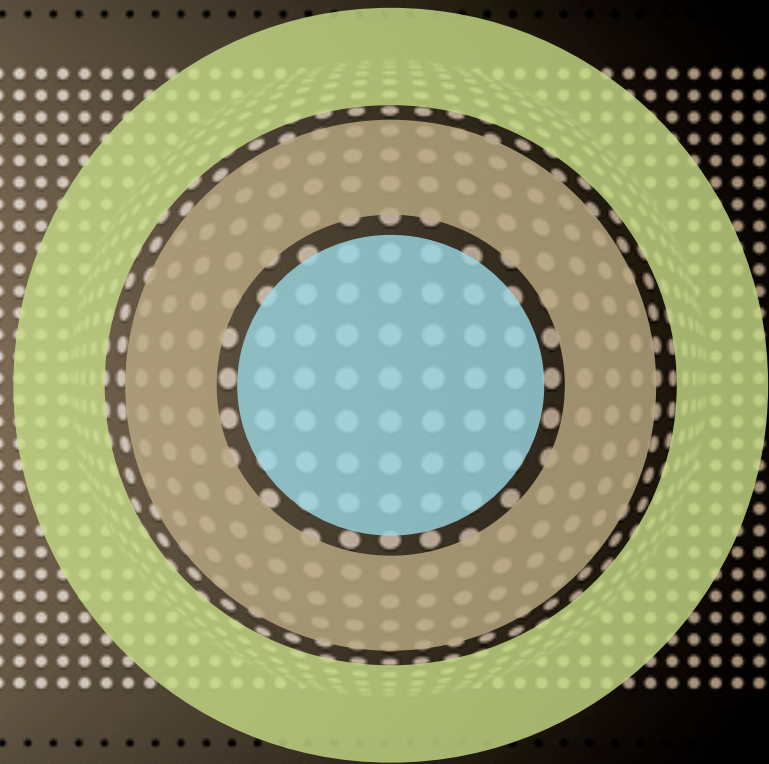


Derivatives valuation in practice

Market drivers for multi-curve pricing and OIS discounting

Dr. Douglas Long, EVP Product Strategy



“Even as the market settles into a new norm of tighter spreads, the consequences of these changes are subtle and involved - and in some cases more material now than even at the peak of the crisis”

Paper 1

PRINCIPIA

Setting the scene

This series of practical papers will examine the fundamental shift in derivatives valuation techniques and demonstrate how new market practices materially impact cashflow projections and discounting when pricing derivatives.

The bursting of the credit bubble in 2007, followed by the collapse of Lehman Brothers and Bear Stearns in September 2008, triggered a paradigm shift in the way the capital markets priced derivative transactions. Single currency basis spreads widened dramatically, reflecting an increased perception of credit and liquidity risk in the market.

It became clear that using a single LIBOR curve for forward rates, and as the 'risk free' proxy to discount cashflows, was no longer appropriate. Today, precision in independent valuation demands the use of multiple curves to:

- Project accurate forward rates that incorporate tenor spread adjustments;
- Reflect the shift from deposit-based to overnight-based funding through the adoption of OIS (Overnight Index Swap) curves for the discounting of derivatives and future cashflows.

In this introductory article, we show why multi-curve methodologies and OIS discounting are now deemed market best practice.

The papers that follow will provide worked through examples that demonstrate how material a failure to address key changes in forward curve construction, discounting and interest rate model calibration can be on mark-to-market valuations and hedge effectiveness calculations. These case studies will examine the impact of these changes in the pre-crisis, peak-crisis and post-crisis environment.

LIBOR Reform

On 1 Feb 2013, The British Bankers' Association (BBA) released its latest update to LIBOR reform. By the beginning of June 2013 the number of LIBOR rates published daily will be reduced from over 150 to 37. This is a direct response to the Wheatley Review and ongoing market consultation. The move aims to restore LIBOR's credibility by focusing on the most liquid currencies and tenors to ensure the provision of reliable LIBOR rate benchmarks that can be corroborated.

The BBA will cease publication of LIBOR for NZD, DKK, SEK, AUD and CAD completely. Additionally, for the remaining LIBOR currencies (CHF, EUR, GBP, JPY and USD), the following tenors will be removed: 2W, 4M, 5M, 7M, 8M, 9M, 10M and 11M.

The inadequacies of the single curve environment

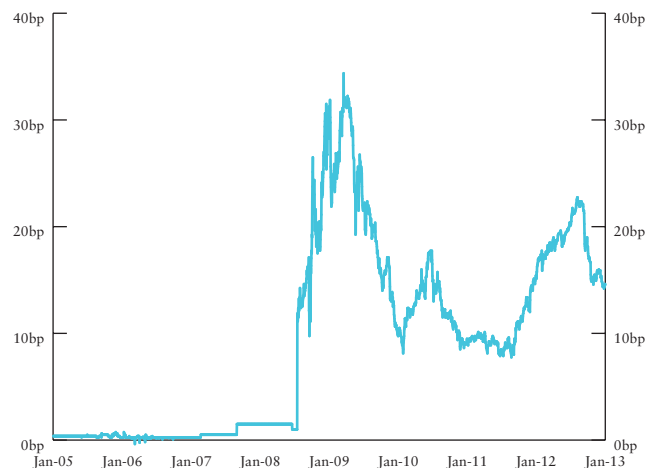
Pre-crisis, forward rates of different tenors were commonly determined using a single benchmark LIBOR curve.

Consider the example of a 2Y USD tenor swap receiving 6M LIBOR every 6 months, against paying 3M LIBOR every 3 months.

Pre-crisis, the premium (the 3M-6M tenor basis spread) you had to pay for receiving 6M rather than 3M was negligible (less than 0.5bp). This lack of market bias between lower or higher rate tenors meant that using a single LIBOR curve to determine forward rates was fit for purpose.

During the crisis however, basis spreads widened dramatically, from less than 0.5bps to over 30bps. Figure 1 shows the 2Y tenor basis spread between trading USD 3M against 6M LIBOR.

Figure 1. USD 2Y Tenor Basis Swap Spread 3M vs 6M



Source: Tullett Prebon, Principia SFP

The widening of spreads between receiving or paying interest on different tenors demonstrated a growing market bias towards shorter tenors and a desire to receive more regular interest payments. The additional risk premium required for higher rate tenors reflects the increased liquidity and credit risk inherent in longer LIBOR rates and risk sensitivity in the interbank money market.

This market sentiment is not picked up in a single curve environment where forward rates are derived from a base LIBOR curve. Projecting cashflows for different tenors requires different curves. This new, multi-curve environment, necessitates the use of tenor basis curves for (at least) 1M, 3M, 6M and 12M LIBOR when projecting LIBOR forward rates.

Pre-crisis, only those with the systems in place to capture multi-curve tenor spreads were capable of incorporating these subtleties into their mark-to-market valuations and risk assessments. Today, it is fundamental to pricing and projecting derivative cashflows accurately.

The impact of new world risks on curve construction & derivatives valuations

Discounting cashflows in a multi-curve world

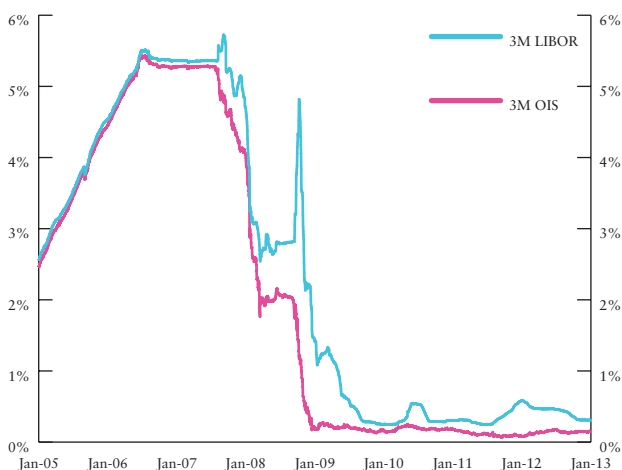
The debate about what constituted the ‘risk free’ curve also came to the fore during the crisis as the market shifted from deposit (LIBOR based) to overnight (OIS-based) funding. At the same time there was a move to central clearing and increased use of collateralization agreements between derivative counterparties (usually through Credit Support Annex (CSA) agreements).

In the pre-crisis, single curve world, LIBOR was also widely accepted as the proxy ‘risk free’ rate for discounting derivatives. As the crisis hit, interbank offering rates started to price-in the perceived credit and liquidity risk of financial institutions, blowing LIBOR rates completely out-of-line with comparable OIS rates. At this point it was clear that LIBOR could no longer be viewed as a risk free curve for the discounting of future cashflows.

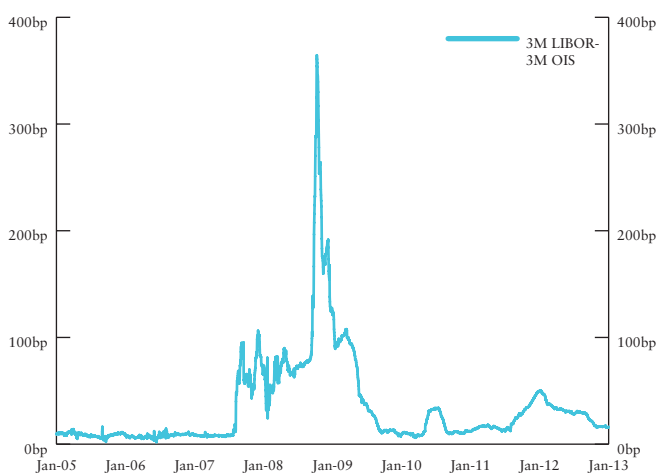
The daily tenor nature of Overnight Index Swap rates minimizes the effect of credit and liquidity risk. Additionally, OIS rates were increasingly adopted as the funding rate for collateralized derivatives (under the CSA) and centrally cleared transactions.

Figure 2. 3M OIS & 3M LIBOR Comparisons

USD 3M OIS & 3M LIBOR



Spreads between USD 3M OIS & 3M LIBOR



Source: Bloomberg, Principia SFP

As such, the OIS curve is now considered the best proxy available to the market for a ‘risk free’ rate. It is now generally accepted as the appropriate curve for discounting cashflows on collateralized contracts.

In Figure 2, we can see that pre-crisis there was little to no difference between 3M LIBOR and 3M OIS. Divergence between these rates in August 2007 was one of the first indicators of the credit crisis. The spread then peaked to over 300bp when Lehman filed for bankruptcy protection.

USD 3M LIBOR

The daily averaged interbank offering rate for 3M unsecured lending in USD.

USD 3M OIS

The fixed rate paid in 3M vs. daily compounded Fed Funds rate paid in 3M.

New world, new pricing methods

Forecasting cashflows of different tenor rates and building discounting curves based on the assumption of a single LIBOR curve is no longer sufficient.

The market’s view of interbank liquidity and credit risk, as well as the move to central clearing means that it is vital for derivatives users to adopt the new multi-curve valuation environment. Valuation practices must adapt in the first instance by implementing systems that fully support:

- The implementation of multiple different tenor curves for use in the accurate projection of forward rate curves. This enables portfolio and risk managers to account for the tenor basis risk which is a material feature of the new environment;
- The implementation of OIS curves to substitute LIBOR as the ‘risk free’ curve when discounting collateralized derivatives.

This is just the tip of the iceberg. The knock-on effects of introducing OIS discounting into multi-curve construction and valuations are numerous and important to understand. For example, it changes the constructed LIBOR (and associated tenor) forward curves, redefines our interpretations of market volatility and increases ineffectiveness in hedging relationships. These second order impacts will be demonstrated in the papers that follow, along with guidance on how to address these immediate and downstream challenges.

At the crisis’ peak, spreads spiked but fundamentally spreads have not reverted to pre-crisis levels where their effects were negligible. The impact of adopting multiple-tenor curves and switching to OIS discounting has a material impact on pricing and should be regarded as highly relevant for any treasury operation today. This is especially the case in today’s low interest rate environment.

The shift is not limited to valuations. Pre-crisis, interest rate risk management was driven by looking at the impact of moves in the LIBOR curve. With the adoption of multiple curves, risk management is more complex, with additional risks associated with moves in tenor spreads, as well as LIBOR-OIS spreads.

OIS discounting in practice

The case studies

In the series of papers that follow, we will examine the practical valuation considerations and impacts of this move to a multi-curve environment with OIS discounting.

We focus primarily on the USD market and its associated OIS (Fed Funds) curve for clarity. Although US adoption of OIS discounting remains less than in Europe so far, this provides an excellent example of the challenges market participants face in this time of transition. The techniques and analysis within this series can just as easily be applied to other countries and currencies that have adopted, or will adopt OIS discounting.

We will refer back to three points in time: Pre-crisis (Jun 2006), the crisis' peak (Oct 2008) and post-crisis (Jan 2013). In Figure 3 you can see the base LIBOR and OIS spot rate curves and in Figure 4, OIS-LIBOR spreads under each scenario.

Even as the market settles into a new norm of tighter spreads, the consequences of these changes are subtle and involved and in some cases, more material now than even at the peak of the crisis.

Paper 1a (visit: www.ppllc.com/Principia_Derivatives_Valuation.htm) includes supplementary data and analysis relating to the key market drivers behind the switch to OIS discounting.

A practical solution

Principia SFP provides clients with a multi-curve valuation and risk management environment to forecast using appropriate tenor LIBOR forward curves and to select the relevant discounting curves for accurate, independent valuations.

Beyond valuations, the system is an end-to-end operational platform for derivatives portfolios allowing users to perform detailed impact analysis, risk management and the full operational implementation of OIS discounting into daily mark-to-market and hedge effectiveness processes. Principia also provides and automates delivery of extensive daily market data and curves as standard, for precise valuations, proven to closely match the interdealer market.

In a world moving towards central clearing, Principia users have the tools to implement industry best practices in the analysis, trading and risk management of vanilla and complex derivatives. With this single coherent platform, clients can streamline derivatives operations from trade capture and risk, through to accounting and central clearing.

Figure 3. LIBOR & OIS Spot Rate Curves: Pre-, Peak-, Post-Crisis

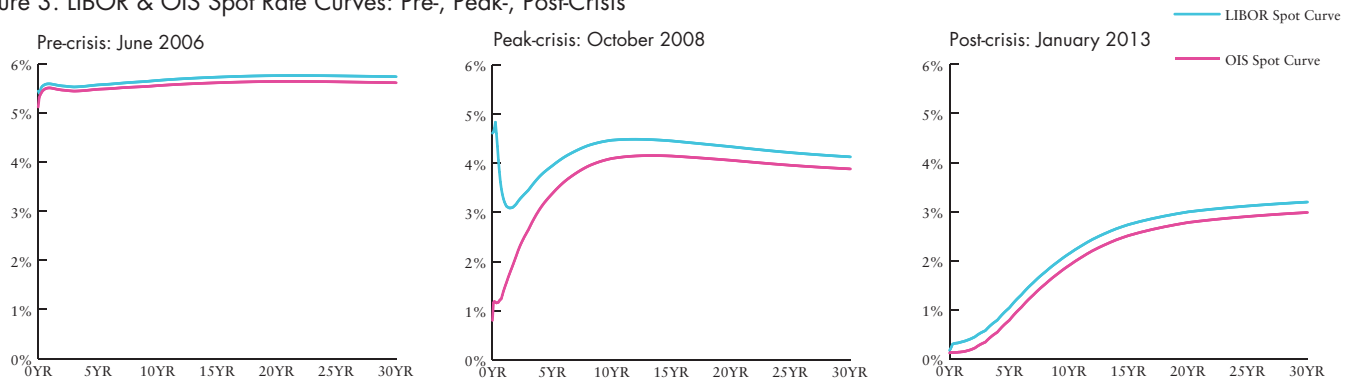
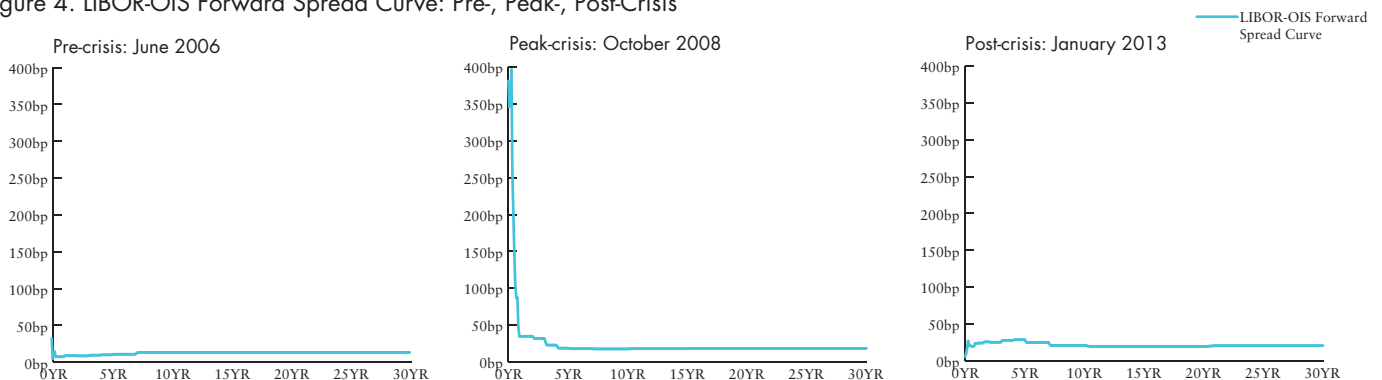


Figure 4. LIBOR-OIS Forward Spread Curve: Pre-, Peak-, Post-Crisis



Source: Tullet Prebon, Principia SFP

About Principia

Principia Partners LLC (Principia) provides a comprehensive single platform solution for the end-to-end management of structured finance and derivative investments. Global financial institutions and independent asset managers have used the award winning Principia Structured Finance Platform since 1995 to unify investment analysis, portfolio management, risk surveillance, accounting and operational control across the breadth of structured credit assets, fixed income investments and complex derivatives.

Dedicated support and continued development of functionality for credit and fixed income instruments is accompanied by a proven and fully integrated derivative valuation framework. This overall credit investment and market risk solution delivers the robust backbone necessary for deeper investment analysis, proactive risk surveillance and operational control across the credit investment and derivatives business.

Principia is based in New York, with an office in London and a technology center in Conshohocken, Pennsylvania.

For more information please visit:
www.ppllc.com

The full whitepaper series will be published online at:
www.ppllc.com/Principia_Derivatives_Valuation.htm

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