Discussion of the paper
Reevaluation of the capital charge in insurance after a large shock: empirical and theoretical views
Borel-Mathurin, Loisel, Segers

Olivier David Zerbib
Tilburg University - ISFA Lyon - I Care & Consult

11th Financial risks international forum
March 27, 2018

Main take-away of the paper

▷ The authors compare the quantile of a random variable before (X) and after ($\tilde{X}$) an extreme event. They show that $Q_{1-p}(\tilde{X}) > Q_{1-p}(X)$.

▷ The understimation is $(\frac{1}{p})^{a_k \gamma}$, with $a_k \sim k^{-1} ln(k)$ and γ the extreme value index.

▷ The 99.5% VaR can be up to twice the pre-event value after an extreme event occuring every 10 years (for 200 records and $\gamma = 1$).

▷ Calibration on pre and post-2014 stress test data, when the risk exposure decreases ($a < 1$), shows that:

- The diversification and loss absorbing mechanisms have to decrease much faster ($b' << b$) than the decrease of the risk exposure.
- Future discretionnary benefits change can be a nice proxy of that of the loss absorbing capacities.

▷ Cautionary recommendation:

Calculate the SCR after the occurence of an extreme event.

Strengths of the paper

▷ Highly important issue for systemic risk from a supervision as well as a regulatory point of view.

▷ Closed formula very easy to compute ⇒ Can be implemented through a standard formula.

▷ Interesting articulation between the quantile reassessment, the risk exposure and the loss absorbing capacities effects.

▷ The additional negative impact through the increase of the risk margin has not been forgotten.

- Weber (2017, Working Paper): Firms can largely reduce their total capital requirements via appropriate transfer agreements within a group structure using VaR to hide their total downside risk.
- Cifuentes and Charlin (2016, Journal of Op. Risk): SF for capital aggregation assumes that the correlation between OR and the other risks is very high.
- Bolviken Guillen (2017, Insurance: Math. and Economics): Build a scheme based on the log-normal distribution, handling tail-dependence, which is superior to the SF and to adjustments of the CornishFisher type.
- Hainaut Devolder Pelsser (2017, Working Paper): Robust framework and closed form forumulas to evaluate the solvency capital requirement (SCR) of a participating life insurance with death benefits.
- Alm (2015, Scandinavian Act. Journal): Show that the uncertainty in prediction of the trend in ultimate claim amounts affects the SCR substantially for non-life insurance risk.
- Laas Siegel (2017, Journal of Risk and Insurance): Critical analysis of the consistency of the standard approaches for market and credit risks under Solvency II and the current and forthcoming Basel III standards.

Comments and suggestions (2/5): The theoretical model

▷ Regarding the relative error (1/2):

$$\mathbb{E}[log\,\hat{Q}_{n,k}(1-p)] = logQ(1-p) + \gamma(\frac{1}{n} + \ldots + \frac{1}{k} - log(n/k))$$

$$\mathbb{E}[log\,\hat{Q}_{n,k}(1-p)|X_{n:n} < X_{n+1}] = (1-a_k)logQ(1-p) + \gamma(\frac{1}{n} + \ldots + \frac{1}{k} - (1-a_k)log(n/k))$$

⇒ The error is entailed by

$-a_k log(Q(1-p)) + \gamma a_k log(n/k) > -a_k log(Q(1-p))$

▷ Regarding the relative error (2/2): You use $logQ(1-p) = \gamma log(1/p)$; but for an Exponential distribution: $Q(1-p) = \gamma log(1/p)$.
Thus, ignoring the remark above (i.e., $+\gamma a_k log(n/k)$), the relative error is $-a_k log(\gamma log(1/p)) = (log(\frac{1}{p^\gamma}))^{a_k} \neq (\frac{1}{p})^{\gamma a_k}$

▷ Interpretation: What is the error I make in removing the highest value in my sample? Not necessarily the last one, since the quantile is permutation invariant. Same applies to the empirical analysis: the last event must be the worst.

▷ Would be useful to provide:

- A clearer defintion of (i) loss absorbing capacities, (ii) defered tax, (iii) absorbing capacities by technical preovisions. See: https://eiopa.europa.eu/Publications/Guidelines/LAC_Final_document_EN.pdf
- A figure showing how the three step diversification process works out and flows: (i) Risk absorbtion ability => (ii) aggregation of the sub-risk modules (with a specific correlation matrix) => (iii) aggregation within a global risk module (with a specific correlation matrix).

▷ Justify why b can be approximated by the Future Discretionary benefits:

- $b'/b(CA1) > b'/b(CA2)$ while $FDB'/FDB(CA1) < FDB'/FDB(CA2)$
- $b'/b >> FDB'/FDB$
- is it possible to get an intuition of this proxy?

Comments and suggestions (4/5): Clarification of some concepts

▷ For the case $a > 1$, a fixed, how do VaR(X) and b change?

▷ p.18 you implicitely use $VaR(aX) = aVaR(X)$ and p.20 you state that it is an assumption. Might be better to precise it before.

▷ Precise the aim of subsections 5.2, 5.3 and 5.4

▷ Clarify in the conclusion: "the decrease in the reassessment of the solvency capital requiriement is in the range 23%-74%"

Comments and suggestions (5/5): One question and some possible extensions

▷ Question: What about the procyclical risk that it entails? Possibility to prevent insurance companies to reassess their SCR after a shock in time crisis?

▷ Possible extensions:

- Could be interesting to estimate $\mathbb{E}(\tilde{X})$ to show how small is the bias
- Simulate the analysis over several years for a specific risk (e.g. market risk)
- Possibility to extend the model with 2 correlated random variables?