FINAL

28 April 2011

Practical application of Liquidity Premium to the valuation of insurance liabilities and determination of capital requirements

1. Introduction

CRO Forum Position on Liquidity Premium

The CRO Forum believes that the liquidity premium is a fundamental part of the economic valuation of insurance contracts. We support the underlying principles agreed by the Task Force, and the formulaic approach for deriving the liquidity premium adopted in QIS5.

Importantly, there must be certainty on the application of liquidity premium, in order to fulfil its counter-cyclical function. A formulaic approach is necessary, within the Level 2 text, to ensure the impact of the liquidity premium adjustment is known under any given market conditions. EIOPA must not have the power to determine arbitrarily when the illiquidity premium can apply without specifying in advance the formula-based approach used for doing so, due to the potential pro-cyclical impact on capital markets.

Further, the CRO Forum reiterates that liquidity premium should be applied to the risk-free forward curve and not to the spot curve, to ensure the resulting curve is arbitrage-free. The liquidity premium should be applied up until the point that extrapolation of the basic risk-free curve begins, to ensure a smooth risk-free forward curve.

The recently introduced Matching Premium concept, depending on final methodology, may be complimentary to the liquidity premium formula adopted in QIS5 for fully illiquid liabilities.

Background

Many insurance contracts embed specific features, such as minimum guarantees, that reduce the likelihood of policyholders claiming funds early. Some contracts may not permit policyholders to surrender early at all. This is in contrast to bank liabilities which are typically highly liquid (e.g. customer deposit accounts which can be withdrawn at very short notice).

This particular characteristic of many insurance liabilities requires the inclusion of a liquidity premium in an economic valuation. While the starting point for a market-consistent valuation should be observed market prices for equivalent financial instruments, these financial instruments are usually highly liquid (typically tradable daily), whereas the insurance liabilities they are intended to replicate are often not as liquid. Therefore, a liquidity premium adjustment is required to reflect the (partial) illiquidity in many insurance contracts.

To date, much work has been done to determine the level of liquidity premium that can be observed in the financial markets and should therefore be reflected in the valuation of insurance liabilities. In particular the CEIOPS Task Force Report on the Liquidity Premium[1] sets out the key principles underlying the use of a liquidity premium. In QIS5, these principles were applied to derive adjusted risk-free rate curves for each currency, for use in valuing illiquid liabilities.

This paper recognises that the QIS5 method developed is a simple yet robust method of applying the liquidity premium. The paper then goes onto address some of the practical issues in the application of the liquidity premium to ensure a consistent valuation across the industry, and to ensure that the application of the liquidity premium does not discourage the use of liquid options for risk management, irrespective of the modelling approach used to value the liabilities.

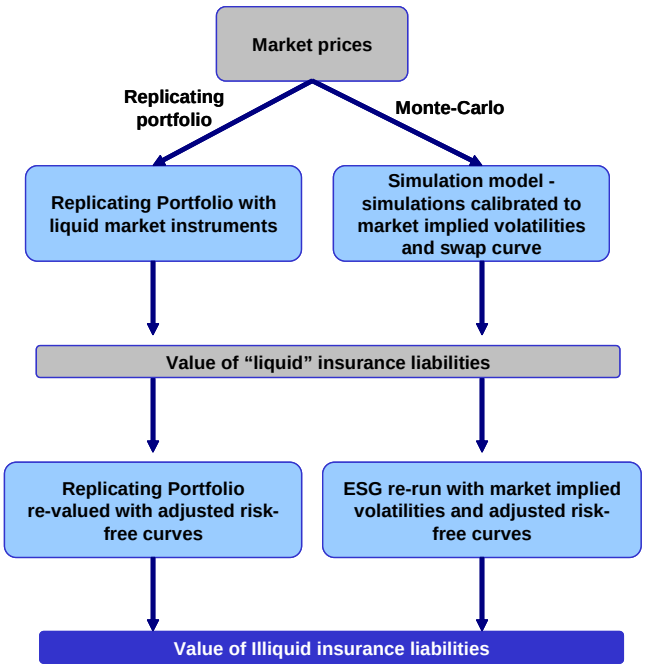
[1] see https://eiopa.europa.eu/fileadmin/tx_dam/files/publications/submissionstotheec/20100303-CEIOPS-Task-Force-Report-on-the-liquidity-premium.pdf, published in March 2010

2. Practical application to liability valuation

The CRO Forum recognises that there are a number of practical modelling approaches which can be used to apply the liquidity premium, and that the most practical modelling approach will vary by company. As set out in this paper, each method will give a consistent valuation.

To value insurance liabilities with embedded options under Solvency II, insurers use either Replicating Portfolio models or Monte-Carlo simulation models[2]. In both cases, to ensure market-consistency, the models are first validated back to observable market prices before allowance for liability illiquidity. As a second step, an appropriate allowance for liquidity premium should be allowed for by adjusting the risk-free curve, as adopted in QIS5, depending on the degree of illiquidity in the liabilities. This will ensure a consistent treatment across the industry, irrespective of the modelling approach, as illustrated in Figure 1.

Figure 1



Using either of these modelling approaches, the application of Liquidity Premium is straightforward once the proportion of liquidity premium to apply to each product has been set. Importantly, using this adjustment to the risk-free rate, put-call parity is also preserved for the valuation of embedded options, such that there is a "unique" valuation result for each type of liability, independent of model choice.

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[2] For liabilities that can be valued deterministically, the same principles apply, and we can apply the appropriate proportion of the liquidity premium to the unadjusted risk free curve.

How should the predictability of cashflows be measured?

The extent to which the liquidity premium can be captured depends crucially on the predictability of the liability cashflow timing. Specifically, to the extent that funds can be claimed unexpectedly early, for example due to unexpected lapses, early withdrawals, increases in portfolio mortality or morbidity rates etc. then the liquidity premium cannot be reliably earned. The type of product and key product features are therefore the main elements in determining the extent to which the liquidity premium can apply (e.g. a with-profits product with large surrender charges has more predictable cashflows than one where policyholders are free to surrender early).

The CRO Forum believes that the uncertainty of cashflows should be measured at portfolio level rather than policy level. For example, unknown mortality experience, while unknown for an individual policyholder, may be reasonably predictable at portfolio level, allowing the liquidity premium to be captured.

To reflect this, the "bucketing" approach used in QIS5 should be applied to allow for the illiquidity inherent in different products depending on the predictability of the timing of liability cash flows (e.g. on the propensity to claim early). To ensure consistent valuation between undertakings for Solvency II, the same product buckets should be specified for use by all undertakings, as per QIS5. The analysis used to calibrate the levels of the liquidity premium applicable for each bucket includes:

- Using stressed decrement rates (or a stochastic projection of liabilities allowing for variations in decrement experience) to derive a highly predictable set of cashflows, and taking a ratio of the highly predictable cashflows to the best-estimate cashflows in each calendar year to give an estimate of the degree of predictability. When deriving the highly predictable cashflows, allowance should be made for dynamic policyholder behaviour, which may cause decrement rates to vary by market scenario. The lapse, mortality and morbidity SCR stresses can be used to give insight into the predictability of liability cashflows;
- Using Replicating Portfolio models to separate predictable cashflows from variable cashflows and therefore the proportion of liquidity premium which should apply. .

To avoid unnecessary complexity, undertakings should be allowed to abstain from applying the liquidity premium for practical reasons when the impact can be shown to be very small.

Practicalities for Monte Carlo calibration

When using Monte Carlo simulations to value liabilities for which the liquidity premium applies, the overall process can be summarised as follows:

1. Firstly, the ESG should be calibrated to observable market prices using an unadjusted market swap curve and market-implied volatilities;
2. Once calibrated, a proportion of the liquidity premium should be added to the swap curve for both the accumulation and discount rate, to reflect an internally consistent option price, for a fully illiquid liability. Making this adjustment in practice will always require a new set of stochastic scenarios to be generated for each liquidity premium bucket, though the parameterisation of interest rate volatility in the ESG can be kept the same as for step 1;
3. The proportion to be applied should be based on the uncertainty in policyholder behaviour, by major product line, as for the QIS5 approach;
4. Once adjusted in this way, it is clear that the ESG will no longer reproduce the price of liquid market instruments (e.g. swaps, swaptions, equity options etc), since it has been adjusted for illiquidity in the liabilities. This should not be expected as part of model validation.

Practicalities for Replicating Portfolio calibration

When using Replicating Portfolio models to value liabilities for which the liquidity premium applies, the overall process can be summarised as follows:

1. Firstly, the ESG used to generate liability cashflows subject to replication does not have to be calibrated to specific observable market parameters but has to cover a wide range of future possible market conditions with special focus on a sufficient amount of extreme events to provide robust SCR results
2. Once calibrated, the replicating portfolio optimisation will be based on "liquid" replicating instruments (i.e. with assets valued using unadjusted risk-free curves)[3];
3. The resulting replicating portfolio will be re-evaluated by means of the adjusted yield-curve taking the illiquidity premium into account, in order to value the illiquid liabilities it replicates;
4. This can be done by applying the full liquidity premium to the predictable cashflows only or by applying a proportion of the liquidity premium to the total replicating portfolio based on the predictability ratios, by major product line, as for the QIS5 approach.

Practicalities for risk management

While the CRO Forum believes that the liquidity premium is a fundamental component of market-consistent liability valuation, it is recognised that illiquid liabilities may still be risk-managed by using fully liquid (tradeable) assets.

A portfolio which comprises tradeable assets valued on *unadjusted* risk-free curves may therefore be used by some insurers as an internal benchmark for creating and managing hedging strategies (whichever modelling approach is used to value the liabilities).

In this case, the benchmark portfolio can be derived by constructing a mix of tradeable assets which have hedge ratios[4] matching those of the illiquid replicating portfolio.

The overall process can be summarised as follows:

1. Set up a replicating portfolio to match the sensitivities (or cashflows) from the liabilities valued on an *unadjusted* risk-free curve;
2. Apply an adjustment to the risk-free curve (as per QIS5) reflecting a proportion of the liquidity premium that is appropriate for the specific liability portfolio, and re-value the same replicating portfolio to give the market-consistent liability valuation for the Solvency II balance sheet;
3. Derive hedge ratios from this replicating portfolio;
4. Set up a benchmark portfolio that tracks the required hedge ratios of the replicating portfolio, by selecting a mix of liquid (tradeable) assets available in the market. This benchmark portfolio can be used to actively manage risks within the business, and is fully consistent with the risks recognised on the Solvency II balance sheet.

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[3] It should be noted that while the replicating portfolio assumes a valuation consistent with liquid market curves, the assets themselves can be "theoretical" (e.g. very long dated bonds which do not exist in the market but may replicate very long-dated liabilities).

[4] Hedge ratios are usually the "greeks" (e.g. deltas, gammas etc.) and are used for risk management.

3. Application of Liquidity Premium in the Spread Risk Module

The CEIOPS Task Force Report concluded that the application of a liquidity premium should not only impact the Own Funds, but also the calculation of the SCR for market risk. Specifically, the liquidity premium has an immediate impact on the measurement of spread risk in the standard formula and internal models.

The spread risk module in the standard formula assesses the volatility of yields relative to the risk-free term structure (i.e. the "spread" over the risk-free interest rate term structure). The liquidity premium is quantified as a function of the market yield spread for a specified model portfolio of assets over a basis reference interest rate term structure. Therefore, the Task Force concluded that the spread risk module is the most appropriate place to recognise the impact of changes to the level of liquidity premium over the one year horizon.

When accounting for the liquidity premium in the credit spread module, the following should be taken into consideration:

- The risk distribution is two-sided as the liquidity premium can increase or decrease.
- The change in liquidity premium impacts on the liability valuation as well as on the asset valuation.

These features can be allowed for in two ways:

1. Calibrate the spread risk factors on the basis of "gross spreads" rather than only CDS spreads. The full asset spread includes the illiquidity component; or
2. Calibrate the spread risk factors on the basis of "net spreads" based on CDS spreads, which do not take into account the liquidity aspect of the risk. In such case the impact of movement in the liquidity premium is not recognized on either the asset or the liability side.

The first method allows for the different risk drivers (credit spreads and liquidity premium) to be separated and is more consistent with the definition of Own Funds, where liabilities are impacted by liquidity premium changes and assets are impacted by total credit spread changes. While this method is considered to be technically sound the second method (as applied in the QIS5 specification) is also considered a valid method of model calibration. It is also less complex to apply which makes it potentially more appropriate for the standard formula.