APPROACHES TO SUIT EVERYBODY

JONATHAN HODGSON AND **DARCY HORROCKS** OF SUNGARD CIRCUMNAVIGATE THE TOUGH WORLD OF CREDIT DERIVATIVES IN SEARCH OF SOLUTIONS OFFERED FOR TREASURERS BY TREASURY MANAGEMENT SYSTEMS.

The working assumption when this article was commissioned was that treasury management systems (TMS) suppliers would not be able to offer an effective solution to the treasurer wanting to engage in credit derivative (CD) transactions. Any TMS supplier would therefore be forced to either embark on a lengthy and complex system enhancement process or provide a Blue Peter-style solution/workaround using Excel and double-sided sticky tape. In common with all good treasurers, we would like to hedge our bets and argue there are two sides to this story.

TMS development is channelled to meet, and hopefully exceed, the demands of the treasury market. Historically, therefore, TMS suppliers have focused on the three main areas of treasury activity: cash; interest rates; and foreign exchange.

Around these core areas have been built a great number of reporting, accounting, settlements, audit, control and risk management functions. In essence, however, it all boils down to these three areas and on the whole we cover them rather well.

DANGER, CREDIT DERIVATIVES AT WORK. However, this same competence in these areas creates a real risk when a treasurer comes to include CDs. Cash, interest rate swaps and bonds, and foreign exchange are well-understood, well-developed markets, with extremely high volumes and tremendous liquidity. They are the purest of the vanilla markets. CDs, on the other hand, are at the very opposite end of the spectrum. They are the least understood instrument available today, consisting of complex elements with no clear way to price them, and are traded in an underdeveloped OTC market.

As you undertake CDs, you are stepping into an OTC world similar to the swaps market in the early 1980s. Your normal trading assumptions and work patterns are invalid and quite likely dangerously risky. You cannot blindly re-apply your existing work practices. You must consider this a whole new world which you need somehow to merge with your existing responsibilities.

PRICING. Many introductions to CDs state you have to be able to build multiple credit curves. Credit curves are not simply interest rate (IR) curves in disguise. They cannot be effectively achieved by creating a workaround using existing IR/FX functionality even if, as we have often been told, in the end it all comes down to a few cashflows. But credit curves are something of a misnomer arising from early attempts to incorporate CDs within existing IR systems.

Essentially, to price a credit-linked instrument, credit-linked cashflows are discounted more than simple interest rates would require, to reflect the instrument's credit exposure to the reference entity. Two otherwise identical CDs must have different values if one protects against the US treasury defaulting and the other protects against an internet start-up defaulting. Trades, simple ones anyway, can be priced in an IR system by over-riding the standard curves with custom constructed trade-specific, credit-adjusted curves. However, this approach breaks down theoretically with non-vanilla trades and, in the real world, breaks down even with vanilla trades as the number of trades increases.

Some early pricing approximations included pricing off the cost of hedging the trade, or by simply matching the price to a publicly-quoted instrument which matched exactly your own trade, or by interpolating between similar instruments' estimated credit spreads to build a spread-curve for pricing simple instruments. However, these are unsatisfactory since they require a large, liquid and homogeneous market – precisely the characteristics the CDs market lacks.

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CURRENT BEST PRACTICE. Hazard rate models are now the market standard. Briefly, broadly, but loosely accurately, they attempt to predict the risk of the reference company or entity defaulting: the hazard rate or the default probability. Various methods have been devised to estimate how the default probability varies with maturity, as with normal IR curves, but also with credit rating, industry, sector, debt ranking and the like.

If the reference entity defaults, of course, the CD's payouts are triggered and then other models attempt to predict how much the payout will be, which is where recovery rates come into it. Pricing models for credit-linked trades must combine both types of model: the likelihood of a credit-linked payout, and the size of the payout if and when it occurs. Hazard rate models vary in how they estimate the curve shape, how they interpolate between curve points, and their market data assumptions or inputs. The big problem each approach attempts to address is the sheer illiquidity and heterogeneity of this market, still very much in its infancy. In increasing order of attractiveness, the models estimate curve shape/term structure/interpolate between known market maturity points in the following ways: parametric; bootstrapping; and curve-fitting.

WAYS TO BUILD CURVES. Parametric is the simplest and least accurate method. It simply assumes the default probability curve's shape is exactly described by a simple mathematical formula. Bootstrapping is the method used in most IR systems, so is quick and simple to implement and widely understood. However, it is dangerous to use for building default probability curves. A fundamental characteristic of the credit derivatives market is the thin volume relative to the IR market, and this is unlikely to materially change within a decade. With few market data points to input, bootstrapping frequently produces invalid or even negative default probabilities. This is fine for interest rates but probabilities can never be less than impossible! Curve-fitting is the best estimation of the curve, given the available data, and by incorporating weighted error minimisation can even allow for varying ages or accuracies of market data estimates.

The huge problem with CDs now rears its ugly head: market data for this curve-building method. How do we estimate any one company's risk of defaulting? Normal time series methods are not much help, since few companies go bankrupt more than once. So proxies for a particular company must be used, and whenever proxies are used, there is a mismatch between what you are trying to estimate and what you are using to estimate it with. Without going into excessive details, these are some of the issues:

- Economic models, such as using credit ratings migration histories, or modelling purely from companies' standard ratings agency characteristics of credit rating, industry, sector and debt ranking, are still too weak at the moment to serve as reliable primary inputs for valuing individual trades. Since, for example, two identically rated sovereigns' five-year credit default swap (CDS) prices can be 40bp-400bp on the same day, a model based on these factors is not likely to be useful.
- The ideal method is to use CDS prices as market data. They are a pure measure of credit risk. But, due to the market's size, finding enough market quotes for companies sufficiently similar to the reference company you are trying to price is often difficult.
- Bonds are also exposed to company default so can be used by carrying out a preparatory transformation to their prices, although this introduces further assumptions and therefore possible error.
- Equities have a levered exposure to the underlying reference company's default risk and provide little information when the firm value drops below issued debt, but can also be used where market data is difficult to source.

The best practical method combines all these in a weighted error-minimising, curve-fitting, curve-building algorithm, granting less weight to the less-reliable estimators. This provides for full price-recovery (your model will return the market's prices for any instrument/maturity you have an actual market input for – that is, its price matches the market), flexible interpolation for non-standard trades, and full robustness to the thin market data, which is the overwhelming problem with CDs.

Looking at the whole problem from a different angle, you have the choice of constructing per instrument-type pricing models, or of deconstructing your analytics into fundamental credit-linked financial engineering building blocks, and then for each new type of instrument, just plugging in the appropriate combination of those building blocks.

The second approach, the same concept as bundling calls and puts to create new instruments, is much harder to build and requires far more rigorous quantitative analysis but is future-proof. This is critical in a market evolving so rapidly. All this makes a workaround approach difficult to contemplate.

'NORMAL TIME SERIES METHODS ARE NOT MUCH HELP AS FEW FIRMS GO BANKRUPT MORE THAN ONCE. SO PROXIES MUST BE USED'

EVEN MORE THINGS TO THINK ABOUT. To engage effectively in CD activity we need to be able to record, value, settle and account for the derivatives (noting in passing the extra responsibilities placed on treasurers by FAS 133/IAS 39). Importantly, all documentation should be ISDA-compliant and fully detailed – an ISDA 99 vanilla CDS confirmation runs to about five pages when all the credit information is included. In addition, the tax and especially netting (including cross-border) implications of entering into these transactions should be carefully assessed.

WHAT CHOICES HAVE TO BE MADE? The basic choices available to the treasurer thinking about starting this activity are as follows:

- build a solution in-house (having discounted the workaround approach);
- go to existing supplier for solution; or
- go to market.

Over-riding considerations to be taken into account when assessing each of the options outlined above are:

- Price: if the chosen solution is too expensive then it may negate the cost benefit of entering into the derivative in the first place.
- Time: both the time (duration) to 'go-live', with the chosen solution

and the amount of time required from treasury staff to build/implement the solution.
- Scalability: any solution must be able to cope with current trade levels and future growth in activity.
- Integration: with existing TMS and accounting applications.

Next we look at these choices in more depth.

BUILD A SOLUTION IN-HOUSE.

PROS	CONS
Can dictate exact requirements rather than have to compromise with an off-the-shelf package.	May take longer to bring solution online.
Possibly cheaper (operating rather than capital expenditure?)	Unlikely to have all the available resource in-house.
Do not waste time developing unnecessary code.	Extremely unlikely to have expertise in-house.
	Do not get regular updates available from a supplier as the market changes.
	Ongoing maintenance overhead.

GO TO EXISTING TMS SUPPLIER. Depending on the supplier you use, it will either have to build a solution (in which case, the pros and cons above apply, but with some reduced risk, as this is the supplier's main area of activity) or implement/integrate new functionality.

PROS	CONS
Cheaper than a build.	Like all off-the-shelf applications, some compromise may be required.
Established functionality (can do reference visits).	Integration issues (everyone wants maximised automation these days).

GO TO MARKET. As above for the existing supplier, but after another expensive system selection process and with the added risk that the new supplier is an unknown quantity.

A MIDDLE WAY. A middle way would be for the system vendor to use an 'enterprise' route to provide a complete solution without the need for designing new software.

For example, our approach within SunGard is based on close communication between SunGard companies across the group that will provide customer solutions through the full integration of products and services. For CDs we look to SunGard Trading and Risk Systems.

THE MARKET. So what is available in the market now? The simple answer is not very much. CDs have grown very rapidly and caught most software suppliers by surprise. Worse, those who have responded in the past couple of years typically tried to simply bolt on CDs to their existing IR system, without addressing the deep fundamental re-architecturing necessary. While this lets them tackle

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simple instruments such as vanilla credit default swaps, they will not be able to handle the more complex cancellable, basket, and credit-linked IR hybrid structures which are booming.

As always, the simplest and fastest developments are as Excel add-ins, and various Excel add-ins allow pricing CDs. Of these, the clear frontrunner is SavvySoft's TOPS, which will actually allow pricing of any credit linked instrument through a credit derivative building block architecture.

Looking at the bigger picture, at the enterprise level, only two primary suppliers are available today: FRONT's Intas system and SunGard's Credient Opus system. Intas was the first to market, setting up a CDS operation at Toronto Dominion Bank a couple of years ago by extending its powerful spread-based IR pricing mechanism.

Opus is the first second-generation ISDA-compliant credit derivatives system, combining re-architected hybrid credit-linked interest-rate instruments with cutting-edge building-block-based weighted error-minimising hazard rate curve building using multiple market data inputs ranging from CDS prices to equity prices. Customers trading CDs with Opus include a French Tier 1 bank and a couple of German central banks, including one of Europe's most active CD traders, according to *Risk Magazine*.

IT'S UP TO YOU. Treasurers looking to incorporate CDs are stepping into the cutting edge of complex OTC exotic structured products. The apparently simple nature of some commoditising products such as credit default swaps hides serious operational and risk management risks.

CD functionality is not a prime candidate for a workaround due to the complexities highlighted above. Increasing requirements for integration and automation lead to the conclusion that a 'proper' solution is required. Existing TMS suppliers are unlikely in the short term to develop this type of functionality in a comprehensive way, which leaves the treasurer with the choice of either building a solution in-house or buying in the functionality.

The optimal solution is, I believe, the enterprise route as this allows for the rapid integration of functionality with the minimum impact on the treasury departments day-to-day activities, and if this functionality can be supplied from the same vendor group, then so much the better.

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