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Old Losses Never Die. Discuss.

5Summary
OpRisk needs all the hard data it can get, and loss data is the most solid kind of data available. Today, the minimum required data set of 5 - 7 years for AMA is reality for many banks. The next question is what to do with older losses. Here, we propose a mechanism to phase out these older losses, but to make an exception for internal tail events. We suggest that internal tail events should not be automatically phased out. They may only be phased out as long as they do not re-occur.

Dear reader,
No matter in what way OpRisk will develop as a discipline, it is safe to say that loss data analysis will continue to be the cornerstone for capital calculation and a crucial factor in OpRisk management. The simple fact is that real events, particularly those that have lead to financial losses, and undeniably those that became part of the public discourse, are a major driver for remedial actions. Such events have the capacity to fundamentally change hitherto accepted practices, sometimes extending to the whole banking sector.[1] But sooner or later, even the most extreme event passes into history. This newsletter discusses how to deal with events that were discovered some time ago with respect to capital calculation purposes. How does a retirement mechanism for losses work?

Losses and Capital for OpRisk
Loss data is believed to be the most objective element in AMAs. As the only data element that is measured in hard currency, it invites comparisons among internal business units as well as between banks. No wonder then that it is often regarded as a key element for loss prediction. Since most banks lack sufficient internal data to make such a prediction, the regulator requires banks to augment their internal loss data with losses from other banks as well with potential losses derived from scenarios.

Preliminary remarks on selecting losses for inclusion in Capital calculation
Before we discuss ageing, a word on data selection. All internal losses above some threshold must be used, but external losses and losses derived from scenario's are by definition the result of some prior selection process. For external losses, this selection process is commonly based on similarity of business lines, product ranges, regional presence and date of discovery[2].
Scenario-based losses, however they are derived, are always attuned to the scenarios which the bank deems to be in the realm of the improbable, yet possible situations. Since these scenarios, and

[1] The most notorious examples are those that lead to changes in the law, such as the 2002 Sarbanes Oxley act which was in reaction to a number of major corporate and accounting scandals such as Enron, Tyco International Adelphia, and WorldCom. More recently, the 2010 Dodd–Frank Wall Street Reform and Consumer Protection act is in direct response to the losses suffered in the wake of the financial crisis affecting almost every aspect of the financial services industry. This season's LIBOR scandal is likely to have severe repercussions across the industry too.
[2] The importance of the regional aspect should not be underestimated. Despite globalisation, the bank's legal environment is a major determinant for the loss distribution. In fact, taken in isolation, 'legal jurisdiction' explains more variance in loss distributions than business line or event type. See, e.g., QIS 4 (2004) and QIS 5 (2005) by the BIS.

their associated losses, are recalibrated yearly in most banks, there is no issue with ageing for these data points.

Also, all losses need to be adjusted for inflation. This is to ensure that loss amounts from 1999 do not lose their impact in 2016. This is now standard practice. Adjusting their place in the frequency and severity distributions is, however, not standard. The following sections deal with these aspects.

The role of ageing losses in frequency estimation

Many banks rely for their frequency distribution on internal loss data only. There are good reasons for doing so:

- Data completeness is crucial for frequency calibration
- External loss data are very unlikely to be complete
- Scenario data are, by definition, never complete
- *Complete* internal loss data is the best estimator for the institution's actual loss profile
- Frequency distributions have much lower data requirements than severity distributions and these requirements can usually be covered by internal data alone for the larger banks.

To get the best possible insight into the true frequency distribution we need to think about the added value of older losses. What matters in frequency distributions is *completeness*. If seven years of complete internal loss data (plus whatever is available from the current year) does not suffice to arrive at statistically reliable estimators, losses from earlier years may be added, going back as far in time as needed. Note that it would not be logical to adjust the older data since that would defeat the whole purpose of adding it to arrive at statistically reliable estimators. In the simplest form, the formula for the full set of losses in the frequency distribution can thus be written as

(1) $\left\{\bigcup_{t=0}^{t=7} \boldsymbol{INT}_{year-t}\right\} + \left\{\bigcup_{t=8}^{t=y} \boldsymbol{INT}_{year-t}\right\}$ where $\mathbf{INT}_x$ represents internal losses with a date of

discovery in year x, and y is determined by the statistical need to derive stable estimators for the frequency distribution. In short, older losses are either in or out, but they not adjusted for age.

The role of ageing losses in severity estimation

For the severity distribution, things are not that simple. There is a chronic shortage of data, especially for tail events. There is no better present for an OpRisk Modeller than a major event, preferably one (nearly) wiping out a rival bank[3]. Since these tail events basically determine the capital, they should come under close scrutiny and here lies the crux of the ageing problem. We need a mechanism to retire these aged tail losses lest a single 2008 event continues to determine the capital for the bank indefinitely. At the same time we should only retire those events that are well and truly 'out of scope'.

[3] Or indeed one that nearly wipes out the bank itself. Most modellers are not that fussy about whether the tail event is externally or internally derived. Both cases provide welcome additions to the tail of the severity distribution.

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The normal case

A common way to start is to apply a weighing mechanism to the loss probability. We can set a weight of 1 for losses with a date of discovery of seven years or less, while the weight of older losses is decreased linearly to zero over a period of, say, 20 years. The initial set of losses and their probability weights in the severity calculation is then given by (2).

(2) $\left\{\bigcup_{t=0}^{t=7} \boldsymbol{INT}_{year-t}\right\} + \left\{\bigcup_{t=8}^{t=20} \alpha_t \boldsymbol{INT}_{year-t}\right\} +$
$\left\{\bigcup_{t=0}^{t=7} \boldsymbol{EXT}_{year-t}\right\} + \left\{\bigcup_{t=8}^{t=20} \alpha_t \boldsymbol{EXT}_{year-t}\right\} + \{\bigcup \boldsymbol{SA}\}$ where $\mathbf{EXT}_x$ represents external losses

with a date of discovery in year *x*, **SA** represents losses derived from scenarios, and

(3) $\alpha_t = 1 - \frac{(t-7)}{13}$, which depreciates losses linearly over 13 years.

This phasing out of losses has the appeal of simplicity. For external losses, where we can expect a steady supply of both 'tail' losses and other losses, this is indeed the only ageing mechanism needed. Just consider rogue trading. This was supposed to be a thing of the past after the 1995 Barings/Nick Leeson case, which amounted to GBP 830m. We now know this loss pales in comparison to more recent events, such as the loss of Societé Générale/Kerviel of EUR 4.9bn in 2008 or the USD 2.3bn lost by UBS/Adoboli in 2011, all in rogue trading. There is every reason to assume that the supply of external tail events will continue apace and hence the older ones can be safely phased out.

A special case: internal tail events

For internal losses, it is a different story altogether. We first label the twenty highest internal losses (irrespective of their date of discovery) as tail events. This set of events will refresh with a much lower frequency than the set of external tail events. Given that we are supposed to calculate capital at a confidence level of 99.9% (which is commensurate with a once in a thousand year excess) it doesn't seem right to *automatically* reduce the weight of these losses after seven years. There is one situation where this would clearly be inappropriate, namely if a similar event in terms of event type / root cause / business line re-occured.

In that case, the circumstances that surrounded the occurrence of a tail event in year ***x*** are clearly still present today. Note that the *size* of the re-occurred event is irrelevant here: the new loss amount may be very low indeed. What matters is that a new incident occurred with the same event type / root cause / business line characteristics. Cleary, the situation that lead to the initial tail event is still somehow present. That is a forceful argument against depreciating the weight of the original tail loss. Instead, the loss must rejoin the ranks of the fully weighted losses for another seven years before it can be considered for weight depreciation again. Like a repeat offender, it has failed within the probation period. Of course, much depends on how specific the root causes are defined. If we make the definition too specific the circumstances surrounding the tail event will never occur

in exactly the same way. If we make it too generic, the tail event will never leave the data set. Risk Management (CRO or RMC) will have to be the decider here and find the middle ground between these extremes. This is left as an exercise for the reader.

The weights of the data set of 'old' internal tail events are then derived as follows:

(4) $\left\{\bigcup_{t=8}^{t=20} \omega_t \boldsymbol{TAIL\_INT}_{year-t}\right\}$ where **TAIL_INT** represents the old top 20 internal losses, and

(5a) $\omega_t = \alpha_t$ iff no repeat event in terms of event type / root cause / business line has occurred

(5b) $\omega_t = 1$ in all other cases, and the event joins the queue as if it occurred this year.

In this way, even a tail event with a discovery date of 15 years ago and that is being phased out can be resurrected if we now experience an event with the same event type / root cause / business line.

The data set for severity modelling

The full data set and probability weights for the severity distribution is thus given as

(6) $\left\{\bigcup_{t=0}^{t=7} \boldsymbol{INT}_{year-t}\right\} + \left\{\bigcup_{t=8}^{t=20} \alpha_t \boldsymbol{INT}_{year-t}\right\} + \left\{\bigcup_{t=8}^{t=20} \omega_t \boldsymbol{TAIL\_INT}_{year-t}\right\} +$

$\left\{\bigcup_{t=0}^{t=7} \boldsymbol{EXT}_{year-t}\right\} + \left\{\bigcup_{t=8}^{t=20} \alpha_t \boldsymbol{EXT}_{year-t}\right\} + \{\bigcup \boldsymbol{SA}\}$

Although this is not the most elegant of solutions, these six sets accomplish the following:

- The full dataset of losses is utilised;
- Internal and external losses with a date of discovery of less than seven years are given full weight, as are all scenario-based losses;
- Internal losses with a date of discovery over seven years ago are given proportionally less weight unless they are tail events;
- Internal tail events over seven years old are only given less weight if no similar losses have occurred since;
- The computation is straightforward and can be independently verified.

Conclusion

Ageing losses for capital calculation is straightforward in most cases. For frequency distributions, no ageing is necessary and a simple inclusion / exclusion algorithm for internal losses suffices. For severity distributions, a steady depreciation of old losses solves most problems. The only real difficulty is in the correct treatment of internal tail events. This needs to be debated at length to ensure all concerned understand the implications. These losses contribute significantly to the capital charge and should not be automatically adjusted for age. Specifically, any recurrence of loss similar to the tail event should stop the adjustment and revive the status of the original loss.