Risk

RISK MANAGEMENT | DERIVATIVES | REGULATION   MARCH 2012

For a few dollars more

*Banks need more capital if they are to survive the worst eurozone scenarios being envisaged by some institutions, say **Barry Schachter** and **Lance Smith***

As the financial crisis in Europe deepened over the past 12 months, what had once been unthinkable became the subject of daily speculation: the departure of one or more countries from the euro, joint guarantee of individual sovereign debts, and default by a member of the European Union (EU).

The range of different outcomes is partly a product of the number of actors involved – ranging from the crisis-hit countries and their own domestic political parties to the so-called core governments, the European Central Bank and the International Monetary Fund, all of which have subtly differing fears and priorities. For example, in July last year a second bail-out was agreed for Greece, but before it could be rubber-stamped by various national governments, the then-Greek prime minister, George Papandreou, surprised his peers by announcing the deal would be put to a referendum in his own country. That decision was swiftly reversed and Papandreou's resignation followed.

In this kind of environment, it becomes difficult to forecast outcomes and impossible to have much confidence in statistical risk measures, so banks and regulators alike have relied increasingly on scenario analysis and stress tests. These are unapologetically subjective tools, so the market moves attached to them vary from one institution to the next.

In recent months, we have discussed stress testing possible eurozone break-up scenarios with several large banks, collecting information about the range and nature of market disruptions envisaged by the industry. The results – outlined in more detail below – were not reassuring. According to our analysis, losses in an extreme scenario would overwhelm bank capital in many cases, suggesting institutions should do more to enhance their defences, however small the chances of the euro fragmenting.

The value of stress tests
When facing a diverse range of outcomes, to which it is difficult to attach accurate probabilities, stress testing comes into its own – and the crisis years have seen it embraced by regulators. In the US, banks are going through their fourth round of Federal Reserve-administered tests – the Dodd-Frank Act requires these to become annual for all banks with $50 billion or more in assets, which are expected to demonstrate capital adequacy in assumed stress conditions. In January, the Federal Deposit Insurance Corporation proposed its own tests on banks with $10 billion and upwards in assets.

Europe's authorities have carried out their own stress tests on either a national, or pan-European basis. Markets paid close attention on December 8 when the European Banking Authority released its stress test-based capital assessment of EU banks, showing the industry needs to raise $115 billion in new capital. The Eurostoxx 50 dropped 5.8% in the days around the announcement.

Stress testing has grown up alongside another, perhaps better-known, approach to risk measurement, value-at-risk. But the latter has shortcomings that were cruelly exposed during the crisis – VAR estimates the maximum daily loss up to a certain confidence level but offers no insight into potential losses beyond that boundary (see pages 30–31).

This is where stress testing comes in – it attempts to estimate losses resulting from specific, hypothetical scenarios without necessarily considering probabilities. As a result, market participants today tend to use a mixture of three main analytic approaches to risk measurement.

The exposure approach simply measures position size in terms of a base currency – say US dollars. For example, a portfolio may contain $10 million of exposure to the euro/sterling exchange rate or $30 million of exposure to EU financial-sector stocks. Because exposure-based risk measurement expresses all positions in terms of the same base currency, a portfolio's positions may be easily added up and compared. However, exposure-based measurements do not take into account the volatility of portfolio positions or how movements in the value of one instrument may be related to movements in the values of others, making it difficult to infer risk from a simple aggregation of exposures.

The statistical approach is epitomised by VAR. If it works properly, VAR takes into precise account the uncertain nature of future possible movements in market prices – individually and in relation to all others. Unfortunately, this is where problems with VAR begin to loom large. It is reliant on historical data when estimating

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volatility and correlations among the assets held. It is also reliant on explicit (or implied) assumptions about how to generate a forward-looking estimate from that historical data. Normally, VAR's dependence on historical data is a manageable challenge to risk estimation. Unfortunately, in the case of eurozone instability, the power of VAR is limited.

Eurozone scenarios

Even a partial eurozone break-up – for example, a single country pulling out and resurrecting its own currency – is not an event that can be anticipated using a statistical approach. Nor are there candidate historical scenarios to look to for insights – currencies have, of course, disappeared in the past, to be replaced with new ones or merged into existing currencies. Examples from recent times include the launch of an offshore renminbi, or the replacement of the guilder with the US dollar during the dissolution of the Netherlands Antilles in 2010 – but most previous examples of currency upheaval have been stage-managed and are not accompanied by severe pressure on the finances of the affected countries.

A eurozone break-up would be something entirely new – which means many banks, hedge funds and other investors are currently turning to the third type of approach, based on scenario analysis and stress testing. But it isn't easy. A eurozone break-up would imply a wide range of knock-on effects including inflation, credit deterioration, disrupted capital flows and economic stagnation.

As such, a hypothetical euro break-up scenario, with no historical precedent, is difficult to craft – it should not attempt to predict the future, as this particular future cannot be visualised with certainty. Rather, the goal is to identify, through the scenario, possible vulnerabilities in a portfolio. For a large, complex portfolio, a constructed stress test will have explicit price moves for key market prices. The assumed market price changes must be coherent and appeal to common sense. Then, estimates must be made about how those price moves would propagate to other markets, usually by means of assumed asset correlations and volatilities.

Because this process is both speculative and subjective, the euro break-up stress tests constructed by different firms will share a high-level resemblance, but are sure to differ significantly in some particulars – as we found when talking to our contacts in the banking industry. Based on those discussions, we have constructed and calculated two stress scenarios – one moderate and the other extreme. The moderate scenario is based on a disorderly withdrawal of Greece from the eurozone. The extreme scenario is based on a break-up of the euro into multiple separate currencies.

Table A shows representative shocks in each scenario. These price moves propagate to other markets, asset classes and geographies based upon actual asset correlations over the four months prior to December 30, 2011 – a period of intense investor uncertainty and fear reflected in high price volatility in markets. To convey a sense of the magnitude of these shocks, the number of standard deviations corresponding to each is indicated. As a benchmark, if returns varied according to the normal distribution, then a four-standard-deviation move would happen, on average, once in 40 years, and a 6.5-standard-deviation move once in 34 million years.

Next, a globally and sector-diverse long/short equity portfolio, with a gross value of $325 million, was subjected to these scenarios. For reference, a standard 99% VAR was calculated using four months of historical returns, with the risk forecast over a one-day time horizon.

Table B shows representative results from the scenarios. The importance of contagion effects can be seen in the US component of the portfolio. The core shocks to the S&P 500 are –10% and –30%, but after taking contagion effects into account, the US stocks experience losses of –9.6% in the moderate scenario and –34.5% in the extreme scenario. Swiss stocks were not given a core shock, but despite being only 45% net long, that portfolio component lost 17.2% and 44.6% of its gross value in the two scenarios.

Conclusions

There is little doubt the extreme scenario would pose severe risks to firms' viability. Losses in the extreme scenario are 28% of the portfolio's gross market value and about 10 times the portfolio 99% VAR. If a firm used leverage of more than 3.5 times, based on gross assets, there would be insufficient capital to cover the losses in the sample portfolio. Using the three-times-square-root-of-10 rule of thumb sometimes employed to transform daily VAR into necessary risk capital, the available capital would fall just short of the losses in the extreme scenario portfolio.

While most market participants would agree a eurozone break-up remains unlikely, prudence dictates financial firms and regulators should focus on ensuring such an event can be survived. ■

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A. Core price shocks in stress scenarios

Markets	Price level as of Dec 30, 2011	Daily standard deviation (STD) (%)*	Size of shocks			
			Moderate	No. of STDs	Extreme	No. of STDs
Euro	1.2945	0.8	−10%	13	−35%	45.5
Gold	1,565.8	1.7	10%	5.8	30%	17.3
Brent crude	98.83	2.2	−15%	6.9	−45%	20.6
S&P 500	1,257.6	1.7	−10%	5.9	−30%	17.6
Eurostoxx 50	2,316.55	2.4	−20%	8.4	−50%	21.0
EEM**	37.94	2.6	−15%	5.9	−40%	15.7
US$ 2Y swap curve	0.72	0.1	−20bp	3.2	−20bp	3.2
Euro 10Y swap curve	2.35	0.02	−20bp	8.4	−50bp	21.0

* 90-days, annualised and calculated as lognormal returns for all but US$2Y and €10Y

** iShares MSCI Emerging Markets Index Fund

B. Long/short global equity portfolio impacts from core shocks and contagion effects

Countries	Weight (%)	% long	VAR* (%)	Scenario losses (%)	
				Moderate	Extreme
France	52	86	2.9	−12.8	−25.9
Germany	11	100	5.8	−18.2	−52.9
Spain	9	100	4.3	−12.5	−42.7
Switzerland	8	45	2.6	−17.2	−44.6
Sweden	7	100	5.9	16.8	30.4
UK	4	100	3.4	−29.4	−62.5
USA	3	100	3.9	−9.6	−34.5
Other	6	66	4.0	−18.4	−34.5
Total	100	80	2.9	−12.3	−29.4

* VAR is not additive as a result of diversification effects