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XVAs: A Gap Between Theory and Practice

John Hull and Alan White

In 2012, we wrote an article on funding valuation adjustment (FVA) for the 25th anniversary issue of *Risk* magazine. *The FVA Debate* argued dealers should not make FVAs – which are supposed to reflect the funding effects associated with derivatives collateral posting – and generated a huge amount of interest, much of it from people who disagreed with us.[1]

The debate continues today, and has widened to include other valuation adjustments – for margin and capital (MVA and KVA), for example. The term XVAs has been coined to describe the entire family.

In a new book, Kenyon and Green (2016) examine some of the arguments concerned with all XVAs, and we have been invited to mark its publication by writing this article, summarising our current views. We will start by revisiting FVA and then provide some thoughts on MVA and KVA.

The first thing to note is that we seem to be losing the argument on FVA. Most dealers now make FVAs. There are one or two hold outs and there are variations from dealer to dealer in how calculations are done, but the pervasive view in the market is: "If everyone else is doing it, I have to do it as well. It does not really matter whether it is theoretically correct". We have a lot of sympathy with that view. Derivatives dealers are running businesses. They are not exponents of financial economics. Nevertheless, we think financial economics is a useful way of understanding the big picture and should be given some consideration.[2]

We are pleased to see that recently Leif Andersen, Darrell Duffie, and Yang Song have written a paper supporting our position that FVA should not affect a dealer's profits or how derivatives are valued for financial reporting purposes.[3] As we will explain later, their assumptions are somewhat different from ours, resting on the conclusion that there is a transfer of wealth from shareholders to bondholders.

When considering whether it is appropriate to make an FVA, it is important to consider how the FVA will be used. Our arguments concerning FVA have been about how one should account for derivatives. The arguments advanced by others are often about whether an FVA should be

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[1] See Hull and White (2012).

[2] One popular criticism of financial economics is that it requires a "risk-free rate" which does not exist in practice. It is true that there is no product that provides an interest rate that is perfectly risk free. But we can imagine such a product and can estimate what the risk-free rate is by considering the yields on existing products that are most similar to this ideal product. In Hull and White (2013) we use this line of reasoning to argue that OIS rates are reasonable proxies for risk-free rates.

[3] See Andersen et al. (2016)

incorporated into pricing.[4] These two different perspectives often lead to confusion in the FVA debate. Our position is that FVAs should not be included in reported mark-to-market values providing the rate paid on collateral is a rate reflecting the risk of losing the collateral.[5] If it is different from this there should be an adjustment. But there should not be an adjustment related to the dealer's average funding cost.

We keep an open mind as to whether FVAs should be considered in pricing. Traders working for a dealer want to recover the costs imposed on them (correctly or incorrectly) by the dealer and make a profit when trading with end users – and in the case of an uncollateralized client trade that is hedged on a collateralized basis, traders are typically charged the dealer's average funding cost. Market participants can use FVAs, MVAs and KVAs to ensure they recoup costs of this nature. But, if these XVAs are not economically defensible, there may be other – better – ways of calculating what the target profit on a deal should be.

The reason for not including FVAs in reported mark-to-market values is that accounting standards regard so-called exit prices as the correct book prices. These reported prices should not be self-referential – that is, they should not depend on the characteristics of the reporting firm, such as its funding cost.

It is true, of course, that if all dealers include XVAs such as FVA, MVA and KVA in their pricing of transactions with end users, mark-to-market pricing and therefore accounting numbers will reflect them. However, there is a messy problem here. If different dealers calculate different XVAs for the same transaction, how should the accounting reflect that? The exit price is the price another dealer would be prepared to pay or receive to take over a transaction. For Dealer X, exit prices may depend on the XVAs of other dealers, but they do not depend on the way XVAs are calculated by Dealer X. If Dealer X has particularly high credit spreads, or a way of calculating XVAs that is different from other dealers, that dealer's pricing procedures will not produce reasonable exit prices.[6] Whether this is something the accounting profession can learn to live with remains to be seen.

One way of presenting the arguments against FVA as a cost when determining the profitability of a derivatives trade is that any transaction entered into at market prices has zero value (at least when the impact of a bid-offer spread is ignored). If an investor buys IBM stock at the current market price, the transaction has zero value. This argument applies to financing as well. If Dealer X borrows money by repoing US Treasury instruments at the market interest rate of 0.5% per annum, the transaction has zero value. If the dealer borrows money on an unsecured basis at the market rate of 1.1% per annum to finance derivatives, what is the value? This is a market transaction and so should also have a value of zero.

At this point, proponents of FVA are likely to argue that there is a cost of 0.6% in the last example. If dealers could repo derivatives, they could finance their derivatives at 0.5% and so

[4] The most common situation considered is what dealers should charge end users when trades are uncollateralized or partially collateralized.

[5] This will typically be close to the overnight rate.

[6] We discuss this further in Hull and White (2014a). We argue that prices that include FVA are not arbitrage free. Other writers agree with us on this point.

there is a market incompleteness that costs 0.6%. This is where the argument against FVA leaves many financial engineers unconvinced. The extra 0.6% is a credit spread. It compensates lenders for the risk of a loss. (The repo financing has a much smaller credit spread because it is secured financing.) Because there is an expected loss to lenders, there must be a corresponding expected gain to the dealer. The dealer will in some states of the world default on the 1.1% per annum loan and its stakeholders will be in a better position than if it had been able to repo the derivatives. In other words, there is a benefit to the dealer from the credit spread it pays because it might default. We refer to this benefit as DVA2. We contrast this with debit valuation adjustment as it is usually defined (so, the benefit to a dealer from defaulting on its derivatives) and refer to the latter as DVA1.

The argument that dealers capture a benefit that offsets the spreads they pay raises two issues. Are DVAs real and are credit spreads – 0.6% per annum in our case – too high? Consider the first point. DVAs must be real in the sense that the transactions we are talking about are zero-sum games. If one party has an expected loss because of default risk, the other party must have an expected gain. But we acknowledge that DVA feels less real to most people than its cousin – credit valuation adjustment (CVA), which reflects the risk of a counterparty's default. Furthermore, the accounting profession has for some types of transactions (but not yet for derivatives) made DVA a direct adjustment to equity rather than flowing it through the income statement.

Dealers have usually ignored DVA2[7] and have never liked DVA1. FVA has often been used as a way of neutralising DVA1. FVA can be split into a funding cost adjustment (FCA) – which reflects the cost of funding derivatives when they have a positive value – and a funding benefit adjustment (FBA), or the funding benefit provided by derivatives when they have a negative value. If only FCA is accounted for, it largely offsets DVA1, so earnings volatility is reduced.[8] We argue from an economic perspective that DVA2 and FVA, not DVA1 and FCA, are natural offsets for each other.

Now consider the second point. Is the credit spread of 60 basis points too high? It implies an expected loss of 0.6% per year on the loan. Here one gets into arguments concerned with real-world versus risk-neutral default rates and the non-default-risk component of credit spreads. The 0.6% per annum credit spread does not represent the actuarial expected loss. It (correctly) incorporates a risk adjustment because there is systematic risk in the debt market. It recognises that a default on the loan is a particularly adverse event for a lender because it is likely to occur when most investments in the economy are giving rise to losses.

In addition to incorporating an adjustment for systematic risk, the 0.6% spread may well have a non-default-risk component, perhaps related to liquidity or some other factors. We discuss this and the associated empirical evidence in Hull and White (2014b). In practice it is very difficult to separate risk adjustments in credit spreads from these other adjustments. But suppose in our

[7] DVA2 is usually calculated only for debt that has some sort of embedded option. This is a result of the fact that this debt is transferred to the derivatives desk to manage the risk of the embedded option and the derivatives desk calculates DVA on its entire portfolio.

[8] This appears to have been the purpose of JPMorgan's much talked about $1.5 billion FVA charge in the fourth quarter of 2013.

example that, of the 0.6% credit spread, 0.4% represents default risks and 0.2% is for other factors. Then the 0.2% can be regarded as a deadweight cost of doing business and from a financial economics perspective is a valid FVA.

The bottom line here is that if the whole of the 0.6% spread is for default risk then FVA is entirely offset by DVA2. If only 0.4% is for default risk then FVA is partially offset by DVA2. In the second case, financial economists would argue an FVA corresponding to the non-default-risk component of the credit spread is valid.[9]

These arguments assume debtholders understand the risks taken by banks on an ongoing basis and price debt accordingly. If debtholders assume a certain level of risk for the bank's investments and the bank then takes decisions that lead to the overall level of risks being less than had been assumed, the debtholders benefit. There is then a transfer of wealth from shareholders to debtholders. This is the assumption made by Andersen et al (2016). They assume that existing debtholders have not anticipated the impact of taking on new derivatives positions on the overall risk of the bank. The new debt used to finance the new low-risk derivatives positions is priced correctly in accordance with the new average risk level of the bank. However, the old debt becomes more valuable, while the shareholders suffer an equivalent loss.

It is, of course, very difficult to know whether debt holders incorrectly assess the risks being taken on an ongoing basis. But, if they do, there is a transfer of wealth between debt holders and equity holders[10] and no effect on the valuation of assets on the left side of the balance sheet. Whether accountants are comfortable with the assumptions made by Andersen et al remains to be seen. If accounting rules are changed for FVA, they should logically be changed for all situations where there are transfers between equity and debt.[11]

We now move on to consider MVA and KVA. What would financial economists argue about these? Consider first MVA. This is a valuation adjustment for initial margin requirements. If the interest earned on initial margin is the market rate of interest that would be earned on investments of similar risk elsewhere, there should not be an MVA. If it is not, an adjustment equal to the present value of the differential is warranted. The risks associated with losing initial margin – whether posted to a clearing house or a third party in a bilaterally cleared transaction – are small, but not zero. If the market rate of interest on a loan with similar risk to the initial margin is considered to be, say, the overnight rate plus 20 basis points and the rate paid on initial margin is the overnight rate, then financial economists would argue for an MVA based on 20 basis points. Is the bank's funding cost relevant to MVA? Finance theory argues it is not (except when there is an Andersen et al argument that bondholders have incorrectly anticipated the risks

[9] However, if you want to include this as a genuine FVA you should probably also consider an LVA (Liquidity Value Adjustment) to reflect how the liquidity or illiquidity of the derivative affects its value to the dealer.

[10] The size of the transfer depends on the remaining life of the legacy debt and the amount by which the new investments lowers the average risk of the bank's investments. The change in risk lowers the discount rate used to determine the value of the legacy debt. If the life of the debt is long this results in a big change in the value of the debt and a large wealth transfer. If the debt has a short maturity, typically the case for banks, the wealth transfer is small.

[11] The risk change and wealth transfer argument applies in reverse if new more risky investments are undertaken. The wealth transfer applies to every investment decision that a bank (or any corporation) takes that is not foreseen by bondholders.

taken). It is the risk of an investment (whether it is an investment in initial margin or anything else) that matters when determining whether the return is reasonable, not how it is financed.

KVA measures costs associated with capital requirements. Here the arguments of financial economists are that how a company is financed should not affect how it evaluates projects, except possibly for tax effects. As a bank uses more equity to finance itself, it becomes less risky and the providers of both debt and equity capital require a lower return. This argument is over 50 years old in the finance literature and so has stood the test of time.

Our conclusion from all this is that financial economists and financial engineers look at the world differently and may never agree. Financial engineers are concerned with immediate cash flows within the bank and the financial economists are concerned with the bigger picture of how the bank's relationship with external markets will evolve. FVA, MVA, and KVA represent a gap between theory and practice. But they are part of the derivatives landscape that all practitioners – and those of us who teach and write about derivatives markets – must now accept.

The XVA debate has an interesting analogy. In a first corporate finance course, students learn how to calculate a weighted average cost of capital (WACC) for a non-financial corporation and how the discount rate used for the expected cash flows of a capital investment project should be calculated. They learn the discount rate should depend on the risk of the project, not how it is financed. For projects that are more risky than average, the discount rate should be higher than the WACC. For projects that are less risky than average, the discount rate should be lower than the WACC.[12]

Students often forget this when they leave academia. Many companies use a single WACC for all projects. This tends to make risky projects more attractive than they should be and safe projects less attractive than they should be. *Ceteris paribus*, the use of a single discount rate leads to companies becoming more risky over time.

The XVA analogy is that many of a bank's investments that we are concerned with when considering FVA, MVA, and KVA are lower-than-average-risk investments. An investment in initial margin, or an investment in the funding of a derivative with an end user when the derivative is fully hedged in the interdealer market, are low-risk investments when compared with other things the bank does. As such their marginal effect is to lower the average cost of the bank's funding.

The difference between the views of financial engineers and financial economists on FVA, MVA, and KVA is that financial economists work with marginal funding costs while financial engineers work with average costs. The essence of the debate can be summarised by the following imaginary dialogue:

Financial Economist: "The cost you should use for funding a project should reflect the risk of the project. By using average funding costs you are assuming that all the bank's projects are equally risky."

[12] There may be some adjustments for the tax advantages of debt.

Financial Engineer: "But tying up funds in initial margin or a low-risk hedged derivatives position prevents me from using the funds elsewhere. On average the bank gets a much higher return that it does on things like initial margin. There is a cost to low-risk, low-return projects."

Financial Economist: You talk as though funds for your business are in short supply. If you have good projects, whether they are low-risk or high-risk, the market will provide funding for you.

Financial Engineer: I am not sure that is how things work in practice.

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