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Why Pillar II is stressful

Will Cook and Said Hirsh look at some approaches to stress testing under Pillar II of the new Capital Requirements Directive

Mortgage lenders are likely to be the main winners from the new Capital Requirements Directive (CRD) – better known as ‘Basel II’ – with significant regulatory capital savings seemingly available for those able to jump through the regulator’s shiny new hoops.

However, once the far-from-simple data handling and analytics that make up the minimum requirements (‘Pillar I’ of the Directive) have been overcome, there lies a further challenge for mortgage lenders. This is ‘Pillar II’ of the Directive – the additional analysis showing that capital calculated under Pillar I will be robust against unpleasant shocks in the future, known as ‘stress-testing’ in the Basel II jargon.

If the regulator is not convinced, then Pillar II is the place where additional capital requirements can be imposed. This is made more problematic by the lack of prescription from the regulator on what a suitable approach might be, or how they might respond to different approaches. So there’s good reason to be stressed by Pillar II. After the hoops of Pillar I, Pillar II might well seem like an assault course undertaken whilst wearing a blindfold.

In this article we look at some alternative approaches to stress-testing under Pillar II and how lenders can present a robust, strongly evidenced piece of analysis to prevent any unnecessary ‘clawback’ of capital savings.

Regulatory requirements

Not being prescriptive is a very helpful and sensible trait in a regulator. In this case, however, the lack of clarity in what the regulator wants to see creates a lot of uncertainty about how to approach the problem. Organisations need to be careful, focusing on the inherent issues, rather than solely on the regulatory requirements. Trying to second-guess the regulator and its response could prove a distraction, and lead to other important issues being missed.

Pillar I is about estimating the risks lenders face based on their own experience. Pillar II is about understanding how ‘stressful’ future experience might affect capital requirements. The implications for capital planning of stressing capital for future shocks is at least as important for businesses and their owners as it is for regulators. A transparent and rigorous stress-testing process should also hopefully demonstrate to the regulator that Pillar I capital is more than sufficient to deal with any adverse experience that can reasonably be expected to occur.

One sensible approach is to consider some adverse economic scenarios and then ask what would happen to default rates and loss given default (LGD) under these scenarios. This can tell us what losses might be expected under different circumstances, which can then be compared with Pillar I capital. This could be extended to estimate the replenishment of reserves required as lenders move through the bad times, and thus to help build the lender’s capital management plan.

Another issue with stress-testing and regulatory requirements is data. Should individual-level data be the focus, or is it sufficient to group into risk pools according to some indicator of risk, such as original loan-to-value ratio (LTV), credit score or even behavioural score? As stress-testing in Pillar II follows from the Pillar I process, it should already have been established that any pooling used adequately differentiates risk. If this is the case, then it is perfectly valid to stress-test pooled data. In fact, there are technical reasons why using pooled data actually improves understanding of how a lender’s book may respond to adverse economic circumstances. For example, the degree of inherent uncertainty around the



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propensity to default at an individual level may mask the change in likelihood of default driven by the economy. Pooling allows for the random differences between individuals to be balanced out.

In short, lenders must use their own experience, as far as possible, to understand how key risk parameters move with the economic cycle. In the next section, we examine some different ways this may be done.

Alternative approaches

There are two ways to approach a stress-test. The first relates the history of the risk parameters to the economic cycle. This involves understanding how the economic cycle affects the risk parameters. This is the 'modelling' approach. Estimating this relationship gives a 'model' of how the risk parameter responds to the economy. The scenarios can then be 'plugged into' the model to get the stressed results.

The second approach goes straight to the data on the risk parameter in question, using the observed historical data to estimate how likely unfavourable occurrences are. Unlike the first approach, this does not involve any 'modelling'. The estimates of the likelihood of unfavourable situations and the value of the risk parameter under these situations are derived using a statistical technique known as density estimation.

We can assess the performance of these approaches based on four criteria. These are things that would be a desirable feature of any approach:

- Experience: Are the estimates from the approach used based on the institution's historical experience?
- It may well be the case that a lender can base analysis on its own experience but does not have data back to the all-important time of the last recession, which must be included in the analysis. What can lenders do in this case? The most sensible answer is to use external data, combined with and benchmarked against their own data, to give a conservative estimate of what their default experience may have looked like had it stretched back to the last recession (this exercise in itself may be a frightening experience for lenders!).
- Scale of risk: Can we attach a likelihood of occurrence to estimates of unfavourable experience?
- This may sound simple, but a myriad of issues spring from this point. Not the least of these is what likelihood should be considered. A number, which is often talked about, is a 1-in-25-year adverse experience. Leading from this is the question of exactly what a 1-in-25-year adverse economic experience is. What does that mean for GDP, interest rates, or whatever a particular lender believes the key driver of risk on their book to be?
- Economically driven: Are the estimates from the approach driven by changes in the economic environment?
- Model uncertainty: Are there any uncertainties surrounding the choice of the model?

The process of estimating relationships via statistical modelling can be quite complicated and is open to the pitfalls of hard-to-detect human error or abuse, the breaking down of a relationship through time and finally to outright random chance painting an incorrect picture of a relationship. It is important to understand that models are not definitive answers but estimates of an observed relationship. As such, although they may be the best possible estimates, they come with a risk.

The first point that jumps out from a consideration of these criteria is that a modelled relationship with a scenario 'plugged in' may give reasonable outputs but has no scale of risk – it does not inform on how likely any such scenario is. How can a stress-testing response really be regarded as useful if it can't give an indication of how rare an event it shows capital to be robust against?

One solution is to base the scenario on the worst ever observed, but although this anchors results in reality, it still does not tell us how likely this is to happen. A better, more comprehensive, solution is to apply the technique used by Volterra to generate the economic scenarios that are plugged into the models. This allows an assessment of how likely the scenario, and therefore how likely the stressed risk parameter, is to be observed.

This gives a third approach, which is a hybrid of the first two. Table 1 shows how the three approaches perform against our desirable criteria.



All three approaches meet the first measure as they are all based on the

institution's own historical experience. Approach 1 fails to meet the second criterion, as we are not able to attach a likelihood of occurrence of the risk parameter. For Approach 3, we correct for this failing by using scenarios generated using density estimation. The first approach only considers the worst-case scenario and therefore we are unable to determine the probability of that event occurring again.

Approaches 1 and 3 both use an econometric model to predict future risk parameters, while the second approach only uses the historical data series; this means the estimates are not directly economically driven. However, the use of models is problematic on its own and is fraught with many issues; for the stress-testing process to prove successful, the model must be proven to be sound and correctly specified. This is the final criterion – model uncertainty. The strength of the economically driven approaches appears as a weakness here due to the issues surround modelling.

Scenarios

We can show how these approaches can be applied in practice using the Council of Mortgage Lenders (CML) historic default rate series. The default series is constructed from CML data to approximate a default series based on the Basel II definition of default, which is 180 days in arrears. We use an econometric model that relates defaults to GDP and affordability for the modelling approaches and we predict default rates over the period 2006 to 2010 for all three approaches.

The scenario used for the first approach is the worst five years in succession over the period 1982 to 2005; these are 1989 to 1993. For Approaches 2 and 3 we use the likelihood of a 1-in-25-year event. For Approach 3, this corresponds to the combined GDP fall and deterioration in debt payment affordability, calculated using the density estimation with historic data. For Approach 2, this is in relation to the distribution of the CML's historical default rate series. For longer time horizons, we apply the statistical technique for two, three, four and five-year distributions to predict possible default rates over the period 2006 to 2010.

Results

The results are presented in Chart 1. These show that the models provide different estimates but that they move in the same direction overall. The econometric model with the worst ever scenario provides the most pessimistic of predictions as it replicates the experience of the 1989 to 1993 period. The econometric model with density estimates, on the other hand, provides the most optimistic scenario. Over the five years, the predicted default rates peak at 3.4 per cent, 2.8 per cent and 2.9 per cent for the three approaches respectively.

It is important to note that the results for the modelling approaches could differ depending on the chosen model. The density estimation approach will always yield the same results, as it is solely based on the historical probability of default (PD) series.



Conclusion

To satisfy the FSA requirements for stress-testing, it is sensible to employ more than one approach. For those lenders adopting a modelling approach, density estimation provides a sense check on the results. It is always good to have more than one take on a problem that is necessarily fraught with uncertainty. Using different approaches, different results can be obtained, and if there are no data-availability problems then it would not be difficult to apply these different approaches. The only consideration would be the availability of the required skills within the institution's own staff and the choice of review and validation procedures.

All the approaches have advantages and drawbacks. For example, using a worst-observed scenario does not have associated with it a quantification of the likelihood of outcome. Density estimation is limited by the fact that the results are not explicitly linked to changes in the macro-economy. The third approach addresses both these issues, but is still open to modelling uncertainty. It is for these reasons we think that it is sensible for lending institutions to use two complementary approaches.

Another important consideration when using econometric models is to consider all the available variables and to conduct the relevant diagnostics and specification testing. The recommendation here is that the procedures of model-building, review and validation be carried out rigorously and be fully documented. Don't forget that this is not a one-off process – capital requirements will need updating, and the auditors and the FSA will want

to see how everything has been done!

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