

ALCO

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EDITORIAL

Finance and banking have never been the precise science that some of their more quantitative-minded practitioners would have us believe. This has always been the main reason why risk management in our discipline must combine a solid understanding of the principles of finance with sound judgement that can only be acquired after years of practical experience. And of course, analogous to a hospital consultant, it helps if that experience includes observation and involvement of a variety of conditions and jurisdictions over time.

I'm always intrigued, though not amused, to see the number of industry practitioners (whether they are bankers, regulators, consultants, or auditors) who give the impression that calculation outputs in finance are precise. But, unlike in Physics, this is rarely—if ever—the case. For example, use of the risk measurement metric known as Value-at-Risk (VaR) is near-universal, and in some jurisdictions required by the supervisory authority. But a simple application of VaR illustrates the point about precision. Bloomberg users can set up a portfolio comprising just one instrument, such as a fixed coupon or fixed term Eurobond, and select three different methodologies to calculate the market risk VaR. The three answers will differ by a factor of 10 or more. So, what is the risk for this bond? And just imagine the range of spreads obtained if one was to calculate VaR for the complex, multi-billion-dollar portfolios that exist on the balance sheets of today's large banks?

The important point here is that analysis in finance is mainly assumption-based and inexact; requiring the user to exercise judgement while remaining adaptable to changing conditions. A reminder of this came when reading about systemic stress tests that were applied in one country jurisdiction. They were comprised of the usual suspects, rise in unemployment, fall in real estate prices, recession in China, and declining GDP. But, these readings also contained two gems: instant rise in base interest rates by significantly more than 200 basis points and simultaneous fall in the domestic currency FX basket value by over one-third.

As The Housemartins might have said, let's just think for a minute. Setting aside the extreme unlikelihood that any central bank in 2018 would raise rates in the middle of a severe recession, what happens to the domestic currency value in FX markets when base rates are raised, while other market rates stay static? Surely, the currency is more likely to appreciate rather than depreciate.

I experienced a similar reaction when learning that, in certain jurisdictions, the counter-cyclical capital buffer was being raised above the 0% level to 1.5% and then to 2.5%—its maximum level under the Basel III standard—over the next three years. This would imply that the economy, or some parts of it, was overheating—in terms of the origin of bank assets—and that a capital increase was deemed necessary to counter the cyclical effects driving capital levels seen from 2002-2008. But, if the economy is in such a state, why are central bank base rates very low, zero, or negative? Surely that suggests the economy is still weak and in need of central bank support.

Finance remains a topic of arcane specialism, hence the need to apply the experience and judgement acquired in practice alongside the quantitative models prevalent in banking. Think of it as the essential qualitative approach to risk management balancing the orthodox quantitative approach.

I hope you enjoy Issue 2 of *ALCO* and thank you for your continued support.

Professor Moorad Choudhry

University of Kent Business School



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ALCO

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ALCO welcomes article submissions from industry and academia. Please submit your manuscript by email to: enquiries@btrm.org.

Questions about the magazine and the status of articles are welcome by email.

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01



LIQUIDITY RISK MANAGEMENT: How to Build a Holistic Control Framework

MICHAEL EICHHORN, MANAGING DIRECTOR, GLOBAL TREASURY
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"Liquidity doesn't matter until it matters. Then it is the only thing that matters".¹

In an analogy developed by Beau et al.², each side of a bank's balance sheet can be imagined as a bucket filled with water. Each bucket has a tap—or taps—at the top and a hole—or holes—in the bottom that represent the respective inflows and outflows (Exhibit 1).

Liquidity risk management seeks to ensure there is enough liquidity instantly available in the asset bucket in the event a bank suffers unexpected outflows and/or inflows dry up. The respective

management frameworks should highlight potential vulnerabilities and help to ensure liquidity can be sourced and liquid assets are available in the right amount, when, where, and in the currency required. The following contribution discusses the objectives and design principles of a holistic liquidity risk control framework before it covers the calibration of the latter.

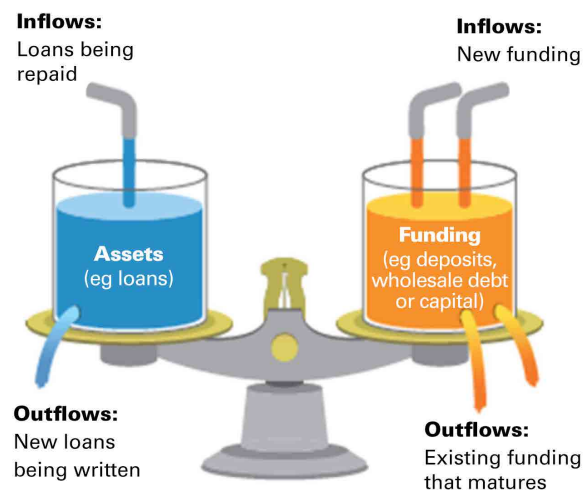


Exhibit 1: Buckets on Scales: A Simplified Illustration of a Bank's Assets and Funds

¹ A Liquidity Risk Manager, Amended from L. Matz: Liquidity Risk Measurement and Management. Xlibris Corporation, 2011.

² For further details see E. Beau, J. Hill, T. Hussain, D. Nixon: Bank funding costs: What are they, what determines them and why do they matter? Bank of England. Quarterly Bulletin 2014, Q4.

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Design Challenges

In practice, particularly for those operating in several jurisdictions, firms are not managing one, but a network of interconnected scales, as they have transitioned from a group-level to an entity-level liquidity risk management framework. They also run multiple scales on an entity level, such as when they are moving from a currency-agnostic view to a view by currency. The dynamics can differ from scale to scale and from bucket to bucket—for example, if one entity borrows short-term and lends longer term, the liability bucket will turn over faster than the asset buffer.

In a crisis, liquidity can dry up fast and the loss of one funding tap can quickly spread to others. Examples like Bear Stearns and Northern Rock demonstrate that the market may stop funding within a few days, regardless of the funding cost the borrower is willing to accept. They also show how the dry-up of one tap and the widening of one hole can quickly spread to others.

For these reasons and many others, liquidity risk is usually so multi-faceted that there is no single metric that captures the flows holistically. As evident during the consultation process on the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR), each metric has inherent limitations. Therefore, multiple metrics are required to capture different stress scenarios and projections over different time horizons.

As a result, the design may also face complexity challenges. For example, a framework that requires compliance for one or two regulatory metrics at a group level is very different than a framework that requires daily compliance of several internally consistent and external regulatory metrics, by entity and currency, to the lowest cumulative point of each metric.

Design Principles

The design of the liquidity risk control framework must cover the entire risk management cycle—from the identification and measurement to the actual management and reporting of liquidity. For this purpose, the framework must span multiple functions, and risk controls must be mapped to the individual parts of the process chain and built into the process as a whole.

As we show in Exhibit 2, the Front Office Business Divisions own the forecasting of liquidity. Treasury owns the planning and execution (e.g., the strategic funding plan that lays out the sources of funding over the next years and the tactical adjustments of the short-term funding). A dedicated unit owns the data processing and reporting of liquidity, and the risk management function owns inter alia the design of stress tests and the modelling of liquidity risks. It also sets the risk appetite.

Due to the limitations of each metric, the control framework should not rely on a single metric but should combine different metrics and controls. Exhibit 3 illustrates the hierarchy of the risk controls applied at an entity level for a bank that operates across different jurisdictions. Multiple regulatory metrics on an entity basis provide the foundation of the pyramid. They are enriched with an internal universal metric that ensures one and the same transaction creates the same liquidity footprint, irrespective of where in the group it is executed and booked. For each entity, the excess over the risk control for each regulatory and internal metric is measured.

The minimum excess over the so-called “binding constraint” represents liquidity that is transferrable across entities. The complementary detective controls help identify liquidity vulnerabilities of an entity or the entire system of entities. For example, the bank measures concentrations across products, counterparties, and tenors, including the so-called “cliff risk”

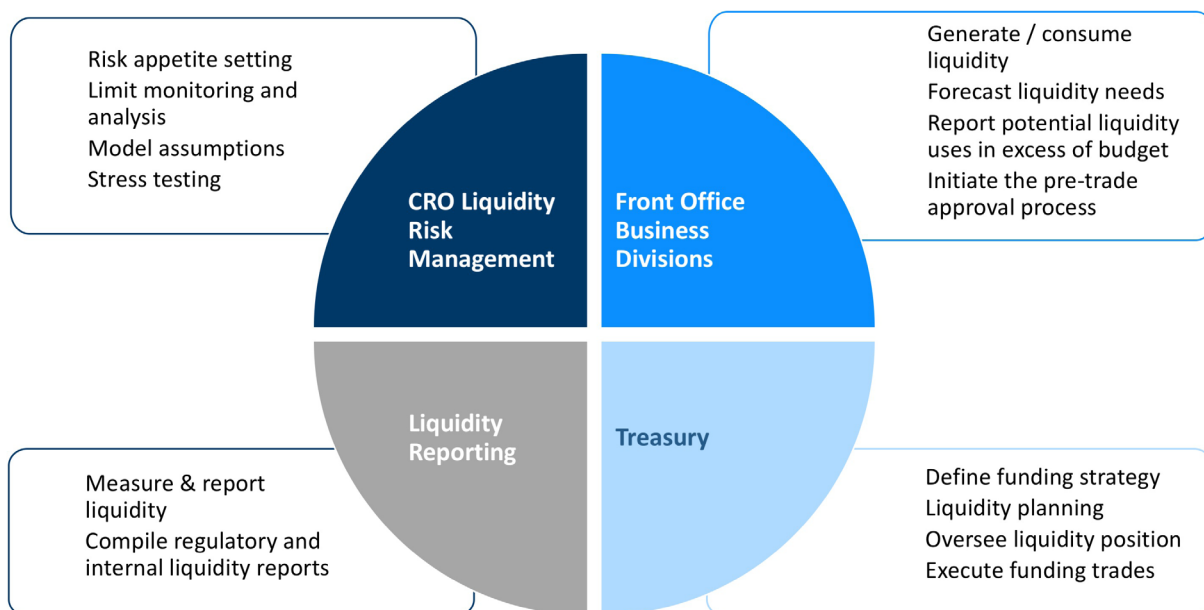


Exhibit 2: Management of Liquidity Risk Across Risk, Reporting Department, Treasury, and Business Divisions

where net outflows are concentrated at a particular time in the future. Intercompany stress tests and controls help to identify contagion effects, therefore complementing the entity focused framework with an analysis of the vulnerability of the network of entities and bringing potential knock-on effects to light. Preventative controls include Pre-Trade Approvals (e.g., funding commitments made to clients for potential mergers and acquisitions). The Liquidity Forecast requires each business to budget for their liquidity needs for the next three-to-six months and is compared and matched with treasury's available supply of funding. Early Warning Indicators (EWI), which combine general market with bank specific indicators and sensitivities, represent another preventative measure.

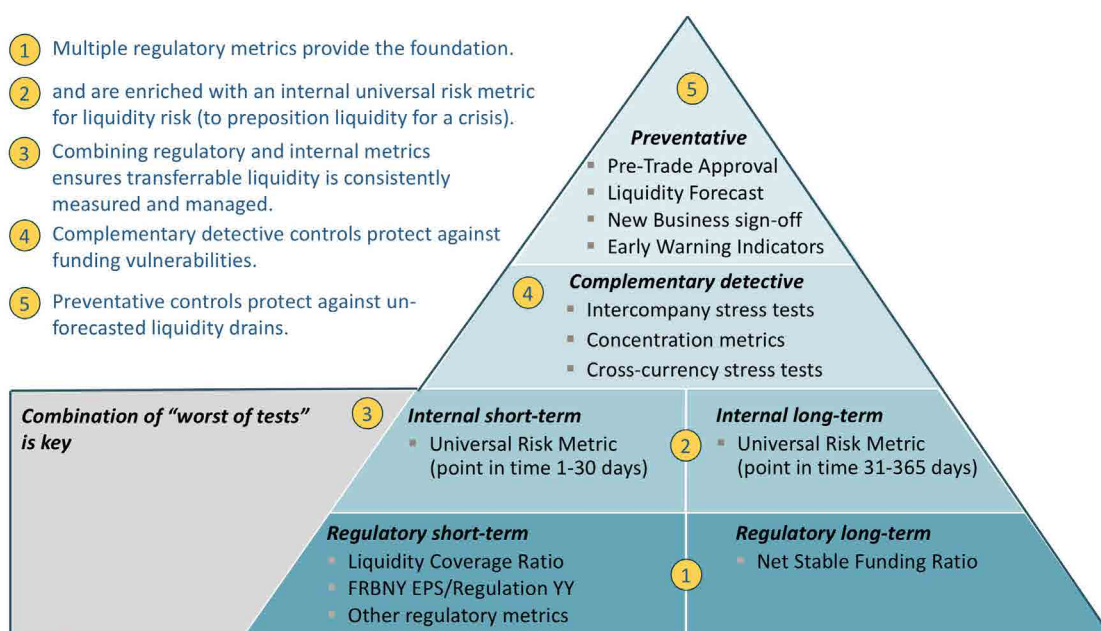


Exhibit 3: Design Principles of Consistent and Holistic Liquidity Risk Control Framework Across Multiple Jurisdictions

Calibration Considerations

The amount of required liquidity reserves will depend on various aspects—such as the type of risk (idiosyncratic, market wide, combined), time horizon (short vs. long term), severity of the underlying stress (business-as-usual, severe stress, recovery, resolution), and conservatism of individual model assumptions (size and timing of in- and outflows, availability of FX swap market).

Furthermore, the type, level, number, and escalation path of risk controls often directly impact the size of liquidity reserves and the amount of fungible liquidity. In other words, more is not necessarily better. A risk control framework should remain effective such that management always focuses on the actual risk instead of just ensuring compliance with all the metrics. Also, for the calibration of the liquidity risk control framework, it is essential to consider the negative impact of increased liquidity buffers on the leverage ratio.

Risk controls will inadvertently create inter-company frictions that restrict the amount of liquidity that can be transferred between entities (“trapped liquidity”). Likewise, risk controls may result in the loss of diversification benefits. For example, if all entities set their limits so they are self-sufficient (i.e., 100% coverage of the outflows) in the stress scenario, this can result in consolidated ratios significantly above 100%. They can also create “buffers on buffers,” e.g., the risk function may protect a board limit with additional limits and treasury may manage toward higher levels to protect against breaching these controls.

Against this background, Table 1 provides answers to frequently asked questions that a bank may consider when calibrating the liquidity buffer and the related risk controls to ensure it holds liquidity if, when, and where it is required in the underlying stress.

If a bank applies the suggested hierarchy of controls at an entity basis, will this not automatically result in a significantly increased frequency of risk control breaches?

A bank that increases the number of risk controls and the measurement frequency (e.g., cascade of daily controls to all entities) may also experience an increase in the number of breaches while the overall group position may remain largely unchanged. Likewise, a bank may want to differentiate between situations where the bank has enough liquidity in the system but “just” not yet in the right places from situations where the bank overall is suffering from structural weaknesses, including an overall shortfall. Such a differentiation should help to separate “noise” on an entity level from “signal” if there is a structural issue with the liquidity situation of a bank.

To what extent should the liquidity risk management framework be integrated with the frameworks for other risk types?

The calibration of risk controls should balance the amount of liquidity reserves with other risk metrics. The liquidity risk framework should be linked with other key risk concepts, such as capital and credit, as larger liquidity buffers will automatically negatively impact the bank’s Leverage Ratio and potentially increase the counterparty credit risk.

How should banks deal with the increased complexity of a comprehensive liquidity risk control framework?

The more risk controls are defined (e.g., low point by entity, by currency, by metric) the more two-way flows and intercompany rebalancing transactions may be needed. These rebalancing transactions, in which entities with an excess provide funding to entities with a deficit, increase the structural and operational complexity and operational risk. Therefore, it is important to also invest into the rebalancing and planning infrastructure when implementing a new risk control framework, for example to allow for an automated management of the rebalancing transactions.

Isn't such a liquidity risk control framework not simply resulting in huge High-Quality Liquid Asset (HQLA) buffers?

The bank should aim to pre-position sufficient, but not too much, liquidity as the reserves generate direct and foregone opportunity costs. Enhancements of capabilities often reduce the liquidity need, hence allowing management closer to risk controls. This may include for example, data quality improvements (e.g., replacement of placeholders) and forecasting enhancements.

Does such a liquidity risk control framework not put a bank in a static "straightjacket?"

Where appropriate, a bank may think about a more dynamic framework. For example, similar to temporary limit increases in credit or market risk, a bank may consider temporary extensions of certain risk controls under specific circumstances (e.g., to cater for temporary forecasting volatility, pre-trade approvals, or internal migrations of positions). For certain internal risk controls at an individual entity basis, treasury may be given one or two days to rebalance liquidity between entities, prior to further escalation, provided the bank overall holds enough liquidity but not in the entity required.

Table 1: Recommendations for The Calibration of Liquidity Reserves and Related Risk Controls

Closing Thoughts

According to an Arab proverb, "a bad sultan is not one who does not foresee a drought, but one who does not prepare for it." As frequently stated, the next crisis will be different. For this and other reasons, there will never be perfect protection against liquidity failure. A risk control framework can only be one mechanism. It must be complemented by others, such as an appropriate Funds Transfer Pricing (FTP) system, which will ensure that there is firm-wide awareness of liquidity as a scarce resource even in times when liquidity is not the only thing that matters. Further key elements to ensure preparedness for a liquidity drought entail timely accessibility to high-quality liquidity data and a strong governance with clear responsibilities to ensure efficient, accurate, and effective decision-making in times of stress. There is also no one-size-fits-all framework; nevertheless, the considerations presented here help one to prepare for the next drought.



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02

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Ziauddin Ishaq, Global Solutions Lead Treasury, Oracle FSGBU



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Professor Moorad Choudhry, Course Founder and Designer, BTRM

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03

INTERBANK OFFERED RATE (IBOR) REFORM

BY KEVIN LIDDY, CONSULTANT, SOLUM FINANCIAL LIMITED

Why Reform IBOR?

Interbank Offered Rate (IBOR) fixings are intended to represent the interest rate charged on short-term (unsecured) loans made between banks. Since the financial crisis, the volume of these transactions has diminished significantly, leading regulators to question their transaction-based definition. IBORs are systemically important to financial markets due to the fact they are extensively referenced in derivative, bond, and loan documentation, and in a wide range of consumer lending instruments, such as mortgages and student loans.

It is reported that there are over \$350 trillion worth of London Interbank Offered Rate (LIBOR) referencing financial products, with three-month USD LIBOR rate being the most commonly quoted¹. It is also estimated Over the Counter

(OTC) and Exchange Traded Derivatives (ETD) account for 80% of IBOR-linked contracts².

Historically, IBOR has been widely used as a measure of trust in a given financial system as it reflects the confidence banks have in each other's financial health. Thus, it serves as a barometer for market participants and observers to assess the general health of the banking sector and, consequentially, the wider economy. The recent manipulation scandal has led many to question the validity of these benchmarks and whether it truly serves its intended purpose. Furthermore, strict regulations, brought in since the global financial crisis (GFC), have inadvertently reduced the liquidity within the interbank funding market, further compounding the lack of transparency of the reported rates.

In the absence of robust transactional data on which to base IBOR consensus, individual submissions have become a subjective and unclear process requiring "expert" judgment by each contributing bank. Consequently, there has been an observable downward trend in

¹ LIBOR's Uncertain Succession Triggers \$350 Trillion Headache, July 2017

² IBOR Global Benchmark Survey 2018 Transition Roadmap, February 2018

rate submitters willing to sustain the various benchmarks, due to their sensitivities toward perceived litigation risks. Since 2013, the Euro Interbank Offered Rate (EURIBOR) panel of contributor banks has decreased from 43 to 20. In addition, the definition of IBOR implies that it must contain an inherent banking credit risk premium, and as such, it may not be suitable for certain financial products. For example, one could argue that borrowers should not be burdened with the risks that their variable rate payments would increase by virtue of the general confidence in banks falling.

Following on from the Wheatley review into LIBOR, the Financial Stability Board (FSB) and various other industry bodies have been spearheading collaborative initiatives to strengthen or reform the IBOR processes³.

Industry Work to Facilitate IBOR Reform

The Financial Conduct Authority (FCA) is currently responsible for regulating LIBOR while ICE Benchmark Administration (IBA) administers and publishes LIBOR.

In February 2013, the Group of 20 (G20) commissioned the FSB to review the major interest rate benchmarks following its concerns regarding the reliability and robustness of major benchmarks, such as EURIBOR, LIBOR, and Tokyo Interbank Offered Rate (TIBOR), collectively known as the IBORs.

A review conducted by the FCA in 2013 recommended the replacement of LIBOR with alternative Risk Free Rates (RFRs). The FSB published its report on interest rate benchmark reform in July 2014 and concluded that an RFR is, in many cases, more suitable than an IBOR, which is not supported by sufficient transactional data to make it robust⁴. As well

as establishing working groups to identify alternative International Organization of Securities Commission (IOSCO) compliant RFRs, they also launched initiatives for transition planning.

In July 2017, Andrew Bailey announced that the FCA reached a voluntary agreement between current panel banks to sustain LIBOR in its current form until the end of 2021⁵. As LIBOR will not be banned post 2021, it is possible that it will continue to be published by the IBA if it can garner sufficient submissions from the panel banks. It is, in fact, an objective of the IBA to ensure that a revised version of LIBOR, using its "Waterfall Methodology," satisfies regulators in order for continued publications⁶.

As the industry grapples with the complexity and scale of amending existing contracts with new reference rates, the continued publication of LIBOR in a revised format could seem appealing. However, it is debatable as to whether panel banks will continue to voluntarily provide the submissions or whether the revised LIBOR would satisfy European Benchmark Regulation (BMR)⁷.

Furthermore, there is clear regulatory guidance that, although the transition to RFRs is led by the market, it is neither safe nor acceptable to assume that IBORs will continue to be published indefinitely. In this respect, regulators support the work being done to incorporate a fallback rate into existing documentation and to see a transition to derivatives that reference new benchmarks based on liquid transactions.

Some market participants would prefer IBORs to continue and not have to deal with a transition. As it is quite possible that LIBOR will continue to be published after 2021, there is a degree of wait and see in the market, which will undoubtedly hinder a faster adoption of the

³ The Wheatley Review, July 2012

⁴ Reforming Major Interest Rate Benchmarks, July 2014

⁵ The future of LIBOR, July 2017

⁶ ICE LIBOR

⁷ EU Benchmark Regulations, June 2016

new RFRs. In addition to this, the situation is not uniform across major jurisdictions. Some regional regulators have approved the continued use of their own IBORs alongside the new RFRs, most notably Japan and Australia with TIBOR and Bank Bill Swap (BBSW), respectively. There is also some indication that a reformed EURIBOR will also be maintained⁸.

Additionally, the roll-off of LIBOR linked products is significant. The New York Fed has estimated that approximately 80% of the existing USD LIBOR market footprint matures by the end of 2021. However, it is worth noting that new contracts referencing LIBOR are being written every day, which may negate the validity of the previous statistic⁹.

Bailey's speech alongside BMR coming into force has resulted in renewed momentum within the industry. International Swaps and Derivatives Association (ISDA) along with the various FSB Official Steering Groups (OSSGs) are working to identify alternative RFRs and to develop a mechanism to implement fallbacks into existing and future contracts.

The areas of work broadly fall into two categories: first, fallback rates need to be documented into legacy contracts. Second, a transitional arrangement is needed to move current contracts on to new RFRs if major IBOR benchmarks cease to exist.

Fallback Rate Documentation

ISDA is leading the work on implementing the fallback rate documentation. In 2016, ISDA established working groups on the development of alternative reference rates and fallbacks. ISDA has confirmed that the current approach, subject to change, is to consider

RFRs as the successor/fallback rate for IBOR. According to ISDA, existing fallback provisions reference bank polling and address a scenario where IBOR is temporarily unavailable rather than permanently withdrawn. This is an unsustainable solution as it is likely that banks may not respond to a poll and it is certainly not transparent or scalable. This would mean that new fallback clauses for all derivative positions linked to IBORs would need the help of an industry-wide protocol. ISDA admits it may not be possible to develop consistent fallback rates for all currencies involved.

As RFRs represent a risk-free rate, it does not contain the bank credit risk inherently embedded within IBOR. Furthermore, RFRs are overnight rates and are, therefore, not mechanically equivalent to IBOR, which represents a term tenor such as three months. As such, there will undoubtedly be a value transfer between entities if a transaction switches from IBOR to their respective RFRs. At this point it is not clear how this value transfer will be quantified and how this will be remediated. As a result, some swaps users are already considering moving out of IBOR-linked products early, most notably on the buy-side¹⁰.

One potential remedy to minimize the value transfer has already been proposed by the ISDA working groups. It involves the introduction of fallback rates that are aligned with IBOR by applying a credit spread on to the relevant RFR, the so-called "synthetic IBOR". To date, no consensus has been reached on how to calibrate this missing credit spread embedded within IBORs.

Suggested proposals range from a snapshot of the IBOR-RFR basis on a single day before the benchmark ends to an average calculation over a defined period or alternatively via a two-way auction.

⁸ EURIBOR can stay if reforms succeed – ECB's Holthausen, May 2018

⁹ Federal Reserve Bank of New York: Reference Rates, April 2018

¹⁰ LIBOR concerns prompt switch to SONIA swaps, March 2018

Another prospective solution is that the credit element embedded in IBOR-based transactions is represented by the IBOR-Overnight Index Swap (OIS) basis term market. Therefore, any resulting present value (PV) change that occurs by switching to the new rate can be cash settled by referencing a market observable spread. To avoid cash settlement, a spread can be added to the OIS leg or, alternatively, the fixed coupon could be amended.

This methodology would aid all transactions in switching to the new rate without the need for a synthetic IBOR. It is possible that the Interbank broker dealer market could transition in this way, however, for end users this may be more problematic. For example, the IBOR trade may be hedging a cash-based IBOR transaction, which would not transition simultaneously, thereby creating a new basis risk. Additionally, hedge accounting tests may be broken, creating the possibility of revenue impacts, net income volatility, and growing balance sheets.

Some argue that the use of a synthetic IBOR is the least disruptive way of managing a sudden discontinuation of a major IBOR benchmark. Others contend that they would get locked in at some arbitrary spread that is not reflective of the trade economics.

ISDA has acknowledged that whichever methodology is adopted, it needs to be robust enough to tackle the risk of manipulation as well as minimize the value transfer of moving a contract to a new rate.

RFR Transitional Arrangements

Industry working groups, including the Alternative Reference Rate Committee (ARRC) and equivalent groups in the United Kingdom (U.K.) and Japan, are focused on RFR transitional arrangements.

The development of each RFR is made more

complicated by the currency-specific proposals from the respective jurisdictional working groups. For example, the U.S. and Swiss RFRs will be secured rates, while the U.K. and Japan have opted for an unsecured rate. In Europe, however, a decision on whether to use secured or unsecured has not been made, following on from their announcement to not progress with a reformed Euro Over Night Index Average (EONIA). These regional differences have provided an obstacle in the development of a single, global methodology for each currency's fallback rate.

RFR Liquidity Requirement

As most of the proposals result in a new rate for the currency-specific RFR, there is a requirement to establish liquidity in the new swaps market in a short timeframe, in order to measure the basis between the RFRs and their respective IBORs. For example, in the U.S. (the biggest IRS market), Secured Overnight Financing Rate (SOFR) has only been in existence since April 2018 with the associated futures only debuted by Chicago Mercantile Exchange (CME) in May 2018¹¹.

Furthermore, building liquidity in the term structure of overnight rate swaps is not a straightforward process. For example, in many currencies the OIS swap rate is currently only liquid for relatively short-dated trades and not for longer dated maturities. This would require the spread to be inferred from longer-term IBOR-OIS basis swaps, which currently reflect an element of supply/demand imbalances rather than exclusively containing a bank credit spread.

Using a fixed point in time or an average rate to determine the relevant spread to the RFR would essentially plot out a curve that could then be applied as the fallback to IBOR in the eventuality of a major benchmark discontinuation at any point in the future. However, the issue of having

¹¹ CME Group: Secured Overnight Financing Rate (SOFR) Futures

to establish liquidity in the underlying RFR swaps to observe the spread and concerns around whether the curve could be moved in anticipation of switching activity have already arisen in the sterling market.

It is also possible to apply an observed bank credit spread to the RFR dynamically on a daily basis to replicate a three-month IBOR that is set every day to include bank credit, but the methodology, governance, and regulation of this is unclear at this stage.

Current Status

There are broadly four demographics of market participants.

1. Wait and See: Assume IBOR publication will continue in the longer term
2. Fallback: Accept the default fallback solution
3. Opportunistic Switching: Trade out of IBOR-based products over time
4. Movers: Eliminate the uncertainty and move to RFRs, for example Sterling Overnight Index Average (SONIA) swaps

It has been reported that certain Liability Driven Investment (LDI) funds are already using SONIA swaps in their hedging activity¹² This has caused long-dated LIBOR-SONIA spreads to move from 12 bps in July 2017, prior to the Andrew Bailey speech, to a level of 37 bps in May 2018 (Figure 1).

Long-dated 30Y LIBOR-SONIA Spread (Source: Bloomberg)



12 CME Group: Secured Overnight Financing Rate (SOFR) Futures

This is mainly due to a lack of SONIA based paying products. Alternatively, this may have also been driven by an extension of the asset management industry moving away from derivatives into gilts brought about by the inclusion of Derivatives Valuation Adjustments (xVAs), clearing and leverage costs now inherent in derivative pricing.

Selection of Appropriate RFRs

Working groups have been set up in several jurisdictions to bring together representatives from both the public and private sectors to determine the most appropriate RFRs in the relevant jurisdictions (Table 1).

Jurisdictional Working Groups

JURISDICTION	WORKING GROUP TITLE
U.K.	Working Group on Sterling Risk Reference Rates
U.S.	ARRC
Japan	The Japanese Study Group on Risk Free Reference Rates
Switzerland	National Working Group on CHF Reference Rates (NWG)

Table 1

European policy-makers have also announced the launch of a similar public/private-sector working group to consider a euro risk-free rate¹³. Similarly, The Bank of Canada announced, in March 2018, the formation of an Alternative Reference Rate Working Group, Canadian Alternative Reference Rate Working Group (CARR), to consider the creation of a new risk-free Canadian dollar rate to exist alongside Canadian Dollar Offered Rate (CDOR)¹⁴. Similar to other central bank approaches, it is expected to look at ways of broadening the traded volumes that are included in the existing Canadian Overnight Repo Rate Average (CORRA).

This represents four of the five currencies for which LIBOR is currently published (Table 2).

Selected RFRs

JURISDICTION	RFR SELECTED	COMMENTS
U.K.	SONIA	The Bank of England (BoE) took over the administration and publication of the SONIA on April 23 (St George's Day)
U.S.	SOFR	The New York Fed began publication of the Treasury repo reference rates on April 3, 2018, reflecting the SOFR, alongside the Broad General Collateral Rate (BGCR) and the Tri-Party Collateral Rate (TGCR) from April 2, 2018
Switzerland	Swiss Average Rate Overnight (SARON)	SARON became the reference overnight fixing leading to the discontinuation of the Tomorrow/Next Indexed Swaps (TOIS) fixing and clearing of TOIS swaps in 2017
Japan	Tokyo Overnight Average Rate (TONAR)	TONAR is currently published by the Bank of Japan (BoJ)

Table 2

¹³ New Working Group on a risk-free reference rate for the euro area, September 2017

¹⁴ Canadian Alternative Reference Rate Working Group

It is ISDA's belief that a multi-rate approach in Japan and Australia could reduce the amount of bilateral negotiation and the amended rates could be used in non-derivative products.

For EUR, the decision on a preferred RFR has yet to be made. An added complication is that EONIA is currently not an approved benchmark from 2020. A European Central Bank (ECB) overnight rate based on wholesale borrowing rates, Euro Short Term Rate (ESTER), is expected to follow a consultation this year but is unlikely to be published until 2019. Meanwhile, the European Money Markets Institute (EMMI) is reforming EURIBOR such that it remains an approved benchmark; the current plan is for EURIBOR to remain as a fixing rate for derivatives.

Non-Derivative Products

Other products also reference IBORs; loans, bonds, and securitized products all use these benchmarks to some degree. According to the ARRC, around \$1.2 trillion of Floating Rate Notes (FRNs) reference LIBOR, as well as a total of roughly \$6.2 trillion of syndicated loans, corporate loans, general business loans, and commercial mortgages¹⁵.

For these products the existing contractual fallbacks differ and in some cases, they are non-commercial. As an example, in the U.S. loan market, the rate may transfer to the U.S. prime rate, which is currently 2% higher. For FRNs, the fallback could be the last published rate effectively converting them into fixed rate bonds.

While ISDA, as a centralized body, is working on a protocol to migrate legacy derivatives contracts on to new reference rates should major IBOR benchmarks cease, this protocol would not be applicable to individual bond issuances or consumer loans where, unlike the standardized ISDA derivative documentation, terms are unique to the bank provider. Contracts referencing these instruments would require manual repapering, an expensive and time-consuming process for banks and clients alike. This may help explain why some regulators are keen to strengthen the existing benchmarks rather than adopt new RFRs for cash-based products.

Challenges to Overcome for a Successful IBOR Transition

In February 2018, ISDA, Association of Financial Markets in Europe (AFME), International Capital Market Association (ICMA), and Securities Industry and Financial Markets Association (SIFMA) produced a transition roadmap that highlighted the challenges to overcome for a successful transition and a significant reduction in the reliance on IBOR with minimal market disruption. These challenges have been summarized in Table 3.

¹⁵ Second Report: The Alternative Reference Rates Committee, March 2018

Challenges to Overcome for Successful Transition

CHALLENGE	COMMENTS
Market Adoption of RFRs and Liquidity	It should be a prerequisite that the alternative RFR market is sufficiently liquid prior to adoption as a benchmark reference rate. This can be achieved by dedicating resources and educating all market participants about RFRs. Exchanges and Central Counterparties (CCPs) can also play their part by listing and clearing standardized products that reference alternative RFRs. Selection of an overnight rate as an RFR would remove any IBOR-OIS basis risks currently seen in collateralized trades. It is unclear whether the collateral remuneration rates will be standardized to the jurisdiction's chosen RFR.
Legal	Inconsistent approaches exist when it comes to fallback rates in the documentation of legacy transactions referencing IBORs. These documents need to be reviewed and segmented accordingly. Other contractual amendments, which may lead to an increased upfront cost and increased operational risks must be considered when transitioning from IBORs to RFRs. This is will be made more difficult when counterparties have diverging incentives.
Valuation and Risk Management	Mechanisms need to be established to minimize value transfer between entities with respect to legacy transactions. For less effective hedges, the transition to RFRs may not occur at the same time or on the same terms for both the underlying asset/liability and the corresponding hedge(s). It is worth noting that IBORs provide market participants certainty because they are fixed in advance, meanwhile RFRs by design can only be determined at the end of the period (i.e., in arrears).
Infrastructure	Once definitive RFRs have been chosen and there is a clear jurisdictional transition plan, institutions must perform broad risk assessments to identify whether their infrastructure is adequate to support an RFR environment. Market participants may have to make significant investments to meet these operational requirements.
Tax	Market participants must consider whether alternative RFR transition would result in an acceleration of payments on financial contracts or tax structures.
Accounting	A switch to alternative RFRs may lead financial instruments and their corresponding hedges to be booked separately in the event that IBOR and RFR are not effectively offset. This may result in net income volatility and growing balance sheets if not managed in proactively. Institutions utilizing accrual accounting under International Financial Reporting Standards (IFRS) may crystallize profit or loss upon RFR conversion. Maintaining hedge accounting relationships would require significant work. Furthermore, an inconsistent adoption of a new RFR could cause an economic mismatch and a broken hedge.
Governance and Controls	Once definitive RFRs have been chosen and there is a clear jurisdictional transition plan, institutions must establish robust governance and controls when transitioning their contracts from IBORs to alternative RFRs.
Regulatory	Existing regulatory requirements may add unnecessary burdens to the alternative RFRs transitions. For example, existing margining rules may be triggered for existing derivative transactions if they are transitioned to an alternative RFR. Regulators need to explore the possibility of implementing exemptions to the clearing mandate for legacy contracts.

Table 3

The Role of Clearing Houses

To promote market acceptance of the new RFRs, it is essential that Clearing Houses broaden their offerings to accept transactions against the new indices. For currencies where the RFR is a modification of an existing rate, such as SONIA, this will not be problematic. However, for currencies where a new rate has been established, such as SOFR, these will need to be added to the suite of cleared products.

The current usage of OIS swaps in various markets also represents a challenge for some currencies. TONAR OIS swaps have traded significantly less than their peers in other currencies. According to swap data compiled by Clarus FT, TONAR only makes up a total of 0.4% of all swaps traded in the Japanese Yen (JPY) market over the first half of 2017. By contrast, in the US dollar market, its OIS rate (Fed Funds) comprised 61% of all swaps traded across the main clearing houses. In Sterling and Euro, OIS as a percentage of total swap volume across the clearing houses was 48.4% and 47.4%, respectively. It should be noted that this is in notional terms rather than Dollar Duration (DV01), which also suggests that liquidity needs to be built across the term structure rather than just in the shorter end of the curve.

Conclusion

Since its first official publication in 1986, the British Bankers Association (BBA) LIBOR fixing and other related IBORs have helped contribute to the exponential growth of the derivatives

market. Alongside cash-based products that also reference IBORs, the total outstanding is estimated to run in hundreds of trillions of dollars. IBORs are, therefore, pervasive in financial markets and their replacement with new regulatory approved reference rates is a monumental undertaking.

The reforms are further complicated by the replacement of IBORs with transactional based RFRs where volumes and liquidity are concentrated in overnight trades. Although a term RFR is not proposed at this point, even if it were, the absence of a banking credit premium would cause a significant change in market value for legacy transactions. The various options to fix a term credit premium as part of the fallback mechanism are an attempt to minimize this value transfer between entities, however, it is unlikely to be a seamless process.

The approach in some jurisdictions to continue with a reformed IBOR alongside IBA expectations of a newly approved LIBOR would on the face of it obviate the need for such a large-scale exercise.

However, no prudent regulator or financial market participant can operate hoping for indefinite continuation of IBORs. Addressing the fundamental flaws in IBOR procedures may present the industry with a unique opportunity to strengthen confidence in the financial markets and all participants need to plan ahead and be prepared for more challenging alternative outcomes as and when they emerge.



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04



“DE-STRESS” TESTS FOR STRATEGIC TREASURY

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In the years since the financial crisis, the responsibility to meet increased regulatory reporting requirements has mainly fallen to treasury, finance, and risk functions within a bank. Financial risk management complexity has increased substantially with stress testing at its core. The strategic treasury view of enterprise risks is highly valuable for executive leadership and offers the prospect of turning the costly exercise of regulatory compliance into a distinct business advantage.

With the vast resources that our industry has dedicated to data collection, preparation, model development, and reporting, the opportunity to become more efficient in this process and yield insightful business strategy outputs is compelling. Technology advances now enable the

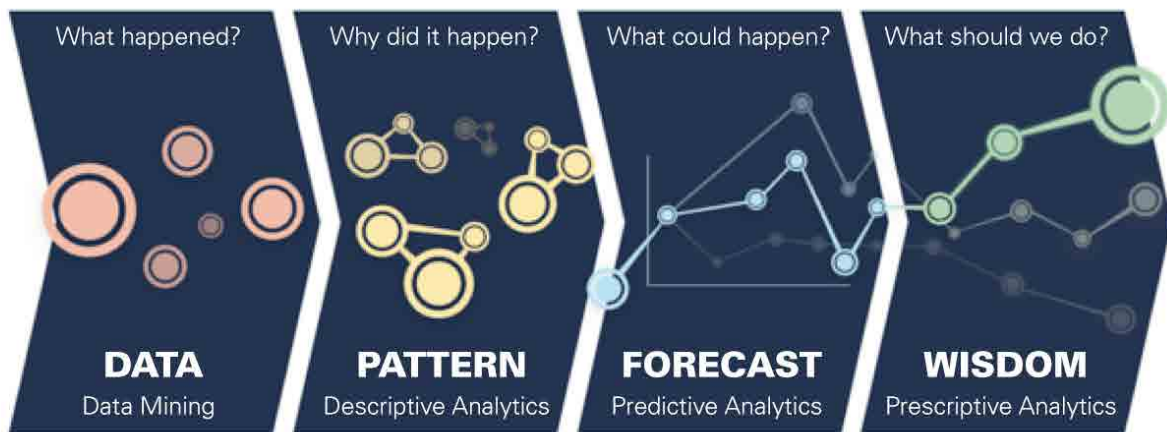
use of artificial intelligence (AI) and predictive analytics at a scale and speed not previously possible.

Robotics and AI are already radically changing sectors of the financial services industry, such as wealth and investment management, as robo-advisors replace traditional consultants. A similar transformation is underway in treasury, finance, and risk, which could free up employees from routine tasks and mean that resource savings can be made and value realized from the vast data sets collected.

This article looks at the potential benefits to bank treasury departments of adding simulation and predictive analytics to their processes.

The pace of advancement in analytics and computational capacity over the last decade has begun to offer the opportunity for executives to approach strategic decisions in new ways.

What happened, why it happened, what might happen, and what actions might be taken to safeguard a bank's position are elements of simulation and predictive analytics (Figure 1).



Advanced Analytics Steps, courtesy of Simudyne © 2017. Used with permission.

Figure 1

Lessons from the past can be highlighted and risk scenarios tested so that better informed decisions can be made.

Justin Lyon, founder and CEO of Simudyne, says “predictive analytics can be thought of as a three-legged stool. There are three disciplines that you need to bring together to do it properly. The first is machine learning, this is a statistical approach that involves trying to understand patterns in data. The second is computational simulation, this involves recreating the real world in a virtual world and understanding how entities within these worlds interact. The third, network modelling, involves using graph theory to understand interconnectivity in complex networks.”

Lyon adds, “the necessary computational power and resources to weave together these technologies at pace and scale are now available, accessible, and reasonably priced. The advent of commodity hardware available in the cloud in combination with the widespread availability of open source cluster computing frameworks means that large scale predictive analytics is now possible. This kind of analysis helps us understand complexity. In an increasingly interconnected world, it is essential that we capture the feedback loops and contagion risk inherent in the complex systems that make up ours.”

The role of treasury, finance, and risk is to manage risks related to the financial well-being of the organization. To achieve this, models are applied to credit, liquidity, collateral, and funding risks, to name a few. These models produce a significant amount of data that, when coupled with enterprise-wide inputs from, say, product development or client analytics, deliver insights to risks or opportunities which influence not only financial risk management but also corporate strategy. (Figure 2).

TYPOLOGY OF SHOCKS AND KEY REGULATORY CONSTRAINTS WHICH CAN BECOME BINDING				
Shocks	Credit	Funding	Liquidity	Collateral
	Risk-weight migration, Credit loss hits capital, Increase in	Maturities shorten, mix changes, funding run-off or “run-in”	Commitments drawn, securitization backup, liquidity puts exercised	Securities prices fall
Regulatory Ratio Constraints Affected	Risk-based capital ratio		Risk-based capital ratio	Risk-based capital ratio
	Leverage ratio	Leverage ratio	Leverage ratio	
		Liquidity coverage ratio	Liquidity coverage ratio	Liquidity coverage ratio
	Net stable funding ratio	Net stable funding ratio	Net stable funding ratio	Net stable funding ratio

Source: OFR Analysis. Reproduced courtesy of Simudyne and Cloudera

Figure 2

Enterprise-wide data access used to just be a key part of compliance. Now that we have the ability to use that data to run simulations of the future, we can use it to think of new ways to drive business as opposed to just regulatory compliance or managing business risks. This creates an opportunity for banks to apply their risk management discipline and compliance frameworks to company-wide strategy.

The Bank for International Settlements (BIS) has categorized four key intermediation functions that banks are engaged in:

1. Credit Transformation
2. Maturity Transformation
3. Liquidity Transformation
4. Collateral Transformation

All too often, a risk is not identified until it happens, and the related impacts of an event can have drastic consequences for a company. Each of these risk transformation areas create channels through which stress can be transmitted to and throughout the bank.

Lyon says that “there are a number of questions a bank needs to answer when it comes to managing its risk and making decisions going forward. Principally, it needs to ask what happened historically and why did it happen? These questions tend to be answerable with standard statistical techniques. Descriptive statistics will tell you what happened and give you an idea of why they did. However, when it comes to answering the harder questions such as what could happen and what should we do, you need to turn to computational simulation. Many of these techniques do not rely solely on statistical relationships.”

“As we’ve discovered, the past isn’t always a good guide to the future. When we’re caught off guard, it tends to be by events that have not previously happened. To forecast these events, you need to understand the physics of them,” adds Lyon. “This means mapping out the entire system you’re

observing, recreating all the points of interaction and then shocking the system to see how interacting parts respond. This can help you spot looming risks such as counterparty credit risk, contagion risks, or marketplace threats.”

The interrelated elements of a bank’s geography and franchise beyond the four BIS risk transformation elements form a broad risk management framework requirement. While techniques applied in each of these areas commonly address business or risk-specific approaches, what we show here is that the number of interrelated risks can be substantial and these channels of risk transmission can be modeled (Figure 3).

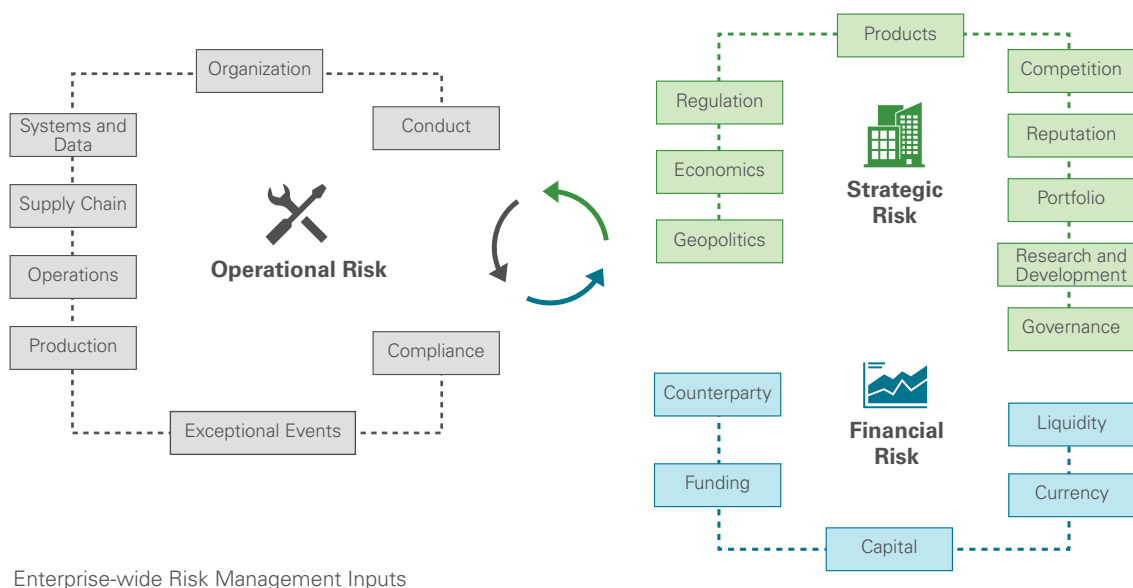
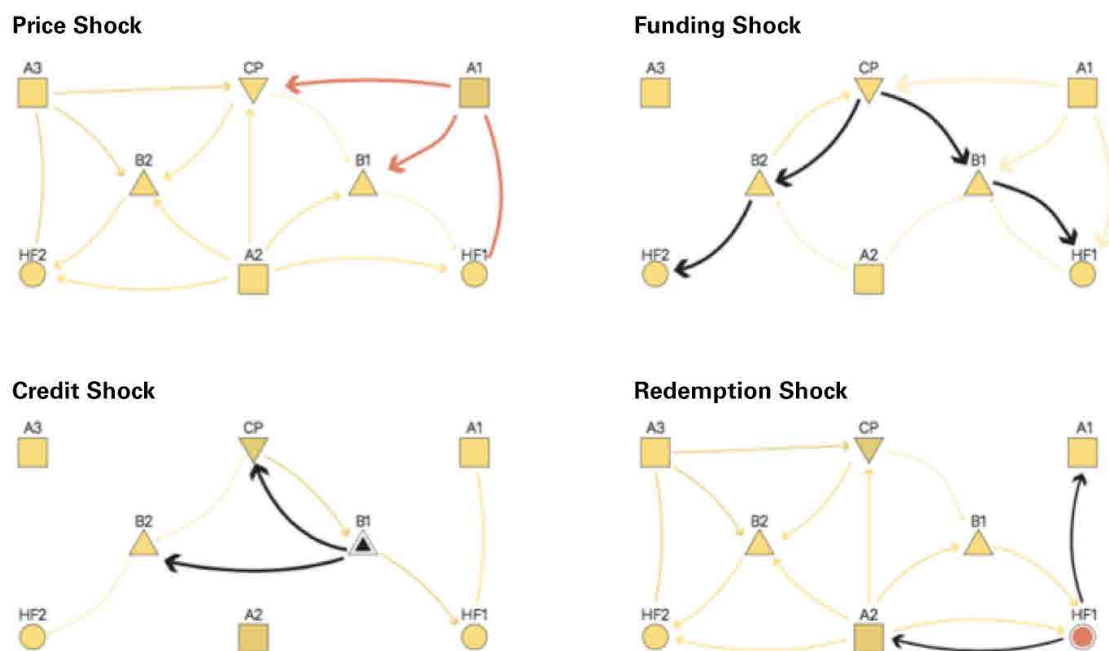


Figure 3

Agent-based modeling is designed to be applied to a wide range of stress testing scenarios which include changes in funding patterns or availability, credit rating migration, or asset and liability redemption shocks. This will enable asset liability management (ALM) managers to understand the sensitivities of the balance sheet more effectively and allow the business to understand the behavior patterns of product and customer types at a granular level. In turn, this enables the risk department to design more tailored stress scenarios, as they can devise situations that would impact specific parts of the balance sheet.

On a business as usual (BAU) basis, this tool would allow the bank to move to a true strategic ALM posture because (i) for new products or customer franchise areas, the expected impact to net interest income and net interest margin will be more predictable, and (ii) the impact on the balance sheet of changes in anything from one to multiple internal and external factors, such as rates, defaults, unemployment, inflation, and so on, can be modeled with greater clarity.

The flexibility of agent-based modeling approach is ideal for creative stress testing. It is used to search for and identify the weakest links or bottlenecks that might be the point of failure that transmits stress across an organization. As regulators continue to raise the bar in their expectations of what constitutes a robust stress testing model, banks must learn to map enterprise-wide risks and their impact, both pre- and post-management actions triggers (Figure 4).



Network view of Initial Shock Propagation. Reproduced courtesy of Simudyne® and Cloudera®

Figure 4

It is imperative that banks implement large-scale simulations to drive their predictive analytics. By doing so, they increase reporting efficiency and improve their strategic risk management.

The risk for an organization of not adopting enterprise-wide risk management approaches is that of being caught off-guard. It raises the possibility of continued fire-fighting rather than an organized and intelligent approach for executive decision-making. Banks, energy companies, and regulators are already adopting these approaches.

As these advanced analytical approaches are implemented, quants and data science expertise inside an organization become more efficient at meeting the immediate demands of compliance and may begin to work with risk owners to run simulation analysis exploring different paths to manage risk, reduce balance cost, or more effectively structure a funding and collateral management base (Figure 5).

POTENTIAL USES FOR SCALE SIMULATION AND PREDICTIVE ANALYTICS IN BANKING
Increased efficiency in stress testing (liquidity and enterprise)
Modeling of isolated risk event transmission across the bank
Simulation of credit events across a portfolio or balance sheet
New product implementation impacts of client behavior and value
Simulate changes in funding patterns, availability and cost
Enterprise wide impact of bank credit migration

Figure 5

In conclusion, a strategic treasury approach to bank asset-liability management requires the tools to manage the balance sheet, comply with regulation and risk appetite, and gain insight to the complex environment in which we operate. Having these in place turns compliance to value added business advantage.



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05

MODERN ASSET LIABILITY MANAGEMENT (ALM) NEEDS TO OPERATE IN A MULTI-DIMENSIONAL WORLD

BEATA LUBINSKA, HEAD OF MARKET RISK, MEDIRECT GROUP

Ever since the 2008 bank crash, the redefinition of the asset liability management (ALM) function in the active management of the banking book is becoming an important challenge for a financial institution. This is driven by the contribution that the ALM function has in the overall profitability of a bank in times where the regulatory landscape is growing more complex and onerous, and the interest margins are squeezed. It is extremely important to have ALM flexibility and proactivity, since many years of low and negative interest rates resulting from the financial crisis have impacted competitiveness and created considerable challenges in balance sheet management. Consequently, there is a clear need to reset the business model and redefine the priorities for the ALM discipline.

The ALM function has two important tools at its disposal in order to be a profitability enhancer: active and integrated management of financial risks, in particular, integrated management of interest rate risk in the banking book (IRRBB), liquidity risk, and funds transfer pricing (FTP). Those tools, if managed correctly, allow for the achievement of a profitable target profile of the banking book and significant reduction in funding costs¹.

It is very clear that there is strong interrelation between interest rate risk and liquidity risk and that those risks should be managed under an integrated approach. The interest risk gap, its impact on the ALM margin and, consequently, the net interest income (NII) sensitivity deriving from the interest rate risk (IRR) exposure is one side of the coin. Then, there is another one that results from the funding gap, its impact on the ALM margin and its riskiness in terms of margin sensitivity.

¹ The details of the economic impact in terms of the reduction of funding costs can be found on: https://link.springer.com/chapter/10.1007/978-3-319-54885-2_17

Let's consider this concept in a very simple case, in which the banking book of the bank is composed of a fixed rate loan funded by a floating rate note with a three-month reset. The financial characteristics are as follows:

ASSET – Fixed rate loan at maturity – notional 100

Repayment type: "bullet"
 Next (capital) payment date: 12/31/2013
 Next repricing date: 12/31/2013
 Customer Rate: 3.5%
 FTP Base Rate: 2.0%
 FTP Liquidity Spread: 0.5%

LIABILITY – Floating rate note 3-month reset – notional 100

Repayment type: "bullet"
 Next (capital) payment date: 09/30/2013
 Next repricing date: 03/31/2013
 Customer Rate: 1.50%
 FTP Base Rate: 1.25%
 FTP Liquidity Spread: 0.25%

The ALM manager finds its banking book structured as shown at Exhibit 1:

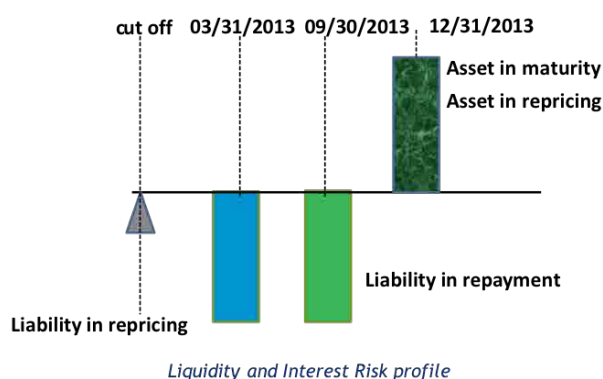


Exhibit 1: Exposure to the IRR and Liquidity Risk According to the Flow Approach

This banking book shows the exposure to the IRR on March 31, 2013, due to the re-fixing of the floating rate liability. Starting from that date, the re-fixed asset will be funded by the re-fixing liability, generating an interest rate gap and,

subsequently, NII sensitivity. The profitability of this position, due to the interest rate risk component, is equal to 0.75% in the form of the locked-in ALM margin. Instead, the ALM Margin at Risk is equal to 1% under the assumption of the decrease in London Interbank Offered Rate Three Month (LIBOR 3M) by 25 bps (from 1.25% to 1%).

However, the same situation analyzed from the liquidity standpoint looks slightly different. The bank begins to be exposed to the liquidity risk on September 30, 2013, when the liability expires and needs to be rolled over. Starting from that date, the funding gap creates NII sensitivity. The ALM locked-in margin deriving from the funding gap is equal to 0.25% (the difference between liquidity spread of asset and liability). Instead, the ALM margin at risk depends on the new liquidity spread related to the liability that needs to be rolled over. Arriving at the total profitability of the ALM book, we need to sum the NII margin obtained by the positioning of the bank in terms of both interest rate risk and liquidity risk. There is a clear trade-off between the unrealized ALM profit, which depends on the new liquidity spread of the liability in maturity, the movement of the LIBOR 3M tenor of the interest rate curve, and the NII sensitivity which those positions have created. Therefore, it is imperative for the ALM function to find this optimal structure.

The second powerful tool that ALM has at its disposal is the FTP process. In a maturity matched transfer pricing (MMFTP) process, ALM has to be a "zero sum game," which means that its profitability is determined exclusively by the IRR strategies and the extent of the maturity transformation that it is running, and not by charging a higher than expected FTP rate to business units in order to create additional profit. FTP is a process that applies the fair (term liquidity) price for funds and transference of interest rate risk and liquidity risk from the business lines to the ALM desk. It must be transparent to all parties involved and it is

calculated according to one set of rules described in the FTP policy. FTP is also a powerful tool in assisting the forward shaping of the banking book. Its steering role consists in the application of techniques, such as FTP curve dampening, an incentives premium, and the application of management overlays (shifting whole parts of the FTP curve up or down) in order to arrive at a desirable banking book shape. The importance of this tool, post-crash, has been recognized across the banking industry. FTP isn't, and has never been, only, a "right-pocket, left-pocket" static mechanism solely used for performance reporting.

Thus, the modern, proactive ALM function works in a multidimensional world. First, it has to be able to determine the best achievable trade-off between profitability of the ALM book and its riskiness through an integrated approach to the management of financial risks. The silo approach, which can still be found in many financial institutions, is sub-optimal and risks damaging the performance of the ALM unit. In today's world, having an overall picture of the risks a financial institution faces are an imperative. Therefore, the revision of the methodological approach determines the first dimension in which a modern ALM desk operates.

Secondly, ALM must steer the banking book through a number of FTP techniques designed to arrive at the target balance sheet profile. If ALM uses FTP as a dynamic tool to incentivize growth or divest certain products, then it actively contributes to setting the target profile of the banking book. The active FTP provides a second dimension for ALM to operate within.

Finally, navigating through the ocean of regulatory requirements is excessively resource intensive. It is the role of the ALM function to manage the compliance with liquidity coverage ratio (LCR), short-term liquidity metrics, funding concentration, and other regulatory requirements. The regulatory landscape is the third dimension in the ALM universe.

Successful navigation in the multi-dimensional ALM universe is an important challenge for every bank and requires strong analytical tools to obtain this objective. But, it is crucial to take this step in order to remain a long-term, viable, and prosperous financial institution.



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The image shows a hand pointing at a financial chart. The chart features a red background with white and yellow lines representing data. A large white number '066' is overlaid on the left side of the chart. The hand is positioned on the right side, with the index finger pointing towards the chart. The overall theme is financial analysis and market risk.

066

THE BANKING BOOK VS. TRADING BOOK BOUNDARY UNDER THE MARKET RISK STANDARD

Fundamental Review of the Trading Book - FRTB

JUAN RAMIREZ, SENIOR PROFESSIONAL, LEADING ACCOUNTING FIRM AND BTRM FACULTY MEMBER

THIS ARTICLE IS AN ADVANCE EXTRACT FROM THE AUTHOR'S UPCOMING BOOK, HANDBOOK OF BASEL IV MARKET RISK – APPLYING THE FUNDAMENTAL REVIEW OF THE TRADING BOOK IN PRACTICE. PRINTED HERE BY PERMISSION.

All of a bank's positions are assigned to either the banking book or the trading book. The classification of a position impacts its regulatory treatment, specifically, the calculation of its regulatory capital charges. One of the main elements of the Basel Committee for Bank Supervision (BCBS) market risk standard is the guidance that sets out the principles for allocation of financial instruments between the banking book and the trading book. The boundary between these two books is, at its heart, an operational construct. It acts as an asset allocation device that seeks to allocate instruments and portfolios into the prudential capital calculation methodology that is best

equipped to deliver the appropriate level of capital for the risk inherent in that instrument or portfolio.

Allocation Hierarchy

The market risk framework sets out objective guidance on the boundary between the trading and the banking books. The allocation of instruments to a book is based on three-tiered criteria, as depicted in Figure 1:

- First, the framework identifies instruments that are “presumed” to be either in the trading book or in the banking book. The BCBS provides two lists of instruments—one for each book
- Second, the framework establishes the conditions for an instrument to be in the trading book, based on a trading/arbitrage intent (e.g., short-term resale)
- Last, there are two further requirements for an instrument to be in the trading book: no legal impediment against its sale or fully hedge, and daily fair valuation through profit or loss

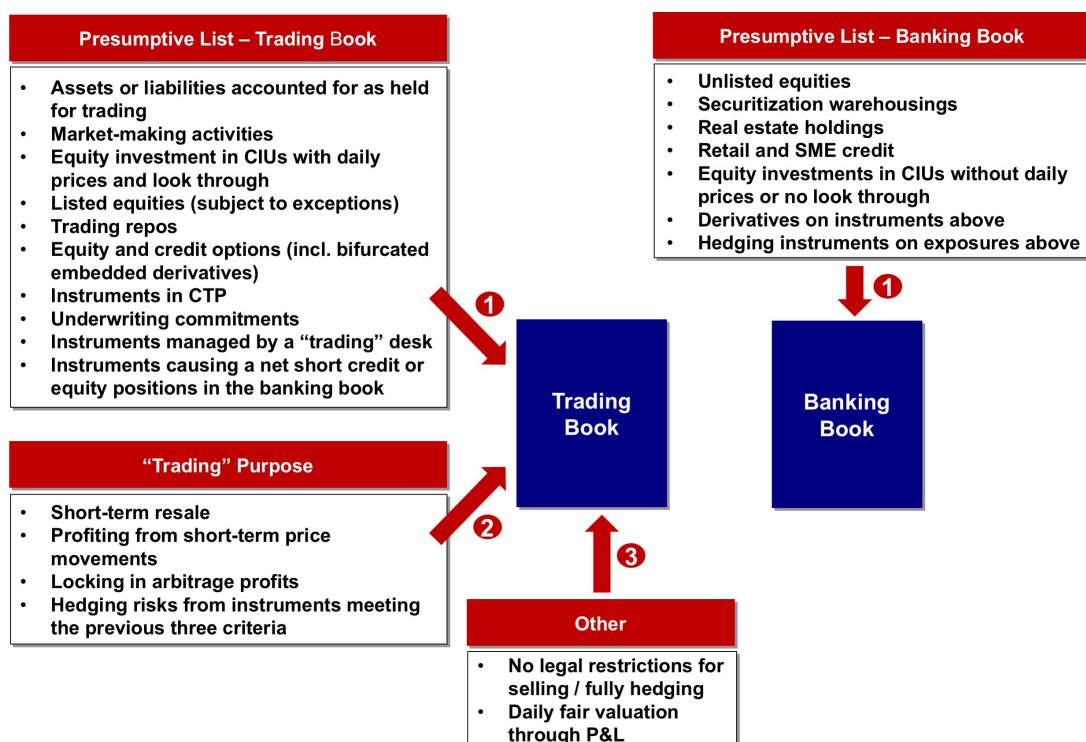


Figure 1: Instrument Allocation Criteria to the Banking and Trading Books

In addition, all foreign exchange and commodities exposures in the banking book are part of the market risk framework and, as such, treated as if they were part of the trading book.

Instruments Presumed to Be in the Trading Book

The following are definitions in the market risk regulatory standard:

- A financial instrument is any contract that gives rise to both a financial asset of one entity and a financial liability or equity instrument of another entity
- A financial asset is any asset that is cash, the right to receive cash or another financial asset or a commodity, or an equity instrument
- A financial liability is the contractual obligation to deliver cash or another financial asset or a commodity

A trading book consists of all instruments that meet the following:

- The instruments comprise financial instruments, FXm and commodities (including non-physical goods, such as electric power)
- There is no legal impediment against selling or fully hedging the instruments
- Instruments are fair-valued daily and any valuation change is recognized in the profit or loss account

Any instrument held for one or more of the following purposes must be designated as a trading book instrument:

- Short-term resale
- Profiting from short-term price movements
- Locking in arbitrage profits
- Hedging risks that arise from instruments meeting the previous three criteria

Any of the following instruments are seen as being held for at least one of the purposes listed in the previous paragraph and therefore must be included in the trading book:

- Any instrument that is managed on a trading desk (an unambiguously defined group of traders or trading accounts that fulfils certain regulatory requirements)
- Any instrument giving rise to a net short credit or equity position in the banking book—a bank will have a net short risk position for equity risk or credit risk in the banking book if the present value of the banking book increases when an equity price decreases or when a credit spread on an issuer or group of issuers of debt increases

There is a general presumption that any of the following instruments are being held for at least one of the purposes listed above and, therefore, are trading book instruments, unless the bank is allowed by the regulatory supervisor to deviate from the presumption:

- Instruments held as accounting trading assets or liabilities
- Instruments resulting from market-making activities
- Equity investment in a fund in which the bank can look through daily and where the bank can obtain daily prices for its equity investment
- Listed equities—subject to supervisory review, certain listed equities may be excluded from the market risk framework. Examples include, but are not limited to, equity positions arising from deferred compensation plans, convertible debt securities, loan products with interest paid in the form of “equity kickers,” equities taken as debt previously contracted, bank-owned life insurance products, and legislated programs

- Trading-related, repo-style transactions
- Options including bifurcated embedded derivatives from instruments issued out of the banking book that relate to credit or equity risk. The bifurcated derivative associated with the issued instrument should be recognized on the bank’s balance sheet for accounting purposes
- Any instrument resulting from underwriting commitments
- Any instrument in the correlation trading portfolio

Instruments Presumed to be in the Banking Book

Any instrument that is not held at inception for any of the purposes listed previously must be assigned to the banking book. Instruments must be included in the banking book if a bank has significant constraints on its ability to liquidate these instruments and value them reliably daily. The following instruments must be assigned to the banking book, unless specifically provided otherwise in the regulatory market risk framework:

- Unlisted equities
- Any instrument designated for securitization warehousing
- Real estate holdings
- Retail and SME credit
- Equity investments in a fund, including hedge funds where the bank cannot look through the fund daily or where the bank cannot obtain daily real prices for its equity investment in the fund
- Derivative instruments that have the above instrument types as underlying assets
- Instruments held for hedging a particular risk of a position in the types of instrument above

Instrument Transfers Between the Regulatory Books

An instrument that has been previously in one book (either the banking book or the trading book) may be transferred to the other book. Historically, transfers from the trading book to the banking book have occurred for several reasons, including change in the business model, regulatory arbitrage, and default.

Change in the Business Model

Let's assume that the bank originally had a portfolio of debt instruments (e.g., bonds) in the trading book and, as a result, the bonds were recognized at fair value through profit or loss (FVTPL). The intent of the bank was to sell the bonds in the near future to benefit from appreciation. At some point, the bank decided to change the business model for managing the portfolio, planning to hold the debt instruments until their maturity. The change in the business model implied that the bonds' accounting classification changed from FVTPL to amortized cost (i.e., no further need to fair value the bonds), which triggered the transfer of the portfolio from the trading book to the banking book.

These types of transfers commonly occur when bonds that were liquid prior to the transfer suddenly become notably illiquid and their fair valuation notably volatile. Maintaining the bonds in the trading book would have caused the volatility of P&L to increase. However, the transfer of bonds to the banking book does not fully mitigate P&L volatility as the bonds would be subject to the impairment rules, implying that the bank would need to calculate and provision the bonds' expected credit losses which are recognized in P&L.

Regulatory Arbitrage

Regulatory arbitrage refers to a transfer from one regulatory book to another in order to save regulatory capital. Since the capital requirements

of the trading book are calculated differently than those of the banking book, transferring exposures from one book to the other may result in a substantially more beneficial risk-weighted asset.

Instrument transfers for regulatory arbitrage have been an area of particular concern by the BCBS. Below, I explore the initiatives taken by the BCBS to preclude the materialization of regulatory capital benefits in the case of internal instrument transfers. For example, switching instruments purely for regulatory arbitrage is strictly prohibited.

Default

Instruments that are held in the trading book and their issuer—in the case of debt or equity instruments—or their counterparty—in the case of derivatives—has defaulted are normally transferred to the banking book. The rationale behind this transfer is that these instruments cease to expose the bank to market risk. Upon default, their value is a function of their recovery value (i.e., the exposure times the loss given default).

Accounting Treatment of Transfers Between the Regulatory Books

From an accounting perspective, the allocation of an instrument to either the banking book or the trading book by itself does not have an impact in its accounting classification. Instruments in the trading book due to their trading intent are classified at FVTPL and, as a result, changes in their fair value are recognized in the profit or loss statement. Financial assets in the banking book are classified into one of the following three categories:

- At amortized cost
- At fair value through other comprehensive income (FVTOCI)
- At fair value through profit or loss (FVTPL)

To determine which measurement category a financial asset falls into, the entity first considers whether the financial asset is an investment in an equity instrument, following the guidance in International Accounting Standards (IAS) 32, by considering the perspective of the issuer (with one exception for equity “puttable instruments,” which are always considered debt instruments for the holder, regardless of how they are classified by the issuer). At initial recognition, an entity may make an irrevocable election to designate an equity instrument [in scope of International Financial Reporting Standard (IFRS) 9] at either FVTPL or at FVTOCI. However, this option does not apply to equity investments that are held for trading, equity puttable instruments, or contingent consideration. Such designation is available on initial recognition on an instrument-by-instrument basis and is irrevocable.

One of the two criteria for determining the classification of a non-equity financial asset is the assessment of whether it has debt-like characteristics. More precisely, whether the contractual terms of the financial asset give rise, on specified dates, to cash flows that are “solely payments of principal and interest (SPPI) on the principal amount outstanding” (the SPPI criterion).

If the SPPI criterion is met, the classification of a debt-like financial instrument is driven by the entity’s business model for managing the portfolio in which the financial asset is held, in

particular whether the entity’s business model for managing the portfolio is to:

- Hold the assets in the portfolio to collect their contractual cash flows. This is a requirement (in combination with the SPPI criterion) to qualify for recognition at amortized cost. Most loans in the banking book are recognized at amortized cost
- Hold the assets in the portfolio to collect the contractual cash flows and to sell. This is a requirement (in combination with the SPPI criterion) to qualify for recognition at FVTOCI. Most bonds in the liquid asset buffer are recognized at FVTOCI
- Any other business model, including holding the financial instrument for trading. These instruments are recognized at FVTPL

Derivatives—financial instruments that are not equity and do not meet the SPPI criterion—and hybrid instruments (i.e., financial instruments with an embedded derivative) are recognized at FVTPL.

A transfer may have a P&L impact on the transfer date if and only if the financial instrument is transferred from the banking book to the trading book and it was classified at either amortized cost or FVTOCI, as shown in Figure 2.

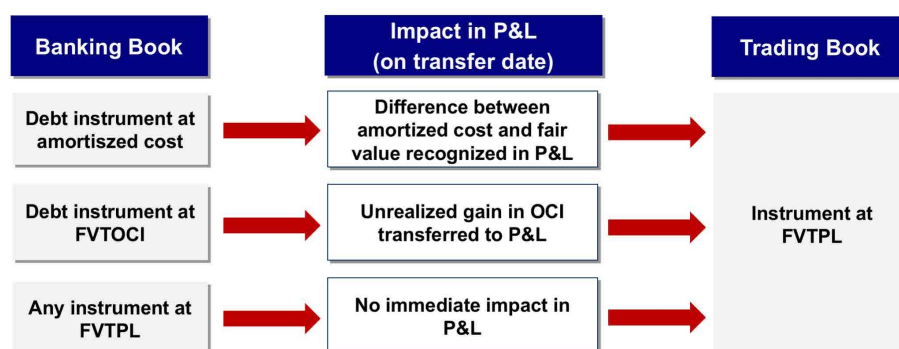


Figure 2: Accounting Impact in P&L of a Transfer from the Banking Book to the Trading Book

If the financial asset was recognized at amortized cost in the banking book, the bank would need to fair value the instrument and any difference between its amortized cost and its fair value would be recognized in profit or loss. Therefore, a loan/bond for which its amortized cost is larger than its fair value, would result in a loss in P&L and if its amortized cost is lower than its fair value the bank would recognize as a gain in P&L.

If the financial asset was recognized at FVTOCI in the banking book, the amounts that were recognized in other comprehensive income (OCI) will be reclassified to profit or loss. Therefore, a government bond that the bank had in its banking book and recognized at FVTOCI, and for which the bank has an unrealized gain (in OCI), its transfer to the trading book would result in a gain recognized in P&L.

If the financial asset was recognized at FVTPL in the banking book, its transfer to the trading book would have no accounting impact.

Regulatory Treatment of Transfers Between the Regulatory Books

The transfer of instruments between the regulatory books is heavily restricted and switching instruments for regulatory arbitrage is strictly prohibited. In principle, the BCBS expects switching to be rare and only allowed by supervisors in extraordinary circumstances. The market risk standard provides a couple of examples of situations that could trigger a transfer:

- A major publicly announced event, such as a bank restructuring that results in permanent closure of trading desks, requiring termination of the business activity applicable to the instrument or portfolio
- A change in accounting standards that allows an item to be recognized at FVTPL. Market events, changes in the

liquidity of a financial instrument, or a change of trading intent alone are not valid reasons for re-designating an instrument to a different book. When switching instruments, banks must ensure that the prescribed list of instruments allocated to each book (e.g., unlisted equities are presumed to be in the banking book) and the other requirements for holding an instrument in the trading book (e.g., daily fair valuation) are strictly observed

Any re-designation between books must be approved by senior management, thoroughly documented, determined by internal review to be in compliance with the bank's policies—subject to prior approval by the supervisor based on supporting documentation provided by the bank—and publicly disclosed. Any re-designation is irrevocable. If an instrument is reclassified to be an accounting trading asset or liability, there is a presumption that this instrument is in the trading book. Accordingly, in this case, an automatic switch without approval of the supervisor is acceptable.

The internal policy guiding transfers between the two books must be updated yearly, at a minimum. Updates should be based on an analysis of all extraordinary events identified during the previous year. Updated policies, with changes highlighted, must be sent to the appropriate supervisor. Policies must include the following:

- The re-designation restriction requirements as established by the BCBS, especially the restriction that re-designation between the trading book and banking book may only be allowed in extraordinary circumstances, and a description of the circumstances or criteria where such a switch may be considered

- The process for obtaining senior management and supervisory approval of such a transfer
- How the bank identifies an extraordinary event
- A requirement that re-designations into or out of the trading book be publicly disclosed at the earliest reporting date

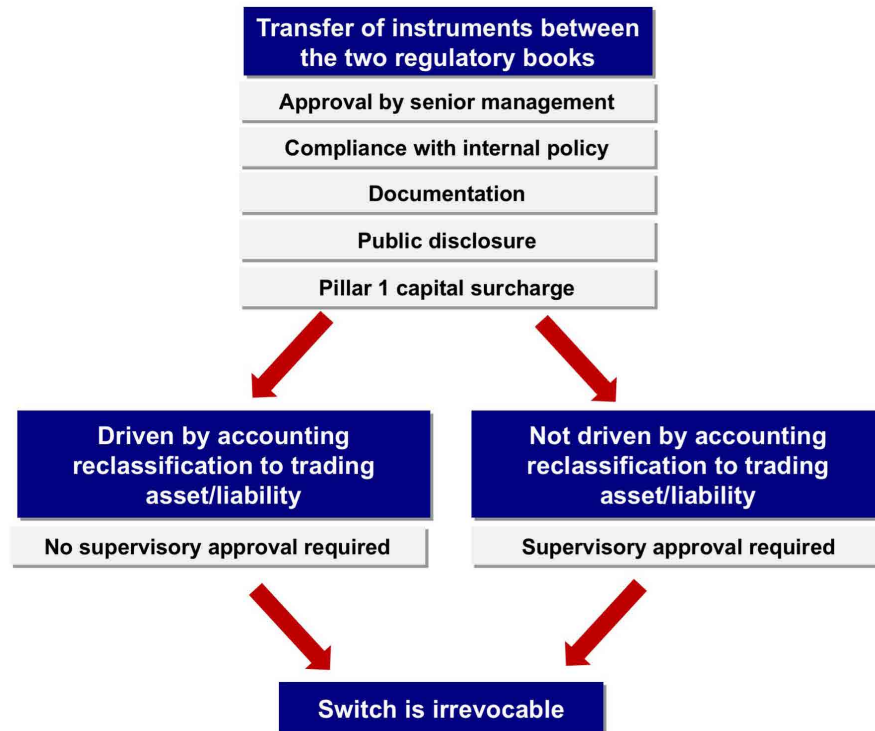


Figure 3: Regulatory Requirements of an Instrument Switch Between Regulatory Books

Treatment on regulatory capital

Any capital benefit resulting from a switch is not allowed under any circumstances. This means that the bank must determine its total capital charge (across banking book and trading book) before and immediately after the switch. If this capital charge is reduced as a result of this switch, the difference at the time of the switch will be imposed on the bank as a disclosed Pillar 1 capital surcharge. This fixed surcharge is allowed to run off as the positions mature or expire, in a manner agreed with the supervisor. To maintain operational simplicity, this additional charge is not recalculated on an ongoing basis, although, the positions continue to also be subject to the ongoing capital requirements of the book into which they have been switched.



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07



X-VALUE ADJUSTMENT (XVA) AND FUNDING DERIVED MARKET DISLOCATIONS

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X-Value Adjustment (XVA) costs have become an integral part of doing business. Regulatory capital charges add more cost to certain deal types that use up the balance sheet of a bank. Though there are many papers about how to calculate them, it is nearly impossible to find any actual data on their size and impact. We show that while they

are significant, they are insufficient to dominate the cross-currency (xccy) basis.

Using the example of the xccy basis, we show exactly why it is usually impossible to arbitrage apparent mispricing. There are numerous papers on the xccy basis, but none of them show precisely why it is not an arbitrage trade. By understanding the details of how such an attempt would fare, the nature and drivers of the basis become clear.

The xccy basis exists because of credit risk and demand/supply pressures for specific currencies. Increased sensitivity to credit risk has driven swap and deposit curves apart since the financial

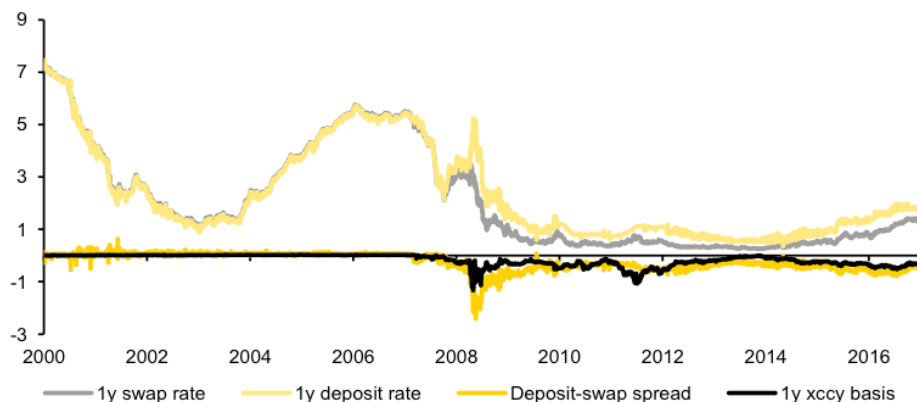


Figure 1: One-Year Swap Rate, Deposit Rate, Spread and Basis, All In % (US Dollars)
Source: Bloomberg, Commerzbank Research

crisis, with market participants putting a different price on the risk of a loan (with its large cash flow at the end of the deal) to the risk of a swap (where cash flows are only based on rate differentials and usually backed by collateral). This curve multiplication drives and sustains the xccy basis.

Credit risk and regulatory arbitrage constraints are driving the short-term basis (Figure 1).

XVA – What Is It?

A Brief Summary of Counterparty Risk

The quantities grouped under XVA are various credit-derived costs of doing deals. XVA began as Credit Valuation Adjustment (CVA), which evolved into XVA as the various valuation adjustments grew. They derive from the older-style management of loan portfolios, where companies wished to avoid excessive or concentrated exposure to individual counterparties or closely correlated counterparties. The traditional calculation would look something like this, for a single loan:

Expected loss = (Exposure at default) x
(probability of default) x (loss given default)

Here “exposure” is the amount outstanding of the loan at the time of default (some may have been partially paid back part way). To value a loan, the bank will consider its expected income, the difference between the interest received on the loan and the cost of borrowing the money to lend on to the customer, against the expected loss. Those earnings are set against the amount of capital the bank is required to hold for the risk. The capital requirement for a loan is a calculation depending on a variety of factors such as the credit risk of the borrower and the maturity of the exposure.

The complexities involved in taking this concept from the simple loan to a derivatives portfolio are many, but the basic building block—that of

exposure to a counterparty—remains the same. They can be qualitatively outlined as follows.

Multiple Transactions

Once more than one transaction is on the books, the interaction between them must be considered. Does one offset the other? Do they add up? Are the counterparties in similar areas which means they are more likely to default at the same time?

Positive and Negative Values

A simple loan has a tenor and a principal amount and only creates an exposure for the lender. But, even a simple derivative product like a swap introduces an additional layer of complexity as it can create exposure for either counterparty; depending upon market conditions it can have a positive or negative value.

Probability of Different Exposures

A complex deal can take on a range of values and neither of the counterparties is sure what it will be worth at different points in time. Therefore, instead of a single value, it has a range of values which have a range of probabilities attached to them at different times in the future.

Exposure Profiles

Different contracts have different risks throughout their lifetimes. Therefore, an interest rate swap has a low exposure (meaning that its overall value will not have moved far from its start value) at the beginning of its life. It will have a low exposure near the end of its life, as there is little uncertainty left about its ultimate value. In the middle of its life its exposure will be highest, as it has plenty of payments left to run, and rates may have moved far from the start values by that time. So, its exposure profile is “humped” as a function of time. A cross-currency swap has its highest exposure right at the end of its life, as it exchanges principle amounts whose values depend on exchange rates and are not fixed till the end point, so its exposure profile rises towards the final date.

Mitigation Measures

To reduce exposure, many counterparties began to take mitigation measures like netting agreements or posting collateral. In a netting agreement, two counterparties agree that in the event of a default by one of them, any payments made will be calculated by netting offsetting deals. The situation this is designed to avoid is where the defaulting counterparty does not pay what they owe but still claims what they are owed. Collateral posting occurs when a deal accrues a positive value to one counterparty (they are owed money), and therefore a negative value to the other (who owes money). The latter counterparty sends collateral in the form of high quality assets to the former counterparty. In the event of a default, this counterparty may retain the collateral, meaning that their effective exposure is much lower. Collateral has become a hugely popular mitigation measure—ISDA estimates that 63% of all FX derivative trades are covered by collateral arrangements¹.

Netting Set

The use of netting agreements leads to the interesting situation where the risk of a deal depends on the portfolio or netting set it will be added to! If it is largely offsetting, its additional risk can be low or even negative. Therefore, deal risk and cost can be determined by and unique to the counterparties involved and their current portfolio and legal position.

Risk vs. Cost

The risk and the cost of a deal are different but related quantities, and it is interesting to note that over the years, the focus has somewhat shifted from risk to cost. All the various complexities described above serve to reduce the risk of a deal to the holder. If we assume that the cost is a function of holding capital to support the deal risk, then reducing risk will reduce cost.

But what if a particular deal turns out to reduce risk overall? Or, perhaps, if a risky but profitable deal can only be justified if it is hedged—but the hedge is expensive?

Additionally, a decision made on risk grounds is complex. Imagine a risky deal which is profitable. The client perhaps does a lot of other business with the bank, so there is a degree of offset. However, this deal adds to risk in a currency where the bank is already highly exposed. This is a decision which would take time and involve multiple people.

While it may be argued that some decisions are inherently complex and should not be oversimplified, it is surely the case that for most deals, if all the various complexities above could be reduced to a simple cost, the process would be that much easier. As long as profit of deal > cost of doing deal then the deal should be done. There is no need to worry about exposures, netting, correlations or collateral. The growing complexity of managing the risk of a portfolio of deals paved the way for the introduction of CVA.

CVA – The First Horse in the XVA Stable

CVA seems like a simple solution to this set of complexities, but it has its own problems. CVA is the change in value of the deal due to the possibility of counterparty default. If the counterparty will never default, CVA is zero. It is useful and convenient to express CVA as a running annualized spread.

There are many methods, varying in complexity, that are used to calculate CVA. We list the most common below.

1. Full Calculation

For a complete and exact value, CVA is given by

$$CVA = (1 - \delta) \sum_{j=1}^m DF(t_j) EE(t_j) q(t_{j-1}, t_j)$$

¹ "Market Review of OTC Derivative Bilateral Collateralisation Practices," ISDA Collateral Steering Committee, 2010.

Here, δ is the recovery fraction, so $(1 - \delta)$ is the percentage of the deal value lost in the event of a default. This is largely dependent upon legal and relationship factors.

$DF(t_j)$ is the discount factor for time t_j . This is relatively simply determined from risk-free rates.

$EE(t_j)$ is the expected exposure at time t_j . This is the idiosyncratic calculation that involves all exposure, netting and collateral considerations, and can vary considerably from one institution to another. It will be obtained from the desk or team in charge of these calculations.

$q(t_{j-1}, t_j)$ is the default probability from time t_j to t_{j-1} . One would usually use default probabilities implied from historical data, though there are occasions where it may be preferred to use market implied figures (though this can become a somewhat circular issue).

2. Cost of Hedging

However, there are other ways of looking at the CVA calculation. If CVA is just the change in value which comes from credit risk, should it not be simply the cost of hedging away this credit risk? For many large institutions, one may effectively hedge away the risk of default using a Credit Default Swap (CDS).

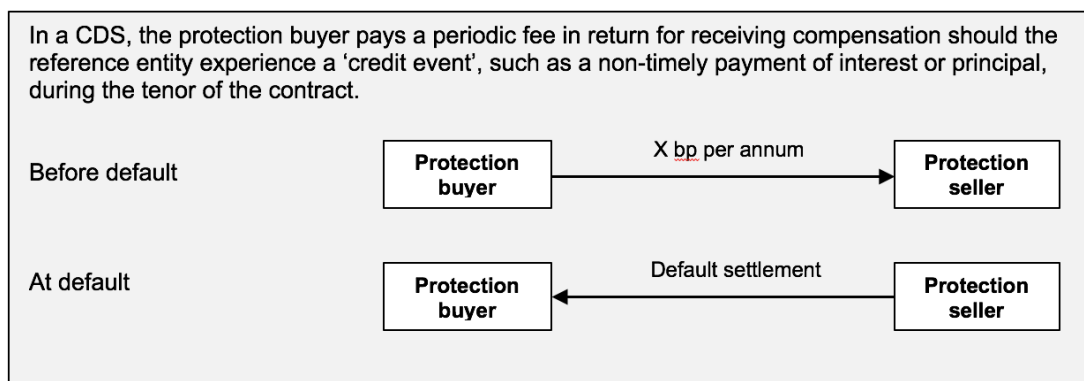
If we use this method, then we have:

$$CVA = \sum_{t=1}^T PV_{cashflow}(CDS_t)$$

This is the sum of the CDS to protect each of the future cashflows of the deal.

It is worth a quick aside on the relationship of CDS to credit spreads. In theory, they arise from the same source—the perceived default risk of a company and its effect on the cost it must pay to borrow. Therefore, the total value of the spread between the company bond yields and the risk-free rate should mirror the value of the CDS payments. However, in reality, these two prices can diverge substantially and create a “basis” between CDS and bonds (defined as the difference between the CDS’ and the bond’s spread). Credit-specific factors, such as documentation can be important, and generally, supply-demand dynamics in the bond market are an important factor behind this basis.

In practice however, the CDS-bond basis is dominated by diverging liquidity dynamics and segmentation between markets. Pre-financial crisis, the creation of synthetic CDO products meant that CDS-bond basis contracted significantly. In Europe, the European Central Bank’s (ECB) € quantitative easing (QE) program has since 2015 created a force in the opposite



direction, causing the basis to become wider. Last not least, the rise of CVA desks during the last decade has introduced another important factor as they tend to be buyers of protection.

While all of these factors have contributed to a structurally wider CDS-bond basis since the crisis, it is interesting to note that the CDS-bond basis is correlated with the xccy basis—although no direct relationship exists between the two (See Figure 2 for an example from Italy). We believe that this underscores that relative scarcity conditions are exerting similar influences on both bases and regulatory XVA costs are also inhibiting arbitrage opportunities in similar ways on both instruments.

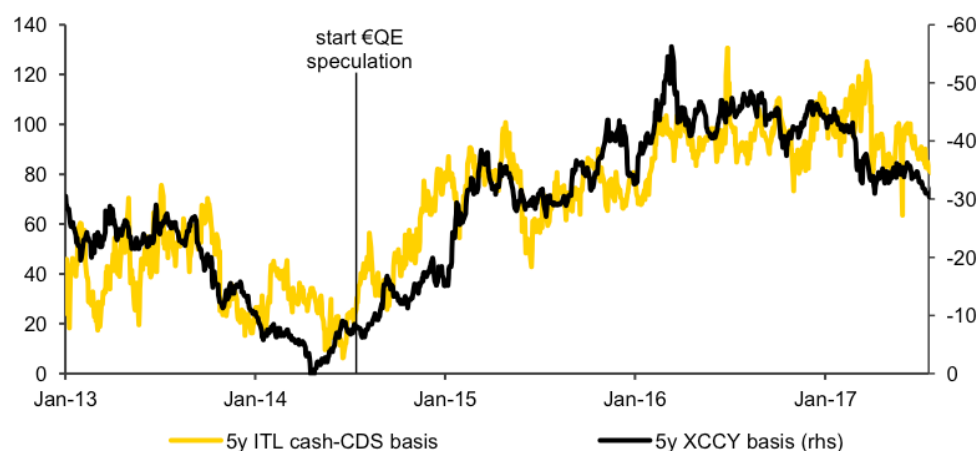


Figure 2: Different Bases, Common Driver, Five-Year Cash-CDS and Cross Currency Bases, In bp.
Source: Bloomberg, Commerzbank Research

3. Discounted Cash Flow Approach

In this case, the CVA is assumed to be the difference between the future cashflows discounted by the risk-free rate and the future cashflows discounted by the credit adjusted rate.

$$CVA = FV_{risk\ free} - FV_{credit\ adjusted}$$

While in theory, this should produce similar results to the other calculations, it has a degree of flexibility in that the credit adjustment spread can be the own or the counterparty credit spread, depending on which way round the exposure is.

4. Duration Approach

This is perhaps the crudest method but is very quick and easy to use. In this case,

$$CVA = MTM \times Credit\ Spread \times Duration$$

This uses the duration to measure how much the fair value of the deal changes by applying the credit spread to the risk-free valuation. It's certainly the "quick and dirty" one of the bunch but is fairly well correlated to the other methods.

DVA – The Next Calculation

CVA was the first universally recognized attempt to apply a simple cost to cut through the various problems of counterparty credit risk and exposure. But, it was very soon realized that it was not the whole story. For every transaction, each counterparty will calculate CVA with respect to the other(s). Debit value adjustment (DVA) is the CVA from the perspective of a company's counterparty looking back at the company. When this was first introduced, it was controversial. Why should a company include its own credit risk in a calculation? And when the credit quality of a company goes down, its DVA goes up, therefore meaning deals may be "cheaper" to do.

However, there are some strong arguments for DVA calculations to be included in the "cost" of a deal to a trading desk. The main ones are

- DVA is needed to arrive at a mid-market value of the deal from both counterparties' point of view (although this must be tempered by the realization that the DVA one counterparty calculates is probably not exactly the same as the CVA calculated by the other)
- In one way, DVA has always been included when valuing transactions like bonds— lower credit issuers have to pay a higher credit spread when selling bonds (i.e., make them more valuable)
- Finally, in case of a default, a lower credit counterparty would repay only the recovery amount, which is lower for lower credits, therefore can be viewed as a benefit to the issuer

Bilateral valuation adjustment (BVA) is sometimes used to refer to CVA+DVA.

FVA – Funding Impact

Funding valuation adjustment (FVA) attempts to capture the cost or benefit to the funding situation, though this calculation tends to overlap with DVA and there is variability in its calculation method among different institutions. It is strongly dependent on documentation and is generally a function of the nature of the business relationship between the two counterparties. It may, in some cases, be thought of as the expected loss that the funding company would incur if the counterparty defaults.

Finally, collateral valuation adjustment (COLVA) attempts to calculate the impact of any posted collateral; this impact is sometimes included in the CVA/DVA calculation.

As these different adjustment quantities arose and were incorporated into valuation frameworks, the catch-all "acronym" which became used to refer to them as a group was XVA. The X, it must be supposed, just stands for "anything." For a useful discussion of the calculation methods behind the XVA suite, see [3], [4] and [8].

How XVA Costs Could Affect the Cross-Currency Basis

All of these various costs mean that some deals, with some counterparties, are more expensive to do than they used to be. Of particular interest are cross currency swaps. We also examined the post-crisis dislocations in the xccy basis in a previous article [2]. Due to their large notional exchange at expiration, they tend to have high risk and therefore XVA costs. However, these are the exact trades that would be used to quickly take advantage of and monetize the arbitrage which is the cross-currency basis. While there are many other factors driving its generation, the XVA costs are likely to be a large part of the reason it persists in the market.

Below we show the 5y cross-currency basis for EURUSD (Figure 3) and USDJPY (Figure 4). Recall that in the days before the crisis when there was only one valuation curve and no XVA, this would have been seen as a pure arbitrage, to be quickly traded on. At current levels there are about 30 basis points per year available for the 10y trade—something substantial must be in the way of doing these deals.



Figure 3: Cross Currency Basis for EURUSD, 5y xccy basis, bp
Source: Bloomberg, Commerzbank Research

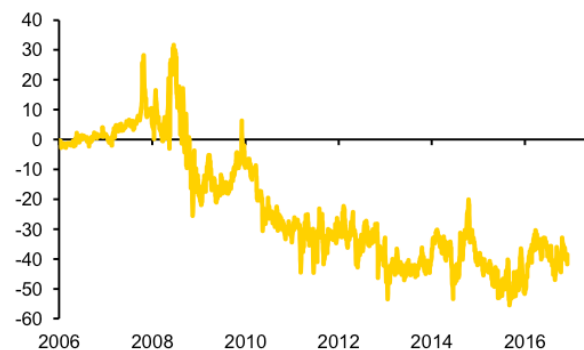


Figure 4: Cross Currency Basis for USDJPY, 5y xccy basis, bp
Source: Bloomberg, Commerzbank Research

Sample XVA Calculation Using Market Standard Calculation Approach

Below, we give a set of sample calculations for the cost of doing EURUSD cross-currency deals from the point of view of a standard market maker, taken from November 20, 2017 (Figure 5). The calculations are done assuming a “standard” counterparty of A (collateralized) BBB (collateralized) and BBB (uncollateralized) credit quality, with no particular degree of offset to other parts of the trading book. The costs are all annualized, in basis points. Note that the total deal cost is calculated as $\max(A, B+C) + D + E$, where A=Net CVA, B = Rating CVA, C = Cost of Capital, D = FVA, E = EU Bank Levy.

EUR USD x ccy XVA Charges	A(c) 10 y	A(c) 5y	A(c) 2y	BBB(c) 10y	BBB(c) 5y	BBB(c) 2y	BBB(u) 10y	BBB(u) 5y	BBB(u) 2y
Net CVA	0.4	0.2	0.1	1.3	1.3	0.9	17.0	6.6	1.1
Rating CVA	0.0	0.0	0.0	0.3	0.3	0.3	3.1	2.0	1.1
FVA	0.0	0.0	0.0	0.0	0.1	0.1	4.1	2.4	1.1
Cost of Capital	1.2	1.0	0.8	1.2	1.6	2.0	7.8	6.2	3.3
EU Bank Levy	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Total Deal Cost	1.3	1.1	0.8	1.5	1.9	2.5	21.1	10.7	5.5

Figure 5: Sample XVA calculations, data from November 20, 2017, for EUR notional deals, in bp annually
Source: Bloomberg, Commerzbank Research

What can we take from this table?

- CVA is higher for longer term deals
- CVA and FVA are higher for lower credit counterparties
- Collateral makes a large difference—total cost of uncollateralized deals is many times that of the same deal with posted collateral.

Take the 10y xccy swap as a benchmark. The table shows that the XVA cost of doing this deal with an AA, BBB(c) or BBB(c) counterparty would be 1.3, 1.5 or 21 bp. On that day (February 20, 2017), the EURUSD 10y basis swap traded at -38 bp. Therefore, this would appear to be a great deal. Even most conservatively, there would have been about 20 bp of profit to be made—and it is likely that our counterparties to this trade would be better credits than BBB, and that we would use collateral, so 30 bp is a more realistic figure.

This seems odd. Much has been made of the impact of regulatory capital and XVA on the cross-currency basis. But our own fairly conservative calculations indicate that these charges are not nearly large enough to cause the substantial basis we see in the market. We are not alone in our calculations of these costs—in [9], page 41, we see that the European Banking Authority has made similar estimates of CVA and regulatory costs.

Can we gain an indication of whether November 20, 2017, is an outlier? Although there is nothing very precise available, we can “scale” the CVA part of the trade costs, assuming that the other costs stay approximately constant.

A reasonable index to use when scaling CVA might be the Markit ITraxx Europe Senior Financial Index (SNRFIN 5Y on Bloomberg), which comprises 30 equally weighted CDS spreads on investment grade European financial entities. If we look back at all the equations for the CVA calculations, it’s clear that it should roughly scale with CDS spreads in all cases.

Therefore, we take the value of this index on November 20, and scale other CVA values in the time series by the ratio of the index value on that date to the value on other dates. We come up with the following chart (Figure 6), which perhaps raises more questions than it answers. We have used the BBB uncollateralized credit 10-y CVA charge as a benchmark.



Figure 6: XVA and capital charges don’t seem to justify xccy basis. 10y BBB xccy basis and uncollateralized trade cost, in bp. xccy basis is plotted as positive number, though usually it would be negative.

Source: Bloomberg, Commerzbank Research

Prior to 2014, we could have made a case that XVA charges and the xccy basis were strongly related, and that the basis was to some extent limited by the charges. We would expect the conservative uncollateralized BBB costs to provide a safe upper bound, which does indeed seem to be the case. The two were highly correlated and the basis did not seem to move too far away. But since then, post-2014, this useful relationship has broken down and the xccy basis is just running away, while the XVA costs are low and fairly stable.

The timing of this change makes the ECB QE program likely to be significant. Since late August 2014, market expectations about the ECB's QE program have been building and in January 2015, Mario Draghi, president of the ECB, announced the expanded asset purchase program, which has continued ever since. This has introduced a relative scarcity of euro denominated assets with the ECB crowding out existing investors while the Fed moved into the opposite direction with its balance sheet reduction since September. Coupled with higher USD demand after the Trump election, this has probably caused the basis to open up regardless of deal costs. But, it reiterates the problem of why it is not arbitrated away.

Funding Constraints

To finally understand what stops market participants from taking advantage of the cross-currency basis, we turned to the trading desk and the mechanics of doing such a deal. Assume that a rookie trader decides that they are going to trade the xccy basis and make some money on it.

The following data is taken from trading screens on July 6, 2017, for deals with start date July 10, 2017, end date July 10, 2018 (interest rates are 1y IRS/3 M).

EUR interest rate	-0.30%
USD interest rate	1.48%
Spot FX rate	1.1423
Market FX Forward Rate	1.1660 (forward points are 237)
Implied FX Forward	1.1626 (implied from interest rates)

The implied forward is calculated using the expression

$$\frac{FX2}{FX1} = \frac{1 + r_2}{1 + r_1}$$

where

FX1= Spot FX rate

FX2 = 1y implied forward FX rate

r2 = USD 1y interest rate

r1 = EUR 1y interest rate

The above expression is famously “broken” by the existence of the xccy basis—prior to 2008, the implied forward rate is always very close to the actual market rate. The xccy basis here is often quoted as a spread to the implied forward, so in this case it would be 33 ‘forward pips.’ This translates back to an interest rate spread of -28 basis points—so one could also imply a USD 1y interest rate of 1.48%+0.28%

= 1.76%. The negative sign attached to the basis is due to the fact that the xccy basis is quoted as a spread to the non-USD interest rate. Therefore, if one applied the “correction” to the EUR interest rate it would come out as -0.58%.

What does the hypothetical rookie trader think? Perhaps, they are thinking that the difference between the interest rate derived FX forward and the actual traded forward is 33 forward pips, or -28 basis points. So, they will choose to do the two interest rate contracts, and the actual traded forward, to lock in the basis.

But now reality begins to bite. Those interest rates above are not depo rates. They are 1y swap rates versus 3m LIBOR. The USD depo rate is about 28 basis points higher, at 1.77%. This is one way of appreciating that the basis (expressed like this) is due to credit. With a swap, the principal is never at risk, only the differences between fixed and floating rates. With a deposit, the principal is at risk, and the rate is higher. So, the hopeful trader cannot borrow and lend at these rates at all. This is part of the “multiplication of curves” which we mentioned right at the start—the yield curve for swaps (less credit risk) and for deposits (more credit risk) are not the same, whereas before the crisis they were almost the same².

Perhaps the trader decided to do the two interest rate components of this set of deals with two fixed-floating IRS. We can now access the above interest rates.

But, because the trader is not doing the deposit contracts now, they will have to fund the cashflows, so will need to hold the principal amount on the books until the deal expiration. This needs to be funded. That means accessing the deposit market again—and the deposit rates include the basis. There is no escape, the trader will have to borrow at an effective rate close to that available in the deposit market. Even though a trading desk usually funds by rolling overnight or short term, the implied forward cost of the accumulated overnight funding will still add up to not the 1y swap rate, but to something like the 1y depo rate³. So, though there is uncertainty as the overnight rate may of course change during the course of the deal, it is not possible to lock in a profit, and the implied P/L is flat.

Before the crisis, the trader would have funded at LIBOR, and the depo and swap rates would have been very little different, so if a basis had existed, it would have been a good opportunity for arbitrage.

On the next page we show the 1y US swap rate and deposit rate since 2000 in the left-hand graph (Figure 7), and the spread between them together with the xccy basis on the right (Figure 8). It’s clear they are closely connected, though not identical as the basis also responds to pressure from the EUR side.

2 Another reason for the discrepancy between swap and deposit rates is the inconsistency of the panel-based LIBOR fixings that are derived from “expert judgement” with no real interbank volumes taking place especially for longer terms (also see our Rates Radar: Fixing the fixings, 23 August 2017).

3 Why can the trading desk not fund cheaply at the OIS rates? The answer is that in most desks, they can get funding from the bank treasury but this will have a spread added on reflecting the treasury’s current position and risk perception. The resulting funding available to the desk is often close to (or sometimes worse than) levels available in the market.

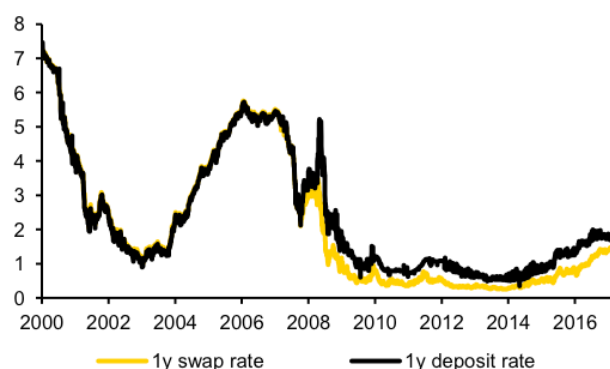


Figure 7: 1y USD Swap Rate and Deposit Rate, in %
Source: Bloomberg, Commerzbank Research

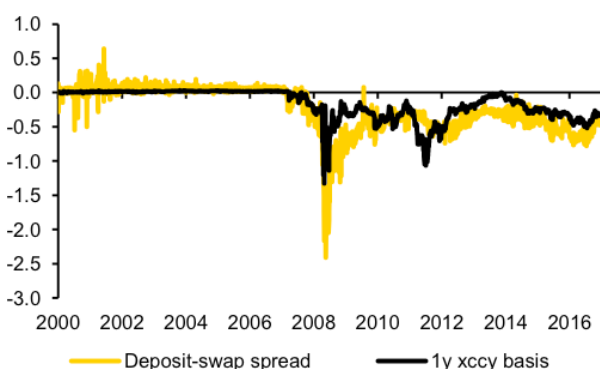


Figure 8: 1y USD Swap-Deposit Spread, with 1y Xccy EURUSD Basis, in %, Spread is Swap - Deposit
Source: Bloomberg, Commerzbank Research

Now, the trader abandons plans to make money on the basis, is there anyone who can do the trade? Yes. Under some circumstances, bank treasuries can borrow at close to the swap rates from the central banks. This is one way that central banks inject liquidity. So, these desks can make a profit from this situation. Similarly, some high-quality credits can do it, or come close.

Our previous paper shows in detail how some entities (for example, large investors or insurance companies) can at times lock in at least part of the basis when hedging fixed income investments.⁴ There is an excellent analysis in [1], showing that the very top-tier banks in some markets have, at some points in the past, been able to fund at levels which allow them to treat the xccy basis as at least a partial arbitrage. The current situation is such that the arbitrage may still be available, though it is narrower than it has been at other times. Therefore, there is pressure on the basis not to widen too far, but not the kind of old-style, risk-free arbitrage pressure.

Would it ever make sense for the trader to do this trade? Yes indeed. If the basis widened too far they might put on the trade believing that the actual funding (as opposed to the implied) would not stay at these elevated levels. But it would be a trade with risk attached, and not a traditional arbitrage.

Therefore, pressure on the basis not to widen has no “hard” level at which it comes in. Those who can make risk-free money on the basis do so only because they can access cheap USD funding. Those who make money on the basis with a risk-based trade do so because they correctly judge when it is too extended. The basis is a natural consequence of greater sensitivity to credit risk, and demand for and access to USD. For a useful discussion of forces operating on the basis, see [1] and [7], and for an excellent explanation of multiple curve discounting, see Hull and White 2014, [6].

Trading the xccy Basis

With a last look at the trader, let’s see when the risk-based trade would have been profitable over time. If the trader puts on the trade assuming that the basis is too large and will close up, then there’s an easy way to approximate the P/L that the trade would make—look at the average levels of the basis over the

4 For an in-depth discussion see Rates Radar “More interest in cross-currency basis swaps,” March 2018.

next year. Below is a chart of the xccy basis versus its average level for the following year, and the difference between them (Figure 9). Note that this is only an indication of the profit of the trade as strictly we ought to look at trades whose tenor shortens towards the end of the deal—but it will be good enough to give us an indication.

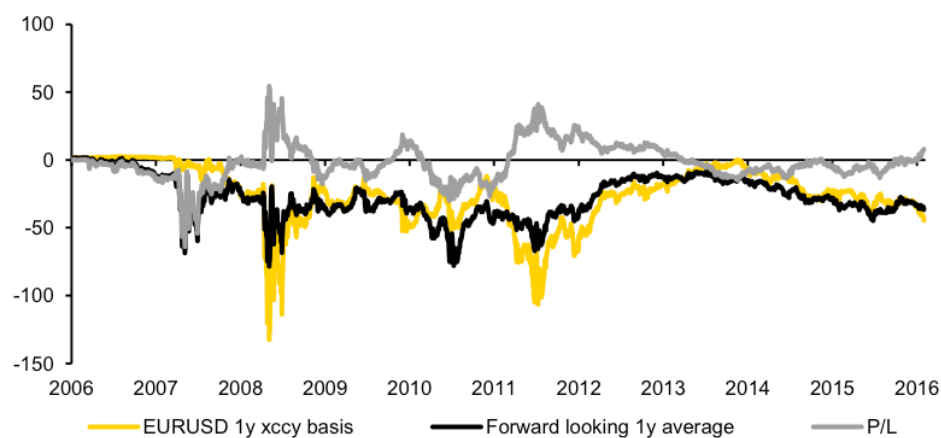


Figure 9: Indication of Profitability of xccy basis Trade, 1y Tenor, All in bp
Source: Bloomberg, Commerzbank Research

Positioning for the transient nature of large basis spikes has been generally beneficial. Below, we also tabulate the average profit per trade if it is entered at different levels (Figure 10).

Level where trade is entered (bp)	-10	-20	-30	-40	-50	-60	-70	-80
Average profit per deal in bp	0.97	2.20	6.51	14.54	22.48	26.40	30.21	35.00
Number of trades	1959	1612	884	491	289	182	106	56

Figure 10
Source: Bloomberg, Commerzbank Research

Though the trade has been overall profitable, this has been less apparent in recent years. But its substantial profitability at entry levels of 40 or greater mean that we might expect trading pressure to close up the basis being strongly felt at that point.

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Professor Jessica James is an independent Rates Strategist at Commerzbank AG in London. Commerzbank AG, London Branch is authorized by Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin) and the European Central Bank and is subject to limited regulation by the Financial Conduct Authority and Prudential Regulation Authority. This paper contains material first published as an article in Commerzbank's Rates Radar on November 22, 2017.



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08

THE BACK PAGE

ZIAUDDIN ISHAQ, GLOBAL SOLUTIONS LEAD TREASURY,
ORACLE FSGBU

RISE OF THE MACHINES: SOLVING TOMORROW'S GLOBAL SOCIAL CHALLENGES?

In 2003, Arnold Schwarzenegger, as the Terminator, saved John Connor and Kate Brewster from the grips of the next-generation Terminator, and got them to the secure nuclear fall-out command center as Skynet launched Armageddon. Vintage Schwarzenegger, but what's the big deal?

That film and many that followed depict scenarios where machines and the ever-powerful presence of technology take over aspects of our lives. The last decade has seen major technological advancements, some of which are deemed essential if daily life is to function. Take the humble mobile phone, a mature technology by today's standards, how long could one survive without it? What if social media platforms did not exist? Would we still have the skills to interact, showing and sharing our emotions in full view of others, rather than hiding behind a shiny screen?

On the flip side, the impact of continued technological innovation has meant our aspirations and dreams are much more likely to be realized. For example, space travel—soon you'll be able to book a trip to orbit the earth and beyond in the comfort of a luxurious space ship. Granted, at the outset, space tourism will be accessible only to a privileged few, but rest assured it won't be long before it reaches a wider market.

Closer to home, many of us manage our daily household chores with the aid of artificial intelligence (AI) systems, which are self-learning and consider a person's emotions that underpin an instruction or question. Will AI become smart enough that it could offer emotional or counseling support, who knows?

In the corporate sector, strategies are being influenced by a raft of data science technologies, be it machine learning, block chains, AI, big data, robotics, or analytics. Gaining a competitive edge, increasing profitability, improving customer retention, and identifying opportunities are some of traditional challenges being tackled with a different strategic lens.

In the U.K. National Health Service (NHS), data scientists and doctors are developing machine-learning-based models that seek to improve the predictability and diagnosis of serious medical conditions, potentially leading to a reduction in misdiagnosis and costs. It'll be interesting to see if, and how far, the medical community incorporates this technology into front-line treatment. In the fight against crime, similar technologies have been piloted by police forces¹ to help detect and prevent crime. Maybe the police will be able to predict a crime and stop it before it happens, something akin to the "Pre-Crime" program in the film *Minority Report*?

In the 1980s, one could reasonably expect that, if we made it to 2020, the great global social problems we saw back then would be eradicated by now. So, what has the reality been? Our awareness of the problems are much greater than ever, but has technological innovation played an active supporting role in helping to solve these social ills? We've made some notable progress, but more work needs to be done to ease the burdens of those millions of people who are still starving, homeless, enslaved, and who don't have access to basic education or medicine. Technology as a transmission mechanism can play a vital role in helping to alleviate this suffering, and I'm hopeful that with our collective conviction, technological advancements made tomorrow will eventually bear great benefits to those who need it most.

¹ <https://www.forbes.com/sites/bernardmarr/2017/09/19/how-robots-iot-and-artificial-intelligence-are-transforming-the-police/#67aa6cb35d61>

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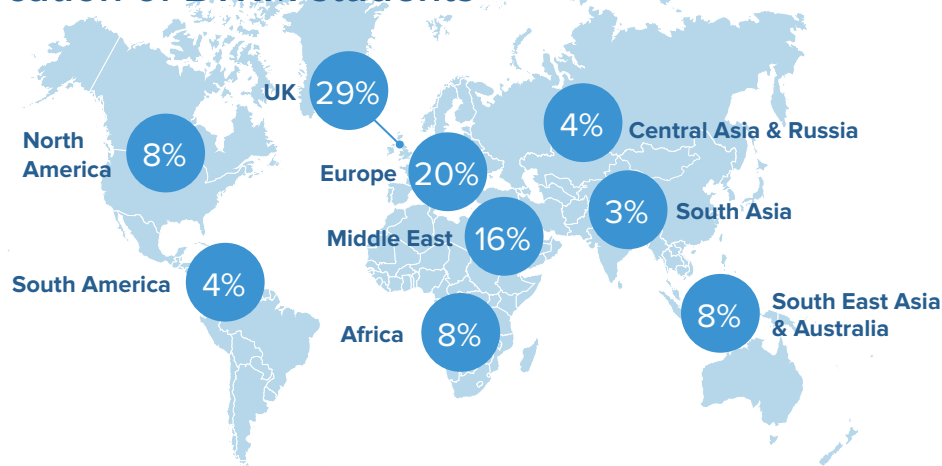
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