Liquidity Premiums

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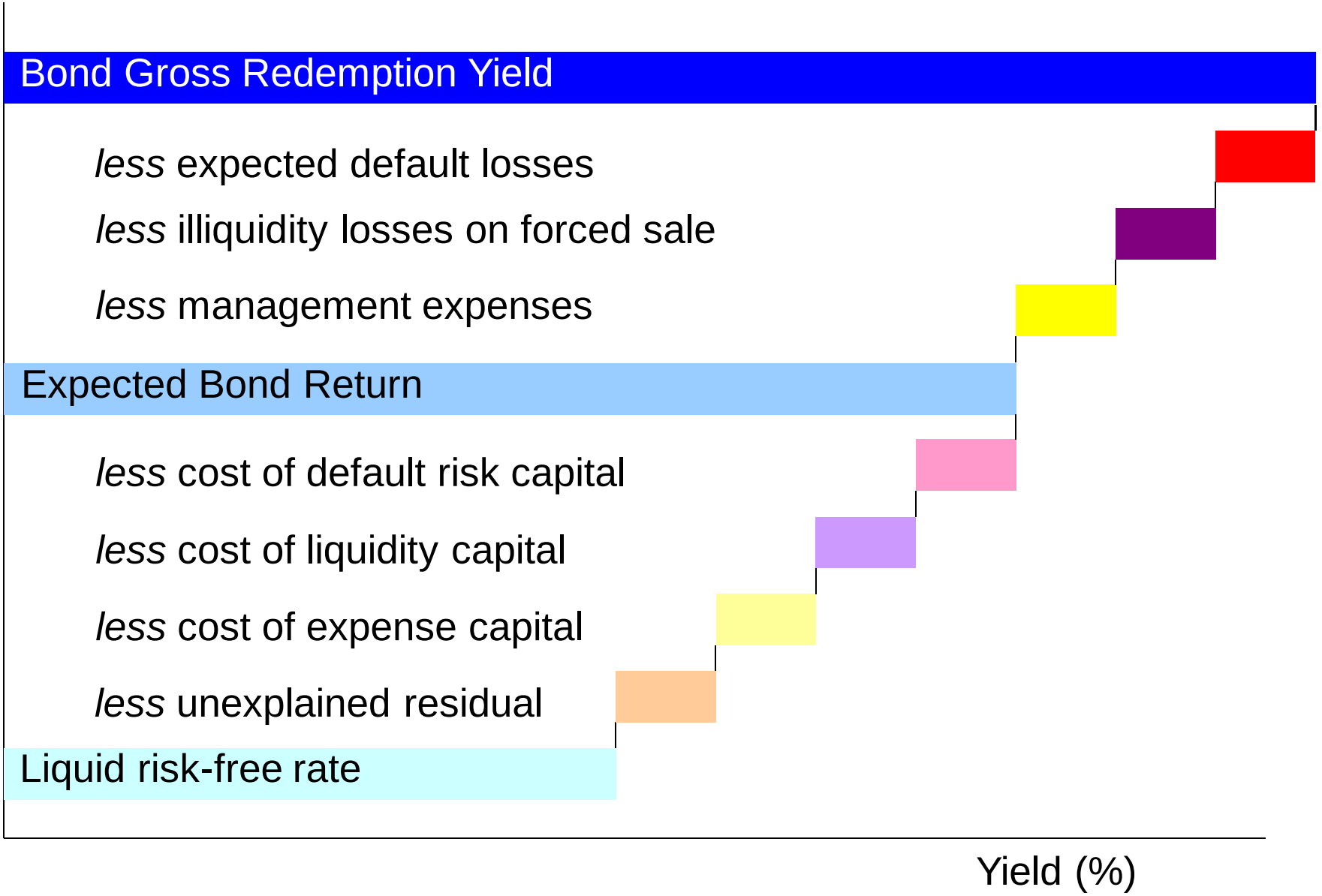
Liquidity Premium: Assets

Elements of Corporate Bond Yields: Illustrative



Direct Illiquidity Costs: Triggers for Liquidity Shocks

Policy Drivers

Catastrophe insurance payout
Loss of confidence /adverse publicity
No MVA dates
Embedded options moneyness
New product launches / churn
Optional additional premium

Market Drivers

Delta hedging
Other guarantee hedging
Hedge rollover
Group fungibility limits
Derivative physical delivery
Collateral posting on derivatives

Credit Drivers

Downgrades effect on
- Investment risk appetite
- Collateral quality
- Tracking an index

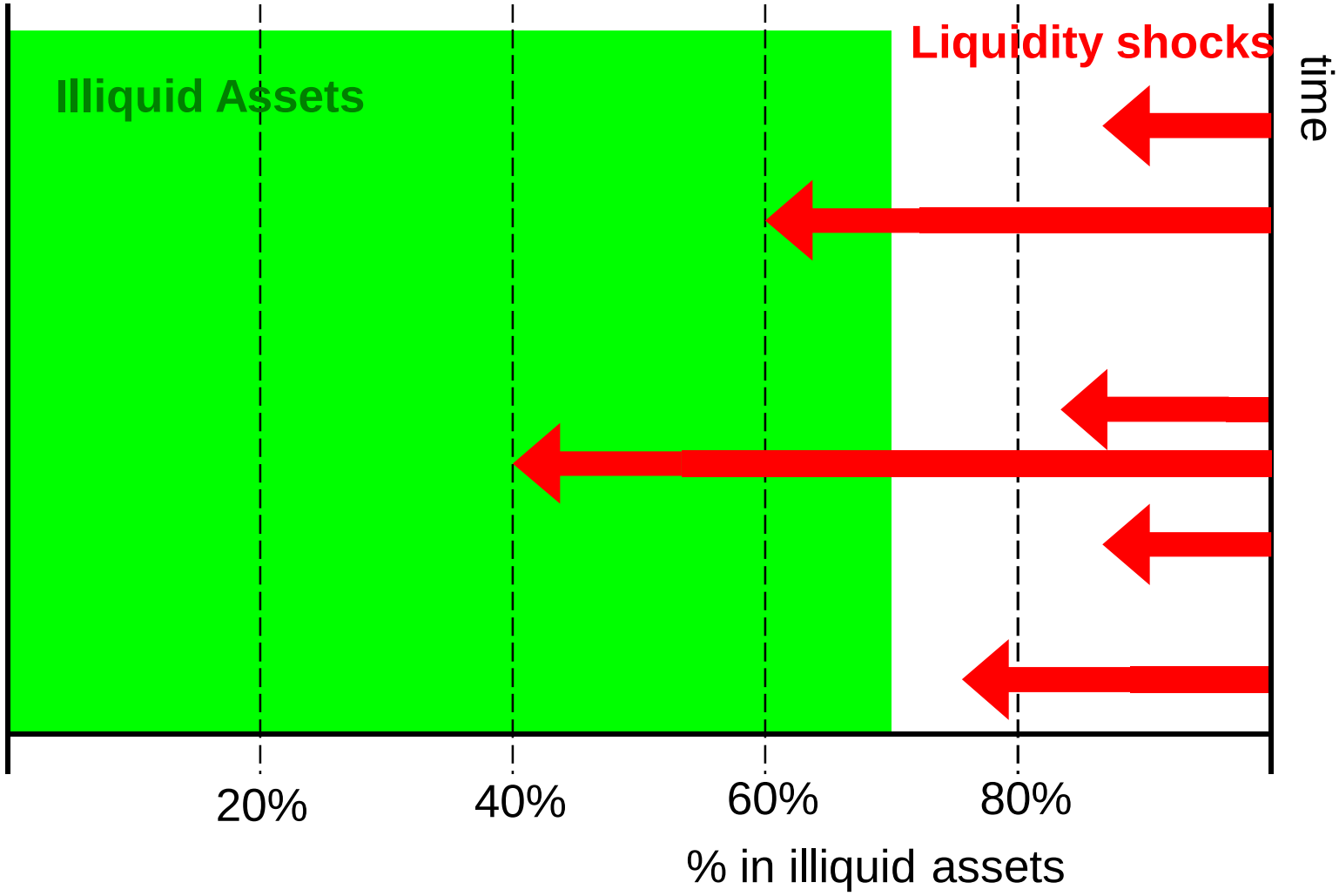
Accelerated settlement / collateral liquidation through counterparty failures

Financing Drivers

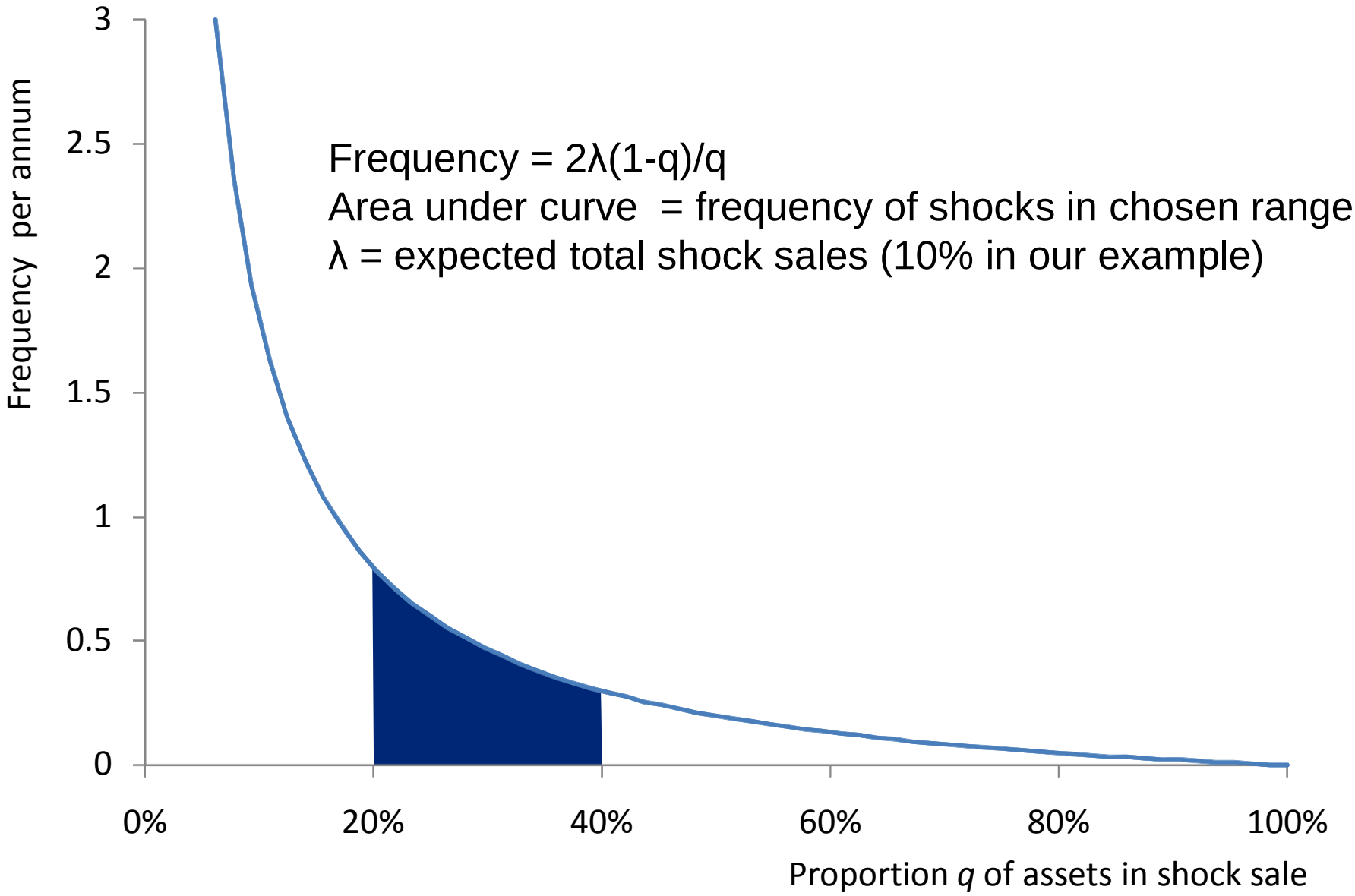
Debt coupons / principal
Merger / acquisition finance
Collateral payments on securitisation

Equilibrium Construction:

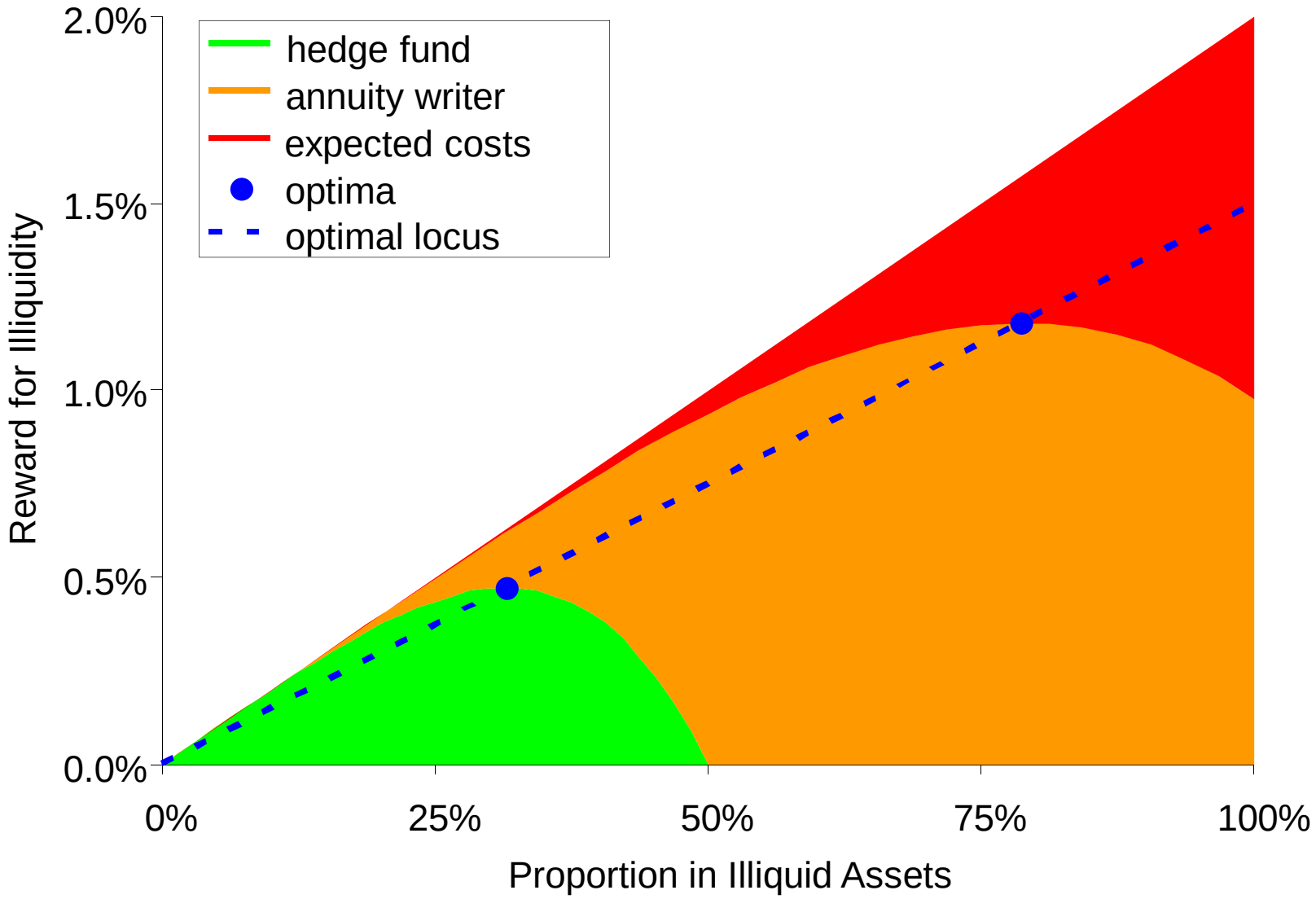
Why marginal > average illiquidity cost



Example of Illiquidity Cost Curve



Illiquidity Optimisation Model



Multi-asset Equilibrium Example

Mean-variance efficient returns net of illiquidity costs

Asset	Vol	Bid / Ask spread	Risk-free	Beta term	Marginal illiq cost	Gross return	Av illiq cost	Net return
1	0%	0%	5.00%	0.00%	0.00%	5.00%	0.00%	5.00%
2	10%	0%	5.00%	2.20%	0.00%	7.20%	0.00%	7.20%
3	20%	0%	5.00%	4.58%	0.00%	9.58%	0.00%	9.58%
4	10%	10%	5.00%	2.20%	0.39%	7.59%	0.25%	7.34%
5	20%	10%	5.00%	4.58%	0.39%	9.97%	0.08%	9.89%
6	20%	20%	5.00%	4.58%	0.42%	10.00%	0.02%	9.98%

Other assumptions: asset correlations 75%, illiquidity cost curve $2\lambda(1-q)/q$, market portfolio is 1/6 in each asset.

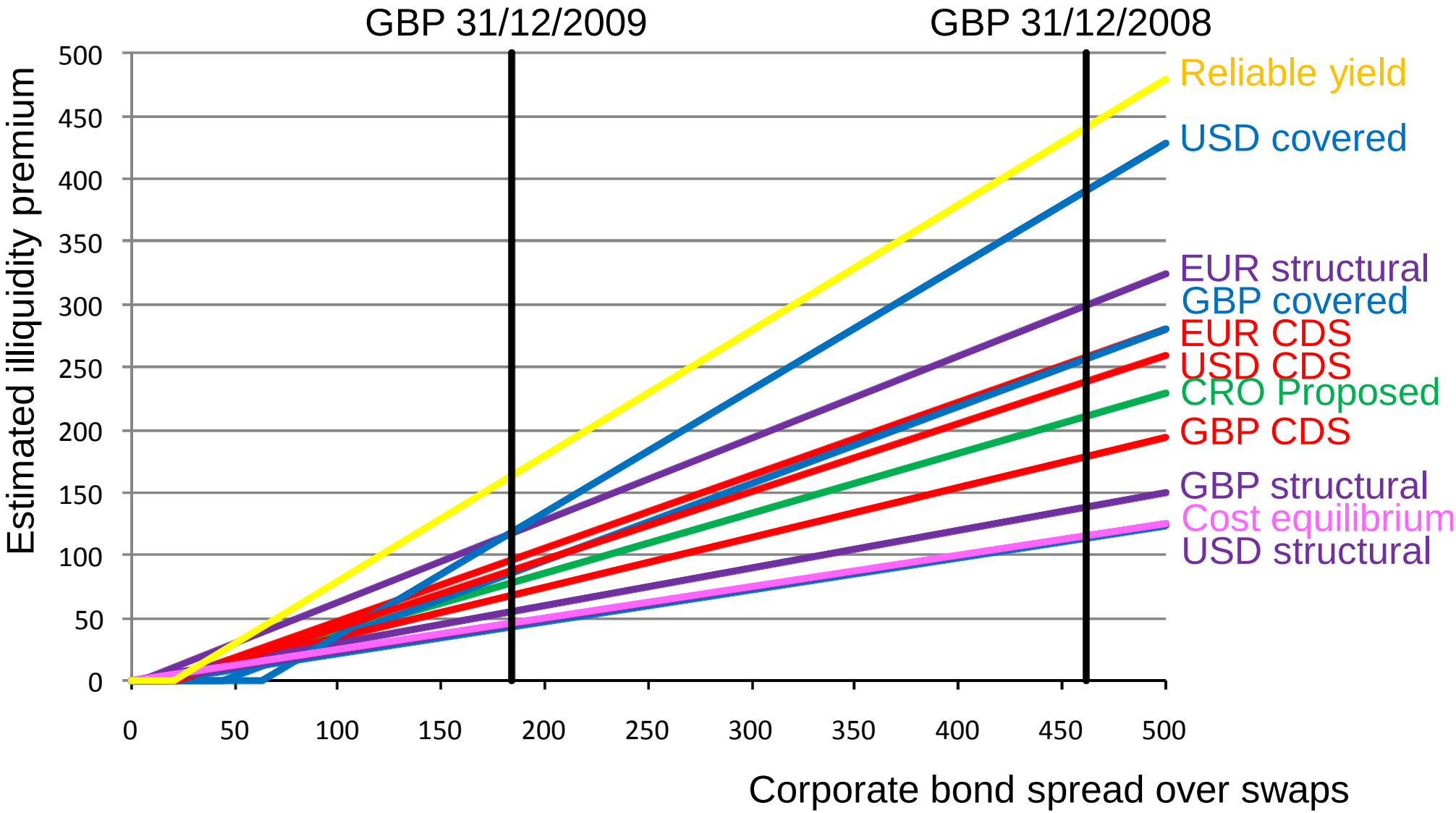
Note the average illiquidity cost depends on arbitrary order of liquidation for assets 4 and 5, while the marginal cost does not.

No Perfect Tool to Estimate Illiquidity Premiums

Method	Description	Chief Limitations
Cross sectional regression	Regress bond spreads against measures of credit risk and illiquidity for many bonds on a single date.	Relies on credit ratings and accounting ratios to be measures of credit risk (and not illiquidity risk). Requires vast data.
Illiquidity cost equilibrium	Equilibrium investment choices relates spreads to historic default and illiquidity costs, allowing for illiquidity cost nonlinearity.	Need description of representative investor illiquidity cost function. Assumes investor rationality.
Asset swap spreads	Bank sells an illiquid asset to a long term investor and swaps back total return for LIBOR + illiquidity premium	Infrequent trades. Also reflects credit risk of joint bank / collateral failure.
Covered bond	Yield on government guaranteed corporate bonds compared to government issued bonds.	Few bonds exist in most currencies, and these bonds are often quite liquid so attract a low illiquidity premium.
Reliable yield	Bond spread minus “prudent” (ie 2x) historic defaults	Premium for uncertainty in defaults counted as illiquidity premium.
Structural model	Bond spread less theoretical value of put option to default	Illiquidity premium counts missing elements in option pricing model (transaction costs, jumps, stochastic, volatility)
CDS basis	Bond spread minus CDS spread	Illiquidity premium estimate includes counterparty credit risk on CDS and ignores illiquidity priced into CDS itself.

Different Illiquidity Premium Estimation Methods

Linear Regression against Yield Spreads



Source: CRO forum risk free calibration / Deloitte calculations.

Liquidity Premium: Liabilities

What is Market Consistent Valuation?

Extrapolating Illiquid Insurance Contracts from Liquid Assets

How do you use the law of one price to determine value? If you want to estimate the value of a target security, the law of one price tells you to find some other replicating portfolio, a collection of more liquid securities that, collectively, has the same future payouts as the target, no matter how the future turns out. The target's value is then simply the price of the replicating portfolio.

Emanuel Derman, The boy's guide to pricing and hedging, 2003

In finance, models are used less for divination than in order to interpolate or extrapolate from the known prices of liquid securities to the values of illiquid securities at the current time

Emanuel Derman, Metaphors, Models & Theories

Solvency II Glossary: Market Consistent Valuation: The practice of valuing assets and liabilities on market values where observable with a given quality (mark-to-market), where not, on market-consistent valuation techniques (mark-to-model).

Market Consistent Valuation: Concept

Best Estimate Liability + Risk Margin

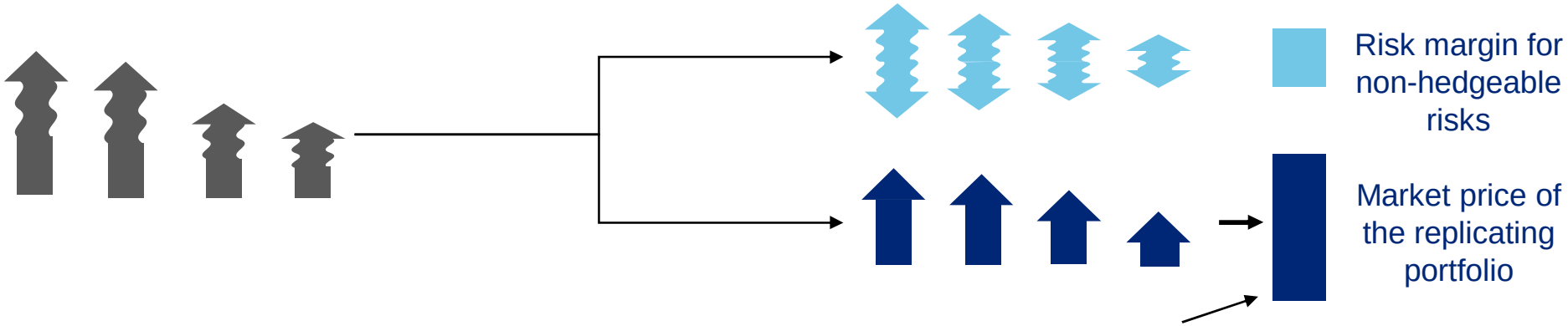
Insurance Liabilities

No reliable market prices exist

Replicating Instruments

Reliable market prices exist

Transfer the problem of valuing illiquid cash flows to a problem of the valuation of liquid financial instruments



The market price of the replicating portfolio is reliable as it consist of deeply and liquidly traded financial instruments

The point of market consistent valuation consists of transferring the problem of valuing illiquid insurance liabilities to a setting where reliable market prices are available

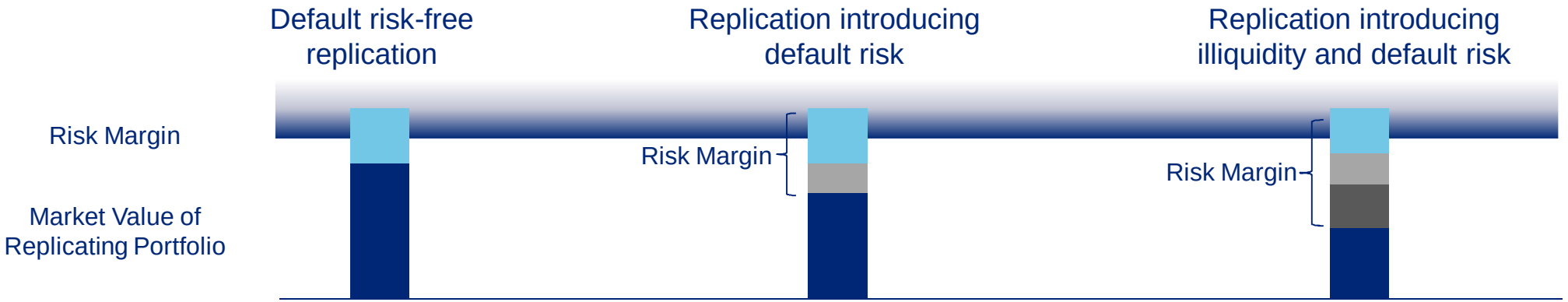
Market consistent valuation of insurance liabilities does not rely on the Efficient Market Hypothesis but on the law of one price only

Replication: Liquid, Risky and Illiquid

The total market consistent value

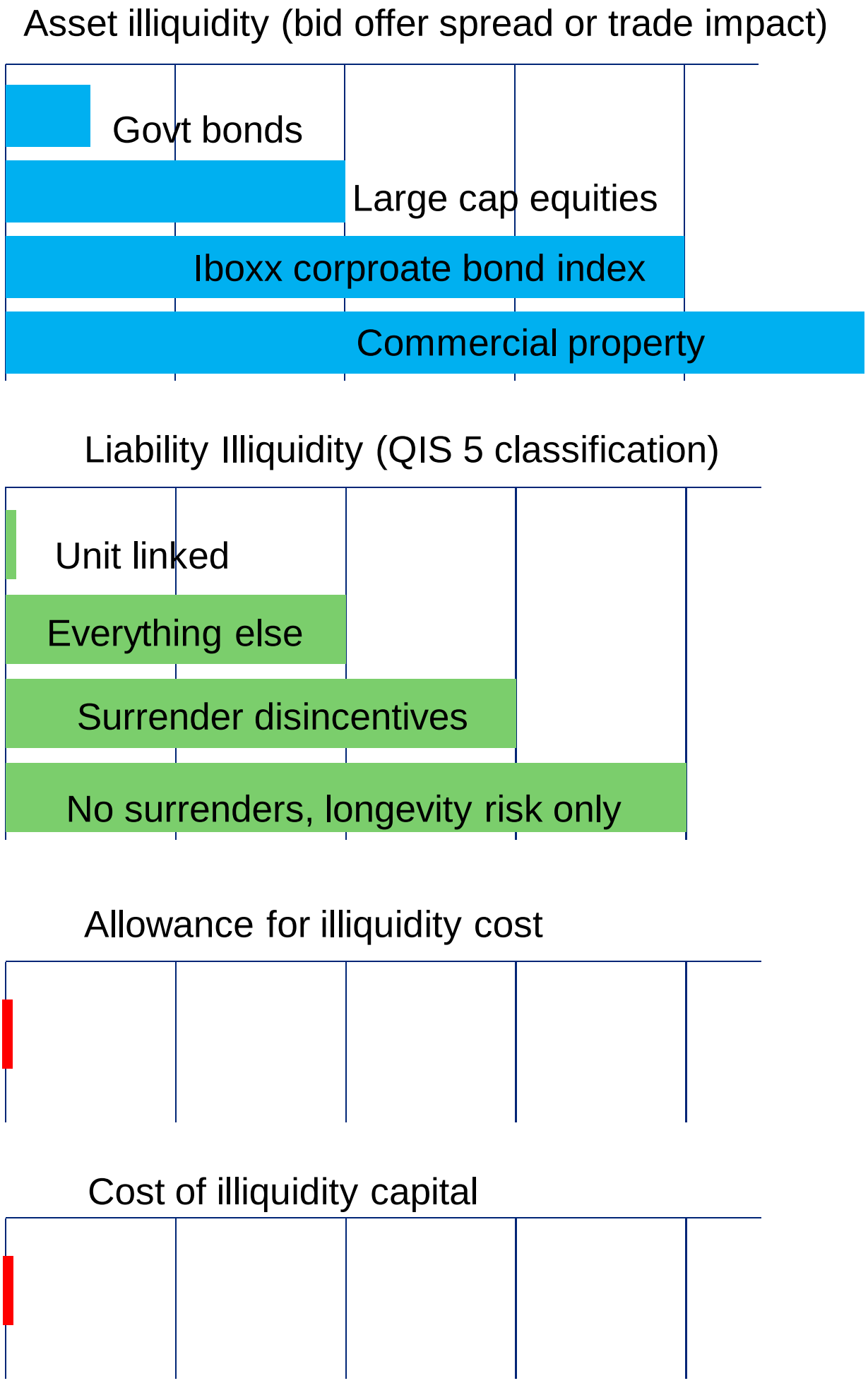
market price of the replicating portfolio + risk margin

of the technical provisions should not depend greatly on the replicating instruments used. The more risky and/or illiquid the replicating instruments, the lower the market value of the replicating portfolio but the higher the risk margin that captures risks that are not replicated

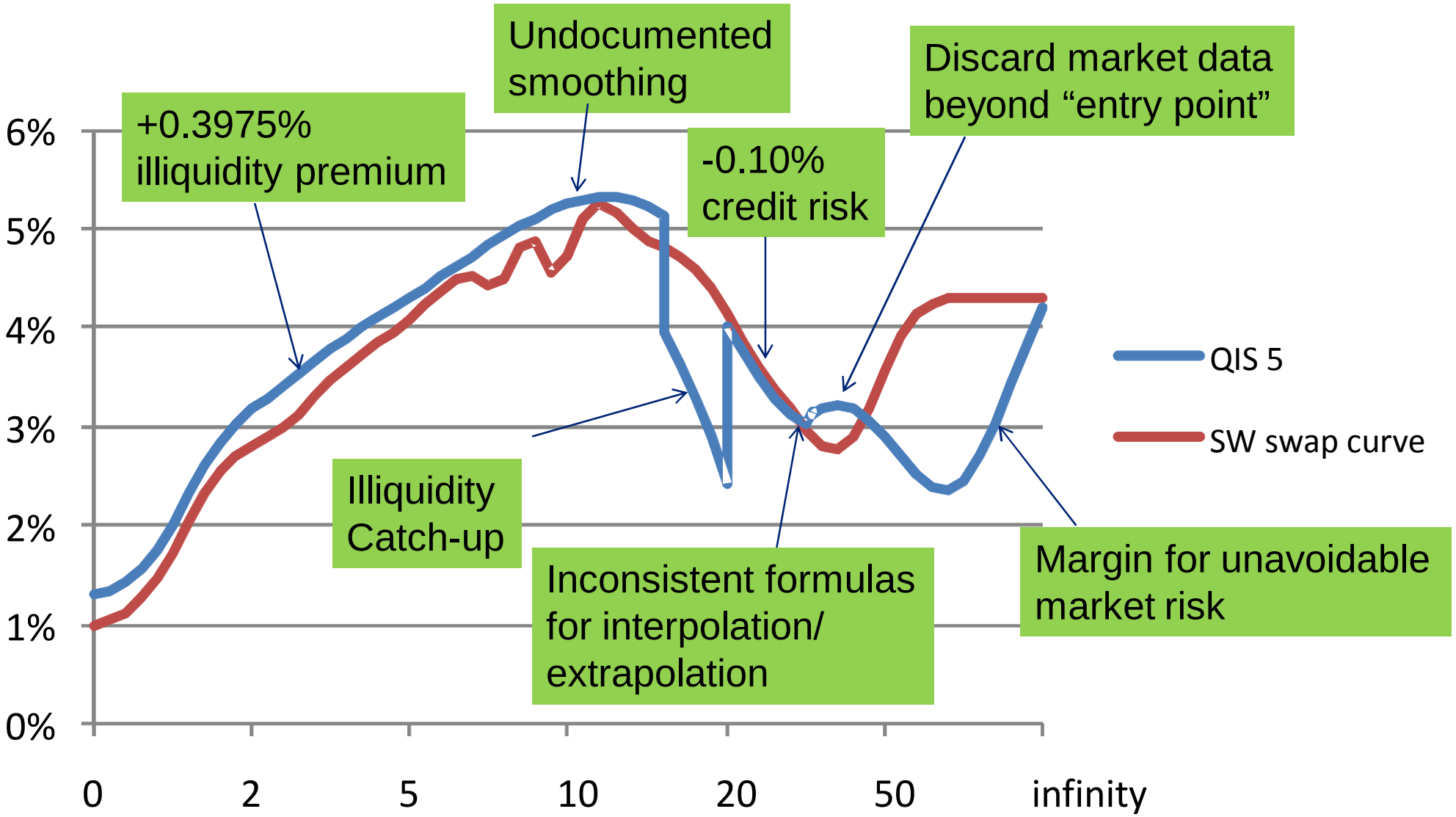


Stable and reliable calculation of the market value of the replicating portfolio and the risk margin	Stable calculation of the market value of the replicating portfolio; more complex calculation of the risk margin due to quantification of credit risk of replicating instruments	Unstable calculation of both the market value of the replicating portfolio and the risk margin due to lack of reliable market prices for the replicating instruments and difficult quantification of credit and illiquidity risk for the risk margin
Little valuation uncertainty	**Medium valuation uncertainty**	**High valuation uncertainty**

QIS5 mapping of Illiquidity premiums to Liabilities



QIS 5 Forward Curve vs Mid-Market Bootstrap from Swaps



Source: http://www.actuaries.org.uk/sites/all/files/documents/pdf/final040111combined.pdf

Different Perspectives

Recent Developments

The Story so far?

- At the end of 2008, some CFO forum members used illiquidity premiums for their embedded value publications, with the illiquidity premium assumption calibrated to reverse basis trades in the credit default swap market. Rather than declare these firms in breach of their principles, the CFO forum decided to suspend the principles. Since the financial crisis, most estimates of illiquidity premiums have increased substantially, as have industry calls to reflect these premiums in reduced liability valuations. The CRO forum has made a series of proposals in a Solvency II context, many of which featured in QIS 5, which was a 2010 dry run for the Solvency II calculations. Naturally, the industry was pleased to see its proposals tested in this way, and is now keen to consolidate these gains in the form of a hard-coded formula which will be difficult for regulators later to reverse..
- Early in 2011, the EU commission and regulators invited a panel of academics to help them sift through the mounting correspondence on this issue. Maybe they hoped to get a more substantial underpinning for their existing approach. However, in a surprise move, the academics unanimously poured scorn on industry proposals for illiquidity premiums, instead favouring “other means ... such as a regulatory buffer on the asset side of the balance sheet”.
- This leaves the EU commission in a more difficult position than they had before. The immediate response has been to deflect the academic criticism with a change in terminology. Alongside “Illiquidity premiums” we now have “countercyclical premiums” and “matched premiums”.

Illiquidity Commentary

Example Quotes

These quotes give an indication of the views on illiquidity premiums in some key documents:

Omnibus:

- "Where EIOPA observes an illiquidity premium in the financial markets in periods of stressed liquidity, information relating to the illiquidity premium, including its size shall also be published. EIOPA shall carry out the observation of the illiquidity premium and the derivation of the information on a transparent, objective and reliable basis"

CXO forum statement:

- "A formulaic approach to the application of the illiquidity premium should not depend on a subjective assessment by EIOPA to determine a period of "stress". The application of the illiquidity premium should follow a pragmatic, independent and predictable approach."

Academic statement:

- "Using a liquidity premium to discount liabilities is in essence a fudge discount rate that is financially unsound and economically indefensible. It would induce risk arbitrage and risk reallocation, e.g. from banking to insurance."

Draft IFRS on Insurance Contracts

- "… if the cash flows of an insurance contract do not depend on the performance of specific assets, the discount rate shall reflect the yield curve in the appropriate currency for instruments that expose the holder to no or negligible credit risk, with an adjustment for illiquidity"

Consequences

Economic Scenario Generators and Market Consistent Value

Purpose: market consistent valuation of options and guarantees

Methodology: simulate stochastic interest rates, equity returns, foreign exchange, corporate bond spreads and defaults, implied volatilities etc

Two key tests:

- Leakage (1=1) tests. Take €1, invest in any (static or dynamic strategy) and redeem at a future date. The resulting cash flow has present value of €1
  - To pass the 1=1 test on corporate bonds, you have to treat all the yield spread as default-related.
- Market calibration. The ESG replicates market prices of traded financial instruments
  - To pass the market calibration tests for options / swaptions you have to use the (liquid) market risk free curve

Under this methodology cash flow valuation depends on the characteristics of the cash flow

- Not on how the fund invests to meet that cash flow
- Nor on the characteristic of who owns the cash flow
- Theoretical basis relies on many idealised assumptions: continuous trading, no dealing spreads, no market impact, infinitely divisible assets and so on. These do not hold exactly; the question is whether they are close enough for the purpose.

Several practical implementation difficulties in QIS 5

- Negative implied forward curve
- Multiple risk free curves within a single profit-sharing fund

Role of Insurers in Bank Financing

Stimulating bank support by influencing insurance regulation

There is the risk that central banks and politicians encourage insurers to take on liquidity risk that is deemed inacceptable for banks.

Financial stability depends on a range of other supporting institutions and infrastructures. For example, insurers provide risk transfer services and have also been important funders of banks; payment systems provide payment services; and central counterparty clearing houses and securities settlement systems facilitate trading.

UK insurers have maintained resilience…

Market perceptions of the riskiness of UK insurers continues to recede. CDS premia have fallen sharply since the start of 2009 (**Chart 4.21).** Since their 2009 lows, equity prices have more than doubled (**Chart 4.22).** Looking ahead, market contacts suggest that the outlook remains largely positive across insurance sectors.

This helps to enable insurers to maintain funding to banks. Insurers are one of the largest global investors, with around £14 trillion of assets under management. Data on a sample of five large, global insurers suggests that they have invested around £240 billion, or 13% of their invested assets, in banks' and other financial companies' debt securities. Forthcoming regulation ('Solvency II') has the potential to change insurers' appetite for long-term bank debt (Section 5).

Investor demand for bank debt may also be affected by changes to regulatory rules for non-bank financial institutions. New capital requirements for insurers operating in the European Union (Solvency II) are currently being finalised. Some market participants have raised concerns that Solvency II may reduce insurers' incentives to invest in longer-term bank debt. Given that insurers are also required to hold capital against duration mismatch, there will be strong incentives not to adjust asset duration too far. The net effect on insurers' demand for term bank debt is unclear. But it may be appropriate to factor the potential impact into the transition arrangements for Solvency II.

Financial Stability Report, December 2010 | Issue No. 28, Bank of England

Possible Illiquidity Premium (IP) Outcomes for Solvency II

Discount at Liquid RFR

Liabilities discounted using swap curves.
No addition for illiquidity premium (as QIS 4)
No deduction for illiquidity costs

IP in Liability Buckets

IP assessed at market level (as QIS 5)
More predictable cash flows are allowed to earn a liquidity premium, independent of asset portfolio.

Matched Premium

IP based on actual portfolio yield minus allowance for defaults.
May also deduct a risk premium.
Direction of EU commission proposals

Swap Based Hedge

Minimise basis risk with a swap-based hedge
Demand drives down swap yields
Government and corporate bonds less attractive.

Bond/Swap Hedge

Encourages (some) illiquid assets to match illiquid liabilities.
Fearsome calculation difficulties, especially for profit sharing funds.

Corp Bond Hedge

Strong incentive to hold high yielding assets, as this minimises stated liabilities
Uncertain effects of risk premium deduction or migration SCR charge.

Latest Negotiations (unreliable gossip)

Everyone wants their slice of the liability discount rate