USE OF CASH FLOW AT RISK REPORTS
IN MAKING INTELLIGENT HEDGING DECISIONS

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Use of Cash Flow at Risk Reports in Making Intelligent Hedging Decisions

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At Risk methodologies have been employed by the investment banks and hedge funds for several decades to project worst case trading losses in order to set risk limits on traders. Corporate hedgers can use similar methodologies to make informed hedging decisions. This paper will discuss the use of cash flow-at-risk methodology to formulate informed and intelligent hedging decisions. It will also provide an illustration of a hedging process, using an airline as an example. The paper will conclude with the evaluation of the hedge post facto, to provide a framework for both devising a hedging program and measuring its result.

Value At Risk Versus Cash Flow At Risk

Value at risk signifies the value (change in the MTM) which can be lost in a portfolio of financial derivatives with x% (e.g. 95%) certainty in a given (e.g. 1 day) time horizon. On the other hand, cash flow at risk signifies the cash that would be received or paid in a portfolio of 'transactions' with x% of certainty in a given (e.g. 365 days) time horizon. Note that value at risk looks at the change in the value while cash flow at risk looks at the cash-flow exchange upon consummation of the transaction. Cash flow at risk, therefore, is a measure that corporate hedgers can use to identify the risk associated with changes in the prices of commodity they may purchase or sell. This normal purchase or sale approach is significantly different from a bank's concern to 'unwind' its financial transactions.

Application of the Cash Flow At Risk

Cash flow at risk is a Monte Carlo simulation methodology with a longer time horizon. For example, an airline can use it to simulate what jet-fuel costs will be in a quarter, six months, or a year's time horizon. It is a statistical methodology that reflects the market opinion (through market forward curves and implied volatilities) on the worst case (defined as x% of certainty) and best case (defined as 1-x% of certainty) for commodity prices. This methodology can be very useful to the treasury or procurement departments for budgeting process.

Currently, budgeting in many organizations is based on the view of its executives which may or may not be rooted in statistical analyses. It is not the intention of this paper to profess that subjectivity should be completely taken out, but rather that subjective views devoid of rational statistical analysis should not be employed in making market forecasting decisions. Subjectivity may be employed in making hedging decisions evaluating various alternatives. Subjectivity, however, needs to be bound by a range provided by executive management so that hedging decisions do not become speculation in the commodity markets.

Example Using An Airline's Hedging Process

This paper uses an airline as an example to illustrate an objective hedging process and how it can be tested post facto.

Suppose that on December 24, 2004 an airline was considering hedging the exposure that would result from jet fuel purchases in the first quarter of 2005. Currently, the airline is budgeting fuel cost margin of 18%; that is, it expects the fuel cost to be 18% of total revenue. The airline purchases all of its fuel based on the daily Platt's Jet/Kero oil index at US Gulf.

Several decisions must be made in the following order:

1. What is our business objective?
2. Should we hedge at all?
3. If so, how much should we hedge?
4. What locations or proxy commodities we should hedge (Crude, HO, etc)?
5. What hedging instruments should we use (Swaps, Options, Collars, etc)?

6. What tenor should we hedge (1months, 3 months, etc)
7. How do we measure the efficacy of our hedging program?

The first question is the most important, and it must be answered by the airline's executive board or board of directors. This paper will answer questions 2 and 3 although cash flow at risk can be used to answer all of the questions. For the following example we have assumed the following objective:

The objective of the hedge program is to keep the fuel margin (the fuel cost as a percentage of the revenue) between 18.50%-19.00%.

The Decision-Making Process

Following is the cash flow at risk report on the worst case scenario, defined as a 95% at risk scenario, on the jet fuel prices conducted by SunGard's Kiodex Risk Workbench's multi-factor Monte Carlo simulation model. The report clearly shows with 95% certainty that the jet fuel prices will not exceed $1.635 per gallon at the end of the 1st quarter of 2005. The price inputs for the calculation came from the markets through the forward curves and the implied volatilities. In other words, this could be construed as the "consensus" forecast of the jet fuel prices that is using an objective statistical analysis, eliminating subjectivity.

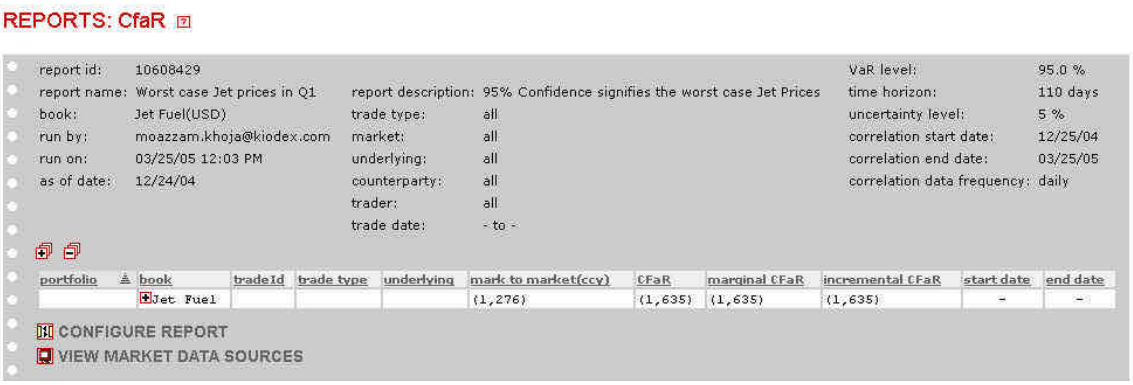

Figure 1: Cash Flow At Risk showing worst case scenario.

The use of the worst case "consensus forecast" will provide an objective framework for the airline to answer the series of questions listed above. The following table shows the effective price per gallon for a series of hedge percentages and the resulting fuel cost margin in each. The effective price of fuel purchase calculated as:

*% hedged * hedged price ($1.28 market swap price on December 24, 2004) + % un-hedged * Worst case prices)*

The fuel margin is calculated based on effective fuel cost per gallon / revenue per gallon. The revenue per gallon is assumed to be fixed at current budgeted level of $7.126 per gallon (18% budgeted fuel cost margin).

%age Hedged	Effective Price per gallon	Worst Case Fuel Margin Percentage
1.00%	$ 1.6315	22.90%
5.00%	$ 1.6174	22.70%
10.0%	$ 1.5998	22.45%
15.0%	$ 1.5821	22.20%
20.0%	$ 1.5645	21.96%
25.0%	$ 1.5469	21.71%
30.0%	$ 1.5293	21.46%
35.0%	$ 1.5117	21.21%
40.0%	$ 1.4940	20.97%
45.0%	$ 1.4764	20.72%
50.0%	$ 1.4588	20.47%
55.0%	$ 1.4412	20.23%
60.0%	$ 1.4236	19.98%
65.0%	$ 1.4059	19.73%
70.0%	$ 1.3883	19.48%
75.0%	$ 1.3707	19.24%
80.0%	$ 1.3531	18.99%
85.0%	$ 1.3355	18.74%
90.0%	$ 1.3178	18.49%
95.0%	$ 1.3002	18.25%
100.0%	$ 1.2826	18.00%

Figure 2: Fuel margin calculation.

Based on the worst case jet fuel prices of $1.635 per gallon, the airline must hedge to ensure its hedge objective that fuel cost does not to exceed 19%. In the table above, it is clear that not hedging at all could have a worst case impact of fuel cost margin of 22.90% that would be unacceptable based on the executive mandate. The table also answers the question: how much should we hedge? The table shows that hedging 80% to 90% of the total fuel purchase would ensure the executive mandate, i.e. hedging 80% to 90% would ensure a fuel cost margin between 18.50% to 19.00 as mandated.

The Role of Subjective Judgements

While still maintaining its hedge objective, the airline's management has some leeway to incorporate its subjective judgments into the final hedging decision. For example the subjectivity could come within the board's objective of keeping the fuel margin within the recommended range. In

the example above, the management could decide to hedge between 80% of total fuel purchase or 90% of the fuel purchase based on their view. The choice to pick the percentage that can be hedged could be based on the management's view about timing of the hedge. For example if the management thinks that there has been a sharp rise in the prices recently, they could hedge only 80% and then wait for the price to revert back to the mean and hedge the remaining amount later (if the ultimate objective is to hedge 90% of the fuel quantity). This limited use of subjectivity, within clearly defined boundaries, ensures that hedging is not being used as a tool for speculation. Using the cash flow at risk analysis can help instill management discipline, while still allowing room to maneuver at the tactical level.

Results of the Hedge Program

The hedge was put in at $1.28 per gallon for 85% of the total fuel purchase. Assume that the total fuel purchase was expected to be 1 MM gallons. As such, the hedge was applied to 850,000 gallons on the jet fuel through a swap at Platt's USG.

The following table shows the actual prices for the first quarter of 2005 and the outcome both with and without the recommended hedge:

	Volume in gallons			1,000,000
	Settlement Price		$	1.4148
		Unhedged		Recommended Hedge (85% of total purchase)
Total Purchases	$	(1,414,769)	$	(1,414,769)
Hedge Flow Cash Payments	$	-	$	112,344
Transaction Cost	$	-	$	(4,250)
Net Costs	$	(1,414,769)	$	(1,306,675)
Effective Cost	$	1.4148	$	1.3067
Expected Revenue	$	7,125,556		7,125,556
Fuel Margin		19.85%		18.34%

Figure 3: Prices with and without hedging.

The transaction costs - the difference between the fair market value and the offer price of the dealer - are assumed to be $0.005/gallon.

As the table demonstrates, the hedge program was successful. The success of any hedge program should be judged by whether it met the hedge objectives. The airline's objective was to keep the fuel margin at 18.75% of the revenue. This hedge actually achieved 18.34% in the fuel margin. The success of a hedge program is not judged by lowest fuel margin possible! Rather, the success is judged by how the hedge achieved its objective when it was put in place. No one has a crystal ball to know where fuel prices will actually end up. Therefore, a company's board should judge management not by whether they 'beat' the market, but whether they achieved what they were mandated to achieve.

Please note that the hedge policy could have been more efficient if other hedging instruments like options were used. The cash flow at risk methodology can also be used to apportion the total hedge volume to several instruments like, swaps, options, etc.

Conclusion

An effective risk management policy requires an objective and statistically sound methodology. Cash flow at risk is a tool that can provide this methodology. It answers the most pressing question facing the company, i.e. "what is the consensus opinion on the outcome of commodity prices in future?" By using such a statistical measure, an end user or a producer of a commodity can devise a hedge strategy that has a rational foundation and takes management's personal opinions of the decision making process. The cash flow at risk tool and the fuel margin concept can be further applied to answer other critical questions for the management such as how much to hedge, what instruments should we use, etc.

Using the above approach will have several positive impacts for a business. First, it will provide confidence to the company's shareholders that the company has a well disciplined process to manage commodity risk. Second, it will offer assurance to the company's debtors that the company has a sound process that will protect their investments and, lastly it will reduce potential conflicts among management and give them confidence in making these types of hedging decisions. ■

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