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Is FVA a Cost for Derivatives Desks?

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ABSTRACT

This paper examines whether FVA should be taken into account when derivatives portfolios are valued and when trading decisions are made. It concludes that it should not.

When Valuing European options in the early 1970s, Fischer Black, Myron Scholes and Robert Merton (BSM) showed that, over any short period of time, an investment in an option could be replicated with a portfolio of stock and risk-free debt. This observation allowed them to calculate the economic value of the option by solving a differential equation. Subsequent analysis showed the economic value of the option could also be determined by discounting the expected payoff on the option in a risk-neutral world at the risk-free rate of interest. The calculated value is 'economic' in the sense that, if the option price were different than this value, an investment in the option would dominate an equivalent risk investment in a portfolio of debt and equity. The BSM analysis also showed that, if it were possible to borrow and lend at the risk-free rate of interest, it was possible to replicate an option by managing a portfolio of debt and equity.

Prior to the credit crisis that started in 2007, Libor was thought to be the best proxy for the risk-free rate, and it was assumed banks could borrow and lend at that rate, allowing them to carry out the replicating trading strategies developed by BSM. However, the credit crisis caused dealers to critically evaluate their practices. Banks became increasingly reluctant to lend to each other because of credit concerns, and Libor quotes began to increase as a result. The Ted spread, which reflects the difference between three-month US dollar Libor and the three-month US Treasury bill rate, is less than 50 basis points in normal market conditions, but was rarely lower than 100bp between October 2007 and May 2009, peaking at more than 450bp in October 2008. Meanwhile, the spread between Libor and overnight indexed swaps (OISs), which is about 10bp in normal market conditions, rose to a record 364bp in October 2008.

These shifts made it all too apparent that Libor incorporates an adjustment for credit risk, and is therefore an imperfect proxy for the risk-free rate. In our view the best proxy available for the risk-free rate is the OIS rate. Many dealers now use the OIS rate instead when valuing derivatives backed by collateral. Eventually, they may do the same for all portfolios.[1]

The reason for using the risk-free rate as the discount rate is that it is required by the risk-neutral valuation paradigm. However, the reason often given for using the OIS rate for discounting collateralised transactions is that these transactions are funded at the OIS rate.

The interest rate paid on dollar cash collateral is frequently based on the effective federal funds rate, which is the one-day OIS rate. In a two-way, zero-threshold collateralisation agreement, dollar cash collateral equal to max (V_B, 0) is posted by party A to party B, where V_B is the no-default value of the portfolio to party B. Similarly, cash collateral equal to max (V_A, 0) is posted by party B to party A, where V_A (= $-V_B$) is the no-default value of the portfolio to party A. Assuming party B (a dealer) hedges, the value of the hedging transactions to B is $-V_B$, and so the collateral received or paid by B, matches the cash required to fund the hedges or the cash generated by the hedges. It can, therefore, be argued that discounting at the OIS rate recognises funding at the effective federal funds rate.

[1] See J Hull and A White, 2012, for further discussion

When a derivatives portfolio is not subject to a two-way, zero-threshold collateralisation agreement, a funding valuation adjustment (FVA), sometimes called a funding cost adjustment, is often calculated to reflect the difference between the actual costs of funding the hedge and the assumed risk-free rate. For example, if there is a one-way, zero-threshold collateralisation agreement that requires the dealer but not the counterparty to post collateral, the FVA adjustment would assume that, when hedges require funding, it would be at the dealer's average cost of funding – for instance, OIS plus 200bp. FVA would be set equal to the expected present value of the excess of the cost of funding over the assumed risk-free rate.

In this article, we argue that FVA should not be considered when determining the value of the derivatives portfolio, and it should not be considered when determining the prices the dealer should charge when buying or selling derivatives. Burgard and Kjaer (2011) make a similar point using different arguments.

It is important to avoid confusion about why the risk-free rate is used for discounting when derivatives are valued. It might be argued that the use of a risk-free discount rate indicates the valuation is only appropriate when the bank can fund the derivative at the risk-free rate. This is not true. We discount at the risk-free rate because this is required by the risk-neutral valuation principle. Risk-neutral valuation is an artificial – but fantastically useful – tool that gives the correct economic valuation for a derivative, taking into account all its market risks.

The funding of hedges is sometimes given as a reason for an FVA. However, trades in hedging instruments involve buying or selling assets for their market prices and are, therefore, zero net present value investments. As a result, the decision to hedge does not affect valuations. Liquidity issues are also sometimes raised as a reason for funding adjustments. While liquidity is something traders should take into account, it should not be confused with the impact of "normal" funding requirements.

Another argument against FVA is a well-established principle in corporate finance theory that pricing should be kept separate from funding.[2] The discount rate used to value a project should depend on the risk of the project rather than the riskiness of the firm that undertakes it. For example, suppose a company that borrows at the risk-free rate plus 200bp has the opportunity to enter into a nearly risk-free project that returns the risk-free rate plus 80bp. Suppose the discount rate for the project, if considered as a stand-alone project, would be the risk-free rate plus 30bp. The project should be undertaken. Clearly, the project has a positive net present value when the appropriate discount rate (risk-free rate plus 30 bp) is used. The project will increase shareholder value because it reduces the risk of the company and, therefore, incrementally reduces its funding cost.

Banks invest in Treasury instruments and other low-risk instruments that return less than their average cost of funding. They do not usually apply a funding cost to these investments. It would, therefore, seem in this context that they implicitly recognise that it is the risk of the project that matters.

[2] An exception arises because debt is taxed more favourably in many jurisdictions. If a new project is to be financed with additional debt, the additional tax benefit should be considered.

FVA is closely related to debit valuation adjustment (DVA), but it is important to avoid confusing the two different types of DVA. One is the DVA arising because a dealer may default on its derivatives portfolio (we will refer to this as DVA_1). The other (DVA_2) is the DVA arising because a dealer may default on its other liabilities – long-term debt, short-term debt, and so on. Both DVA_1 and DVA_2 are beneficial to the dealer's shareholder because they gain when the firm does not have to honour its obligations.

We define $\Delta(DVA_2)$ as the increase in DVA_2 resulting from the funding requirements of a derivatives portfolio with a particular counterparty. The FVA for the portfolio, as usually calculated, is equal to the present value of the extra return required by lenders to compensate them for costs associated with possible defaults by the dealer on the funding. This is exactly equal to the benefit to the dealer from the possible defaults.[3] Hence:

$$FVA = \Delta(DVA_2)$$

Credit valuation adjustment (CVA) and DVA can be referred to as economic valuation adjustments (EVAs) – they move the model value for a transaction closer to its economic value to the firm's shareholders. The purpose of making EVAs is to promote better decision-making – the purchase of a derivative may appear to be profitable based on the model value, but if the economic value is lower than the price paid when CVA and DVA are taken into account, the dealer should not buy it.

CVA, DVA_1 and DVA_2 are valid EVAs, but DVA_2 is usually automatically considered by a dealer and does not have to be accounted for separately. Suppose a dealer borrows $200 million to finance the hedging of its derivatives portfolio by issuing a security that promises interest payments based on a rate that is 50bp above the risk-free rate. If the debt payments were discounted at the risk-free rate, their present value would be $205 million. The market price of the liability is $200 million, which incorporates the DVA_2 of $5 million – the present value of the cost of a dealer default. But it would be a mistake to reduce the liability by a further $5 million to $195 million.

For a bank, therefore, DVA_2 does not need to be calculated for most liabilities at inception because it is already reflected in the market prices that are recorded. As time passes and interest rates change, the market value is recalculated and the implicit DVA_2 may change. If a liability is valued assuming no chance of default by the bank – using the risk-free rate as the discount rate – then a DVA_2 adjustment is necessary.

[3] As pointed out in Morini and Prampolini, 2011, this assumes the credit default swap (CDS)-bond basis is zero. FVA is calculated from the bond yield spread whereas DVA2 should, in theory, be calculated from the CDS spread.

FVA is a form of 'anti-EVA'. It serves to adjust the economic value of the debt to a model price, and leads to poor choices if used for economic decision-making. To see why, consider the earlier example – an FVA adjustment would incorrectly move the debt value from $200 million to $205 million. FVA adjustments should never be made because they move calculations away from the economic value.

In practice, there is sometimes a transfer pricing problem. If the current average funding cost for the bank is the risk-free rate plus 200bp, then the funding desk may charge the derivatives desk 200bp more than the risk-free rate on its funding. In response, the derivatives desk may feel it needs to recover this apparent cost, which leads to suboptimal decision-making. One way of avoiding this is for the funding desk to charge the derivatives desk the risk-free rate, which means the decisions made by the derivatives group are aligned with the interests of the organisation for which it works.

The message of this paper is simple although it is not one most practitioners readily accept. The apparent excess funding cost the derivatives desk faces should not be considered when a trading decision is made. Assuming the objective is to maximise shareholder value rather than employ some accounting measure of performance, FVA should be ignored.

References

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