The Liquifiability Index (LiX) of an Asset

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I. Preface

The Liquidity Coverage Ratio (LCR) in Basel III deals with funding or illiquidity risk of individual banks. For a given (stress) scenario, the banks' risk adjusted cash exposure (Total Net Cash Outflows) in 30 days is calculated and set into relation with its High Quality Liquid Asset (HLA) holdings. The underlying idea is to ensure that the bank can cover an eventual cash shortage in the first month with the cash it could get by 'liquifying' its HLA.

Although in principal this concept is addressing the problem of a bank's illiquidity correctly, it is too raw to be used or a bank's internal liquidity risk management. From the various possible enhancements, we will focus in this article on the bank's CounterBalancing Capacity, the economically more elaborated version of the HLA. In the LCR there are only three classes of liquifiability of securities: HLA_1, HLA_2, and the rest which is considered as 'not liquid'. In practice, an asset's liquifiability can range from 'immediately liquifiable' (e.g. in a central banks refinancing window) to piecewise liquifiability in time with changing haircuts and prices and is also scenario-dependent.

Specifying the liquifiability of each asset separately would be arduous and hardly consistent. To circumvent this, we define an algorithm to assign a number to each individual asset (its Liquifiability Index LiX). The LiX expresses for a pre-defined scenario the asset's assumed liquifiability as a number, e.g. from zero (completely illiquid) to 100 (best conceivable liquifiability). We will subsequently fine-tune an asset's LiX to mirror the asset's specific liquifiability relative to an average asset with the same credit rating. Because the LiX numbers are linearly ordered (0, 1, 2, ... , 99, 100) we can then for practical purposes sort assets with a comparable LiX in liquifiability groups (e.g. from 80 to 90) and assume they have (almost) the same liquifiability in our model. The first is to group securities together that will behave similarly in the chosen scenario.

II. Introduction

A bank's illiquidity risk is its risk to be unable to meet all contractual payment obligations as they fall due. It is measured by a forecast of the cash position at its central bank nostro(s) the Future Liquidity Exposure, FLE(t)[1]. As the FLE is driven by predictions of future payments (cash flows), which cannot be known, it is impossible to determine one unique FLE. In value driven risks like market or credit risk, it is best practice to generate many possible outcomes of the future (simulations) and interpret their mathematical mean as the 'most likely simulation (of the future). In liquidity risk however, it is meaningless to look at the average of scenarios, as the outcomes are not values (or profits or losses) which can be added but potential exposures which may lead to illiquidity of the bank – or not. One scenario in which the bank becomes illiquid, cannot be averaged with hundred scenarios where FLE>0.
In practice, the bank might specify various scenarios S (possible states of the future) and forecast for every S its FLE_S (the simulation of the FLE in a scenario S).

Nevertheless, the dissimilarity to value risks goes further: a negative result of a value simulation (a loss) is the materialisation of value risk. If however a simulation produces a negative FLE, simply proto-illiquidity risk has so far emerged: the ultimate illiquidity risk will finally materialize when the bank is as unable to counterpoise the negative FLE in due course[2].

[1] Compare: Robert Fiedler: Liquidity Risk Modelling, 2011; RiskBooks: ISBN 978-1-906348-46-5.

[2] In order to reflect this relationship, we could more appropriately say, that the FLE is an indicator for pre-illiquidity risk.

To specify this a bit more in detail, assume that the bank's FLE is positive until a future point in time t_X where the FLE is expected to turn into negative for the first time: $FLE(t_X) < 0$. In our model, the bank is liquid until t_X, but is so far unclear what will happen in t_X: if the bank would not take any actions to counterpoise the expected shortage, it would become illiquid then. In practice, however the bank will try to execute a Liquidity Generating Strategy (LGS) in order to achieve that $FLE(t_X) \geqq 0$.
If $FLE(t_X) + LGS(t_X) \geqq 0$, this strategy is successful and the bank stays liquid in t_X.

Our focus is now to select out of the many possible liquidity-generating strategies CounterBalancing Capacity (CBC), which creates the maximal amount of new (not yet scheduled) cash inflows until t_X – and quantify it[3].

In our model the bank will remain liquid in t_X if the anticipated shortage of the FLE can successfully be compensated with the CBC in time: $FLE(t_X) + CBC(t_X) \geqq 0$.
We will call the sum of exposure and CounterBalancing Capacity the Total Net Liquidity (TNL): $TNL(t_X) = FLE(t_X) + CBC(t_X)$. This inequality entails that both FLE and CBC have a term-structure.

III. The Liquidity Generation Process in the CBC

In order to generate cash inflows, the bank needs to enter into not yet existing (hypothetical) transactions: either acquire new liabilities from potential donators or sell existing assets to potential purchasers. A new liability (unsecured or secured) can give only temporary liquidity assistance: although it produces cash inflows at the start, it correspondingly causes correspondent cash outflows at maturity. A sold asset, however, will add 'endless' liquidity – unless the sales transaction has been coupled with an agreement to buy the asset back later (temporary sales transactions).

A. The Role of Potential Counterparties

1. Completely New Hypothetical Transactions

If the bank tries to persuade existing or new counterparties to agree on concluding a liquidity generating transaction (i.e. give a loan to the bank or to purchase one of its assets), it is not within the bank's own authority to exact such a deal; in contrary any transaction is solely contingent on the will of the potential counterparty to accept the bank's offer to enter into it. The decision of an individual counterparty to accept or reject a hypothetical transaction depends on:

(i) the counterparty's ability to enter into transactions with the bank:
- the counterparty might have external (e.g. legal restrictions) or internal (e.g. lack of credit limits) constraints to deal with the bank;

(ii) the counterparty's real or anticipated own liquidity situation:
- a rational counterparty will reject any transaction if its current own Total Net Liquidity (TNL) is negative or too small (for the time span of the transaction) or already if it is not certain enough about the size of its TNL;

(iii) the counterparty's judgement whether the transaction's benefits will outweigh its risks:
- if the counterparty assesses its own TNL as sufficient and not too uncertain, the problem reduces to judging if the expected return will prevail over the risks.

[3] A detrimental liquidity exposure $FLE(t_X) < 0$ cannot be counterpoised by capital which has been invested by the bank and thus will not be additionally available in t_X.

2. Hypothetical Transactions Generated By Existing Contracts

If the bank can exercise existing option contracts to generate the liquidity generating transactions, the situation is completely different. If for example the bank makes a drawing under an existing credit facility it is long or exercises the sale of an asset according to a put option it is long, it generates not yet existing and thus hypothetical transactions, but the contracts incorporating the rights to produce the hypothetical transactions do already exist.

The counterparties of these option contracts are contractually obliged to fulfil their duties. Therefore the uncertainty in the bank's view shifts to whether the counterparties are both able and willing to execute on demand the transactions as agreed before.

B. Types of Liquidity Generating Transactions

We want to figure out how likely it is for the bank to find a counterparty for a desired liquidity generating transaction. Therefore we focus in the following on a potential counterparty's view on the distinctive return and risk profiles of different transaction types.

1. Uncollateralized Loan

By giving an uncollateralized loan to the bank, the counterparty runs the risk that the bank will not be able to perform the contractual redemption payments. This is the bank's credit risk, in the lender's view – which is strongly correlated to the bank's credit rating, but is not necessarily identical to it. Credit risk and its relation to ratings is analysed and discussed in many other places; therefore we will not examine it further in this paper, but take it as a given.

2. Collateralized Loan / Repo

By giving a collateralized loan to the bank (a repo from the bank's perspective), the counterparty owns a debt claim towards the bank. If the bank defaults (does not perform its contractual payments), the counterparty can assert an additional title towards the collateral and claim its ownership from the obligor.

The counterparty's assessment of the return/risk relationship is trickier than in the uncollateralized case. Assume that the obligor's credit risk realizes and a payment defaults:

(i) if the value of the asset used as collateral can be realized in due course and is greater or equal than the outstanding debt, the lender can claim the asset, sell it and thus meet its claim.
(ii) if however, the asset cannot be sold in time or its value is less than the outstanding debt, the reclamation of the debt requires a mixture of liquidating both the collateral and the bank's balance sheet.

In practice the technical process of moving the asset's ownership to the obligor is very important. Bankers Trust, for example, was supposedly unable during its liquidity crisis, to raise cash from other market participants via repo transactions although the offered collateral was of best quality and the proposed haircut was generous enough to cover 'all' risks. Obviously the potential counterparties refused to enter into these transactions because they feared that – after Banker's Trust's presumed illiquidity – the uncertainty about when and how they would gain ownership of the collateral. Thus they doubted whether the collateral's market and credit risk could be hedged in time and estimated the risks and uncertainties of the transaction higher than its probable benefit.

3. Final Purchase of an Asset

After having purchased an asset from the bank, the counterparty's risk and reward depends solely on the asset. It makes a remarkable difference if the counterparty intends to hold the asset until maturity or might sell it on before:

(i) If the counterparty assumes that it will hold the asset until maturity, its risk/reward assessment depends on the proposed purchase price in relation to the cost of funding and the counterparty's estimation of the asset's credit risk.

(ii) If the counterparty considers selling the asset in t_X before maturity, the risk/reward assessment depends strongly on the asset's expected price development, which again is driven by the cost of funding it until tX, and on other potential buyers' estimation of the asset's credit risk. If the likeliness of default increases, the offered prices will decrease. In this case the potential counterparty's assessment comprises not only its own valuation but also the expected valuation of other market participants[4].

[4] If a new potential buyer uses exactly the same valuation model, the asset can be sold with no or only minor losses. The inherent assumption is, that both parties also concordantly evaluate the expected change of the asset's credit spread in relation to costs of holding it.

4. Transitory Sale of an Asset (Sell & Buy Back)

This transaction is very similar to a repo: the counterparty buys an asset at the start of the transaction t_S at a certain price from the bank which in return agrees to buy back the asset on the expiry date t_E of the repo at a pre-determined price. Here the ownership of the asset is transferred in t_S from the bank to the purchaser (and back in t_E), whilst in a repo only the possession of the asset is transferred to the counterparty (and the ownership remains with the bank). The counterparty's expected profit is simply given by the difference between purchase and re-purchase price; the associated risk again is a bit trickier. From t_S to t_E the counterparty is hedged by the agreed repurchase price, but exposed to the bank's credit risk:
if in t_E the bank fails[5] to repurchase the asset, the ownership stays with the counterparty which has now to retrieve the initial purchase price by selling the asset. If the achieved price is less than the agreed re-purchase price, the counterparty can claim back the difference from the insolvency estate.

C. The Contribution of Securities to the CBC

In the following we will simplify our considerations by restricting ourselves to those inflows in the CBC that can be created by repo or (final) sale of securities. We want to estimate for each eligible asset the cash inflows that can be generated in time by liquifying it (fully, partly, or not at all) in different possible liquification venues.

The bank can:

- Get loans from central banks against suitable collateral[6]
- Agree repos with other market participants as well as with central counterparties
- Irrevocably sell securities to other market participants.

We define the liquidity buffer of the bank as the set of securities that can in principle be liquified in one of the above liquification venues. Our aim is, to quantify the liquifiability of each individual asset in the bank's liquidity buffer: "how much cash can be generated per asset, per day, per liquification venue?".

To simulate the liquification of assets via transactions with a central bank, we can just take the list of accepted (eligible) assets with their haircuts, as specified by the central bank[7] and assume that each asset can immediately be turned into cash by being accepted as collateral for an appropriate loan from the central bank. This assumption applies well to a 'business-as-usual' scenario, but if we want to simulate more detrimental scenarios, we might want to be able to simulate e.g. that the central bank restricts the list of eligible assets, or raises haircuts[8], or defers the immediate access to the central bank funds; etc.

For the other liquification venues (repo and sale in the secondary market) we need to estimate the appropriate term-structured saleability and repoability parameters (as well as the according haircuts) for every individual asset (in each scenario separately). Firstly we will assign a Liquifiability Index (LiX) index to each individual asset, and then we will group securities with comparable LiX into liquifiability classes.

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[5] We assume here that if a bank defaults on a payment it will have to declare itself bancrupt.

[6] Here we might unleash our restriction again and consider central bank eligible assets which are not only securities.

[7] If the central bank makes this publicly available.

[8] Recent history has shown that after a certain severity of the crisis the central banks in fact eased the access to funds. Nevertheless, good risk management practice requires not relaying on such assumptions.

D. The Repoability / Saleability of an asset

The traditional rating of assets expresses the inability of its issuer to carry out the contractually scheduled payments without disruption – which is sometimes interpreted as the issuer's probability of default. If this probability increases, a potential purchaser will require a better purchase price as compensation for possible losses induced by the growing likeliness of disruption.

A potential counterparty's acceptance to buy or reverse repo a given asset depends predominantly on the asset's rating, but securities with the same rating observably do not always find the same level of acceptance.

We want to analyse those other factors that need to be taken into account when estimating the liquifiability of an asset. We do not, however, want to propose better, or more appropriate rating methods, and therefore we do not question if the rating given by the rating agency is 'correct' in the above sense of probability of disruption, but take it as given.

Our first observation is, that although the rating is strongly correlated to the credit risk of an asset, both are not identical. Without going into further details, we note here that more advanced internal credit risk evaluation models of banks simulate what might happen after the disruption: the probable 'recovery flows' and their expected time of occurrence. Banks often use internal ratings (which can be credit risk adjusted in the sense above) instead of external ratings, but as different banks come to different conclusions, it is not so straightforward, that internal ratings are 'better' than external ratings. If we consider counterparties that do not intend to hold the asset until maturity, their appetite to purchase or accept it as collateral in a repo, depends primarily on the quality of the asset, but also its presumed saleability thereafter (quickly and at a 'fair' price). In case the asset cannot be sold, the detrimental effects stemming from holding the asset can vary, subject to e.g. optional elements in the structure of the coupon and/or the redemption flows, which can require risk provisions.

For a collateralized asset, the recovery flows depend on the one hand on the quality of the underlying collateral, i.e. what it is worth and how fast can this value be converted into cash. On the other hand, the legal mechanism that takes the collateral out of the reach of the issuer (for example in the German Pfandbrief law) diminishes the loss for the holder and thus improves the quality of the asset. This is again, not conflicting with the appropriateness of the rating but an additional facet.

Other aspects can be found in the structure of the internal investment processes of potential buyers. If, for example, an investor has an internal limit on the total holding of a certain industry or country, he will simply be unable to buy such securities, even if their price is acceptable for him (or even better than that). A single investor makes possibly only a minor effect, but if many investors have similar restrictions, the saleability of the asset suffers.

Another issue is, that an investor might consider buying an asset at the offered price but is uncertain, if he will need to sell the asset probably soon. He then will be concerned if the asset is easily sellable. An asset with e.g. a small issue size or high ratio of permanent investors is expected to be of lesser saleability.

The liquifiability adjustments for each criterion have to be well balanced in order to get the desired results. If a certain asset type is seen as very illiquid like e.g. ABS in 2008 the issue type criteria 'ABS' needs to receive negative liquifiability adjustments to make sure that other positive effects like a AAA rating, Euro issue and (temporarily) ECB-eligibility are counterbalanced: The total score should be then low enough to distribute all ABS in the last class disregarding more or less all the other criteria.

IV. The Liquifiability Index (LiX)

A. The Construction

The Liquifiability Index (LiX) of an asset seeks to rationalize the assessment of its quality from a liquidity perspective by taking the above aspects into consideration to adjust the rating with a 'liquifiability component'. Technically speaking, the algorithm, which determines an asset's LiX, is based upon the asset's static data. The more data are available the more granularity can be achieved.

For the beginning we consider a scenario 'going concern', that is, we assume that prices, risks etc. do not change within the given time horizon of the scenario. Later we might want to consider other scenarios as well.

We propose an algorithm, which will assign a LiX between LiX_{min} and LiX_{max} to each individual asset. For the sake of simplicity, let us assume that $LiX_{min} = 0$ and $LiX_{max} = 100$. If an asset scores zero, it is considered as 'un-liquifiable'; whereas a score of 100 indicates that the asset is as 'liquid as possible', which means that it can be liquified almost instantaneously, in large or small amounts and within the range of normal bid offer costs[9].

(a) Firstly we define a table T_0 that maps every (external or internal) rating appropriately to a specific scoring value between zero and 100. This will be the starting score $\lambda^0(S)$ for each individual asset (if it has no rating, it gets the lowest scoring points possible).

(b) Then, we determine a list of possible liquifiability attributes $A^1, A^2, \ldots, A^N$ of securities which we regard as potentially relevant for the liquifiability of an individual asset, which could for example look like this:

- Asset Class (bond, equity share…)
- Issue Type (government bond, ABS…)
- Issuer Country
- Guarantor Type
- Guarantor Country
- Issue Size
- Currency (major currency, 'home' currency)
- Structure (coupon and/or redemption)
- CB Eligible (ECB, SNB, BoE, ...)
- Qualification as High Quality Liquid Asset according to the LCR in Basel III.

[9] We do not assume that an asset can be liquified in this process without incurring certain costs.

(c) Next we determine for each individual asset S the values $\alpha^1(S)$, $\alpha^2(S)$, …, $\alpha^n(S)$ of its attributes where each $\alpha^n(S)$ can be a combination of possible values of A^n.

(d) Then we define mapping functions Λ^1, Λ^2, ..., Λ^N; where Λ^n maps every possible value combination $\alpha^n{}_m$ of an attribute A^n to a positive or negative integer number:
Λ^n: $\alpha^n \to \Lambda^n(\alpha^n) =: \lambda^n$ the liquifiability scoring points of α^n.

(e) Finally we apply the Λ^n to the attributes $\alpha^1(S)$, $\alpha^2(S)$, …, $\alpha^n(S)$ of the individual asset S.

(f) The liquifiability index LiX(S) of an individual asset S is then defined as the sum of the starting value $\lambda^0(S)$ plus its liquifiability scores $\lambda^1(S)$, $\lambda^2(S)$, …, $\lambda^n(S)$:

$LiX(S) = \lambda^0(S) + \lambda^1(S) + \lambda^2(S) + \ldots + \lambda^n(S)$.

B. Example:

1. A Simple Example

Assume we want to apply the LiX algorithm. Our first consideration is to pick one of the most liquid securities, e.g. a German bund with a lager issue size and no 'specialities' and use it as benchmark. Further we assume that this asset is in the prevailing scenario in fact 'as liquid as possible', so we set its LiX as 100.[10]

In a next step we work out the following table, which specifies the scoring points for each attribute:

[10] If a certain scenario or specific market condition prevails, the most liquid asset is not ‚as liquid as possible' and we would then assign a different LiX < 100. Then the benchmark with the maximal LiX would be 'the most liquid asset' in 'the most liquid scenario'.

Liquifiability Attribute	Value	Scoring Points
Rating		
	AAA	20
	AA	15
	A	10
	BBB	5
	< BBB/none	-25
Issue Type		
	Government	15
	Supra	15
	Region	10
	OF, Pfandbrief	10
	Agencies	10
	Other Covered Bonds	5
	Financial	0
	Corporate	0
	ABS/other	-25
Guarantor/Issuer Country		
	D, US,	20
	F, GB, CH, NL, A, CDN, S, N, SF, DK, JPN	15
	Other EU member states	10
	COR, BRA, RI, RUS	5
	Other	0
Issue Size		
	≥ 1 bn EUR	5
	< 1 bn EUR	0
Structured		
	No	5
	Yes	0
Currency		
	Home / Issue Currency is Major Currency	10
	Issue Currency is Major Currency	5
	Other Currency	0
Guarantor		
	No	5
	Yes	0
Central Bank Eligibility		
	Multi Central Bank Eligible	10
	One major Central Bank	5
	No / minor Central Bank	0
Basel III - HLA Eligibility		
	HLA1	10
	HLA2	5
	None	0

A German Bund will attain a starting score of 20 for its AAA rating. As it is a Government Issue it will get 15 scoring points and 20 for its Issue Country ‘Germany’ ... and so on, according to the following table:

Liquifiability Attribute	Achieved Value	Scoring Points
Rating	AAA	20
Issue Type	Government	15
Guarantor/Issuer Country	D	20
Issue Size	≥ 1 bn EUR	5
Structured	No	5
Currency	Home / Issue Currency is Major Currency	10
Guarantor	No	5
Central Bank Eligibility	Multi Central Bank Eligible	10
Basel III - HLA Eligibility	HLA1	10

C. Liquifiability Classes

Once we have attributed a LiX number to each asset in the bank's liquidity buffer, we can come to the real purpose of our exercise. We simulate the liquifiability of each single asset in time in specific scenarios. Firstly we define a time bucket structure $T_1, T_2, \ldots, T_N$ with $T_n := (T_{n-1}, T_n]$. Per asset we define its repoability, saleability, haircut, price decay and eventually upper sales and repo limit for every time bucket as specified in FIEDLER[11].

As in practice it will be particularly cumbersome to assign all these parameters individually to many thousands of securities, we simplify this task, and introduce liquifiability classes LC_1, LC_2, ..., LC_N, where an individual liquifiability class LC_n contains all assets, that have a LiX within a certain range.

More formal, we cover the full range [0,100] of LiX numbers with non-intersecting intervals: $LC_1, LC_2, \ldots, LC_N$ with $LC_n := (L_{n-1}, L_n]$[12] such that $[0,100] = LC_1 + LC_2 + \ldots + LC_N$[13].

An individual liquifiability class LC_n contains all securities S with $L_{n-1} < LiX(S) \leq L_n$.

D. The Role of Scenarios

The liquifiability scores as well as the interval of LiX of each LC can be scenario dependent. In one scenario, for example, the LiX of the assets in the highest liquifiability class might range from, say, 91 to 100, whereas in another scenario, only assets with a LiX between 94 and 100 are considered as 'as liquid as possible'.

In addition, certain asset attributes can be weighted differently in specific scenarios, thus the same asset can get different scores in different scenarios. Assets, for example, that are issued by European AAA-rated governments, might get the same score in a going concern scenario, e.g. German and Dutch government bonds are regarded as similarly 'liquid' in an unperturbed market environment. In a certain crisis scenarios however, this might change dramatically to the detriment of the Dutch bonds.

Furthermore, the scenario dependent composition of the Liquifiability Classes allows to steer the number of classes per scenario: as, for example, Basel III only requires three classes (HLA_1, HLA_2 and non-HLA), the third class would comprise all LiX that do not qualify neither for class one or two.

For each liquifiability attribute a certain number of liquifiability scores are endorsed to the asset. The more liquid an asset is, the higher its score will be: a plain vanilla bank bond with a large issue size (> 1 billion Euro) for example, would achieve more scores than a small sized structured (and thus non-CB eligible) private placement of the same issuer and would therefore end up in a higher Liquifiability Class. As outlined before, the absolute number of scores is scenario dependent. In going concern scenario, the above liquifiability attributes 'issue size' and 'structure' could be of a smaller relevance as distinguishing criteria, the second asset would just be in a lower liquifiability class LC. For stress testing purposes, the difference is then more important: the structured, non central-bank-eligible issue would end up in an (almost) illiquid class by just amending the number of liquifiability scores for the 'non-structured' respectively 'CB-eligible' criteria: if in the going concern scenario, a structured bond gets zero scores whereas the non-structured one gets five, the stress scenario could extend, for example, the range to -25 points for the structured and +25 points for the non-structured bond.

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[11] Compare: Robert Fiedler: Liquidity Risk Modelling, 2011; RiskBooks: ISBN 978-1-906348-46-5.

[12] Fort he sake of exactness: the first interval LC_1 is closed on both ends: $L_0 \leq LiX \leq L_1$.

[13] This ensures that every individual asset will be mapped into exactly one liquifiability class.

Each liquifiability class is composed of assets with a comparable LiX.
If, for example, a going concern scenario has 10 liquifiability classes and 100 points maximally, which are equidistantly distributed:

	Scenario:	Going Concern	
Liquifiability Class	Characterisation	LiX Range	Range Width
LC_1	highly liquid	(90, 100]	10
LC_2	partly liquid	(80, 90]	10
LC_3		(70, 80]	10
LC_4		(60, 70]	10
...			
LC_9	more or less illiquid	(10, 20]	10
LC_{10}	completely illiquid	[0, 10]	10

In a going concern scenario, a German Government Bond with the following attributes: plain vanilla Euro-denominated benchmark issue would reach 100 points. The decomposition could be as follows: 20 points for the AAA-rating, 15 points for the issue type (Government), 20 points for the country, 5 points as it is a direct (not guaranteed) issue, 5 points for the benchmark size, 5 points for being a plain vanilla issue and finally each time 10 points for the currency, the (assumed) multi-CB eligibility and the qualifying for HLA2 under Basel III. A (fictive) private placement (smaller issue size) in USD with a slightly structured coupon of the same issuer would then get 65 points only (5 points for the major currency and each time 0 points for the small size, the structure, the non-CB eligibility and the non-HLA qualifying).

On the other hand, a AA-rated GB corporate plain vanilla benchmark issue in GBP would receive 65 points as well: 15 for the rating, 0 points for the issue type, 15 points for the country, 10 points for the currency, and finally each time 5 points for the direct issue, the benchmark size, the plain vanilla issue, the CB-eligibility and the HLA_2-qualifying.

Following our a.m. LiX distribution, the first issue would end in LC_1 whereas the second and the third one would be in LC_4.

If we however consider a stress environment, the good liquifiability classes will become narrower because there is a sharper distinction between 'best' assets and the number of feasible classes will reduce because the assets with lower liquifiability will migrate to the lowest liquifiability class. The new distribution could look for example like:

	Scenario:	Stressed Markets	
Liquifiability Class	Characterisation	LiX Range	Range Width
LC_1	highly liquid	(95, 100]	5
LC_2	partly liquid	(90, 95]	5
LC_3	poorly liquid	(70, 90]	20
LC_4	more or less illiquid	(50, 70]	20
LC_5	completely illiquid	[0, 50]	50

V. Conclusion

One of the key elements of a bank's illiquidity risk assessment is the classification of how its eligible assets are apt to be repoed or sold. In the HLA / LCR of Basel III this is done in a cursory way: there are two classes of liquifiable assets, the rest is regarded as 'illiquid'; the process of turning the assets into cash is undescribed and the quantification of the resulting cash generation is only vaguely sketched by haircuts.

In the CounterBalancing Capacity[14] the idea of the HLA is specified in more details: the different liquification venues (central bank repo, secondary market sale and repo) are distinguished and an algorithm that describes the liquification process is described and its results are quantified in time.

In the previous we have outlined how an asset's liquifiability can be systematically assessed by means of mapping it to a number from zero to 100.
We see the benefits of the LiX as follows:

- the LiX is based on the assessment of the asset's credit quality, its rating, but other factors that make it more or less attractive to possible repoing or purchasing counterparties are considered as well;
- the liquifiability adjustments are given by quantifiable attributes of the considered asset;
- if the importance of a certain liquifiability attribute should change in certain market conditions, its scoring points can be made scenario-dependant
- different assets in a bank's liquidity buffer can come with distinctive cost of carry; the LiX allows to relate these costs to the 'usability' of the assets
- the LiX allows to order the liquifiability of two securities in a mathematical way: they either have the same liquifiability or one is easier to liquify than the other;
- as the LiX scores for a single security are to a certain degree changeable by their nature, assets with approximately equal LiX numbers can be grouped into liquifiability classes which contain assets with comparable liquifiability;
- if the market's discrimination of more and less liquifiable asset changes, e.g. in crisis circumstances, scenario-dependant liquifiability classes can adapt to the situation.

It is clear that all the above quantifications are the results of foregone qualitative judgements and quantitative parameter settings. An unambiguous and 'scientifically correct' numerical description of an asset's liquifiability is hardly possible.

The authors would greatly welcome if regulators could make use of their rule setting authority and use this LiX concept as a basis to define the liquifiability of assets in a consistent and more granular way so that it can be become a standard banks can use internally as well as when assessing mutually an asset's liquifiability.

[141414] Compare: Robert Fiedler: Liquidity Risk Modelling, 2011; RiskBooks: ISBN 978-1-906348-46-5.