

Collateral Discounting: Rethinking the Interest Rate Pricing Framework from its Basic Concepts

This article examines how a swap portfolio's value differs under the single and multi-curve approaches at four different snapshots in time, including pre-crisis, at the height of the crisis, post-crisis and today. The case studies in this article also highlight risk sensitivities under the two approaches and how swap moneyiness and maturity factor into the calculations over a period of time from 2006-2012.

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With the 2008 financial crisis a catalyst for significant change, market practitioners witnessed the tremendous increase in basis swap spreads, implying a divergence from implied rates and traded rates in interest rate markets. Collateral disputes rose dramatically as counterparties began discounting at the overnight rates dictated by the credit support annexes: the world had forever changed.

As a result, many financial institutions are currently in the process of migrating to new market standards, but questions remain as to the potential impact on existing portfolios and how to effectively manage instruments with longer-dated maturities when spreads in Libor versus overnight indexed swap (OIS) rates begin to diverge.

Collateral discounting and the impact of standardisation in the market is adding a whole new level of complexity when it comes to derivative pricing and risk management. Market participants are seeking a deeper understanding when it comes to the potential consequences of moving to collateral discounting.

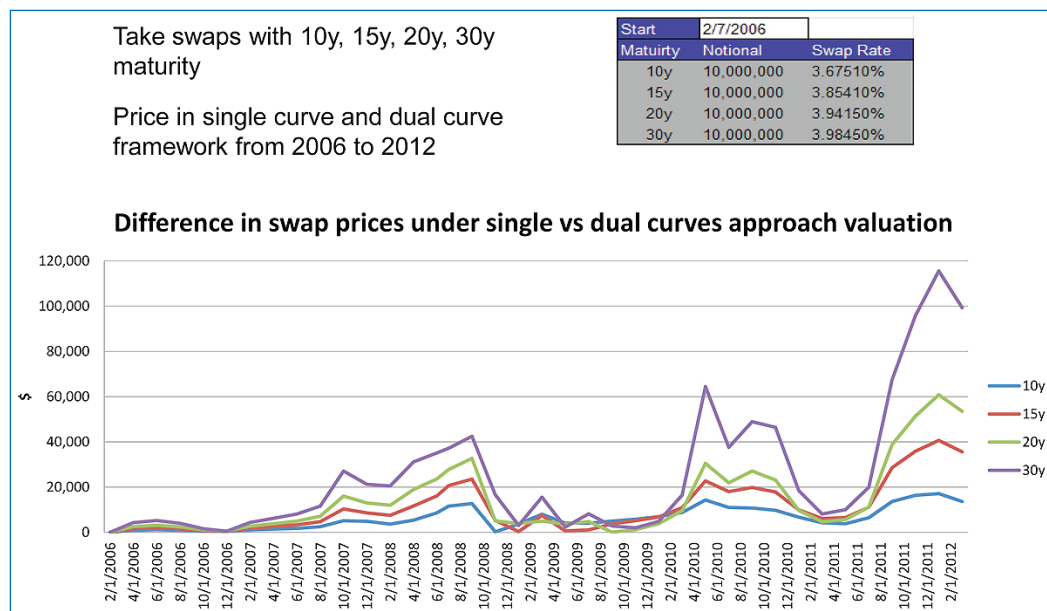
The case studies that follow clearly demonstrate the substantial divergence in single- and multi-curve pricing and risk calculation outcomes. We come to see that the entire interest rate pricing framework needs to be rethought and carefully reviewed from its basic concepts, from curve stripping and volatility surfaces to modelling and pricing, to calibration and risk management valuations.

The Evolution Towards the Multi-curve Approach

Currently, not all markets are created equal. Pricing and valuation via collateral discounting is not 'yet' a consistent market standard. Yet: a small word, that packs a powerful punch.

The swap market has already moved to the dual-curve approach, with the London Clearing House using OIS discounting for clearing swaps, and the International Swaps and Derivatives Association (ISDA) credit support annex (CSA) standardisation on the imminent horizon. Other markets, including swaptions, caps/floors, exotics and equities, are very much still evolving. Let's take a closer look at what all of this means for today's market participants, using the case study examples that follow.

Figure 1: Case Study 1 - Pricing Under Single Versus Dual Curves



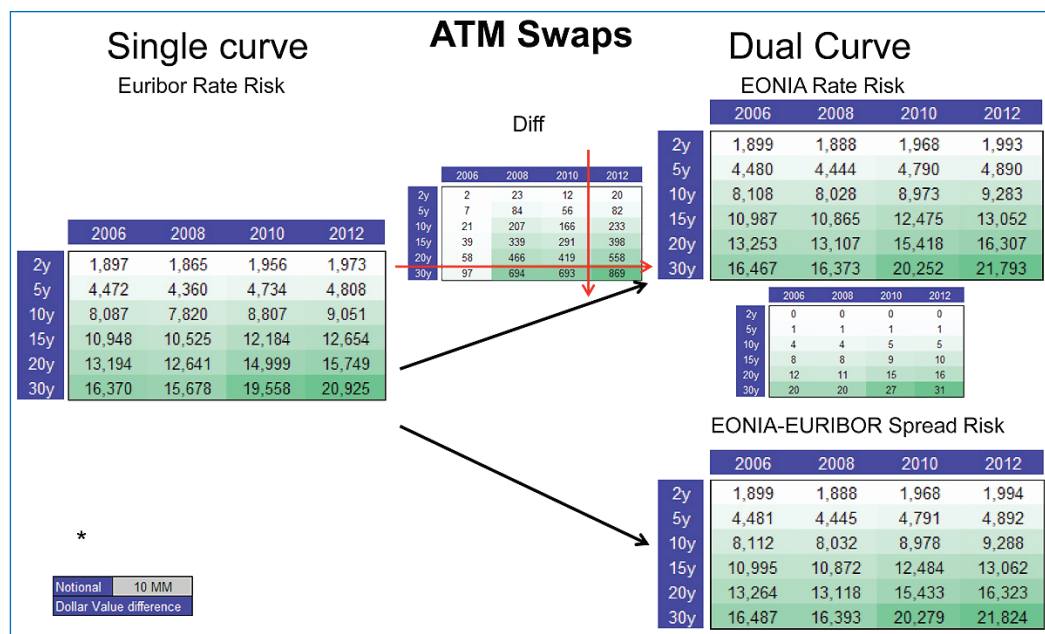
Source: Numerix

Here, we can clearly see that price difference is the greatest in the region of highest spreads, and most significant for longer maturity swaps. In fact, the further off the market the swap is, the bigger the difference. We can also deduce that receivers of fixed rates gain under OIS discounting, while payers lose.

Taking into account recent studies of the swap market moving towards the multi-curve approach, we come to the conclusion that swaps can be significantly mispriced under the single curve framework.

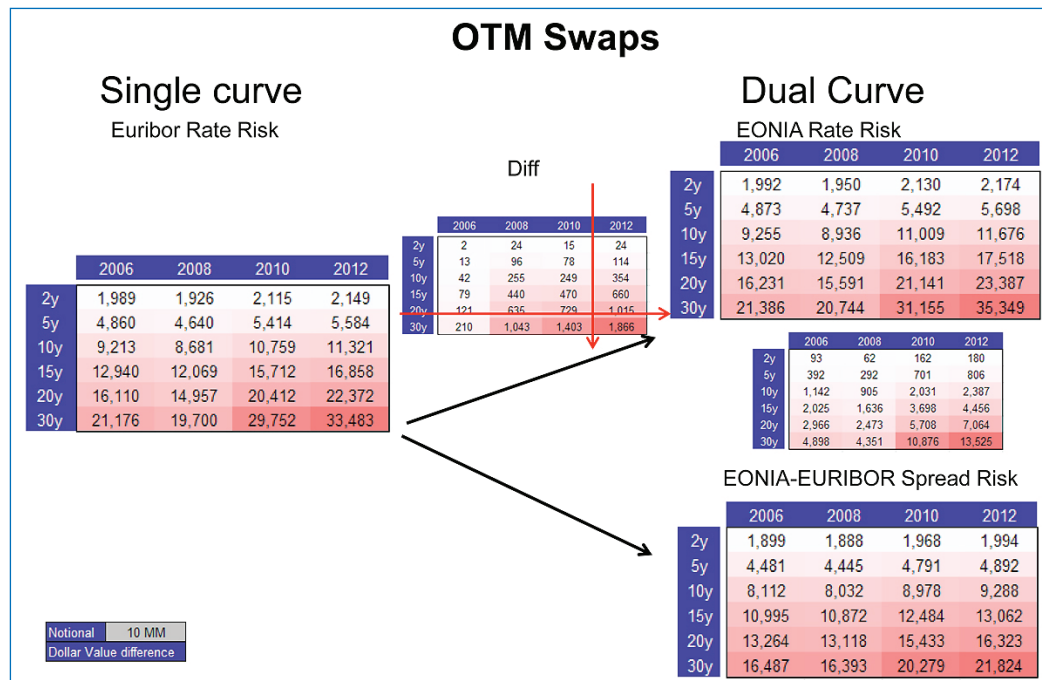
In the second case study analysis, where the numbers are US dollar values on notional of US\$10m, we can clearly observe that under the single curve approach, one does not account for OIS rate risk and spread risk separately. Neglecting these risks becomes crucial for off-market and aged swaps, as well as for long-dated swaps.

Figure 2: Case Study 2 - Risk Sensitivities: ATM Swaps Risks



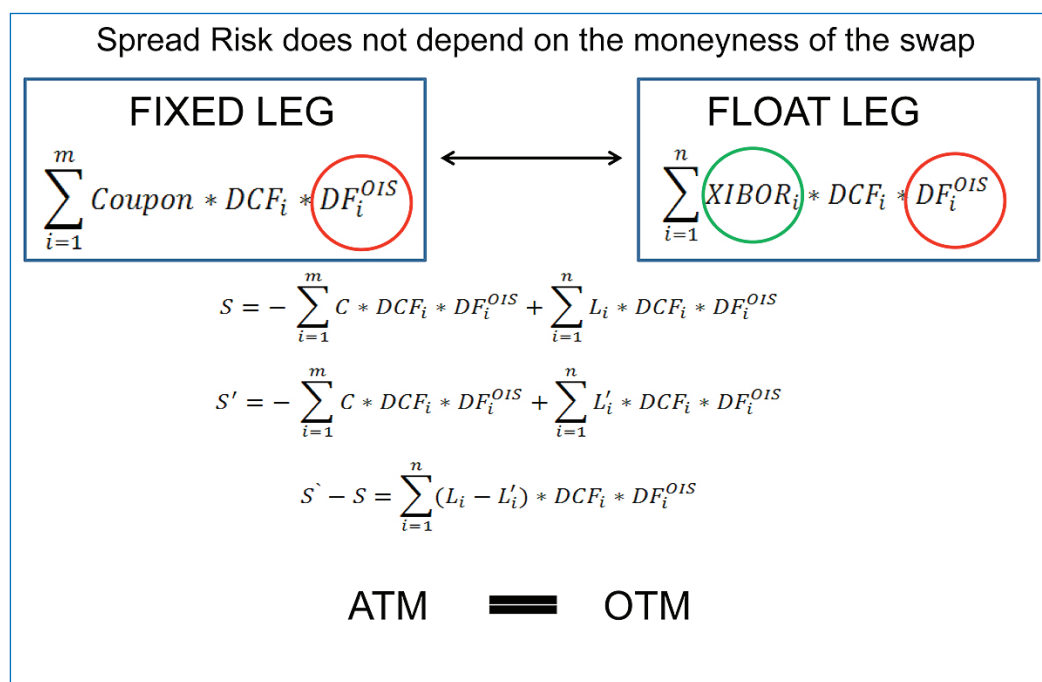
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Figure 3: OTM Swaps Risks



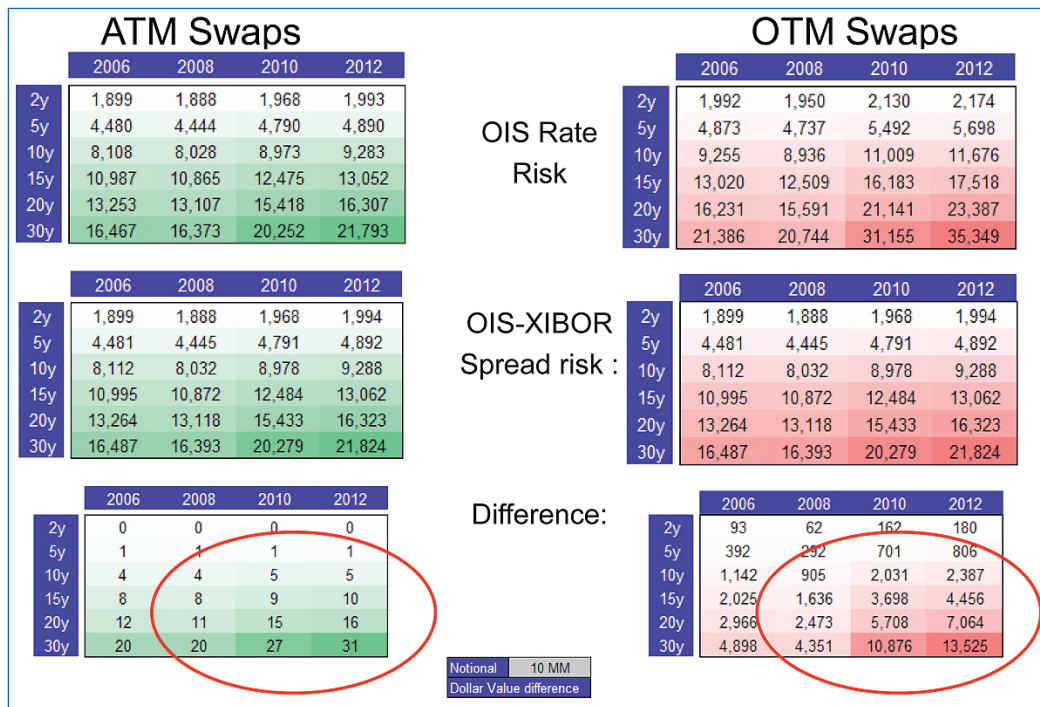
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Figure 4: Spread Risk Observation



Source: Numerix

Figure 5: ATM Versus OTM Swaps: Spread and OIS Rate Risks

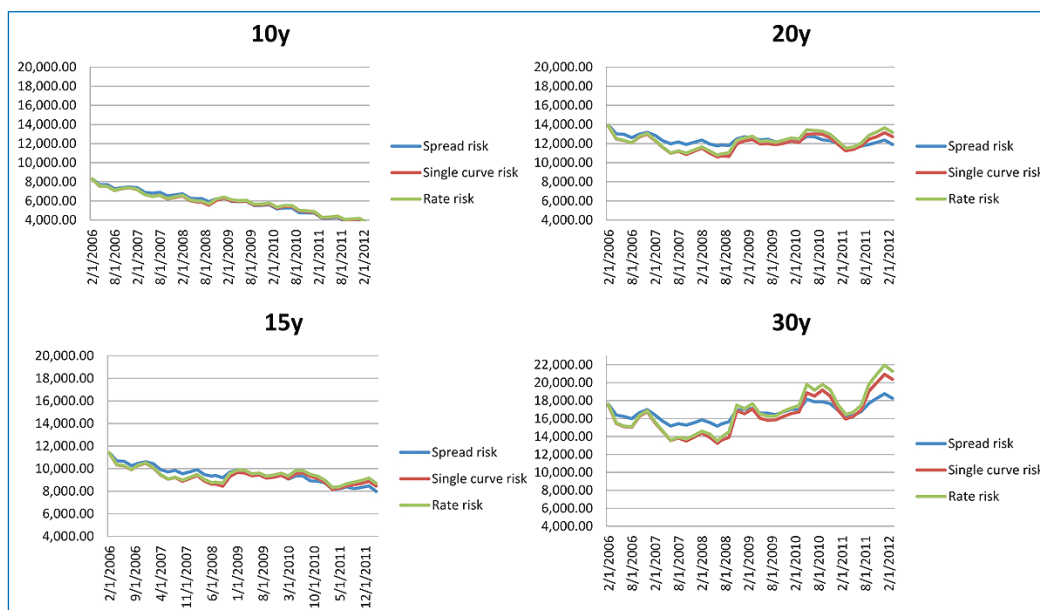


Source: Numerix

Given the above, we can also observe that spread and OIS rate risks are close for par swaps; however, spread and OIS rate risks become significantly different for out of the money (OTM) swaps (versus at the money (ATM) swaps). We see that under the single curve approach, one neglects the risk that actually exists, while under the dual-curve approach one can estimate these risks. Risk under the single curve approach is mispriced.

In the final case study presented in this article, we observe swaps with 10 year, 15 year, 20 year, and 30 year maturities and price them in the single curve and multi-curve frameworks (every two months from 2006 to 2012) to compute risk sensitivities.

Figure 6: Case 3 - Swaps Portfolio Risk 2006-2012



Source: Numerix

Case study 3 highlights the fact that the single curve approach is problematic because it fudges OIS and spread risks together. The difference in pricing and risk between the two approaches is most apparent for long dated swaps, seasoned swaps, and off-market swaps. We also observe that OIS rate risk and spread risk tend to diverge significantly for off-market swaps.

Conclusion

These case study examples in this article clearly demonstrate that the single curve and multi-curve approaches can diverge substantially in pricing and risk calculations. The most significant difference in pricing and risk between the two approaches is most apparent for long dated swaps, seasoned swaps, and off-market swaps. Moreover, as the case study unfolds, we come to see that the single curve approach essentially ignores collateral and spread risks together. The bottom line becomes clear: the mispricing of risk is significant when the spread increases.

Consistent valuation techniques are critical, throughout a firm and relative to the market, with front, middle and back office computational consistency a necessity. Without this consistency, market quotes and counterparty valuations will diverge, risk calculations will differ between departments, and correct hedging decisions will be compromised. Given the movement toward standardisation, the interest rate pricing framework needs to be carefully reviewed from its very foundation. Institutions that aren't pricing and valuing swaps in accordance with the direction in which the market is currently moving will indeed be ignoring significant risk.



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