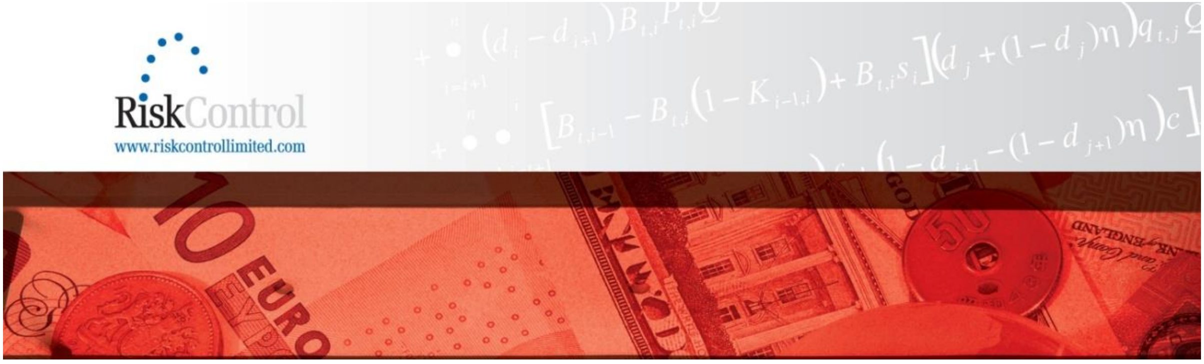

Comment on Antoniades and Tarashev[1]

Date: 2-1-2015
Number: 15-1a

An interesting recent article in the BIS Quarterly Bulletin by Antoniades and Tarashev argues that capital for mezzanine tranches of securitisations should be boosted substantially because of uncertainty about pool default probabilities. The authors claim that this is true even when the securitisations are Simple, Standard and Transparent (SST) in the terminology of the recent EBA discussion paper (see EBA (2014)).

The authors perform an exercise in which they calculate what they refer to as the expected under-capitalisation for securitisation tranches of different seniority. Let p^* denote the true default probability and $\hat{p}$ denote an estimate of the default probability.

For a particular value of $\hat{p}_j$ (namely 3%), the expected under-capitalisation for a given tranche is defined by the authors to be:[2]

$$\sum_{i=1}^{N}\left(K\left(p_i^*\right)-K\left(\hat{p}_j\right)\right)\times 1\left\{p_i^*>\hat{p}_j\right\}\times \Pr\left(p_i^*\middle|\hat{p}_j\right) \qquad (1)$$

Here, $K(.)$ is the regulatory capital formula, and the possible values of p_i^* are indexed $i=1,2,..,N$ [3].

The definition of expected under-capitalisation in equation (1) may be seen as conservative for a bank holding multiple tranches in that, in a portfolio of tranches, some exposures may be under capitalised while others are over-capitalised. The approach attributes no weight to any over-capitalisation and

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[1] This note was prepared by William Perraudin, Director of RCL.
[2] This quantity is not defined directly in the paper but we infer equation (1) from the description provided.
[3] To calculate this, the authors take three steps:

1. They specify a prior uniform distribution for p_i^*, denoted $\Pr\left(p_i^*\right)$, specifically that p_i^* takes values equal to points spaced 0.1% apart between 0.1% and 11%.
2. They perform a Monte Carlo simulation in which they calculate values for $\Pr\left(\hat{p}\middle|p_i^*\right)$ by randomly drawing default-non-default time series for 1000 borrowers assuming 10 years of data.
3. Using Bayes Rule, they calculate: $\Pr\left(p_i^*\middle|\hat{p}_j\right)=\Pr\left(\hat{p}_j\middle|p_i^*\right)\times\Pr\left(p_i^*\right)/\sum_{i=1}^{N}\Pr\left(\hat{p}_j\middle|p_i^*\right)\times\Pr\left(p_i^*\right)$

Some important aspects of this exercise are not explained in the paper. For example, no details are given of the correlation between defaults that the authors assume.

calculates for any given tranche, the average undercapitalisation for states of the world in which the capital for that tranche is indeed undercapitalised.

As is well known, when considered as a function of attachment point, the Marginal VaR for thin tranches is an inverted S-shaped curve. For some models, this curve is steep in the region of the pool capital, K_{IRB}. In particular, for a single risk factor model (also called the Asymptotic Single Risk Factor (ASRF) model), there is a cliff effect in that for thin tranches attaching below K_{IRB}, tranche capital (based on the Marginal VaR) is 100% while for tranches attaching above K_{IRB}, the thin tranche capital is zero.

Regulators and researchers in the industry have generally seen the cliff effect implied by the one risk factor model as a major deficiency and modelling efforts have focussed on improving the assumptions in ways that yield more reasonable results. The Supervisory Formula Approach (devised by Gordy and Jones (2003)) adopts the assumption of random attachment points to mitigate the problem. This approach has, in turn, been criticised because the capital it implies remains steep in the neighbourhood of $K_{IRB,}$ encouraging capital arbitrage and implying inadequate capital for non-junior mezzanine tranches.

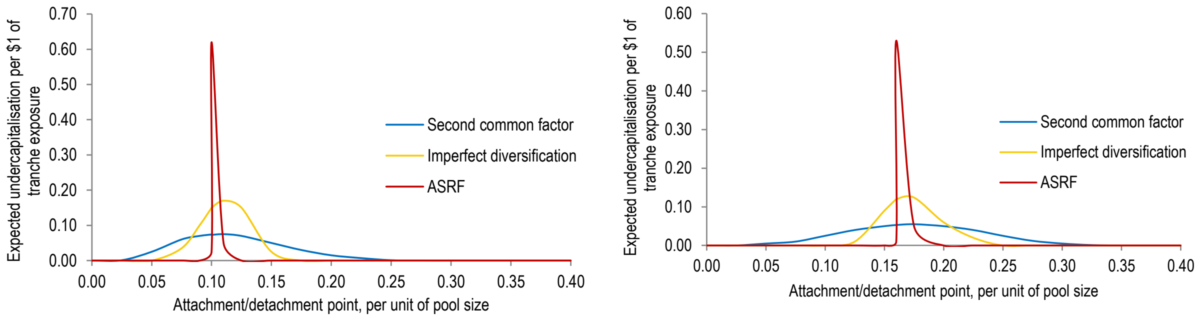
Another approach, more consistent with reality and which yields higher capital for non-junior mezzanine capital assumes that a second common risk factor affects pool asset defaults. Proposed by Pykhtin and Dev (2002) and recently revisited by Duponcheele et al (2013a), the two factor approach differs from the one factor model in the important respect that the cliff effect is removed and the S-shaped curve for capital is much flatter for attachment points in the region of K_{IRB}.[4] Importantly, the two factor approach is employed in the Basel Committee's recent calibration of the Simplified Supervisory Formula Approach (SSFA) (see BCBS (2013)).

This discussion of models is highly relevant to the propositions made by Antoniades and Tarashev because their finding of significant under-capitalisation for mezzanine tranches largely disappears in the two factor model as the sensitivity of capital in the neighbourhood of K_{IRB} is substantially reduced.

Surprisingly, even though they present results for the one-factor and two factor models (and a version of the one-factor model that includes some idiosyncratic risk) Antoniades and Tarashev base their conclusions almost entirely on the one-factor model results. This is perplexing because the Basel Committee in its recent calibration of securitisation capital (BCBS (2013)) has adopted the two factor model, and most specialists would regard the one-factor model as inappropriate for risk analysis of securitisation tranches.

Figure 1: Graphs for Thin Tranche Capital Reproduced from Antoniades and Tarashev

Low pool PD estimates | High pool PD estimates



4 Duponcheele et al (2013b) show how the two factor approach can be extended, without losing analytical tractability, to multi-period securitisations, a major advantage. Duponcheele et al (2014a) present a detailed, asset-class-based calibration of the two factor model.

In the figure above, we reproduce results from the Antoniades and Tarashev paper. One may observe that the expected undercapitalisation while large (50-60%) for the one-factor model (that most specialists would regard as ill-suited for modelling securitisation capital) are quite minor for the two factor model (6-7%).

The expected under-capitalisation is likely to be still lower if one uses higher multi-period intra-pool correlations as do Duponcheele et al (2014b) in their calibration of the SSFA using a multi-period two factor model.

On the basis of the figure, one might well question the strong conclusions reached by Antoniades and Tarashev that mezzanine tranches, even in SST securitisations, require a major boost in capital. A more moderate capital premium like that suggested by Duponcheele et al (2014b) would appear to be better justified.

Note that several other aspects of the Antoniades and Tarashev study merit comment. For example, many mezzanine tranches are far from the neighbourhood of K_{IRB} on which the authors focus, being much more senior.[5] In effect the Antoniades and Tarashev comments relate to junior mezzanines not to most of the securities that the market would regard as mezzanines. Another point is one may represent default probability uncertainty through adopting conservative correlation parameters. This is what Basel already does in that the asset correlations employed by Basel for loans (and hence for determining K_{IRB}) are distinctly higher than one obtains by applying statistical methods to actual loan default data.

Also, the analyses of thick tranches performed by Antoniades and Tarashev for the two cases of low and high PDs are not directly comparable as tranches are considered a fixed percentage of the capital structure; to make results comparable, thickness ought to have been defined as a percentage of the underlying capital requirement. Last, it is natural to wonder what the sensitivity of the results is to the assumption the authors make on the prior distribution of the true pool default probability. Assuming a uniform distribution on points from 0.1% to 11% presumably implies very different results from assuming a more skewed distribution or a uniform distribution with possible values ranging up to less than 11%, for example.

Rather than discussing these additional aspects and issues at length, we have, in this note, focussed on the narrow but crucial issue of the numerical magnitude of under-capitalisation. Using an appropriate two factor model (rather than the one-factor model that is largely discredited as a way of understanding securitisation risk) leads, according to the paper, to under-capitalisation of 6-7%[6]. This figure is many times smaller than the capital premium implicit in the latest BCBS proposals. So, even if one accepts the technical nature of the analysis performed, one may argue that the paper's conclusions are not a fair representation of the findings.

[5] Many senior mezzanines attach at multiples of K_{IRB} around 2.5, much higher than the multiplier of 1 on which the authors focus.

[6] This is based on the method proposed by Antoniades and Tarashev.

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