Executive summary

Managing the growth in value of a company in a world of uncertainty is a daunting task. There are so many variables that change from day to day that it is usually easier to ignore the uncertainty altogether or to be convinced that several prescribed scenarios are sufficient to explain the value impact of market variability. Inadequately measuring the impact of the variability of these factors can result in either significantly underestimating or overestimating the possible future value of your portfolio of financial contracts and physical assets. This is especially so in energy markets where there is always a mix of market price risks, treasury risks, as well as production volume risks and the risks from operating a highly capital intensive portfolio of assets. Furthermore, it can be difficult to marry the information from these risk sources together in a coherent single measure.

This paper discusses the range of risk factors that should be considered, the latest methods employed in their quantification, the business value to be attained by their measurement, and the benefits of being able to achieve a single consistent framework for analysis of risk metrics across all commodities and regions being traded.

Importance of measuring market variability

Underestimating the variability in future value means that the possible financial outcomes can be much more catastrophic as they will not have been foreseen and thereby managed. Overestimating the variability of value through conservative measurement creates an environment where the company inefficiently spends precious capital on managing non-existent exposure. It is important therefore to establish the level of variability in value correctly. Organisations that fail to appropriately model the risks they face are likely to misrepresent the earnings across their business, which then adversely affects their ability to meet target returns and alter the strategies to manage their risk exposures.

What quantifiable risk factors are there?

There are a number of risk factors that an organisation trading in energy and commodities needs to manage. Of these risks, there are those that are quantifiable and those that are not.

The quantifiable risks include market, volumetric, financing and financial risks, as they can be enumerated and modelled with a known degree of accuracy. The non-quantifiable or qualitative risks usually include operational, staffing, and organisational risks, as these do not have any easily interpreted data associated with them. These risks are generally managed

through the implementation of operational processes.

In this paper we will focus primarily on those risks that are quantifiable, which can be summarised as follows:

Market/price risk - the risk of loss due to changes in market prices on the value of the contracts in the portfolio. This covers numerous aspects of price behaviour including volatility, correlation, illiquidity, and inadequate price discovery.

Credit/default risk - the risk of loss due to a counterparty defaulting on its commitment to either pay or make delivery on a contract.

Modelling/valuation risk - the risk that the models employed for valuation, pricing, and risk measurement produce inaccurate results.

Volumetric risk - the risk of not being able to deliver a contractual amount of energy, including operations risk, as well as the impact of other external uncertainties (e.g., weather).

Financing/financial risk - the risk that the estimated cost of financing a business deviates significantly from original forecasts; includes the risk of loss resulting from inadequate interest rate and foreign exchange activity as well as the risk of loss from cash flow problems.

How does risk quantification create value for a company?

For the major risks that are quantifiable, we shall now describe the method employed to measure them and what the results from the measurements provide.

1. Measuring fair asset values

Measuring asset values involves the modelling of costs, revenues, accounting and tax costs and benefits over the life of an asset. This generally means that the value has to be calculated initially over years where the market is actively traded ("market years"), where market information on levels and volatilities is available, and then subsequently over a period when the market is no longer actively traded ("non-market years"), where price discovery is more difficult.

By being able to measure asset cashflows using stochastic methods, one is able to derive distributions of net present value and internal rate of return. These distributions provide information on the probability of not meeting the hurdle rate, and thereby the ability to alter the strategy to ensure that the hurdle rate can be met to an acceptable probability.

2. Measuring the impact of variability on the value of asset portfolios

Measuring asset values is generally performed over a restricted group of assets and contracts and not the whole portfolio. This is due to the fact that

most organisations are regionally diverse, having assets in different countries with different currencies while also having a large number of traded commodity types. Furthermore, it can be difficult to marry the information from these sources together in a single software application.

By being able to measure all assets and contracts across all regions in a single application using stochastic methods, one is able to derive distributions of earnings of the whole business and thus measure the full impact of diversification. This provides information on the probability of meeting target returns while also providing vital information by how much targets may be missed. This information provides the ability to alter the strategy earlier to manage down side exposure.

The implementation of an appropriate risk method requires the simulation of all measureable supply and demand variables over the budget period, taking into account all revenues and costs, resulting in a distribution of earnings over the period. These results can then be compared to the historic outcomes allowing a comparison of historical performance and future potential outcomes.

3. Measuring economic capital adequacy

Economic capital adequacy is a measure of economic value or the capability for a company to complete its planned business activities to enhance shareholder value. Even if the present outlook for the company is favourable, uncertainties in the market may present situations that are unfavourable. The capital required to overcome these unfavourable outcomes is known as economic capital.

Economic capital is therefore the capital required to retain and grow equity. Not doing so generally leads to an increase in debt. Being able to measure the variance in capital required from year to year allows a company to manage and structure their debt and asset mix to optimise their potential for growth.

Measuring capital adequacy allows a company to manage their asset's value on an incremental year by year basis without having to worry about the long term nature of the asset value. In addition, measuring capital adequacy provides a company with the opportunity to react to short and medium term impacts from the market ahead of time, and thereby minimise the capital impact of these events.

Usually capital adequacy is measured using earnings at risk distributions aggregated by each fiscal year and over the market years (usually 3-5 years). The most practical application is to model the risk factors as stochastic variables and in addition to derive a series of scenarios to estimate the impact of significant events. The results should highlight the impact of potential events on capital adequacy and hence the economic value.

4. Measuring cash flow adequacy

Financial liquidity is a measure of the cash flow adequacy of the company and is therefore a measure of the requirement of cash over any period of time to meet payment terms. The largest disparities between the receipts of cash versus the requirements for the payment of cash are generally caused by the differences in these terms. It is these disparities that can result in large requirements for cash when a market event requires the immediate payment of a large sum of money while the payment might be spread over a significantly longer period of time. For example; a company is required to pay the market operator a large sum with one week payment terms on an exposure to high spot prices; however, they will only receive payment from their retail customers over the following 3 months.

Knowing how many times a year, or the probability of the occurrence of a particular magnitude cash event, allows a company to prepare an optimal combination of short term lending and other facilities. This creates value for a company by reducing the inefficient use of capital in the company.

5. Measuring budget uncertainty

Most CEOs set budgetary targets that their companies are measured against. These targets are generally expressed against the current and following fiscal year. As part of understanding the outcome relative to targets, it is necessary to understand the impact of all the major risk factors that might contribute to a change in that outlook. If 6 months into a budget period the results differ significantly from the outlook, the culprit for the difference can usually be easily spotted. It might be the spot price consistently averaged lower than expected, or production volumes have been lower than expected. It is not usually as simple to determine whether the impact is highly probable or not, or whether the event was as big as it could have been.

Knowing the possible variability of the company's budget is important in allowing companies to explain the outcomes better to shareholders and to prepare reporting of future budgets in light of the variability that may be expected. It also allows companies to balance the cost of hedging strategies against the expected return while managing the downside.

Measuring the earnings at risk allows the company to determine the main sources of variability in the portfolio, while also measuring the variability in the budget outcome.

6. Measuring performance of trading strategies

Most utilities or large asset based companies assume that trading is just about managing the reliability of revenue. This is certainly a large part of trading and can not be ignored; however it is also important to know whether the trading strategy is beating the market (or not) and the possible variance of the position.

Measuring trading performance is important in that it allows management to track the performance and risk of the company's trading strategy, including that of individual trades, individual traders and the trading desks as a whole. Being able to sort the performing traders from the non-performing traders is critical in ensuring that the company optimally hedges their position. If the average position is improved by one million dollars then the EBITDA of the company is improved also improved by one million dollars.

For hedging it is common to implement a standard measure of zero return based around a non-discriminatory algorithm of buying and selling hedges. Once implemented it is up to the traders to contract to maximise their return against this standard measure.

When implementing contract trading strategies it is common to create a standard mark to market hurdle profitability. This hurdle is usually a base strategy that the trading desk is required to beat and most times is closely related to the base strategy required when hedging. The downside risk is normally controlled using a VaR measure.

The results provide a direct measure of performance of the trading strategy, trading teams, and individual traders. It ensures that traders are incentivised to trade in a manner that is conducive to maximising the final return they achieve.

Implementing risk limits on the traders and the portfolios also ensures that each trading strategy does not expose the company to any undue trading risk. Improving the effectiveness of traders is therefore the most efficient manner in which to improve profitability.

7. Measuring credit exposure

Credit exposure is the probability of loss of revenue through the default by a counterparty. The measurement of credit exposure is critical in the assessment of the cost of replacing the portfolio of contracts that will no longer be honoured. Measuring credit exposure further allows a company to place a limit on its exposure to any one counterparty in their OTC positions. Furthermore, measuring the counterparty exposure for the possibility of default at different points of time in the future allows a company to ascertain how long the exposure is likely to last. These future points of time relative to today are generally referred to as the horizon or withholding period.

When a company becomes overexposed to a counterparty in accordance with the company's risk policy guidelines, a trading hold is generally placed on that counterparty until the position is again within tolerance.

Measuring the exposure over different horizons may allow the company to trade with the counterparty at different horizons where it is not exposed. For example if it is known that the bulk of the exposure is 2 years out but not 6

months out, then there is no reason why another trade 6 months out will increase the exposure at the 2 year horizon thereby leaving the position under limit. It might also highlight that closing the 2 year exposure position to lock in the profit could be an advantageous strategy.

One common method for measuring credit risk at multiple horizons is potential future exposure. The potential future exposure can be derived by analysing the upper tail in the distribution of mark to market at these future horizons.

The results obtained provide an overview of the replacement value of the transactions in the portfolio of any counterparty.

The role of technology in risk quantification

Technology can play an important role to help companies to address the risk quantification challenges described with the ability to:

- Calculate, model and simulate risks that are characteristic of the energy markets accurately;
- Draw data from a variety of different sources/systems, and allow the creation of a holistic view of risk;
- Integrate simply and work effectively with other IT systems;
- Provide auditability to comply with international regulatory requirements for risk reporting

Conclusion

In today's more volatile, faster moving commodity markets, sophisticated valuation, sound risk management and accurate risk reporting is more important than ever. As a result, companies engaged in commodity production and distribution; need to reassess the rigor of their valuation methods, risk management processes and financial reporting practices.

General energy trading and risk management systems are unable to provide the range of risk measures and level of accuracy to achieve these goals. Based on acclaimed pioneering research in energy risk modelling, Lacima has built software to specifically address pricing, valuation and risk management of complex contracts and physical assets across multiple commodities and regions, without the cost of replacing other systems. Lacima's combination of software and advisory expertise can help energy companies to deal with this challenging area more effectively. Visit **www.lacimagroup.com** to learn more.

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