Charting a Course for a Successful XVA Program

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XVAs are deeply engrained in the derivatives business today. Whether a global firm is quantifying them or not, XVAs are there. This white paper outlines market perspectives and best practices for navigating through an XVA implementation project. Author Satyam Kancharla explores the impact of XVA on different business functions, considers the balancing act of measuring, managing and optimizing XVA costs and explains modern XVA methodology approaches. With clear priorities of the various XVA participants defined, Satyam concludes with implementation best practices.

XVA, in the simplest terms, is about capturing the costs of running an OTC derivatives operation. Doing so, however, is far from simple. As valuation adjustments represent a real cost and are having increasingly onerous impacts on balance sheets, they must be factored in everywhere OTC derivative pricing and valuations live within an organization, and should not be limited to the XVA desk, risk management, or accounting operation.

In my previous whitepaper, “The Rise of XVA and How It Transformed an Entire Industry,” I examined the current state of XVA valuation adjustments and detailed how these adjustments continue to profoundly change trading behavior in the capital markets. We established the fundamentals of the XVA desk, the data challenges it presents, and why the successful management of XVAs requires the cooperation of separate business functions, such as front office, treasury, finance, compliance, and market and credit risk.

In this paper, I explore the XVA business process, consider the delicate balancing act of measuring, managing and optimizing XVA costs, and detail a modern XVA methodology approach. With clear priorities of the various XVA participants defined, we also address implementation best practices.

THE EVOLUTION OF XVA

The roots of XVAs, the ways they impact an institution’s business processes, and the methods needed for calculating XVAs have evolved over the last several years.

In the aftermath of the financial crisis, regulators and financial institutions realized that one area that needed special attention was counterparty credit risk for OTC trades (think Lehman Brothers, which had an estimated $35 trillion notional derivatives portfolio at the point of its bankruptcy). The absence of appropriate assessments of credit exposure and not paying much heed to default probabilities or correlations during systemic market shocks were the key causes of the financial crash of 2007/2008. One outcome of this event was the demand that all financial institutions improve their performance in terms of understanding, assessing and properly managing their counterparty risk as well as their own credit risk.

Derivatives trading post crisis is now much more complex as it requires explicit pricing. This is where XVAs come into play. Derivatives trading post crisis is now much more complex as it requires explicit pricing. This is where XVAs come into play. Today, it is mostly a standard practice to adjust derivative prices to account for the cost of counterparty risk (CVA) and the risk of one’s own default (DVA). Funding collateral also has a significant role in pricing the trading portfolio (FVA). Other adjustments that are used in practice is the cost of regulatory capital (KVA) and initial margin costs (MVA). All these adjustments are commonly referred to as XVAs, which, as you can now tell, also reflect the costs of running an OTC derivatives operation.
All of the XVA measures have evolved and matured over time. If we think of an XVA timeline, CVA (Credit Valuation Adjustment) and DVA (Debt Valuation Adjustment) came about first, soon after the turn of the century (2002 and 2003, respectively). It is important to note, though, that while the theories behind CVA and DVA existed before the financial crisis, they were not necessarily defined as CVA or DVA and were known only to a small group of the largest banks, and each addressed them differently or not at all. The post-crisis crackdown on derivatives and counterparty risk is what placed CVA and DVA center stage.

Regulations and accounting standards then became key forces in shaping other valuation adjustments. Regulations that drove collateralization led to ColVA (Collateral Value Adjustment) being introduced in 2010 and then FVA (Funding Valuation Adjustment) in 2011. After that, we saw KVA (Capital Valuation Adjustment) and MVA (Margin Valuation Adjustment) come into the foreground in 2015 as a result of capital being explicitly defined and by the onset of initial margin rules and SIMM.

**HOW XVAS IMPACT BUSINESS PROCESSES**

XVA calculations have a significant impact on profitability and risk management across an enterprise. Firms must actively manage the impacts of XVA from pre-trade through to risk management and then to accounting and regulatory reporting. Here is a breakdown of where XVs are relevant within different business functions:

- **Front Office:** XVs are leveraged in the front office for pricing and quoting, as well as for hedging, P&L, and for running an XVA desk. They also can come into the picture due to limits and limits management strategies of front office trading operations. XVs have a high impact on trade economics and XVA desk strategy.

- **Middle Office:** For the middle office, XVs have a role in valuation of mark-to-market, P&L, product control, as well as counterparty risk and market risk.

- **Finance and Treasury:** Finance, treasury and compliance business functions also have to be engaged. The XVA measures represent a significant potential impact on the balance sheet, regulatory capital, economic capital and collateral management, as well as for treasury in terms of having a high impact on trade economics.

The buy-side perspective is also not to be forgotten. The buy-side will bear the cost of the XVA, whether implicitly or explicitly. When you think about a buy-side participant, or a price-taker seeking a best quote or best execution on a product, the process must be revisited in the context of XVA, as these prices must be factored in.

**UNDERSTANDING THE XVA BALANCING ACT**

With XVA, there is a balancing act of measuring, managing and optimizing costs. While XVA is difficult to define and operationalize, and there are significant costs to consider, we believe that flying blind could potentially be far more expensive—or worse. It could mean the loss of business or an accumulation of unmanageable risks. To understand the scope of the XVA balancing act, these are the key points to consider:
The Data Challenge

Data-aggregation tasks to support an XVA desk are significant, and the quality of this data is of paramount importance in accurately determining the price of OTC derivatives. This will require previously siloed parts of a bank to come together and work from a unified set of data. As noted in Figure 1, these inputs are gathered from a range of sources across a firm. Aggregating and marrying data from individual lines of business with no common data models could be more than complex.

Figure 1. What Kind of Data Is Fed to an XVA Desk?

Source: Aite Group

Key Technology Risks

Simulating future PVs, including credit factors, applying various netting and collateral terms, and computing XVA may not seem complex on the surface, but we are actually dealing with very significant compute and big data challenges—from both pre-trade and post-trade perspectives.

For example, for a small portfolio of 10,000 trades with 5,000 simulation paths and 100 sensitivities, we are looking at 600 billion PV calculations and 600 GB of memory for the exposure of data—and that’s just for a single run. For multiple runs throughout the day and pre-trade response time requirements of single digit seconds or less, computing these calculations is a significant challenge.

While XVA is difficult to understand, manage and operationalize, flying blind could mean an accumulation of unmanageable risks.
Understanding and Managing “Unhedgeable” XVAs

There’s an argument that many XVAs are unhedgeable, especially in less liquid markets. What is the point of measuring what cannot be managed? This is a valid question, but it is still important to understand the factors that are driving these XVAs, where they are coming from, and to understand how to charge clients. This can be important for understanding P&L and its drivers even in cases where hedging may not be practical.

Stakeholder Management

Stakeholders involved in an XVA transformation project can be many because of the number of factors that are involved and the cross-organizational impact that takes place. This can slow down decisions. Having a clear vision and strategy for phasing in an XVA program can help achieve the amount of alignment that is needed across business functions for the XVA transformation to be a success.

XVA METHODOLOGY: THE FOUNDATION OF XVA METRICS

Because of the establishment of all these XVA measures, the market has seen a paradigm shift to the methodology used for the pricing and valuation of OTC derivatives (as well as for risk management and capital management).

With XVA, all risk factors must be simulated jointly using hybrid models—multi-factor, multi-asset class models (see Figure 2), calibrated jointly (to, typically, the risk neutral measure). This model determines your exposure profiles (future projections of the portfolio and then IR forward calculations) to produce all of the various XVAs (see Figure 3).

On the methodology side, there are a number of fundamentals to understand:

- All XVA measures are a form of integrals over the exposure of a trade
- Netting and collateral can have a significant impact on the XVAs so they must be considered when calculating the portfolio exposure
• Forward costs need to be projected using simulation paths (choosing simulation dates where the last date is the longest maturity in the portfolio)
• Several risk factors need to be modeled jointly using what are known as hybrid, multi-factor, multi-asset models:
  - Increased DVA benefit also increases FVA costs
  - Correlations between exposure and counterparty risk or between collateral and counterparty risk need to be modeled ("wrong way" or "right way" risk)
  - Counterparty and Self default need to be modeled jointly

**XVA PERSPECTIVES AND PRIORITIES**

Having looked at the XVAs, we can now consider what the perspectives are of the different groups looking at XVAs in the industry. These can be very different depending on the market segment and how various XVAs are being prioritized.

Looking top down at Figure 4 below, we’ve outlined the various business operations inside an institution, and alongside you can see the corresponding priorities for each, mode of use, computational needs and the most important XVAs for each.

The most demanding operation is the XVA desk, requiring quoting, real-time, hedging and managing the PnL, and this, as discussed prior, is driving the data challenges and computational needs.

**XVA – PERSPECTIVES & PRIORITIES**

<table>
<thead>
<tr>
<th>Business Operation</th>
<th>Top Priorities</th>
<th>Mode of Use</th>
<th>Computational Needs</th>
<th>Most Important Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>XVA Desk</td>
<td>Fast xVA/EVA calc for quoting, PnL and hedging</td>
<td>Interactive, Real-time</td>
<td>Highest</td>
<td>All xVAs, TVA, Sensitivities</td>
</tr>
<tr>
<td>Sales / Fixed Income – non-XVA Desk</td>
<td>Fast xVA/EVA for quoting</td>
<td>Interactive, Real-time</td>
<td>High</td>
<td>All xVAs, TVA</td>
</tr>
<tr>
<td>Middle Office</td>
<td>Valuation, PnL – high accuracy</td>
<td>End of day, Batch</td>
<td>Medium</td>
<td>All xVAs, TVA, Sensitivities</td>
</tr>
<tr>
<td>Product Control</td>
<td>Valuation, Drilldown</td>
<td>Interactive, not Real-time</td>
<td>Medium</td>
<td>All xVAs, TVA, Sensitivities</td>
</tr>
<tr>
<td>Quant / Model Validation</td>
<td>Drilldown, Model Transparency</td>
<td>Interactive, not Real-time</td>
<td>Medium</td>
<td>All xVAs, TVA, Sensitivities</td>
</tr>
<tr>
<td>ERM / Risk</td>
<td>Drilldown, Model Transparency, Limits</td>
<td>End of day, pre-trade for Limits</td>
<td>Medium</td>
<td>PFE, EPE, CVA, CVA Capital</td>
</tr>
<tr>
<td>Treasury</td>
<td>Valuation, Forecasting</td>
<td>End of day</td>
<td>Low</td>
<td>FVA, CoIVA, Cashflows</td>
</tr>
<tr>
<td>Accounting</td>
<td>Valuation</td>
<td>End of day</td>
<td>Low</td>
<td>CVA, DVA</td>
</tr>
<tr>
<td>Issuer</td>
<td>Valuation, Drilldown</td>
<td>End of day</td>
<td>Medium</td>
<td>All xVAs, TVA</td>
</tr>
<tr>
<td>Buy-Side</td>
<td>Valuation, Drilldown</td>
<td>End of day</td>
<td>Medium</td>
<td>All xVAs, TVA</td>
</tr>
</tbody>
</table>

Source: Numerix

**XVA IMPLEMENTATION BEST PRACTICES & STRATEGIC GOALS**

While XVAs do add value and opportunities, they also bring difficult questions when it comes to implementing them. Pricing a book of derivatives is quite a complicated task. XVAs cannot just simply be slotted into an organization’s existing technological framework.
To be deployed effectively, financial institutions must carefully consider their objectives, resources, such as budget and staff, and whether to buy or build the needed technology.

But having a good XVA system in place can put an institution head and shoulders above some of its competitors, while those that ignore XVAs or have a weak system in place may end up being considered dead weight in the market.

Consider these best practices before embarking on your journey:

- Identify relevant metrics and priorities depending on business
  - Most relevant pricing adjustments
  - Limits strategy
  - Collateral optimization goals
  - Margin replication priorities
- Balance goals with budgets and timelines
- Identify performance requirements—pre-trade, real-time or end of day
- Establish needs not only for calculating XVA but also what-if analysis and full P&L drill-down
- Acknowledge organizational and process issues
  - Integration and collaboration between trading, risk, treasury and collateral management functions
  - Skill sets of users and training
  - Managing political risks
  - Interdependencies

**KEY TAKEAWAYS**

XVAs are deeply engrained in the derivatives business today. While there are challenges to rolling out an effective XVA program, the risk of not managing valuation adjustments could come at a greater cost. It is simply too dangerous to fly blind. Our advice here is to focus on the business processes most relevant to you, and aim for impact. Create an XVA roadmap that articulates the strategic impact of what you’re trying to achieve. Note your data and technology choices, and choose carefully. And lastly, strive for alignment across the organization and do not underestimate the needs for strong executive buy-in and cross-collaboration between departments and groups.

For more information on the topics discussed in this paper, please access this Numerix on-demand webinar: The XVA Transformation: Market Perspectives and Best Practices.
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Mr. Kancharla, as Chief Strategy Officer and Senior Vice President, is responsible for corporate strategy and currently heads the Client Solutions Group at Numerix. This group is responsible for Product Management, Financial Engineering and Business Analysis. Prior to this, he has served in various roles in Quantitative Software Development, Financial Engineering and Client Services at Numerix. Before transferring to Numerix in New York City, he was the CTO for Numerix Japan LLC in Tokyo, heading the Pre-Sales and Financial Engineering teams for Asia. Prior to joining Numerix in 2003, Mr. Kancharla also worked with Merrill Lynch and GE Capital in Quantitative Finance and Product Development roles.

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