

Credit exposure

Post-delivery problems

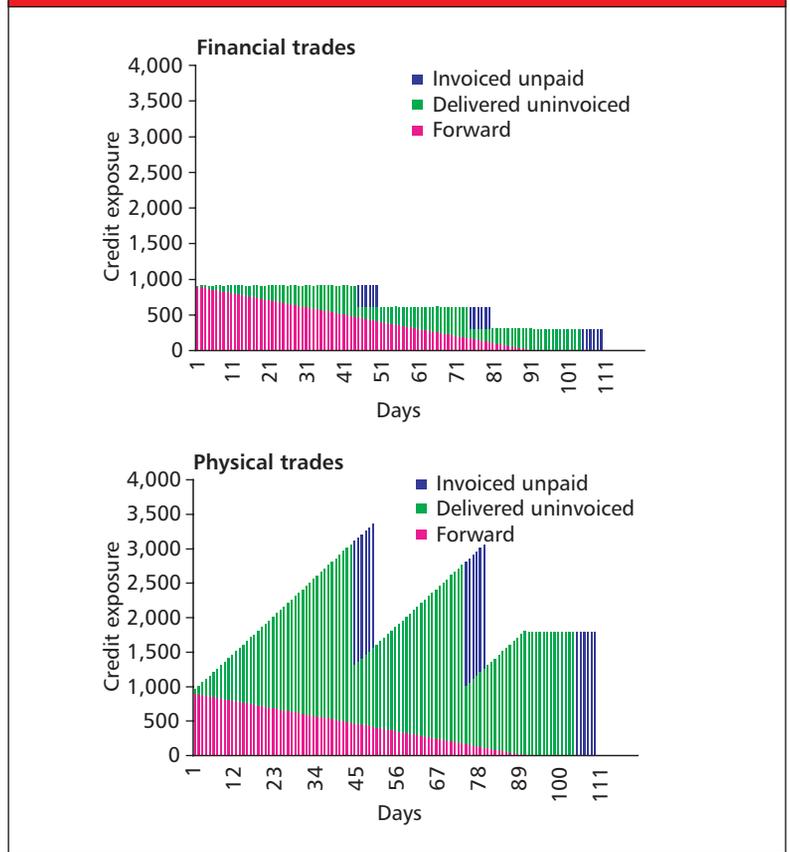
The credit exposures that arise from trading physical and financial energy are inherently more complicated and volatile than those encountered in trading purely financial products. *Richard Sage* looks at the different elements to be considered

Brett Humphreys has argued that credit value-at-risk (CVaR) is not a sufficient metric for monitoring credit risk (see *EPRM* August 2002, page **XX**). He mentions that potential credit exposure only applies to existing forward transactions, as any profits that have been realised are no longer credit risks. But there is a trap here for the unwary, in that the point at which credit risk “actually” disappears is when the cash is collected, not when the market risk disappears because the reference date has passed. This marks a significant difference between the banking and energy trading worlds.

In the banking world, on a typical interest rate swap, each settlement amount covers a period of six months. The amount payable is the notional times the difference between the fixed rate specified in the trade and the reference rate fixed at one particular time every six months. Payment is made within two days of each fixing. Thus the difference between the credit exposure and the mark-to-market (MtM) value is almost always very small, and indeed is zero except for two days every six months.

In the energy trading market, the amount to be settled depends on the spot prices for each individual day – or even half-hour. The MtM value usually refers only to reference dates in the future, because there is no longer any market risk for traders to manage relating to past dates. Hence, on January 7 the MtM value will no

Figure 1: Financial v. physical trade exposure



longer include amounts for liquidation/delivery on January 6.

However, settlements are generally only made monthly, and up to three weeks after the end of the month – depending on the particular commodity market. For example, in the UK gas market, the amount resulting from trades referring to the January 6 will

not move as cash until February 20. For this commodity, there are always between 20 and 50 days that are not in the MtM forward value but are still part of the credit exposure.

So even for financial energy swaps, this means that the credit exposure due to unsettled amounts is bigger and lasts longer than on an interest

Credit exposure profiles for three contracts

Nature	Notional	Fixed price	Floating price	Term	Notional value of contract	Frequency of settlement	Maximum credit exposure in excess of market value	Days open
Interest rate swap	\$10 million	5.50%	5.00%	1 year	\$10 million	Six-monthly	\$25,000	2
Gas financial	\$10,000/mmBtu/day	2.50%	2.25%	1 year	\$9.125 million	Monthly	\$125,000	20–50
Gas physical	\$10,000/mmBtu/day	2.50%	2.25%	1 year	\$9.125 million	Monthly	\$1.25 million	20–50

rate swap.

For physical contracts, the exposure from unsettled amounts can be significantly larger than this, since it is the total notional that is delivered each month and is due as cash the next month, rather than the net between the fixed and floating prices.

The table shows the exposures resulting from the three types of contract, given in each case a 10% move in the reference price between the date the deal was struck and the fixing date.

Now to the practicalities. If one has a single integrated system for all operations, then the process is simple. But I am not aware of any company in this enviable position. So one has to decide from where to source the exposure arising from past dates that have not been settled.

Banks would typically use the trading system as opposed to the accounting system, deeming cash to have arrived when it was supposed to. But energy trading companies – even before the Enron meltdown – are not always as punctilious at paying on the due date as banks, for whom the significance of value date is crucial, and interest penalties are automatically due for late payment. It therefore makes sense to use the accounting system, which will continue to report amounts due until they are actually paid.

However, this approach does not give the complete picture, since the accounting system will generally only include amounts once they have been invoiced. Invoices are generally issued a few days before settlement is due. Until this time, the exposure must be sourced from elsewhere, and solutions vary from company to company.

Hence, there are three elements to credit exposure:

- invoiced unpaid;
- delivered uninvoiced; and
- future MtM.

The contrast between financial and physical energy deals is shown in figure 1, which shows the exposure over the life of two three-month trades that are otherwise identical, using the same scale:

When multiple commodities with different settlement cycles are included, the picture can be more complex, which can mean there are

Figure 2: Single-commodity credit exposure, assuming no forward price movement

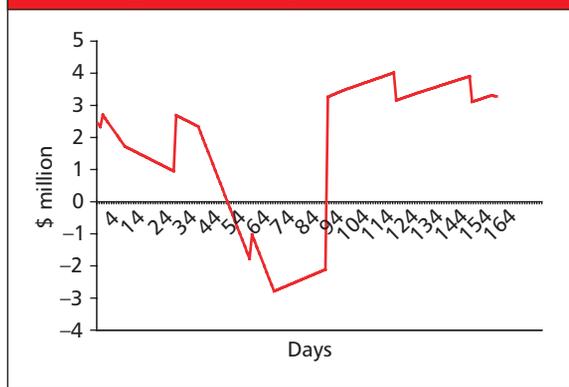
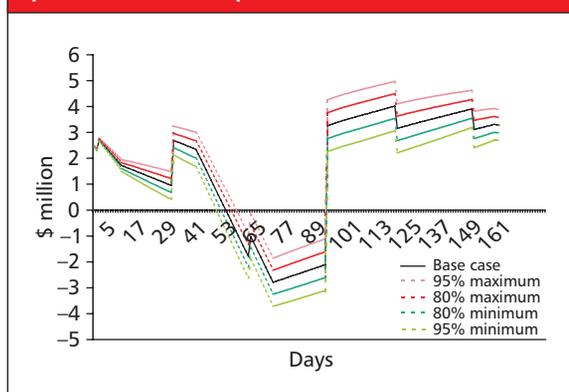


Figure 3: Credit exposure profile, assuming possible forward price movement



extra risks. For example, in the UK, if party A has delivered physical gas to party B during a month and received physical electricity to the same value, one might think the credit exposures would net off. This would often be true, but the difference between the normal settlement cycles for the two

days different from the normal settlement cycle for one or other product.

An example of a real overall credit exposure profile for a single commodity looking six months ahead is shown in figure 2. This presents the situation if there were no movements in forward prices.

The notable features are that:

- the vertical lines show the effect of payments expected to be made or received;
- the sloping lines show the effect of physical commodities being delivered or received day by day;
- exposure may swing from negative to positive and back again, due purely to the expiry of existing contracts and the settlements cycle; and
- future trading or price movements mean that the actual exposure on future dates may be different from this forward view.

If we want to combine the effects of time that cause deliveries and settlements to happen with those that cause prices to move, we can use a graph such as figure 3.

The base case in solid black is the same as that in figure 2, but here we also show 80% and 95% confidence contours, which widen as time proceeds into the future before shrinking as the notional remaining becomes smaller.

In many companies, obtaining reports of actual credit exposures – including those due to continuous physical deliveries – may involve

“What ultimately will work is having firms disclose as much information as possible as about their risk profiles” **Frank Partnoy, San Diego University**

commodities would involve party A paying for the electricity on the 14th of the following month, but not receiving payment for the gas until the 20th. If party B went bankrupt in between the two dates, then party A would have an additional credit loss that it might well not have been expecting. A cross-commodity settlement netting agreement between the two parties will not necessarily help unless it causes settlements to occur on

significant work in linking together different systems. However, developing projections into the future reduces the likelihood of surprise breaches of credit limits. Even a few days' notice enables the credit risk to be mitigated by, say, increasing the size of bank guarantees, or insisting on selective prepayment. [EPRM](#)

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