Preface to the IJTAF special issue
Frontiers of Counterparty Risk
Following the workshop
"Counterparty Risk Frontiers: Collateral damages"
held on 4 May 2012 at the French Banking Association in
Paris

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On 4 May 2012 a workshop "Counterparty Risk Frontiers: Collateral damages" was held at the French Banking Association in Paris. The workshop was organized by Evry University, and sponsored by the French Banking Association (which hosted the workshop) and the Institut Louis Bachelier. About one hundred of participants (a balanced mix of academics and practitioners) attended presentations by Damiano Brigo (King's College at that time, now Imperial College), Cristin Buescu (King's College), Masaaki Fujii (University of Tokyo), Igor Smirnov (Banco Santander, London), Claudio Albanese (Global Valuation Limited, London), Pierre Henry-Labordère (Société Générale, Paris), and Frank Oertel (Federal Financial Supervisory Authority, Bonn). This IJTAF special issue " Frontiers of Counterparty Risk" is a collection of contributions by the workshop presenters and organizers. We believe that the papers of the volume offer a nice picture of most topical aspects of counterparty risk and funding, that are now reviewed as an introduction.

TVA, or "Total Valuation Adjustment" in the jointly sense of (strict) CVA, DVA and FVA, is today one of the main P&L centers of investment banks. It touches to many areas: modeling, computation, pricing, risk management, regulation, economics, legal, lobbying (from banks by regulators), politics, geopolitics (through different legislations and legal practices), often in conflicting perspectives. A bank has to cope with often discording economic risk, accounting P&L and regulatory capital considerations. This preface reviews a few aspects of these controversial issues which are illustrated in the papers.

1 A so complex CVA

Counterparty risk is the risk of either party defaulting in an OTC derivative contract (or portfolio of contracts). This is the native form of credit risk, which affects any OTC transaction between two parties, as opposed to reference credit risk present in the cash-flows of credit derivatives. The Credit Valuation Adjustment (CVA) prices the counterparty risk on an OTC contract (or netted portfolio of OTC derivatives) between two parties. Since the counterparty risk exposure is the positive part of the mark-to-market of a position (assuming here zero recoveries for simplicity), therefore for a swapped contract (as opposed to, say, a long bond, which is always in-the-money), the loss associated to this risk has an optional feature. This is why counterparty risk cannot be simply handled by the application of a credit spread in the discount factor, but has an intrinsically dynamic and optional flavor. In the end CVA is by far the most complex derivative, and it is one you are forced to hold as soon as you are engaged into OTC derivative transactions (unless all of them are perfectly collateralized, which is far from possible in practice). A CVA desk can be viewed as a hybrid derivative desk, and is treated as such by the risk control, who imposes market limits and monitors its risks using VaR and sensitivities. The CVA desks values the counterparty risk and channels this charge back to the various business desks (after a not so trivial desallocation and conversion of a global and upfront CVA charge into streams of fixed coupons). The CVA desk is in charge not only of valuation, but more globally of management of the CVA risks. These can only be partially hedged, so that CVA also has to be managed on a reserve basis. A peculiarity of a CVA desk is that in principle it should really have a flat P&L. However, in the current market environments, CVA (and its DVA companion to be dwelt upon later below) is one of the main profit center of investment banks. Finally one should have in mind that there are two perspectives on the CVA, an accounting one and a regulatory one, where under the most recent advisory and regulatory developments, IFRS 13 allows a bank to account for CVA and DVA gains and losses, whereas Basel III only reckons CVA into capital relief calculations (as DVA is not a buffer against defaults).

1.1 Cash-flows

CVA is not such a well defined quantity. Even the payoffs are not so clear. Regarding close-out valuation ISDA uses a "replacement" formulation which leaves it open between rather different possibilities: default-free versus substitution valuation, where the meaning of "substitution" is not fixed either: does substitution mean valuation accounting for the default risk of the surviving party only, or valuation of the contract between the surviving party and a new party "similar in every regard" (including credit risk) to the defaulted one? in the latter interpretation what should be the assessment of the credit risk of the replacing party: same as the credit risk of the defaulted party right before its default? but what would "right before the default" mean in this expression: the day before? or one week before? or one month?

A fix to all these issues would be standardization, but the complexity of the whole matter is such that standardization is a sense not possible here. In the same line of thought one could think of introducing CVA indices, but these would be too difficult to setup and the bespoke CDO tranches experience of Bear Sterns and Lehman does not push into the direction of a line of indices that would be "mapped" by some ad-hoc devices to account for the variety of situations that occur in practice.

1.2   Models

In addition to the above ("order zero" and quite unusual) payoff risk, CVA also has very important model risk. In the first modeling place it is not so clear whether CVA should be regarded under the historical or under a pricing (risk-neutral) measure, especially when one talks about a regulatory Basel III CVA meant to enter capital relief calculations. In early times of CVA there were some attempts to adopt a hybrid methodology, treating historically the unhedged risk factors and risk-neutral the hedged ones. However such a hybrid perspective is very complicated to implement and typically results in ad-hoc, not to say inconsistent, solutions. Secondly, CVA has a large sensitivity to parameters like various correlations (e.g. between interest rates and credit), which are neither observed nor liquidly priced in the market (and can therefore hardly be calibrated). This also relates to the important wrong-way risk issue in CVA modeling (particularly with credit derivatives), namely the possibly adverse dependence between the exposure and the credits of the two parties. Right-way risk can also be important and is in principle not much preferable given that a CVA desk should target a flat P&L. However wrong-way risk creates negative gamma and cross-gamma. Thirdly, via the netting agreements which tie the contracts together for the good sake of counterparty credit risk mitigation, CVA really appeals to a consistent modeling across asset classes. Moreover this modeling needs to be dynamic in view of the optional feature of the CVA (an option on the underlying portfolio). Cross-currency and best-to-deliver optionality issues are also present when the collateral can be posted in different currencies, especially on foreign-exchange derivatives. Finally to make it really correct it would also be wished to incorporate systemic risk effects into a CVA model, especially with the growing importance of centrally cleared trading.

All these aspects require advanced dynamic CVA modelling in terms of processes of all risk factors and of the defaults of the parties. And this is without even mentioning some particularly tough mathematical difficulties that arise if one starts questioning the theoretical bottom-lines of the above-sketched financial engineering approach, which points out to issues like market incompleteness, utility maximization under random horizon or nonlinear pricing rules.

1.3   Computations

CVA is by far the most intensive computational task in the investment bank: valuing overnight like one million trades under one thousands scenarios at one hundred time points, so one hundred billion of contract valuations, times the number of Greeks which are needed for hedging! With nowadays parallel GCP and multi-core technologies this is however doable at a hardware cost of less than say 100 000 US dollars. Intra-day incremental CVA computations are also necessary for assessing the profitability of a new deal, and these can typically be done in less than one minute on individual computers.

Moreover CVA bears on a very large time horizon, like 20 years, over which no "linearization" or any kind of scaling is possible. For instance the standard add-ons allowing one to compute a (heavier, in principle) 10 days VaR as $\sqrt{10/250}$ times a (simpler) daily VaR, are simply prohibited on a CVA time scale, over which it is not only a matter of time, but also of ageing of a portfolio, with some products expiring or others being converted into different ones.

Recall finally that CVA has to be computed globally in dynamic models across all the asset classes. In the end Monte Carlo valuation is unavoidable; and the "compound

option" feature of the CVA (an option on a portfolio of credit derivatives) added to the high dimensionality features can only be addressed by nonlinear kinds of American Monte Carlo or particle simulation schemes. These are also needed in view of the nonlinearities of the CVA pricing problem (especially when bilateral, which ties together the CVA and the funding issues). But nonlinear simulation schemes are difficult to implement properly, requiring some nontrivial "experimental mathematics" for finding appropriate regressors depending on every market/product under consideration.

1.4 Risk management

Hedging of CVA is only possible on counterparties with a liquid CDS market. Moreover when this happens this is essentially only true for the 5 years maturity, whereas strong term structures effects that are present (over 20 years!) with CVA would need a whole CDS term structure. In addition, CVA hedging instruments should be clean of counterparty risk, meaning collateralized, which can be the case for CDS, but not with for instance swaptions that one might consider using for hedging the interest risk of the CVA. From the risk management point of view it should also be noted that the assessment of the default risk which is taken into account in the Basel III CVA capital relief formula is based on CDS spreads, not on ratings or fundamental analysis. This really pushes banks to dynamic management of CVA, and not only large investment banks, but even small and/or mostly retail ones. Intensive CVA hedging by banks can then raise stability issues. In the recent sovereign debt crisis hedging of CVA by banks was pointed out as a factor of pressure on the sovereign CDS markets.

2 Such a dubious DVA

With most financials perceived today as risky as only corporates used to be in the past, the unavoidable, logical consequence of CVA is DVA (Debit Valuation Adjustment), which corresponds to the CVA of say a bank viewed from the point of view of its counterparty. Accordingly, under the last IFRS I3 recommendation to become effective in principle in 2013, it becomes possible for a bank to account for DVA gains.

Mathematically speaking the presence of the DVA makes things technically a big step even more complicated than above, since DVA ties the (now bilateral) counterparty risk and funding sides of the problem. Inclusion of DVA thus leads to nonlinear pricing rules, which may be justified from a theoretical and economical point of view, but at the same time are exactly what traders do not want to see and cannot really implement, since it means that their decisions should depend on the wealth of the bank as whole, an evasive quantity (unless one relies on postulates like the wealth of a well-managed bank being always zero, as totally invested at any point if time).

But before being a mathematical issue, the DVA raises important financial points of concern. In particular hedging one's DVA means selling protection on oneself, which is either forbidden (like with CDS in many countries), or impossible (at least dynamically, for instance one cannot keep asking one's treasury to repurchase one's own bond), or the last thing to do in view of the related wrong-way-risk (since it would have such a high funding costs by times of high credit spreads). Except for very special cases all one can do in general is hedging the systematic credit spread risk component of DVA through peers, which in adverse scenarios can be very dangerous (like with any correlation or factor hedge). As hedging of DVA is far from clear, it is not clear either how to monetize DVA, so that DVA gains could well reduce

to paper money. DVA should then better be viewed as a cost reducing the economic capital, not as a risk that one could monetize. In this perspective the last IFRS 13 development is sometimes perceived as an effect of the lobbying of banks, since by times of high and volatile credit spreads of the latter, accounting for DVA gains is of course of considerable stake for them – up to the point that nowadays CVA/DVA gains can be the main driver of the P&L. At the same time it is fair to say that not reckoning the DVA into the accounting CVA puts a huge pressure on banks by leveraging the corresponding volatility. In the end it's worth recalling that IFRS 13 allows for DVA, but does not force banks into it, and that the spirit of IFRS recommendations is an overall prudential rule which should always predominate. A perverse effect of the system however is that through competitive effect such allowances/tolerances tend to become mandatory to market participants.

This was about hedging, but to the extent that hedging the DVA means selling protection on oneself, pricing the DVA in the first place means buying protection on oneself; this is in principle equally nonsensical as selling protection on oneself (and forbidden in some countries too), but it is what happens - whether one likes it or not- when one goes into a transaction to a price accounting for DVA. DVA refers to a business model in which one accepts to lose money whilst one is alive, in the perspective of a compensation at one's default – a sure road to default!

Finally, since regulators look at losses, not at gains, Basel III capital charges are myopic to the negative side of the CVA, which is DVA. This discrepancy between an accounting CVA/DVA and a regulatory strict CVA is actually sensible in view of two different perspectives, but it makes of course life difficult for banks, which incidentally should also and primarily deal with their economic CVA, that is the cost of effectively hedging their counterparty risk! – the accounting P&L being probably the most stressful of the three since an accounting P&L passing from 600m in one month to 500m in the next one (not unusual under a strict CVA accounting rule) and the corresponding 100m being treated as a loss is really a killer to a bank.

3   Costly FVA

Even though there is no related regulatory environment, it is crucial for a bank to have a fair view of its funding costs (FVA for Funding Valuation Adjustment) in order to have a fair appreciation of its P&L, particularly in the long term. The reason why there is no regulatory environment for FVA is that a fundamental accounting principle is to only reckon effectively contracted liabilities (or assets), not foreseen ones. So, as a bank typically funds itself short-term for financing longer term investment, an accounting perspective misses the refunding liabilities which will have to be rolled-over throughout the whole life of the investment. However the corresponding funding costs will accumulate over years and may ultimately modify the structure of the P&L, with respect to a say one year horizon.

In old times a bank used an (affordable) Libor funding rate throughout and channeled the corresponding charge to the client. With the rising Libor this additional charge has become problematic. Moreover in principle a higher funding rate compensates for a higher credit risk (and/or liquidity cost). Under the credit risk explanation of the Libor spread and to the extent that DVA should really be considered as a benefit, this additional charge to the client is not justified, since it is simply the fair price to the bank of her funding benefit at her default time. In this last perspective (which is subject to the DVA debate) a deal is found valuable whenever the perspectives/expectations of returns exceed the funding cost

of the bank net of its credit spread; Channeling the totality of the Libor charge to the client would be double counting.

By the hard liquidity times that are faced since the 2008 crisis, funding has sometimes been the main motivation for a deal, allowing a bank to get funded at a collateral OIS rate for a collateralized transaction, rather than going unsecured at a say Libor plus 300 bps. Going into deals for funding motivations cannot be the main line of a bank, however one can say that funding should be considered for not going into a trade that could look worthwile without it. Again in the long run funding may damage the P&L of a trade which looks worthwhile on a shorter time horizon.

4   Collateral Damage

Focusing on the previously under-estimated systemic risk, Basel III, Dodd-Franck in the US and EMIR in Europe (subject to the related political and legal hazard regarding the two latter) push everyone to collateralize and clear as many trades as possible (hedging has not so much recognition as a capital relief center, in many cases by the current capital rules hedging actually increases the capital charge). However in the future CVA will still be there via in particular shadow-banking (OTC trading between banks and hedge funds), which is not supervised, and is currently in rapid expansion. Moreover collateralization cannot be perfect. Management of collateral in the last crisis was often found a disaster. This was reckoned by Basel III which extended the length of the margin period of risk from 10 days in Basel II, to 20 days in Basel III. Given various thresholds and all kinds of frictions (it has been noted that collateral may also leverage recovery rates), the effect of collateralization on CVA is often not so important in the end, reducing it by a factor of a few units rather than a few tens as one would think or wish. This is another limit of the efficiency of collateralization as a protection against default. So collateralization does not only raise liquidity and systemic risk concerns, it also worsens the severity of defaults as they occur.

On certain asset classes including in particular credit derivatives where credit cash-flows are to some extent unpredictable (think of Lehman collapsing over a week-end), collateralization is simply not effective.

Regarding clearing, it is true that a central counterparty (CCP, or clearinghouse) can deal with risk differently, on a mutualization basis. A CCP does not charge for CVA but asks for excess-collateral and independent amount (initial margin). A clearinghouse can setup a better management for collateral, like calling for margins five to six times per working day, instead of daily at most for a bank. Cleared transactions were found to be better managed in the last crisis than non-cleared ones, yet it should be pointed out that the most toxic assets were typically not cleared transactions. There is also the issue that on one hand clearing has to go by asset classes, since otherwise in case of a default holders of more liquid assets (e.g. IRS) would be treated much better, like in the two days following the default, than holders of less liquid ones (e.g. CDS), like in ten days; but on the other hand this would imply a large number of clearinghouses, whereas a paper by Duffie and Zhu pointed out that a large number of clearinghouses fragment the market and make it inefficient in the end. Maybe clearinghouses should be considered for some asset classes, whereas other asset classes should better not be cleared.

Anyway collateralization and central clearing means cash, so that the current regulatory trend puts a high pressure on liquidity. This is in particular a tough issue for corporates, only the largest ones having a significant amount of liquidity. Collateralization puts a hard

liquidity constraint on the smaller ones, and tends to exclude them from financial markets, where the more honorable justification for expansion of the derivative markets since Black-Scholes has precisely been to let corporates hedge their unwanted financial risks! The danger is that collateralization and clearing simply transforms counterparty risk into systemic and liquidity risk, creating "too big to fail" clearinghouses, where too big to fail was clearly seen in the last crises as the most costly issue to the taxpayers and to the system as a whole.

In the quest of liquidity some people claim that huge reserves of cash and collateral are not exploited by the system, being stuck for instance in custodians (like Bank of New York, which follow the "Roman law" of keeping deposits, not investing them, and are very popular since the crisis, even at negative deposit remuneration rates!). This also points out to restructuration of the CVA. The idea is that the payment of the margin calls could be transferred to investors in exchange of a premium stream. Maybe the introduction of financial devices making this risk transfer possible could be a solution to the CVA/DVA spiral. However it is far from clear that the regulators will buy this idea after the 2008 subprime debacle of securitization of assets as simple as bonds.