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SKIN-IN-THE-GAME IN ABS TRANSACTIONS: A CRITICAL REVIEW OF POLICY OPTIONS*

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Abstract

In response to the financial crisis, as a way to align incentives of originators and investors, new regulation in the US (Dodd-Frank) and the EU (CRR) requires issuers of asset backed securities to hold some skin-in-the-game, offering a set of options for risk retention. We propose an intuitive metric exposing effective risk retention and demonstrate that it varies widely across the available retention options. Requiring open disclosure of the metric, rather than demanding choice among arbitrarily specified and dissimilar retention options, would allow markets to price retention properly, and issuers to choose their desired retention level freely.

Keywords: Structured finance, ABS, STS (simple, transparent, and standardized securitizations), regulation, retention, Dodd-Frank Act
JEL Classification: G28

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1 Introduction

The collapse of securitization markets, particularly in the case of securitizations based on housing loans, mark the onset of the financial crisis in 2007. Reports suggesting unexpectedly low credit quality led prices to tumble and market liquidity to disappear. Fraudulent marketing behavior of US real estate lenders, typically relying on an unqualified and adversely motivated sales force, was widely blamed for losses in real estate lending. Academic research has found evidence for the presence of big scale mis-selling in mortgage markets, see for example Keys et al. (2010).

With respect to securitizations, an important insight from the subprime mortgage lending crisis is probably this: that the standard design of a credit ABS (asset backed security) violated fundamental incentive conditions, as spelled out in the theoretical literature (Cerasi and Rochet (2014)). Without a deductible of sufficient magnitude, originators of credit securitizations bundling loans and repackaging them in a set of bond-like instruments, were neither motivated enough to engage in proper screening of loan applicants, nor were they interested in strict monitoring over the life of the loan contract. As a remedy of the incentive problem, loan originators should keep the default risk, or parts thereof, on their own balance sheet, i.e. they should hold on to a sufficiently large *skin in the game*. This will help to align the incentives of the originator with those of the investor (Franke and Krahnen (b) 2009).

On the policy side, the G20 Pittsburgh summit in 2008 concluded with a plea for credit risk retention in order to induce a strong alignment of interest of investors and originators/issuers. Similar arguments were raised by the international association of supervisors, IOSCO. Following this, strong acceptance of the retention idea can be observed, with an extensive regulatory push for minimum skin-in-the-game requirements, both in the US and the EU. In the US, the current efforts to nail down a skin-inthe-game property through specific retention options are found in the Dodd Frank Act (DFA (2010)), with implementation rules specified by the SEC, see SEC (2014). In the EU, similar efforts have led to CRD IV and CRR (EC (2013)), with implementation proposed by the European Banking Authority (see EBA (2016)). In both the US and the EU, the current rules offer a number of options for the issuer of a transaction, how to meet the risk retention condition.

But are these rules adequate? Do they force the issuer to withhold a sufficiently large share of the default risk inherent in the securitized loan portfolio? Or, rather, do existing rules offer a menue of options to issuers, allowing them to effectively sideline the new regulation? Thus, is the regulation likely to be effective, or not?

In this paper, we investigate the extent to which a mandatory incentive compatibility requirement has effectively entered the new rule books of securitization markets. For this purpose, we propose a new metric that summarizes by a single number the effective risk retention in a given transaction. This retention metric $\mathcal{RM}$ is defined as the portion of expected losses of a given transaction that is retained. The metric naturally ranges between zero and one, i.e. zero for no retained losses and one for full loss retention.

For the purpose of a comparative study, $\mathcal{RM}$ is then applied to the different regulatory retention options to determine the effective risk retention implied by each option. This is done in two steps. First, for a particular ABS portfolio, we simulate the loss allocation to individual tranches, using a simple firm value model, akin to the model used by major rating agencies. In this model, loan default is captured by a stochastic process which allows to factor in the correlation between loan defaults. Second, based on the simulated loss values for both, individual exposures, the entire portfolio, and the individual tranches, we determine the effective retention implied by particular retention options as specified in the respective US and EU regulation.

While the regulatory efforts go in the right direction, we find that despite all retention rhetoric, some of it is apparently "lost in translation", i.e. cannot always be found in the final implementation rules. More precisely, each retention option implies a different level of effective retention, with a large range of very low to very high numbers. This means that the effective retention is very different across the retention options provided, thereby giving the originator the possibility to minimize effective retention. In addition, the actual level of retention remains intransparent to the investor, since the one relevant retention information that investors may need, the retained share of expected loss, is not provided openly under both the US and the EU regime. We conclude by proposing the full disclosure of the retention metric $\mathcal{RM}$, allowing markets, through the pricing mechanism, to select their preferred level of retention. In this case, a uniform level of minimum retention is no longer required.

The paper is organized as follows. In Section 2 we revisit the theoretical and empirical literature on ABS and give an overview of the current regulation and the various retention specifications it offers. In Section 3, an easy-to-understand metric, which we label the retention metric $\mathcal{RM}$ is suggested. It is used to compare different retention rules for ABS. We show that actual risk retention varies significantly across the alternative rule specifications, ranging from the maximum level of one hundred percent of an issue's default risk to much lower retention levels, all the way down to five percent or, in some cases, even less than five percent. Section 4 discusses policy implications of an improved retention metric, in particular for regulators and rating agencies.

2 Risk retention (skin-in-the-game) as a key characteristic of asset backed securities

2.1 Literature review

The market for asset backed securities has increased sharply since the mid 1990s, along with an interest in the theory of structured finance, and the empirical evidence. The early (pre-crisis) literature focused on the statistical properties of asset backed securities, resulting from the pooling and tranching of debt assets, like mortgages and corporate loans, or credit card loans. The newly created securities are characterized by different levels of seniority implying different risk characteristics (Coval et al. (2009), Franke and Krahnen (a) 2006, and Krahnen and Wilde (2006)).

Early empirical work on European CDOs has found the size of first loss (equity) pieces in transactions with several mezzanine tranches to be 'small' in absolute terms, but at the same time to be 'large' relative to expected loss. Haensel et al. (2006) find the exceedance of retained risk over expected loss to average +50% of the latter, for a sample of 39 European CDO transactions issued between 2002 and 2006. For these issues, effective risk transfer from banks (as originators of the pooled loan assets) to capital markets (e.g. institutional investors) is defined by the allocation of the junior-most tranche, the so-called equity piece. Significant risk transfer, therefore, requires at least part of the first-loss piece to be sold to outside investors.

The theoretical literature on loan sales and structured finance transactions has concentrated the analysis of the moral hazard inherent in the transfer of loan assets, see for example Innes (1990), Gorton and Pennacchi (1995), DeMarzo (2005), Hellwig (2009) and Hébert (2015). From these papers, and others, it became clear that a theory of structured finance has applications well beyond the design of asset backed securities, e.g., the choice of an optimal capital structure of the firm.

In this spirit, Hébert (2015), derives the conditions under which the issuance of debt mitigates the trade-off between debt and equity incentive problems, already addressed in the classic article by Jensen and Meckling (1976).

Hébert (2015) and also Hartman-Glaser et al. (2012) derive conditions for optimality of a contractual design. Hébert (2015) finds equity issuance, i.e. first loss retention, and also debt issuance, to be needed for optimality. A role for regulation in the sense of mandatory retention is identified in Chemla and Hennessy (2014) who find that originators do not fully internalize the risk sharing externality. Cerasi and Rochet (2014) embed the role of first loss retention in a simple Holmström-Tirole model. They find that monitoring incentives are preserved if and only if a sufficiently large junior tranche is retained.

There has been a lot of empirical work on the performance of asset backed securities since the outbreak of the financial crisis in 2007; a detailed description of the ABS market is in Ashcraft and Schuermann (2007). Keys et al. (2010) find evidence for a negative impact of securitization (likelihood) on ex-ante screening effort by the issuer. Begley and Purnanandam (2013) and Ashcraft et al. (2014) both find additional support for the risk mitigation hypothesis of retention.

Begley and Purnanandam (2013) rely on 163 securitization deals with more than 500,000 underlying residential mortgage loans in the period 2001-2005. They find an inverse relationship between the size of the equity tranche and the level of foreclosure experienced among borrowers in the asset pool. Based on 483 CMBS deals issued between 1995 and 2010, Ashcraft et al. (2014) find similarly the probability of senior tranche default to be inversely related to the size of the first loss piece.

Benmelech et al. (2012) analyze whether securitization was associated with more or less corporate risky lending. They compare two data sets with largely similar loan portfolios, one of which was transformed into a collateralized loan obligation (CLO) while the other was not. They find that adverse selection problems are not more severe in the CLO sample. In a horse-race exercise, securitization does not help in predicting default. The authors explain this (negative) finding, which they say is in disagreement with commonly held believes in the literature, as the result of the a strong reputation mechanism inherent in the syndication process.

Kara et al. (2015), in a difference-in-difference exercise using Euro denominated syndicated loans, find evidence in favor of a more general quality deterioration hypothesis, where the quality of securitized loans deteriorates more than an otherwise identical sample of non-securitized loans. The authors interpret their finding as evidence for the incentive effect of loss retention.

Overall, the literature shows the importance of incentive issues in securitizations. Regulators around the world have responded by defining retention requirements for securitzations, demanding minimum skin in the game by issuers. We will next evaluate existing regulatory rules in the US and the European Union focusing on risk retention.

2.2 Skin-in-the-game in post-crisis regulation: the case of the EU (CRR, Art. 405) and the US (Dodd-Frank Act)

Motivated by the experiences during the 2007/2008 financial crisis, and in accordance with the emerging academic literature on the sources of the systemic risk event in those years, regulators around the world have tried to counter the observed loss of asset qualities in securitization processes through appropriate regulation. Most prominently, the regulators in the US and in the EU have amended existing rules by making a minimum level of skin-in-the-game held by the originator or some other controlling party, like the deal servicer, a mandatory element of all publicly issued deals.

The intention behind mandatory retention is in both cases, US and EU, a closer alignment of interest between originator and investor. Material loss retention, therefore, is a crucial element of these regulatory reforms.

The relevant regulations are the Dodd-Frank Wall Street Reform and Consumer Protection Act in the US (see DFA (2010), Title IX, Subtitle D) and the Capital Requirement Directive in the EU, CRR/CRD IV (see Article 405 in EC (2013)). These two regulations are quite similar in spirit, though not identical in the specifications of what the term "retention" actually means. In the Dodd-Frank Act (henceforth DFA), Title IX is on "investor protections and improvements on the regulation of securities", with subtitle D dealing with "improvements of the asset-backed securitization process" (DFA Sections 941-950). Section 941 specifies the regulation of credit risk retention. Implementation provisions have been defined by the SEC in 2014, see SEC (2014).

The new rules allow for several different ways how to fulfill the 5% retention requirement. The "Final Rule" defines a menu of three options, including the two basic forms, vertical and horizontal retention rule. The implementation rule just cited defines a list of exemptions, largely related to the treatment of securities that enjoy government backing, e.g. from GSEs (Government Sponsored Entities), see pp. 533 seq. The three eligible options are:

(a) retention of no less than 5% of the fair value of each of the tranches sold or transferred to the investors (vertical piece);

(b) *retention of a horizontal piece, starting from the first loss, until no less than 5% of the fair value of the total transaction is reached.;*

(c) *retention of linear combination of a vertical and a horizontal piece, summing up to no less than 5% of the fair value of the total transaction.*

Likewise, the European regulation stipulates in Article 405 of the Capital Requirement Directive as follows:

Only any of the following qualifies as retention of a material net economic interest of not less than 5%:

(a) *retention of no less than 5% of the nominal value of each of the tranches sold or transferred to the investors;*

(b) *in the case of securitisations of revolving exposures, retention of the originator's interest of no less than 5% of the nominal value of the securitised exposures;*

(c) *retention of randomly selected exposures, equivalent to no less than 5% of the nominal value of the securitised exposures, where such exposures would otherwise have been securitised in the securitisation, provided that the number of potentially securitised exposures is no less than 100 at origination;*

(d) *retention of the first loss tranche and, if necessary, other tranches having the same or a more severe risk profile than those transferred or sold to investors and not maturing any earlier than those transferred or sold to investors, so that the retention equals in total no less than 5% of the nominal value of the securitised exposures;*

(e) *retention of a first loss exposure not less than 5% of every securitised exposure in the securitisation.*

The relevant implementation regulation in the EU has been drafted by the European Banking Authority in its Regulatory Technical Standards on the Retention of Net Economic Interest and Other Requirements Relating to Transferred Credit Risk, EBA/RTS/2013/12.

Thus, both regulations, DFA and CRR, offer a menu of implementation options for the fulfillment of the 5% retention requirement, including the two basic models, a 'vertical' and a 'horizontal' retention of a 5% value. But there are important differences as well.

First, the US rule is based on fair value calculation, whereas the EU rule relies on face values (see for example the IFRS educational material on fair value measurement, IFRS (2013)). The fair value of a financial instrument is guided by principles developed within the US-GAAP and in the IFRS framework along similar lines. Fair value is determined for each financial instrument by approximating a market price in an unconstrained market environment. If market prices are not available, or not easily observable, alternative methods are defined, comprising income data and cost calculations.

Second, apart from the basic retention models 'horizontal' and 'vertical', the EU rule allows for additional retention models, i.e. randomly selected on-balance sheet assets, a 5% retention of each individual underlying exposure in the case of revolving exposures, and a 5% first loss piece of each asset. Similarly, a linear combination of vertical and horizontal withholding ("L-shaped retention"), i.e. retention of a first loss plus a certain percentage of all remaining tranches, is admissible under US regulation, while it is not foreseen in the EU rulebook.

Third, the SEC implementation rule specifies a set of disclosure requirements that go well beyond what is required in the EU rule. Under the SEC Final Rule, the sponsor has to reveal all input parameters required to calculate the fair value of the transaction and its tranches, including the relevant estimates of loss given default and default risk (pp. 75-82). Under the EU regulatory standards, the identity of the retainer has to be disclosed, as well as the option selected, from (a) to (e), and a re-confirmation of factual retention, at least annually (Art. 23, p. 23).

The terms 'horizontal' and 'vertical' refer to Figure 1, where tranches of different seniority are stacked one above the other. Vertical retention implies withholding a percentage of each tranche, ranging from the first loss piece to all mezzanine tranches, and the senior-most tranche. For example, by retaining 5% of each tranche, overall retention equals 5% of the issue volume, fulfilling the regulatory requirement. Horizontal retention, in contrast, refers to withholding the junior-most tranche, and if needed the most junior mezzanine tranche, followed by the second most junior mezzanine tranche, etc., until the retained issue volume reaches the 5% threshold.

The take-away from this section can be summarized as follows: First, since retention is defined in money terms – fair values in the US and face values in the EU – *not* in terms of the risk contained in the respective tranches, the possibilities for investors to apprehend the retention of actual default risk is limited. It is weakened further under the current EU regulation, given its somewhat lower disclosure standards. Second, across retention options acceptable under the respective regulation, the effective risk retained may differ not only between the permitted options, but also between the US and the EU.

The rest of the paper will develop these last two points in greater detail.

3 Deriving a standardized skin-in-the-game metric for the use of regulators and rating agencies

3.1 The Retention Metric

We will now develop a simple metric, capturing the extent to which the issuer has skin-in-the-game, by retaining a certain portion of the securitization transaction. The basic idea is to measure the magnitude of potential default losses that is included in the retained 5%, according to the retention option chosen by the issuer.

The goal is to achieve a suitable, incentive-conscious retention metric. This metric should be based on retained (expected) default losses as a manifestation of the skin-in-the-game (rather than the nominal value of the retained portion). Thus, we propose the retention metric $\mathcal{RM}$, capturing the *portion of overall portfolio losses that is retained by the originator.* In other words, effective retention is given as the expected loss of retained exposures weighted by its value, relative to total expected loss. Formally, it can be defined as follows:

$$\mathcal{RM} = \frac{E[retained\ portfolio\ loss]}{E[total\ portfolio\ loss]} = \frac{s_r \cdot \int_P LRR \,\mathrm{d}p}{s_{PF} \cdot \int_P PLR \,\mathrm{d}p}, \tag{1}$$

where LRR is the loss rate of the retained portion, PLR is the portfolio loss rate, s_r is the nominal size of the retained portion, and s_{PF} is the nominal size of the securitized portfolio. Thus, $\mathcal{RM}$ captures the size of the default loss retained by the issuer together with the likelihood of the loss event occurring.

Note that $\mathcal{RM}$ is bound by zero and one. $\mathcal{RM}$ equals one if all possible losses are borne by the originator. Similarly, $\mathcal{RM}$ equals zero if no losses are retained. For partial retention, $\mathcal{RM}$ takes values between zero and one. By construction, retaining more junior tranches automatically leads to a higher value of $\mathcal{RM}$ as compared to retaining more senior tranches of equal size.

The $\mathcal{RM}$ metric has several useful properties. It is easy to understand and it is normalized to the interval between zero (for no retention at all) and one (for full retention), i.e. the metric rises with the extent to which default losses are retained. A closely related metric to ours captures the level of expected loss in the first loss tranche, the so-called loss share, see Franke et al. (2012). The $\mathcal{RM}$ metric equals the loss share if, in case of option (d), the retention requirement is exactly met with the size of the first loss piece.

Another property of the $\mathcal{RM}$ metric is that it naturally gives first losses higher weight than second and higher level losses. Retaining a fraction of a senior tranche entails very little default risk, since the default probability of an AAA-rated tranche, and equally its loss given default, tend to be very small. Hence, the retention of a senior tranche, or parts thereof, will have very limited, if not zero positive incentive effects.

3.2 Applying the retention metric to the proposed retention options

Next, we apply the new retention metric $\mathcal{RM}$ to major admissible options under the existing regulatory regimes in the EU and the US. Note that the menu of options is partly the same in the EU and the US, both allow for horizontal and vertical rules, and –in the US– also for combinations of those two basic alternatives. Moreover, the EU regulation also admits three additional options, namely 5% of every single exposure, 5% of randomly selected exposures, and 5% first loss in every individual exposure. Furthermore, the EU bases its rules on the nominal value (i.e. face value) of the exposures, while US rules refer to fair values (i.e. market values). Both regimes will be discussed separately. The "fair value" of an exposure refers to the market price, or in the absence of liquid secondary markets, a credible estimate of a secondary market price. Under normal circumstances, this fair value captures expected loss. For example, if valuation is based on risk neutrality, the fair value of a tranche is the discounted value of [(1-LGD)*F], where LGD is loss-given-default, and F is tranche face value. The fair value is large, approaching the nominal value, if expected loss is small, and vice versa.

Table 1 shows the retention options according to EU and US regulation. The 5 options according to the EU regulation and the 3 options offered to US issuers are displayed in separate rows. The numbers in Table 1 show how the retention options differ between the EU and the US when it comes to nominal retention, and it shows how effective retention differs between the different options even within one regulatory framework. For simplicity, and without loss of generality, when referring to fair values we will rely on expected values, assuming risk neutrality in valuation.

As discussed above, all regulation options imply a retention of 5% of the transaction, but the 5% may be achieved in different ways. While in the EU, the calculation basis is the nominal value of the transaction, it is the fair value according to US regulation. This implies, that the size of the retention differs between the two regulatory frameworks (EU and US). Column 4 of Table 1) shows the difference. In the EU, nominal retention is always 5%. In the US, however, nominal retention depends on the retention option. For vertical retention, i.e. option DF(a), nominal retention is also 5%. For the horizontal slice, i.e. option DF(b), nominal retention is greater than 5%, since the fair value of the retained first loss piece is smaller than the fair value of the non-retained senior portions per unit of the nominal value of the transaction. This holds true simply because first loss pieces are more risky than senior tranches as they absorb losses before the more senior tranches are hit. For option DF(c), nominal retention is also greater than 5%, but it is smaller than option DF(b), because DF(c) is a combination of DF(a) and DF(b). Overall, the US regulation is more strict than regulation in the EU, since a 5% retention based on junior tranche fair values implies larger effective default risk retention under than an otherwise identical regulation based on face values.

The retention metric $\mathcal{RM}$ takes the value 5% for retention options EU(a)-(c), and also for option DF(a). These option all imply forms of vertical retention, i.e. retention of portions that are of equal risk as compared to the non-retained portion. In these cases, retaining 5% of the reference portfolio always implies retaining 5% of the losses. In the case of horizontal retention, i.e. option EU(d) and DF(b), $\mathcal{RM}$ takes higher values, ranging from 5% up to 100%. This implies that horizontal retention is always associated with a higher fraction of loss retention than vertical retention, and it may be substantially higher. Option DF(c) implies effective retention values between those of the vertical options and the horizontal options. The retention metric $\mathcal{RM}$ takes values higher than 5%. Finally, option EU(e) also implies a form first loss retention. Thus, the retention metric $\mathcal{RM}$ takes values higher than 5%, but the value is lower than the one achieved with pure horizontal retention since the loss participation of the retained portion is truncated at 5% at the level of each individual exposure in the portfolio.

Next, we consider option EU(e). Under this scheme, the 5% retention requirement is met by holding a 5% first-loss stake in every single loan in the securitization transaction. By construction, loss participation in each loan default is limited to a maximum value of 5% of nominal loan value. Thus, effective retention is always lower than in the case of horizontal retention (option EU(d)), and it is higher than vertical retention (option EU(a)). The expected value of loss experience hinges upon the number of defaulting loans in a given portfolio and the loss realized in case of default (LGD), since the loss participation of the retained portion is truncated at 5% of each individual loan. If LGD per loan is low, then rule EU(e) can produce a retention metric significantly larger than 5%.

The L-shape option under Dodd Frank (combination of horizontal and vertical slice), i.e. option DF(c), allows to target any desired level of the retention metric between the horizontal and vertical option through an appropriate choice of weights.

If we account for incentive issues, the retention metric $\mathcal{RM}$ has to be adjusted. The last column of Table 1 shows $\mathcal{RM}$ under asymmetric information. This applies to retention option EU(c), since this option relies on a random selection of exposures from a set of underlying securities by the issuer, potentially allowing for some discretion. Several incentive issues are of relevance here.

First, it has to be assured that the selection of retained exposures (i.e. loans) is truly random. Only then the 5%-rule is actually valid. If the selection is discretionary rather than random, an adverse selection is possible, and the retained portfolio may consist of good loans, with a smaller loss expectation than the remaining exposures.

Second, even if the selection is totally random and there is no adverse selection, the monitoring and servicing behavior of the issuer during the life of the contract may be more intensive in the case of those exposures that were not selected for securitization, and which are now on the balance sheet of the issuer. Monitoring is then less intense, and more cursory for the securitized (and sold) exposures. This is a form of moral hazard, since the issuer has a clear incentive to minimize losses for the exposures still on her balance sheet, while her monitoring incentive is lower (or rather non-existent) if an exposure has been taken off balance sheet, because monitoring is costly. If such varying monitoring intensity is taken into consideration, the loss expectation of the retained exposures remains constant, while loss expectation of securitized exposures actually rises. Compounding these two numbers will yield a retention metric below 5%, reaching zero in extreme cases.

Finally, assume the issuing bank wishes to securitize but a fraction of her total loan assets, say 20%. In this case it can always pretend wishing to securitize 21% of her loan assets, of which it withholds 5% equaling 1% of its total loan book. As a result, there is zero retention of the 20%-securitization portfolio in any economically meaningful sense.

As can be seen from the numbers in the last column of Table 1, only option EU(c) is affected by incentive issues; all other options fare exactly the same as under symmetric information. That is an interesting result in itself: under all retention rules, except for the random selection rule, effective loss retention in securitizations is not affected by asymmetric information. For option EU(c), this latter retention metric varies between zero and 5%, depending on the severity of the moral hazard problems on loan portfolio management.

The concept underlying EU option EU(c) has initially also been discussed under the DFA in the US. However, as the SEC "final rule" document shows, the operational difficulties with a proper (i.e. incentive compatible) implementation of this retention option have led the SEC to remove it from the set of available retention options.

Overall, Table 1 shows general considerations on the economic difference between the retention options, providing a complete comparison of the retention options for both regulatory regimes. The table shows numbers for the retention metric $\mathcal{RM}$ and ranges for $\mathcal{RM}$ where these numbers may vary. The exact numbers depend on the loss distribution of the reference portfolio and thus typically differ from transaction to transaction.

3.3 Applying the retention metric to a real-world example

Next, we determine the level of effective retention for a real-world example of a synthetic CLO transaction: Deutsche Bank's London Wall 2002-2 transaction.

We refer to a widely used methodology to estimate the loss distribution of a portfolio. The methodology is used, e.g., by rating agencies in their evaluation of asset backed securities, and by investment banks in their advisory work on the structuring of asset portfolios for securitization purposes. The obtained portfolio loss distribution will serve as basis to determine the value of the retention metric under different retention options.

Information on the transaction is given in Moody's new issue report (Moody's (2002)). [1]

Figure 1 shows the structure of the London Wall 2002-2 transaction. The securitized reference portfolio has a value of 1.8 billion Euros. It is split into twelve tranches of different seniority, except for tranches A1 and A2 as well as B1 and B2 which have the same seniority, but different currencies. Of these twelve tranches, eleven tranches are rated, corresponding to

[1] Naturally, the presented modeling techniques can also be applied to well-defined model cases. While we apply the London Wall transaction as base case for this exposition, we also show that the findings are not specific to this particular case. Additional calculations for other transactions are shown in Appendix A. The implications are the same.

97.39% of the nominal value of the transaction. The biggest part of the nominal value (84.49%) is covered by the most senior tranche (in the London Wall case represented by a Senior Credit Default Swap). The non-rated, most junior tranche, i.e. the first loss piece, amounts to a comparably tiny 2.61% of the nominal value.

We refer to the offering circular regarding the composition of the reference portfolio. We apply the information provided to estimate the loss distribution of the portfolio by means of Monte Carlo simulation. Figure 2 shows the resulting loss distribution of the London Wall reference portfolio, assuming the standard simulation parameters as utilized by Moody's rating calculations. The simulations rely upon the standard assumptions used by Moody's for this transaction, namely a uniform bi-variate correlation among exposures of 0.3 for issuers within the same industry, a Baa2 average rating (with some dispersion), and a total of 264 loans in the portfolio. The London Wall transaction shows a compressed loss distribution around a relatively low mean value of 1.49%. Note that the horizontal axis is truncated at 10%, implying that the loss distribution is concentrated at the very left end of the entire range. This means that small losses do occur and are quite likely, while large losses essentially do not occur. This structure leads to a rather small first loss piece where most the probability mass in concentrated, and a rather large senior tranche.

A vertical slice implies a portion of the portfolio with equal risk. Thus, the loss distribution of a vertical slice is exactly the same as the loss distribution of the entire portfolio. A horizontal slice, however, implies a different risk profile. Figure 2 shows how portfolio risk is redistributed in the case of horizontal slicing. A retention requirement of 5% in nominal terms, as implied by EU regulation, leads to slicing as depicted in the figure. The retained first loss piece amounts to 5% of portfolio face value, while the securitized portion amounts to the remaining 95%. The first loss piece contains the major part of the risk, while the more senior portion is protected by the more junior first loss piece. Thus, the loss distributions of the two slices are entirely different. While the first loss piece is almost always hit by some losses, the senior tranche rarely is hit. Correspondingly, the first loss piece has higher default probability, mean loss, loss standard deviation, and loss given default compared to the senior tranche. Thus, the transfer of risks is non-proportional, due to the principle of subordination implied by horizontal slicing.

Table 2 presents comparative results of the retention metric for 8 retention options, five from the EU regulator [EU(a)-(e)], and three from the US regulator [DF(a)-(c)]. We use the letters "EU" and "DF" together with the letters (a)-(e) to designate the different options under EU and US rule, respectively. The European rules EU(a) to EU(e) are listed in CRD IV, Article

405. Options EU(b), EU(c) and EU(e) reference individual securitization exposures (e.g. loans), whereas options EU(a) and EU(d) reference the entire reference portfolio. The US rules DF(a) and DF(b) comprise the vertical and the horizontal rule; a linear combination of both is DF(c), the so-called L-shape.

The estimation results reported in Table 2 are based on the input parameters defined by the London Wall case, described above. The reliance on the specific example of London Wall is without loss of generality, and qualitatively similar results are achieved when the parameters of the model are altered, i.e. the assumptions concerning expected loss of individual exposures, their pairwise correlations, and the exposure-specific loss given default estimates are increased or decreased (reported in Panels B and C). Specifically, the bilateral correlation assumption is increased to 0.4 in panel B, the default risk is changed by assuming that each loan is rated one notch lower (Panel C).

From left to right, the table reports the name and description of the different retention options, the corresponding value convention (nominal value or fair value), the size of the retention in terms of the regulatory standard (nominal value or fair value), the size of the retention in terms of the effective nominal holding, the expected loss of the retained piece and, lastly, the retention metric $\mathcal{RM}$ which captures the share of retained losses. This last metric comes in two versions, the symmetric information case (SI) and the asymmetric information case (ASI). As we will see, the assumption about information and incentives affects option EU(c) only - all other options are immune to incentive considerations.

Note that the retention metric is our key variable. As can be seen from the second to last column in Table 2, the symmetric information case, the retention options EU(a), EU(b), and EU(c) have identical retention metrics in all three panels - suggesting an invariance to change in the modeling assumptions. The retention options EU(a), EU(b), and EU(c) are equivalent - they all imply the same degree of skin-in-the-game of 5%. Moreover, that level is already determined by the retention volume (i.e. 5%), and it is the same irrespective of the composition of the portfolio and portfolio quality.

This is not surprising, as it is well known that the expected value of a sum of random variables is the sum of their expected values. Hence, retaining 5% of each individual exposure results in an expected loss retention of 5% and, similarly, retaining 5% of each tranche leads to the same expected loss retention statistic.

Now let us turn to Option EU(d) which can lead to a very high level of effective risk retention, as can be seen in Table 2. The retention metric $\mathcal{RM}$ takes values much larger than 5%. In the base case, $\mathcal{RM}$ is equal to 99.86% - twenty times as much as in options EU(a) to EU(c). A comparison of Panels A, B, and C shows that for option EU(d), the $\mathcal{RM}$-statistic is more sensitive to the properties of the underlying asset portfolio than any other available option. The London Wall transaction has a rather homogeneous portfolio of loan assets of high average quality, which leads to a loss distribution with low mean loss and low variance, high skewness, yielding a high retention metric under the horizontal 5% rule. The metric is sensitive to changes in asset correlations and default probabilities (Panels B and C of Table 2).

If applied to the London Wall case, EU(e) in Table 2 yields a value of the retention metric of 8.81%. Mean loss of the retained piece is 2.6%. Note that in the case of the London Wall transaction, the largest loss realization observed in our simulation is just above 6%, very close to the 5% covered by the retention rule. The value of the retention metric is inversely proportional to loss per loan, conditional on default, i.e. it is high for low LGDs and vice versa, reaching 100% for LGD values of 5% and less.

Turning to the rules under Dodd Frank act, we look at lines 6 to 8 of Panel A in Table 2. Again, the same underlying securitized loan portfolio is assumed, London Wall 2002. The main difference between the European and the American approach to risk retention relates to the way nominal retention size is measured. While the European regulation relies on the face value of outstanding claims, the Dodd Frank act is based on fair value measurement. For the purpose of the present study, fair value of a financial instrument is approximated using its expected value under risk neutrality, where repayment expectations reflect default risk and loss given default from the very Moody's tables that were used to structure the transaction at the time of issuance.

The question is whether the use of fair values has an impact on the retention metric. A comparison of DF(a) with EU(a) in Table 2 shows the equivalence of the vertical slice under both regulatory regimes. However, a comparison of EU(d) with DF(b), i.e. horizontal slice, reveals that effective retention is larger under US rule, since the size of the retained piece in terms of nominal values is larger under Dodd Frank. This is because under fair value consideration, a larger portion of the low-value first loss parts needs to be retained to achieve 5% retention.

Lastly, we turn to Column 8 of Table 2, which captures the size of the retention metric for all options when incentive problems due to asymmetric information are explicitly considered. In this case, moral hazard with respect to the application of the retention requirement is considered. There is room for moral hazard only under option EU(c); all other options rely on well-defined moments of the loss distribution and are not subject to additional issuer activities.

As far as robustness is concerned, we can look at Panels B and C in Table 2. Changing the parameters of the basic simulation model does not change the resulting retention metrics by much. All qualitative results remain unchanged.

4 Implications for policy makers, regulators, and rating agencies

In this paper, we suggest a simple measure to capture effective risk retention in ABS transactions. The retention metric $\mathcal{RM}$ expresses the share of expected losses retained by the originator in a single number, ranging from zero to one, i.e. from a low of zero expected loss retention to full loss assumption.

When applying our retention metric to major admissible options under the existing regulatory regimes in the EU and the US, we find that, for the same securitization transaction, effective retention can be very small (close to zero) under one option and very large (close to 100%) under another option. This in itself is a troubling finding, given that risk retention is the explicit objective of the regulation in both constituencies. This leads to the central question: If the options imply very different retention levels, and if issuers can self-select, then what has the regulation actually achieved in terms of originator/issuer deductible?

The answer to the above central question is sobering: *not much* has been achieved, despite easily available better alternatives. As of today, it seems that issuers can easily limit their skin in the game, simply by selecting an option that does not tie retention to the first loss piece, like options (a) and (b) of CRR, Article 405 and option DF(a). Under these retention rules, the effective retention is just 5% of the expected loss of the issue. The value of 5%, which arguably is already a small number for attaining incentive alignment between debt holders and issuers, is even further reduced under CRR option (c) if moral hazard on the side of the issuer is taken into consideration. Thus, CRR's option EU(c) may effectively be empty, since there may actually be no skin in the game at all.

Under the current regulation, only horizontal retention fulfills the expectation of a significant deductible for the issuer. This holds true for the pure horizontal retention options EU(d) and DF(b), and to some extent for the mixed options EU(e) and DF(c). Thus, if the objective of the ABS retention rules is to tie risk incentives to the originator, by giving him/her a significant ex-ante stake in ex-post risk realizations, then the pure horizontal retention options EU(d) and

DF(b), respectively, are more convincing than any of the other existing alternatives.

On a more general level, the rather low effective retention levels of 5% or not much more for most options under the EU and US regime, and possibly even lower retention levels under EU(c), might facilitate the re-emergence of incentive misalignments in the securitization business. With low levels of skin-in-the-game, insufficient asset risk monitoring cannot be excluded.

On a deeper level, the uneasiness with the current state of retention regulation is due to the lack of user-friendly, concise disclosure and transparency. Investors simply do not know the actual retention level of a given transaction and will therefore have a hard time understanding the implications for the originator's behavior. In order to resolve this rather unsatisfactory state of affairs, policy could opt for increased transparency. The new metric that we have suggested could, if disclosed publicly, allow the market to price the instrument properly, taking due consideration of possible incentive problems.

What are the lessons for policy makers? In light of simple and transparent securitizations, a possible policy option is to reduce retention optionalities, specifying horizontal retention as the only way to fulfill the 5% minimum retention requirement. This always implies more retention than in any other option, for any given level of the retention requirement, be it fair value or nominal value. However, the actual level of retention depends on portfolio characteristics and may vary from transaction to transaction, without considering which level of risk retention is needed to achieve incentive alignment.

A second policy option is to impose a particular level of expected loss retention rather than nominal issue retention. In this case, retention can be captured by the retention metric $\mathcal{RM}$. It is then irrelevant how the critical value is reached, through vertical or horizontal retention, and no further retention option has to be specified. This approach is suitable if there exists an optimal level of retention and it is known. However, in general, we have no clear prediction for an optimal level of retention, beyond a minimum level, and the 5% level for retention that is now in place can itself not be justified economically. Thus, generally requiring a certain retention level might not be optimal in the first place.

As a third, and least intrusive, but potentially most effective option, the regulator could just impose ongoing transparency about retention by making $\mathcal{RM}$-disclosure compulsory for all ABS issues, without stipulating any minimum level of default risk retention. This option combines transparency about risk retention with complete freedom about securitization design. The preferences of investors and issuers would decide - and, due to increased transparency, the market could differentiate between retention levels, and would set prices accordingly. This would help to improve market quality, and might eventually increase the attractiveness of ABS as a funding vehicle.

Whatever option is chosen, a market standard for retention reporting seems to be needed. If the effective retention level of each transaction would be disclosed publicly, using the retention metric RM proposed in this paper, the complexity of ABS products would be greatly reduced. Moreover, a comparison between different ABS products would be much easier with an explicit, public retention measure; a major determinant of quality differences among different issues would then be visible after all. Both aspects, reduced complexity and improved comparability among products, are likely to enhance the development of a transparent and liquid secondary market for ABS tranches.

As far as implementation of a mandatory retention metric is concerned, market institutions and regulatory institutions both could play a role. On the market side, rating agencies can do the math and disclose $\mathcal{RM}$. This is a model-based exercise, and agencies are well prepared to carry out such a task during the issue process. Note that models to determine the portfolio loss distribution, which is needed for calculating $\mathcal{RM}$, have been developed and applied since the 1990s by major rating agencies, like Moody's and Standard & Poors, see Cantor et al. (2002). $\mathcal{RM}$-values could be published by the agencies prior to the initial public offering, along with further rating information. The market regulator ESMA could oversee the agencies with respect to the quality of their $\mathcal{RM}$ assessment.

Disclosure of a standardized retention metric, like the $\mathcal{RM}$, would help to improve transparency, facilitate pricing, and strengthen the development potential of ABS markets more generally.

Tables

Table 1: Retention metric (general)

This table presents, for a general case, the retention metric as applied to the different retention options according to CRD IV and DFA. The columns present, from left to right, name of regulation, description of regulation, calculation basis, size of retention, and retention metric with symmetric information (SI) and with asymmetric information and incentive issues (ASI).

			Retention options			
Regulation	Description	calculation basis	size of retention (regulation)	size of retention (nominal)	Retention metric $\mathcal{RM}$ (SI)	Retention metric $\mathcal{RM}$ (ASI/incentives)
EU a)	5% of each tranche	nominal value	5%	5%	5%	5%
EU b)	5% of each individual exposure	nominal value	5%	5%	5%	5%
EU c)	5% of randomly selected exposures	nominal value	5%	5%	5%	0%-5%
EU d)	5% horizontal slice (first loss)	nominal value	5%	5%	5%-100%	5%-100%
EU e)	5% FLP of each exposure	nominal value	5%	5%	>5%	>5%
DF a)	5% vertical slice	fair value	5%	5%	5%	5%
DF b)	5% horizontal slice	fair value	5%	>5%	5%-100%	5%-100%
DF c)	5% L-shaped slice (50%-50%)	fair value	5%	>5%	>5%	>5%

Table 2: Retention metric (London Wall)

This table presents, for a real-world transaction (London Wall 2002-2), the retention metric as applied to the different retention options according to CRD IV and DFA. The columns present, from left to right, name of regulation, description of regulation, calculation basis, size of retention, mean loss of retained portion, and retention metric with symmetric information (SI) and with asymmetric information and incentive issues (ASI). In Panel A (London Wall), the reference portfolio consists of 264 loans from 22 distinct obligors, a minimum diversity score of 70, a minimum average rating of Baa2, and a minimum average recovery rate of 45%. Following the practice performed by rating agencies, the correlation for loans within an industry is assumed to be 0.3, while between-industry correlation is assumed to be zero. The loss distribution is calculated with 10,000 simulations. In Panel B, the base case is altered and the default correlation is increased to 0.4 (within industry). In Panel C, each loan is assumed to be rated one notch lower.

Panel A: London Wall transaction							
Regulation	Description	calculation basis	size of retention (regulation)	size of retention (nominal)	mean loss	Retention metric (SI)	Retention metric (ASI/incentives)
EU a)	5% of each tranche	nominal value	5%	5%	1.5%	5.00%	5.00%
EU b)	5% of each individual exposure	nominal value	5%	5%	1.5%	5.00%	5.00%
EU c)	5% of randomly selected exposures	nominal value	5%	5%	1.5%	5.00%	0.00%-5.00%
EU d)	5% horizontal slice (first loss)	nominal value	5%	5%	29.8%	100.00%	100.00%
EU e)	5% FLP of each exposure	nominal value	5%	5%	2.6%	8.81%	8.81%
DF a)	5% vertical slice	fair value	5%	5%	1.5%	5.00%	5.00%
DF b)	5% horizontal slice	fair value	5%	6.4%	23.3%	100.00%	100.00%
DF c)	5% L-shaped slice (50%-50%)	fair value	5%	5.7%	12.4%	47.35%	47.35%
Panel B: Different correlation ($\rho = 0.4$)							
Regulation	Description	calculation basis	size of retention (regulation)	size of retention (nominal)	mean loss	Retention metric SI	Retention metric ASI/incentives
EU a)	5% of each tranche	nominal value	5%	5%	1.5%	5.00%	5.00%
EU b)	5% of each individual exposure	nominal value	5%	5%	1.5%	5.00%	5.00%
EU c)	5% of randomly selected exposures	nominal value	5%	5%	1.5%	5.00%	0.00%-5.00%
EU d)	5% horizontal slice (first loss)	nominal value	5%	5%	30.2%	100.00%	100.00%
EU e)	5% FLP of each exposure	nominal value	5%	5%	2.6%	8.73%	8.73%
DF a)	5% vertical slice	fair value	5%	5%	1.5%	5.00%	5.00%
DF b)	5% horizontal slice	fair value	5%	6.4%	23.5%	100.00%	100.00%
DF c)	5% L-shaped slice (50%-50%)	fair value	5%	5.7%	12.5%	47.31%	47.31%
Panel C: Different default probability (rating one notch lower)							
Regulation	Description	calculation basis	size of retention (regulation)	size of retention (nominal)	mean loss	Retention metric SI	Retention metric ASI/incentives
EU a)	5% of each tranche	nominal value	5%	5%	2.3%	5.00%	5.00%
EU b)	5% of each individual exposure	nominal value	5%	5%	2.3%	5.00%	5.00%
EU c)	5% of randomly selected exposures	nominal value	5%	5%	2.3%	5.00%	0.00%-5.00%
EU d)	5% horizontal slice (first loss)	nominal value	5%	5%	38.9%	84.81%	84.81%
EU e)	5% FLP of each exposure	nominal value	5%	5%	2.9%	6.34%	6.34%
DF a)	5% vertical slice	fair value	5%	5%	2.3%	5.00%	5.00%
DF b)	5% horizontal slice	fair value	5%	7.2%	30.7%	95.84%	95.84%
DF c)	5% L-shaped slice (50%-50%)	fair value	5%	6.1%	16.5%	43.70%	43.70%

Figures

Figure 1: Overview of the London Wall 2002-2 transaction

This diagram presents the structure of Deutsche Bank's London Wall 2002-2 transaction, based on Moody's New Issue Report.

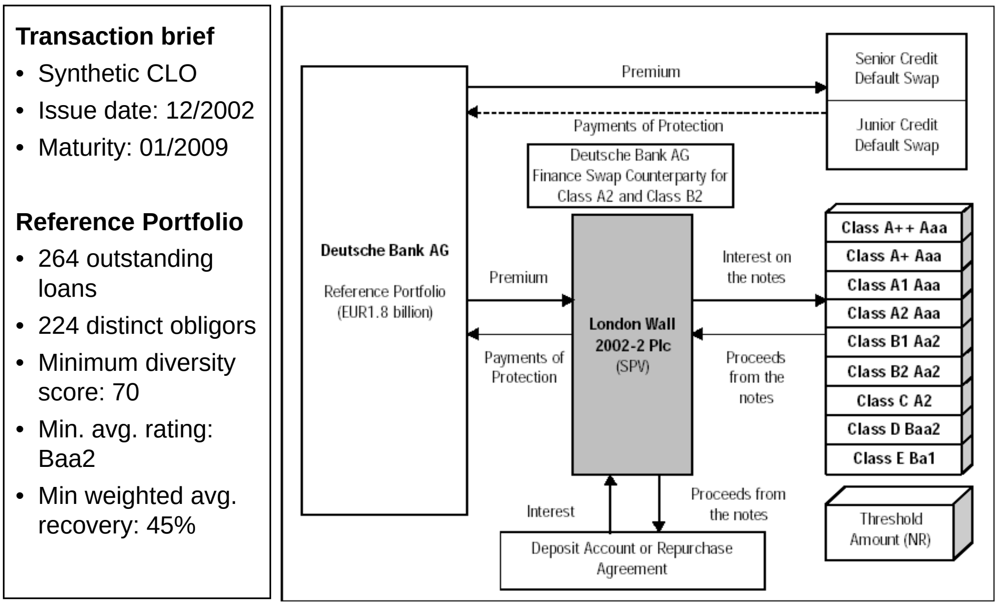
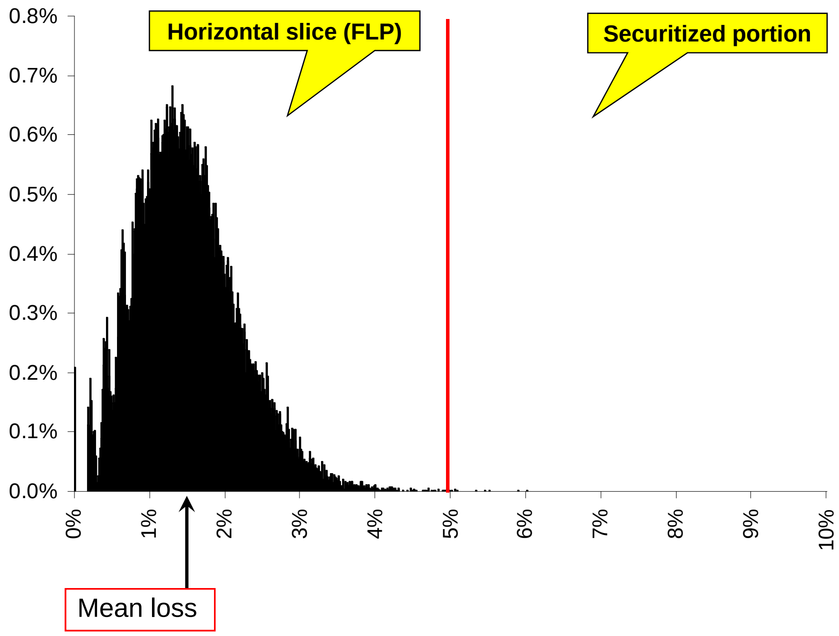


Figure 2: Real-world tranching example: The London Wall 2002-2 transaction

This diagram presents the simulated loss distribution of Deutsche Bank's London Wall 2002-2 transaction. Relevant information on the reference portfolio as provided in the offering circular is used as basis for the simulations. The assumed correlation structure is 0.3 within industries, and 0 between industries. Credit migration risk is modeled according to Standard and Poor's rating migration table. The horizontal axis denotes the portfolio loss rate (PLR), and the vertical axis denotes the associated probabilities based on 50'000 simulation runs. The red line shows the boundary of a 5% horizontal slice (first loss piece).



Appendix A

Table A1: Retention metric

This table presents, for the base case example, the retention metric as applied to the different retention options according to CRD IV and DFA. The columns present, from left to right, name of regulation, description of regulation, size of retention, mean loss of retained portion, and retention metric. In Panel A (base case), the reference portfolio consists of 10'000 zero bonds, and all of them are assumed to have a default probability of 7.63%, 10 years maturity, 24.15% recovery rate, and a default correlation of 0.15. The loss distribution is calculated with 500'000 simulations. In Panel B, the base case is altered and the default correlation is increased to 0.3. Panel C applies the portfolio characteristics of the base case, except the default probability, which is increased to 19%. In Panel D, the settings of the base case are applied, with the exception that the number of loans in the reference portfolio is 100.

Panel A: Base case				
Regulation	Description	size of retention	mean loss	Retention metric
EU a)	5% of each tranche	5%	5.79%	5.00%
EU b)	5% of each individual exposure	5%	5.79%	5.00%
EU c)	5% of randomly selected exposures	5%	5.79%	5.00% / 0%
EU d)	5% horizontal slice (first loss)	5%	69.01%	59.55%
Panel B: Different correlation ($\rho = 0.3$)				
Regulation	Description	size of retention	mean loss	Retention metric
EU a)	5% of each tranche	5%	5.80%	5.00%
EU b)	5% of each individual exposure	5%	5.80%	5.00%
EU c)	5% of randomly selected exposures	5%	5.80%	5.00% / 0%
EU d)	5% horizontal slice (first loss)	5%	60.11%	51.82%
Panel C: Different default probability (p=0.19)				
Regulation	Description	size of retention	mean loss	Retention metric
EU a)	5% of each tranche	5%	14.42%	5.00%
EU b)	5% of each individual exposure	5%	14.42%	5.00%
EU c)	5% of randomly selected exposures	5%	14.42%	5.00% / 0%
EU d)	5% horizontal slice (first loss)	5%	73.83%	25.60%
Panel D: Different number of loans (100 loans)				
Regulation	Description	size of retention	mean loss	Retention metric
EU a)	5% of each tranche	5%	5.79%	5.00%
EU b)	5% of each individual exposure	5%	5.79%	5.00%
EU c)	5% of randomly selected exposures	5%	5.79%	5.00% / 0%
EU d)	5% horizontal slice (first loss)	5%	66.45%	57.36%

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