Tooling up >>>>>>>>>>>>>
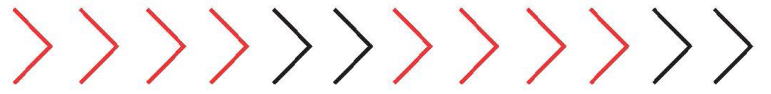
Tooling up risk management

Risk management systems come in all shapes and sizes. Head of Client Development at UBS Delta Lindsey Matthews CFA discusses some of the key issues to consider in building risk management tools, illustrated using examples from the system

A look through past editions of Financial Risks Today clearly shows that the risk issues facing financial market participants are continually evolving. Contrast the sovereign debt worries, ETF analyses and OTC clearing requirements in the last issue with the focus a year ago on the Arab Spring and the oil price, DB scheme derisking and exposure to China.

In a world where change is the only constant, it remains vitally important that we have a set of risk management tools that can be readily applied to new situations. We may not be able to predict the future, but we CAN predict that a set of flexible, adaptable and granular multi-asset-class risk tools will be a better choice than a rigid one-size-fits-all approach. Wherever risk analytics are calculated, users should be able to apply them to all appropriate situations, including new ones.

For example, a set of benchmark interest rate and individual issuer spread curves, built every day, would be needed for properly valuing and risk managing fixed income portfolios. But these could then also be applied to managing pension fund assets and liabilities, to building interest rate hedge trades for corporates, or to identifying individual issuer exposures and achieved returns

on an equity and bond portfolio. These are all ways of re-using similar market data and analytics and applying them to different situations (and are illustrated with examples below.)

Furthermore, such issuer curves could also be applied to new risk situations. For example, individual issuer curves could be used for analysing counterparty risk (and even CVA) on OTC trades. Or analytics could be re-aggregated to highlight total exposure to European sovereign governments.

Market Data & Curves

The financial crisis provided much evidence that risk methodologies, which assume that all entities with the same credit rating have the same characteristics, can miss a large contribution to overall portfolio risk. To properly understand the risks in financial market transactions and in investment portfolios, managers need to be able to drill down to risk at the level of individual counterparties or individual issuers of securities.

To fully capture such issuer and counterparty credit risk, a history of daily issuer-level spread curves, derived from cleaned bond and credit derivative prices, is needed. These can then be aggregated up into whole market or rating-based curves, which may

be used for discounting liabilities on pension schemes, or for proxying risk on counterparties that are not separately quoted, but the starting point needs to be the issuer level curves.

For example the senior debt spread curve for UBS AG in CHF, for 12 March 2012, built using bonds in multiple currencies and CDS quotes, shown alongside an aggregated curve for global single-A banks:
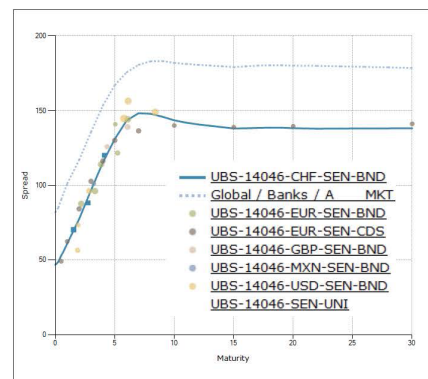
Building such issuer-level spread curves, every day, will allow risk managers to measure risk levels, to perform what-if analyses, and to properly analyse performance.

When building such issuer spread curves, greater robustness and stability can be achieved by using all available information. Using the example above, the UBS bonds issued in EUR, GBP, MXN

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and USD along with the CDS referencing UBS are all used to support the building of the UBS bond curve in GBP.

UBS Delta

UBS Delta, the portfolio risk and performance system offered to clients by investment bank UBS was used here to illustrate risk functionality. "Used by 9 out of the top 10 global insurance companies, as well as pension funds, hedge funds, corporates, and banks, UBS Delta is often praised by clients for its great flexibility," says Dermot Shortt, global head of UBS Delta. The system allows users limitless choice in the classifications used to 'slice-and-dice' portfolios. Standard choices such as issuer, sector, country, currency or maturity, as well as user-defined categories give the user great flexibility in how they see their exposure, risk and performance sub-divided.

Furthermore, UBS Delta has thousands of issuer level and market curves which are built daily and used throughout the system. "Our issuer-level curve building process is key to helping our clients view their risk," continues Shortt. "We build curves each day from bond prices and CDS quotes, and we focus significant attention on ensuring that our curve building methodology is at the cutting edge, using all the available data to support each curve." This attention to detail is seen in the example curve shown to the left.

UBS Delta has risk models, as illustrated here, along with a proprietary liquidity risk score for fixed income assets, as well as hedging and optimisation tools, and a full performance attribution module using the same categories and risk drivers as are available for risk analysis.

Issuer	Portfolio PV	Portfolio VaR (EUR)	Volatility	Relative VaR	Tracking Error ▼	Tracking Error Contribution	Category TE
ALL	201,330,186.55	2,186,374	0.66 %	1,456,608.34	43.99	43.99	
UBS AG	35,999,368.61	1,126,930	0.34 %	1,126,929.63	34.03	29.45	
REPUBLIC OF FRANCE	20,987,130.76	211,865	0.06 %	406,072.27	12.26	2.99	
REPUBLIC OF ITALY	20,422,756.68	599,855	0.18 %	403,561.03	12.19	5.32	
UNITED KINGDOM	12,815,526.28	345,096	0.10 %	345,096.14	10.42	5.37	

Source: UBSDelta

Choice of analytics - sensitivities, volatility, tracking error, VaR, etc.

There are many risk analytics that managers might use depending on their situation - e.g.: risk factor sensitivities, projected volatility, value-at-risk (VaR), stress scenario results, solvency risk and projected scheme shortfall.

Whilst a full discussion of these different measures is beyond this short article, it is important to give users a choice from a range of such analytics. Sensitivities, such as delta or PVBP (price value of a basis point - a measure of sensitivity to interest rates) show the risk in the most fundamental way. Projected volatility and tracking error can be useful measures of active portfolio risk, and

VaR can be appropriate for comparing portfolios with each other and over time. However, for other situations, stress scenario results will be a more appropriate approach.

Whichever risk measures are used, users will also need to be able to drill down and see the contribution to the risk exposure from each issuer or counterparty. Equipped with a set of issuer curves such as the ones discussed above, VaR or tracking error on a benchmarked portfolio could analysed by issuer, as shown on top of this page. Showing this alongside PV - present value (or spread deltas if there are non-cash instruments) by issuer also allows users to get a view of the amount that is exposed to any one name.

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> ## "Risk systems need to provide all of these risk measures in a consistent way as well as giving maximum flexibility"
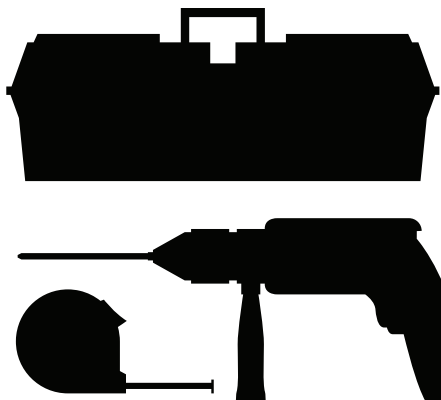
Risk systems need to provide all of these risk measures in a consistent way as well as giving maximum flexibility in setting the parameters (holding period, confidence level, start / end dates for historical data period etc.) and users should have transparency on the underlying risk model and be able to see the risk drivers giving rise to the volatility - such as interest rate moves (parallel and non-parallel), credit spreads, fx rates, inflation curves, equities, commodities.

Of course, drill-down to issuer or counterparty level is not necessary in every situation. And it is also important to be able to aggregate risk at sector, country, portfolio or even asset class level. What is most important is to be able to choose, at the point of running the analysis, which of these is used.

Market curves and discounting liabilities

As well as viewing issuer level risk on assets, users will also need various market spread curves. For example, an insurance fund or pension scheme should be able to discount a stream of liabilities based on an interest rate or spread based curve. The table below shows a set of GBP insurance scheme liabilities discounted using a LIBOR curve (GBP-LC) compared with discounting using a GBP corporate iBoxx index curve (IBX-GBP-COR). Not only is the present value (PV) of the liabilities different, but the risk (measured here by duration) is also quite different.

Pension scheme managers are also likely to want to view risk measures on assets and liabilities, and compare them. Required measures are likely to include projected cashflows and the present value of those cashflows, as well as sensitivities across the curve as shown in the chart below.

Stress testing

Alongside these analytics, users should be able to perform stress testing of portfolios or groups of portfolios.

To do this, many systems allow users to simulate performance under certain scenarios. These scenarios can be drawn from historical events or can be created to reflect particular risk exposures. To be useful, scenario analysis tools should use full revaluation - answering the question: "What would my portfolio (and its benchmark or liabilities) be worth, if these market moves happen?"

Whilst a library of standard scenarios (such as 'Crash-of-'87', 'Oil-Price-Shock', 'flight-to-quality') is useful, it is potentially even more important to allow users to easily create and upload their own scenarios. Scenarios should be defined in terms of risk factor shocks. These shocks should, in turn, be applicable to sub-sets of the portfolio, allowing rating-specific credit spread movements or country-specific equity market shocks, for example. These sub-sets should be as granular as possible, allowing (in the extreme) instrument-level shock definition. ●

Curve	Nominal (base ccy)	PV	Yield	Duration
GBP-LC	7,360,420,074	2,257,063,546	4.44	22.10
IBX-GBP-COR-	7,360,420,074	1,682,277,586	5.84	19.74

Bucketed interest rate risk on assets vs liabilities

Source: UBS Delta, UBS
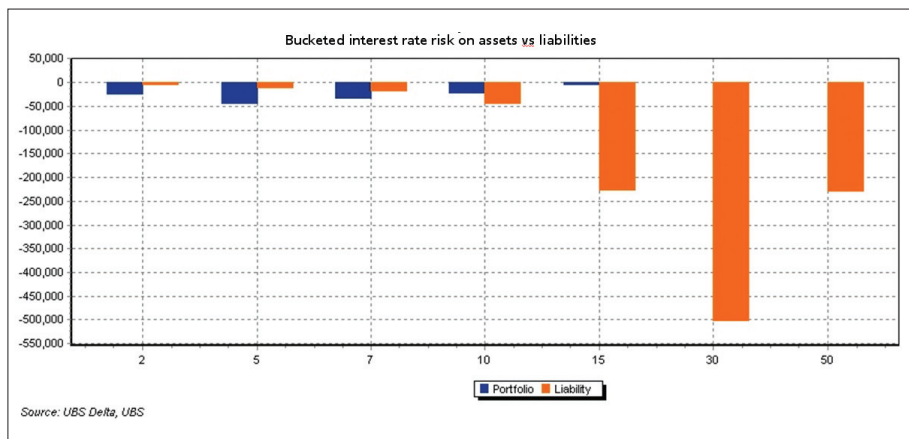
Counterparty risk >>>>>>>>>>>>

Issuer level data applied in portfolio aggregation tools can allow risk managers to answer concentration risk questions such as "what is our exposure to bank XYZ across all of our portfolios?" But as well as exposure to XYZ as issuer of securities, exposure may also arise from OTC derivatives with XYZ as counterparty.

Counterparty risk can be seen in the first instance by viewing the value and risk of derivatives aggregated by counterparty, as below. As well as showing current exposure - which is positive if the value is positive; zero if it negative - this also shows the market risks associated with a counterparty which would disappear on default.

Breakouts by Counterparty [user]		
Category	PV ▾	LiborDeltaD1
DEF Bank	4,172,571	- 37,079
City of PQR	1,582,041	- 15,597
JKL Auto	491,196	- 167
XYZ Aero	99,734	- 1,550
GHI	- 317,937	10,412
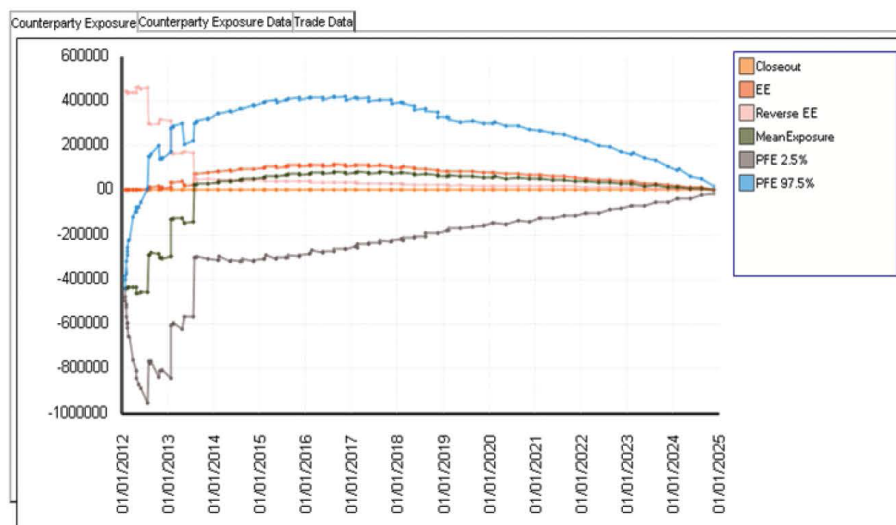
The tools discussed in the previous article can be applied to analysis of counterparty exposure. Risks can be disaggregated by maturity to show drivers of exposure across the curve. Exposures can be stressed by shocking the risk factors and exposure changes can be explained using performance tools.

But current exposure does not tell you everything about counterparty risk. Modelling potential exposure gives an idea of how much the exposure could be under potential market moves.

The chart above shows measures based on such simulations, including potential future exposure (PFE), expected exposure (EE), and "Closeout" showing the close-out risk on a book of collateralised trades from UBS Delta. ●

www.ubs.com/delta
Lindsey Matthews, UBS Delta >>>>>>>

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