrived at on a DCF basis unless appropriate allowance is made, inter alia, for efficiency and output differences.

Some simple examples

The abovementioned intangible asset valuation error is best demonstrated by way of the example of a property asset such as a suburban commercial office building, in an area where there is no shortage or surplus of office accommodation. For financial reporting purposes, if, for example, the owner is the trustee of a property trust, the building must be regularly revalued. This would correctly be done by an analysis of the present value of the future cash flows that the building can generate. The cash flows that the asset can generate may fluctuate from year to year

In a business that basically comprises only a single cash flow generating asset, the discrepancy between the present value of the cash flows that asset can generate and the cost of that asset, and the discrepancy between the present value of the future cash flows that asset can generate and its DHC, DRC or DIRC, is not an intangible asset. It would simply be reflected in the market value of the fixed asset.

due to factors such as tenancy agreements, demand for rentals, changes in outgoings or maintenance requirements, the existence of competition from other buildings, vacancy factors and upgrades. If it is determined by the valuer that the net future cash inflows that the asset can generate have increased, that would be reflected in their discounted cash flow (DCF) analysis (or capitalised yield basis, which is often used[4] as a surrogate for DCF).

A developer considering the purchase of land and construction of such a building would not undertake the task and associated risk unless it expected to be able to sell the building at more than the cost to complete it, which is the replacement cost.

When there is an immediate need for the asset or where it can generate cash flows immediately, rather than at the end of a development or construction period beginning from the time that the acquisition decision is made, the 'in use' or DCF value (capitalising what the asset can be used to earn) may be substantially in excess of the replacement cost.

For example, in the 1980s, there was a shortage of warehouse/office premises in Sydney, and older buildings with poorer design and construction qualities and in poorer condition sold for much more than their replacement cost. Another more recent example involving large 'equipment' is that, at times,[5] the prices of some second-hand ships (on a bareboat basis) with prompt delivery even had a higher value than new vessels (replacement cost). In such circumstances, the market value (price) of a second-hand vessel was, self evidently, much greater than DRC of those vessels.

These simple real-life examples demonstrate two of the key principles outlined earlier in this article:

- DHC, DRC and DIRC may be materially less than the market value of the fixed assets; and
- unless the market value of fixed assets is measured on a consistent conceptual basis with that of the entity (i.e. discounted future cash flows) then the value attributed to the residual, such as goodwill and/or reserves, will be flawed.

Common sense cross-check

In neither of the above building nor the ship examples would a valuer reasonably or rationally conclude that there was, in addition to the physical fixed asset (the office building, the warehouse or the ship) an 'intangible' asset in addition to the fixed asset value.[6] The fixed asset simply has a higher value by reference to its expected cash flows (its 'in use' value). A valuation by reference to what it would cost to replace the fixed asset, (in its partly worn-out state), would not only significantly understate its market value. It would also imply the existence of, and attribute value to, another asset (e.g. goodwill) when, even as a matter of common sense, it is clear that no such other asset exists.

Value of option to expand etc

Similarly, where there is an opportunity to improve the asset (e.g. the office building can be turned into a partly retail use, the warehouse converted into wholly offices or the ship refitted) a valuer should take into account the opportunity and the cash flows it can produce, just as the owner takes the value of expected future cash flows into account in deciding whether to undertake the improvement. There is added value if the benefit of the improvement exceeds its cost. Yet, it would not be argued by the valuer that any goodwill value has been created, but rather the present value of all the future cash flows that the asset can generate, including those from the option to expand the asset, would be reflected in the value of the asset. This is simply 'market value in use'.

In a business that basically comprises only a single cash flow generating asset, the discrepancy between the present value of the cash flows that asset can generate and the cost of that asset, and the discrepancy between the present value of the future cash flows that asset can generate and its DHC, DRC or DIRC, is not an intangible asset. It would simply be reflected in the market value of the fixed asset.[7]

Some conclusions

The following conclusions can be drawn:

- There may be important conceptual framework differences between the conventional valuation techniques of plant and equipment valuers and the context in which their reports are used. In-situ fixed assets may be worth a lot more than DHC, DRC or DIRC because:
  - (i) the basis of depreciation used may not reflect economic use. Cost-based values are accounting and tax concepts. While they may be used for pragmatic reasons in some circumstances, in many cases they are not a reliable measure of 'value'; and
  - (ii) the future cash flows assets can generate are the real measure of their market value.
- reliance on conventional fixed asset valuation practice may lead to serious valuation errors in the case of a high-value/complex fixed asset intensive business;
- this has serious implications for financial reporting, tax, tax consolidation, CGT and stamp duty matters;
- not only may fixed asset values be materially misstated but consequential errors will flow through to other asset values whose values are often assessed on a top-down basis; and
- these problems are avoidable if the present value framework is applied in both the entity valuation and the underlying asset valuations.

Notes

1 For example, the real estate valuer's assumption that value is assessed 'after an orderly marketing period' differs from present value unless that marketing has actually occurred. This is rarely the case. Furthermore, the orderly marketing period can vary between six months (or less) and up to 24 months (in depressed market conditions).

2 Where depreciable fixed assets are relatively minor, this conceptual error is generally not material. However, where large values of fixed assets are involved, the conceptual and valuation error can be serious.

3 Such as pricing a new computer to replace an older computer. There will be problems in that the new computer will have qualities and capacities that the older computer does not but the older computer may perform the required task perfectly adequately and not need replacement. Quality upgrade issues are generally solved by applying the modern equivalent asset method of valuation.

4 Not always correctly.

5 B. Sachau, Managing Director, Andreas J. Zachariansen Maritime Cyprus 2005 address 'Second hand and newbuilding ship market'.

6 I have, however, seen examples where such erroneous conclusions were drawn.

7 There may be contract intangible assets such as cheap power or favourable input or output contracts. These are separate assets and their value should be assessed accordingly.