# Benefits of integrating risk and strategic goals models

**Recent developments in numerical computer-based portfolio valuation and risk models make it possible to integrate rapidly traditional portfolio theory with simulation, statistical analysis of downside risk and optimisation techniques, writes David Wood**

THE ECONOMIC VALUE of an oil and gas company is closely associated with the value of its asset portfolio. But, because of complex asset interactions, it is usually not the same as the sum of the value of the individual assets. The key task for a portfolio-manager is to evaluate forecasts for cash flow, earnings, risk and business environment in the light of prevailing strategic objectives and corporate financial circumstances.

The main use of such evaluations is to identify the mix of assets that optimises the economic value of the portfolio and achieves corporate objectives with minimum risk.

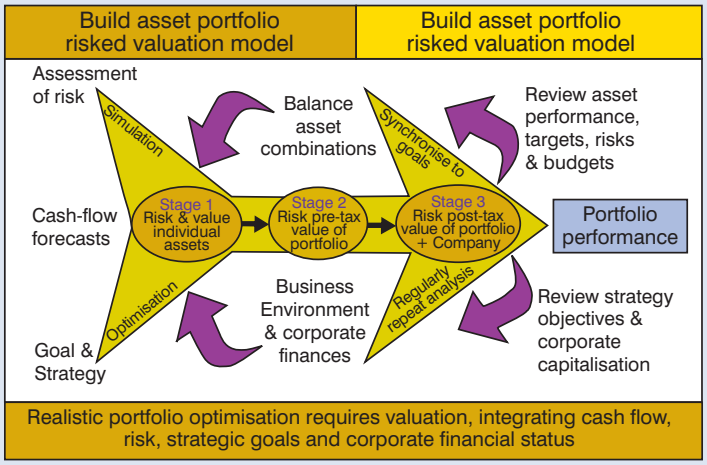
To be effective, however, evaluation models need to be systematically constructed and carefully aligned with corporate strategic goals. Companies that do this successfully can optimise and integrate their portfolio and strategy on a continuous basis. They use the numerical models to monitor and forecast the short- and long-term effects of all significant strategic and operational decisions on a range of aligned portfolio and corporate valuation metrics and performance yardsticks.

The problem is that many organisations and portfolio modellers do this badly, by inadequately accounting for risk. If risks at the individual asset level are not fully accounted for or understood, it will fail to provide a realistic risked valuation for the overall portfolio. Unfortunately, some practitioners imply that the calculation of economic risk from the statistical analysis of economic value simulation outputs on its own fully describes the risk associated with an oil and gas portfolio.

It is true that many aspects of asset risk, such as uncertainty in applicable values for reserves, production rates, products prices and costs, among others, are best dealt with by inputting them as estimated ranges to calculate value distributions in simulation and scenario models. However, other aspects of risk (such as chances of: no reserves; political intervention; no access to markets) influence more fundamentally whether an asset will be viable or not. These latter risks should be dealt with by risk-weighting factors applied to the cash-flow forecasts for each asset during the simulation.

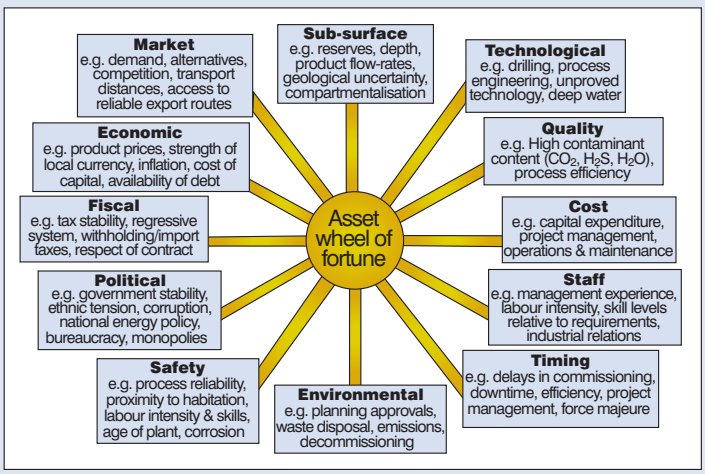
To avoid such pitfalls it helps to build portfolio models in stages and use each stage to provide valuable, but different, information regarding the risk and value associated with individual assets and the portfolio as a whole (see Figure 1).

**Figure 1** **Asset portfolio optimisation and valuation process**




*Source:* David Wood & Associates

**Figure 2** **Factors contributing to oil and gas asset risk**




*Source:* David Wood & Associates

Risks and uncertainty are best identified at the asset level. Stage 1 of the proposed modelling process should focus on being systematic and comprehensive in attempting to quantify, on a probabilistic basis, the key aspects of risk associated with each asset. The broad international spread of assets in most oil and gas firms means the key risk can vary widely from asset to asset (see Figure 2). By risk-adjusting each asset cash-flow forecast independently, with an evaluated chance-of-success factor, a realistic expected value is calculated for each asset.

At the portfolio level, risk focuses on statistical downside economic risk, measured relative to specifically defined strategic targets for discounted cash-flow and earnings distributions, together with a range of performance-related criteria generated by simulations. Dependencies among assets and input metrics should be identified and quantified for the simulations to value realistic scenarios.

For stage 2, the analysis is performed on a pre-tax basis (before corporate interest, debt and tax), providing a stand-alone risked value assessment of the portfolio. This information is not only useful for a company wishing to value its portfolio for divestment purposes, but also provides details of how the assets perform together, indepen-

dently of corporate complexities. Stage 3 post-tax analysis (after corporate interest, debt and tax), relative to specific corporate performance targets and forecasts, provides risked values of the portfolio to a firm in its current state of capitalisation. It also quantifies, on a probabilistic basis, the ability of the portfolio to achieve the firm's strategic goals.

Simulation outputs of both stages 2 and 3 are analysed for various asset combinations in the portfolio (ie, varying participating interests in assets within feasible limits). This analysis generates a feasible envelope of possible portfolios (different asset combinations) on a risked value versus risk diagram (see Figure 3), which includes "the efficient frontier" (asset combinations yielding the highest risked values for given levels of risk). Feasible envelopes are usefully defined for several metrics (such as cash flow, earnings, investment-efficiency ratios, production, capital expenditure) and compared to identify optimum asset combinations for specific strategies and budget constraints.

Optimisation algorithms, such as the simplex method, are useful for this stage of the analysis. It is essential to take the analysis back to the individual assets and to understand how each asset is influencing portfolio value and interacting with other assets. Only then is it possible to make informed decisions on which assets should be culled from, or added to, the portfolio to optimise risked value.

The strategic targets and economic forecasts are applied, evaluated and, if need be, adjusted, subject to analysis of the post-tax simulation output. An optimiser routine can be applied to select an optimal portfolio positioned at, or near, the efficient frontier, subject to the strategic constraints applied.

Portfolio models developed to this point are then valuable management tools for providing rapid and detailed risk versus value positions for a range of potential asset combinations, strategy targets, economic scenarios and budget constraints. This tool is useful for continuous performance monitoring, merger and acquisition analysis, capital expenditure allocation, budgeting, refinement of strategic objectives and scenario planning. It is worth the effort to update the models regularly with new asset and economic forecasts to keep them available as management decision tools.

Depending on an organisation's risk preferences and short-, medium- and long-term strategic priorities, it is possible for it to define a strategic window (see Figure 3) incorporating part of the feasible envelope within which it aims to maintain its portfolio. This window is then used to guide the optimisation process. Such an approach forces a company to specify and quantify its strategy, to rank its goals in order of importance and to optimise its portfolio using the highest-ranking strategically defined metrics.

## Communicating strategy

Having selected a preferred portfolio of assets, the real fun starts when trying to rationalise the existing portfolio to the selected optimum portfolio. This requires communication of the revised strategy throughout the organisation. For significant portfolio realignments a structured change process may need to be carefully project-managed within an organisation (for example, to reconcile a business unit to the fact that one of its valued assets is to be divested for the benefit of the company as a whole).

A key part of such re-structuring is to ensure performance measures are selected to reflect the highest-ranked strategic goals and that staff remuneration incentives are also linked to achieving those goals (alignment of portfolio, staff and strategy). The popular and well-tried "balanced scorecard" approach to strategic alignment fits well with this approach and is analogous to some of the steps required for the portfolio optimisation process shown in Figure 4.

Combined with modern graphic capabilities and large-screen visualisation hardware, such portfolio valuation and risk models become powerful boardroom tools for real-time what-if analysis, scenario planning and complex decisions.

The models are best managed or co-ordinated at a high corporate level to ensure they are focused on corporate goals. But the models are most effective when they are applied and integrated at several levels within a company (level 1 – corporate headquarters; level 2 – industry sectors; level 3 – international divisions; level 4 – strategic business units), with each level forming part of a matrix that provides the other levels with valuable information with which to refine the model.

The reason for this is that information critical to the accuracy of the model is held at each level. For example, strategic business units generally have the most comprehensive understanding of each asset, whereas higher corporate levels usually have a greater understanding of the strategic business objective of the organisation.

Most energy companies apply at least one or two stages of the portfolio valuation and risk process outlined above. However, many still omit to take into account the underlying asset risks and/or fail to calibrate their portfolio models with quantified strategic targets and/or align performance measures with such targets. □

**Figure 3** **Feasible envelope defines value-risk limits of possible portfolios from available assets**

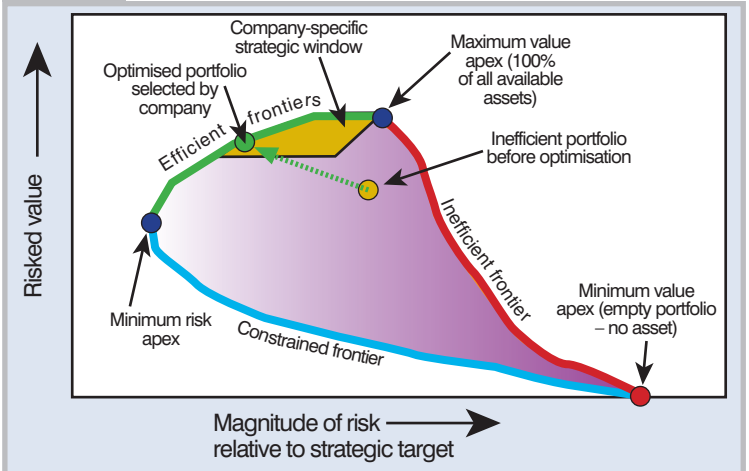
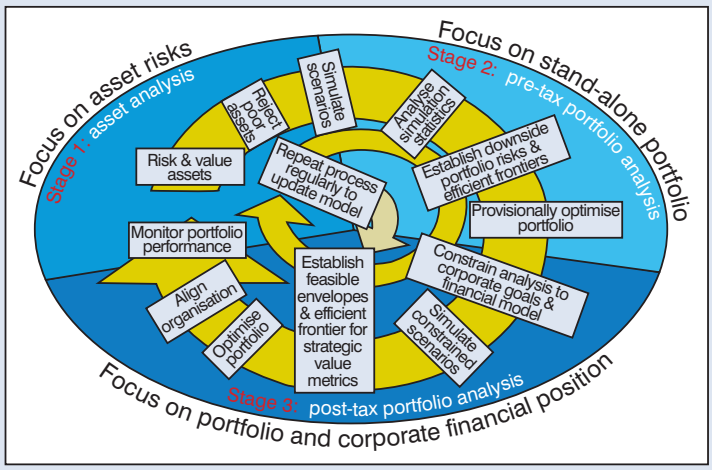



**Figure 4** **Key steps to develop and maintain an asset portfolio valuation model**




*Source:* David Wood & Associates

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