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OPTIMIZING THE COST OF CUSTOMIZATION FOR OTC DERIVATIVES END USERS

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This paper examines the regulatory treatment of OTC derivatives under the Dodd-Frank Act and the Basel III accord for market participants and financial institutions in the United States and abroad. It evaluates the capital and margin required for OTC derivative transactions under both frameworks and examines the potential impact on transaction costs applicable to end users for bilateral and centrally cleared transactions. Firms face a tradeoff between the costs associated with initial margin, regulatory capital, execution and structural factors for bilateral transactions relative to SEF-executed centrally cleared transactions. For many end users, minimizing these costs will be the primary objective behind their derivative hedging strategies. To illustrate this, we quantify many of the implicit and explicit costs for standardized cleared swaps and customized bilateral swaps for end users and examine the impact on them according to their credit quality. The paper evaluates transactions predominantly on a stand-alone basis, without the effects of risk netting. While this overstates both the capital and margin required for participants with offsetting portfolios, it reflects the marginal impact for many end users who hedge predominantly one-sided risk in the markets. It evaluates the limit of regulatory impact on participants, which many will seek to reduce through targeted hedging strategies and counterparty netting.

Governments and regulators alike acted prudently to implement financial system safeguards intended to reduce the likelihood of future shocks and mitigate the systemic risk in the wake of the financial crisis of 2008.

The U.S. response was the Dodd-Frank Act which, for the first time, brought the over-the counter (OTC) derivatives markets under regulatory oversight. The international response was put forth by the Basel Committee, which revised capital standards for financial institutions in a series of proposals that comprise the Basel III accord. Both frameworks incorporate changes to the regulatory treatment of OTC derivatives and require banks and regulated financial institutions to hold greater capital for derivative transactions.

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The impact of these changes will be felt by non-financial firms as well. These entities face higher costs passed on to them by financial firms acting as their trading counterparties. The frameworks set forth by both the Dodd-Frank Act and the Basel III accord address systemic risk inherent in the markets from counterparty credit risk. Both seek to ensure that the vast majority of OTC derivative contracts are cleared through central counterparties using a combination of legal mandate and economic incentives that increase the cost of customization and bilateral trading.

I. THE DODD-FRANK ACT

In July 2010, Congress passed the Dodd-Frank Act, which brought regulation to the over the counter (OTC) derivative markets by establishing a broad framework for the treatment of risk related to these transactions. The Act established joint oversight for OTC derivative transactions by the Commodities Futures Trading Commission (CFTC) and the Securities Exchange Commission (SEC) and allows for continued bank oversight from the current prudential regulators including the Federal Reserve Board (Board), Federal Deposit Insurance Company (FDIC), the Office of the Comptroller or Currency (OCC), and other agencies in their respective jurisdictions. Banks, bank holding companies (BHCs) and other regulated financial institutions will continue to adhere to existing prudential regulation. In most circumstances the capital treatment of OTC derivative transactions for bank and BHCs under the Act is governed by existing regulation.

The Act categorizes market participants according to their size, role, and systemic significance in the derivative markets. The application of the Act differs for each category and sets the terms under which institutions are allowed to transact in the OTC markets. Participants fall into three primary categories: Swap Dealers (SD), Major Swap Participants (MSPs), and End Users (EUs). Different requirements exist for each category, with heightened requirements for SDs and MSPs that include the collection of both initial and variation margin from their counterparties for bilateral transactions that are not cleared. SDs ad MSPs are required to clear all transactions that are accepted as "clearable" by a derivatives clearing organization and are also required to execute clearable transactions on a swap execution facility (SEF).

End users have considerably more flexibility handling their transactions than SDs or MSPs and are classified as financial or non-financial. "Financial end users" are those financial entities whose OTC derivative transactions fall below threshold levels set for designation as a MSP. They are further divided according to their risk level: high risk and low risk. "Non-financial end users" are given an exemption from both clearing and execution. Those hedging commercial risk have full discretion over clearing, execution and collateralization of their transactions. Non-financial end users may elect to clear and execute on SEFs, but are not required to do so. They are also exempt from collateralizing transactions.

Under this framework, it will become increasingly important for all end users to evaluate the relevant costs incurred with derivative transactions. Firms face increased costs, which include funding collateral used for initial and variation margin,

capital (both internal and that of their counterparties), structural and execution costs. Each of these factors will influence end users' hedging decisions and determine how they chose to execute transactions.

A. Capital Requirements

The Act sets minimum capital requirement for financial entities, including SDs and MSPs that are subsidiaries of regulated banks, BHCs and financial institutions. It includes separate requirements for entities that are not currently regulated. It also establishes guidelines for SDs and MSPs that are registered as Futures Commission Merchants (FCMs) handling customer margin for cleared transactions.

Most SD and MSPs that either directly or indirectly fall under jurisdiction of a prudential regulator will continue to adhere to applicable prudential guidelines. For many, this constitutes supervision by one or more of the FDIC, OCC, Board, or other agency. These institutions calculate their regulatory capital, including that for OTC derivatives, using either a foundation rules-based approach or an advanced approach. Banks that calculate their economic capital through internal models seek the approval of their regulator for the flexibility to use these models to calculate their regulatory capital. Many prefer more risk-sensitive methodologies to the formulaic approach because they more accurately reflect their specific risk characteristics and allow them to take advantage of multi-product counterparty netting.

For those SDs and MSPs that are not currently regulated and are not registered as an FCM (and otherwise not under the jurisdiction above), the CFTC has established capital requirements that mirror those for BHCs under existing prudential banking regulations.

The Act sets a permanent floor on aggregate bank capital equal to the level at the time of its enactment. This floor is calculated using what is referred to as the "general risk based capital rules." It requires BHCs using the advanced approach methodology, in the United States and abroad, to determine their capital requirements to also perform a calculation under these rules and use the more conservative of the two measures.[1] The "general risk based capital rules" are analogous to the rules proposed in the first Basel accord and subsequently used in Basel II's foundation approach, which forms the basis for U.S. regulation. The general rules are standardized across regulatory agencies and are contained in the federal code of regulations (see 12 CFR Part 3 Appendix A-OCC, Part 208 & 225 Appendix A-FRB, Part 325 Appendix A-FDIC).

Given the requirement for dual calculations, banks and affiliated SDs and MSPs will face two possible measures for their regulatory capital, and two measures for the capital required for OTC derivative transactions. Their marginal cost of regulatory capital will be either that which is calculated from the "general rules" or that which

1. U.S. regulations for bank and BHC capital adequacy are derived from the Basel accords (Basel I & II). The Code of Federal Regulations largely reflects the standards and requirements set forth in the accords, with some modifications. For example, Basel II's standardized approach to calculate counterparty exposure for OTC derivatives is not permitted for U.S. institutions.

is calculated internally using the advanced approach methodology. Bank capital will be determined by the rules that produce a more conservative measure for the institution as a whole, across all product lines and asset classes. In most cases the general rules should yield a more conservative measure of capital adequacy and will determine the amount of regulatory capital required.

B. Prudential Regulation

Current U.S. bank regulation and international capital adequacy standards are based on the principles detailed in the Basel II accord. Financial institutions are allowed to calculate regulatory capital for credit risk under two approaches: the foundation approach or the internal ratings based approach. Banks may use three methods to calculate their counterparty credit risk: the current exposure method (CEM), the standardized method, or the advanced approach, of which two (CEM and advanced approach) are permitted for U.S. institutions. Those with less sophisticated modeling capabilities can use the formula-based approach. Those seeking more risk sensitive measures do so using internally modeled parameters under the advanced approach to calculate their regulatory capital requirements.

C. General Risk Based Capital Rules

The general risk based rules were detailed in the first Basel accord and form the basis of the CEM for calculating capital under Basel II. The methodology is used in the United States as the default method for calculating capital requirements for OTC derivatives for firms that do not or are not allowed to use their own internal models for the calculation. Under the CEM, firms calculate counterparty credit risk from the sum of a transaction's current and potential future exposure. Current exposure is the replacement cost of a transaction after including applicable collateral. Future exposure is calculated by multiplying the notional value of a transaction by a conversion factor from Table 1.

Capital Required = Risk Weight × Counterparty Credit Risk (CCR)

CCR = MTM or Replacement Cost + Potential Future Exposure (PFE)

PFE = Notional Value × Conversion Factor

Netting is calculated using the formula: $A_{net} = 0.4 \times A_{gross} + 0.6 \times (NGR \times A_{gross})$ where NGR is the ratio of net exposure to gross exposure. This is the same methodology used to calculate capital under the general risk-based capital rules. Current and future exposures are offset by collateral, which is adjusted by applicable haircuts for quality, liquidity, and tenor.

D. Advanced Approach

Under the advanced approach, firms may use internal model methodologies (IMM) to estimate many of the parameters used to calculate their regulatory capital, including: the probability of default (PD), loss given default (LGD), expected positive exposure (EPE) and exposure at default (EAD). The EAD is scaled by a capital

Table 1. Conversion Factors (in percent).*

Remaining maturity	Interest rate	Exchange rate and gold	Equity	Commodity, excluding precious metals	Precious metals, except gold
One year or less	0	1	6	10	7
Over one to five years	0.5	5	8	12	7
Over five years	1.5	7.5	10	15	8

*Code of Federal Regulations, Title12, Appendix A to Part 225, Capital Adequacy Guidelines for Bank Holding Companies: Risk-Based Measure.

factor "K" to determine the capital required for a particular counterparty or netting set.[2]

$$\text{Capital Required} = K \times \text{EAD}$$

$$\text{EAD} = \alpha \text{ x effective EPE}$$

Alpha (α) is a scaling parameter equal to 1.4 or may be calculated internally, but not less that 1.2. EPE is the expected positive exposure of the trade or netting set.
Where:

$$K = \left[LGD \times N\left(\frac{N^{-1}(PD) + \sqrt{R} \times N^{-1}(0.999)}{\sqrt{1-R}} \right) - (LGD \times PD) \right] \times \left(\frac{1 + (M - 2.5) \times b}{1 - 1.5 \times b} \right)$$

- N (.) is the cumulative distribution function for a standard normal random variable.
- N^{-1} (.) is the inverse cumulative distribution for a standard normal random variable.
- R is a correlation factor, $R = 0.12 \times (1 - e^{(-50 \times PD)}) / (1 - e^{(-50)}) + 0.24 \times [1 - (1 - e^{(-50 \times PD)}) / (1 - e^{(-50)})]$.
- B is a maturity adjustment, $b = (0.11852 - 0.05478 \times \ln(PD))^2$
- M is the effective maturity of the counterparty netting set.

Table 2 highlights the relative capital requirements for US $100mm notional interest rate swaps under the applicable regulatory frameworks. The CVA Var charge implemented in Basel III leads to a significant increase in the capital necessary, particularly for long-dated transactions.

E. Clearing

Under U.S. regulation and Basel II, trades with a central counterparty receive a risk weighting of zero. This weighting applies to both current and future exposure from derivative transactions. Under the general risk-based capital rules, current

2. *Code of Federal Regulations*, Title 12, Appendix G to Part 225, "Capital Adequacy Guidelines for Bank Holding Companies: Internal Ratings-Based and Advanced Measurement Approaches."

Table 2. Capital Comparison (US$).

	General Risk-Based Rules	U.S. Prudential Regulation		Basel III Collateralized w/ CVA Charge
		Uncollateralized	Collateralized	
5 yr Swap	100,000	39,949	20,465	67,858
10 yr Swap	300,000	79,742	38,089	195,000

Single 'A' rated counterparty at 20% risk weight.
10 day collateral holding period.

exposures collateralized with cash also receive a risk weighting of zero. Potential future exposure, however, is only partially offset within netted portfolios, up to a maximum of 60% of the gross risk (see the netting formula above). The residual exposure is floored at 40% of the gross PFE based on the gross notional value of individual transactions in the netting set. The capital required under the general rules is much greater than that required by firms using Basel II's advanced approach for large offsetting portfolios.

F. Collateral and Margin

One of the significant provisions of Dodd-Frank is the requirement for participants to post a combination of initial and variation margin to their counterparties for non-cleared transactions. The Act requires financial end users to collateralize most transactions with their counterparties. Non-financial end users are generally not required to collateralize exposure. In its current form, there are two different standards for the collateral and margin relating to bilateral swaps. A firm's regulatory supervisor determines the applicable standard: either that of the prudential regulators, or the CFTC and SEC.

G. Prudential Regulators Margin

SDs and MSPs supervised by the Board, FDIC, OCC, or other agency are required to collect and segregate initial and variation margin from their counterparties for all bilaterally executed swaps. Low risk financial end users and non-financial end users are not required to post initial margin until their exposure exceeds specified threshold levels, initially proposed to be US $15mm to $45mm in mark-to-market exposure, or 0.1% to 0.3% of a firm's Tier I capital. Non-financial end users operate under an identical threshold for variation margin. Other financial firms must operate with CSAs and are required to post initial margin for bilateral trades.

Dealers and MSPs required to receive initial margin from their counterparty have the option to determine the amount through a standard look-up table or through their own calculation. In both scenarios cross-product netting is not permitted across asset classes.

Firms choosing to calculate margin internally must calculate potential future exposure to a confidence level of at least 99% using a minimum 10-day holding

period. Data used to calibrate the model must be greater than one year and incorporate periods of financial shock. Notwithstanding, the margin amount must be greater than that which would be required by a central counterparty for a similar transaction.

H. CFTC Margin

The primary difference under CFTC rules is an exemption granted to non-financial end users from the requirement to post initial margin under any circumstances. For all other participants, SDs and MSPs are offered two similar options to calculate initial margin. Rather than a look-up table, firms may calculate margin for bilateral trades as double that required by a CCP for a similar trade based on its risk characteristics. Alternatively, they may calculate margin internally, to the same 99% confidence over a 10-day holding period.

I. CCP Margin

CCPs calculate margin to a minimum confidence interval of 99%, assuming a five-day or greater holding period. For example, LCH Swapclear calculates for 100% loss coverage based on a historical data set and a five-day holding period for its members. IDCG calculates for 99.7% coverage over five days using historical and stressed data. CME Clearing and ICE Credit Clearing use similar specifications with their respective internal models. We expect regulators to set margin for non-cleared transactions at a minimum of 140% of the cleared equivalent, which would reflect the longer holding period.

II. BASEL III

Internationally, the Basel Committee on Banking Supervision responded to the financial crisis with its own revised framework for capital adequacy. It addressed many of the shortcomings that exist in the current Basel II framework through revisions that increase both the overall quantity and quality of bank capital. It includes a more comprehensive set of guidelines for the calculation of a bank's risk-based capital requirements. Basel III includes significant changes to the capital adequacy framework, particularly for counterparty credit risk embedded in OTC derivative transactions. The new accord encourages banks to centrally clear derivative transactions and will require banks to significantly increase the amount of capital held against bilateral transactions that are not cleared.

Basel III is expected to become effective in January 2013 and should be phased in over the next several years. It is the committee's response to the financial crisis and includes a variety of measures to improve the quality of bank capital and to increase the quantity of capital relative to risk weighted assets. It employs more stringent criteria for measuring and evaluating various types of risk.

In the trading book, it provides for increased capital to be held against market risk, particularly for OTC derivative and securitization transactions by requiring stressed Var calculations based upon historical data. It strengthens the counterparty

credit risk framework and includes incentives for firms to use central counterparties. The methodology for calculating exposure is revised to be more stringent and includes evaluating Var during scenarios of significant financial stress. A CVA Var capital charge is added to Basel II "default" capital for counterparty credit risk. Transactions with CCPs are risk weighted according to the financial strength and structure of the clearinghouse and its compliance with International Organization of Securities Commissions (IOSCO) standards. The accord addresses systemic risk among financial firms by raising the risk weight for transactions between financial firms relative to non-financials. Other enhancements include the use of capital buffer and a non-risk based leverage buffer and new liquidity standards.

Several of the changes implemented under Basel III will directly impact the calculation of capital for counterparty credit risk inherent with OTC derivative transactions. CCR will include Var calculations using stressed input parameters that reflect the most recent three years of historical data. Institutions active in the derivative markets will be significantly affected by the addition of a new CVA Var capital charge that is added to the existing Basel II default capital requirements. It requires them to hold capital against potential mark-to-market losses resulting from a deterioration of counterparty credit quality. The CVA Var charge will only be calculated for bilateral transactions and will serve as an added incentive for firms to use CCPs.

The framework strengthens the treatment of collateralized exposure by increasing the minimum margin period of risk for collateralized transactions in large netting sets and those containing illiquid trades or collateral. It prohibits the use of rating downgrade triggers in calculating expected exposures. It also increases the risk weighting to financial institutions relative to non-financial institutions through a correlation adjustment to reflect the systemic risk among financial firms.

A. Aggregate Capital Requirements

Similar to Dodd-Frank, Basel III imposes heightened capital requirements for systemically important institutions. They are subject to an additional capital buffer of up to 2.5%. Basel III also changes both the composition and quantity of bank capital. It adds a countercyclical buffer of up to 2.5% and a conservation buffer of 2.5% to institutions' capital requirements. The increase in aggregate capital required across banks as a whole could lead to a greater focus on internal capital allocation to respective business lines at both a macro and micro level within financial entities.

B. CVA Var Charge

The adoption of a CVA Var capital charge is one of the more significant changes implemented in Basel III. The charge will lead to a substantial increase in the capital required for bilateral OTC derivative transactions, even for those that are collateralized. Conceptually, the charge is intended to capture the potential MTM losses from deterioration in counterparty credit quality that could occur short of a default. Regulators require firms to calculate the charge using a 99% Var estimate

resulting from changes in credit spreads over a one-year horizon. Firms are required to use market-based spreads and LGD assumptions in their models and are permitted to include CVA hedges, including both single name and index CDS, in the calculation.

Banks have the option to calculate the CVA charge internally or using a standardized formula detailed in the framework. In both approaches, the methodology involves calculating the EAD for a counterparty according to the bank's selected method (CEM, standardized, IMM), incorporating the effects of collateral and netting. The bank will then calculate the Var in a manner similar to that of a bond with a notional equal to the EAD and a maturity equal to the notional weighted effective maturity of a counterparty's netting set. Var must be calculated solely from the volatility of the counterparty's credit spreads and measured over a one-year horizon. The CVA charge is a stand-alone charge that is added to the Basel II default capital calculation for each counterparty.

Banks using the IMM approach to calculate the CVA Var charge are required to use a specified formula as the basis for their model's calculation of a counterparties CVA (see Appendix A). The formula uses currently available market rates, including CDS spreads and recovery values, to estimate PD and LGD and incorporates CVA hedges. CVA is calculated by applying marginal default probabilities to expected exposures over the life of the netting set. The CVA Var charge is then calculated to a confidence level of 99% over a one-year horizon.

For those firms not able to calculate CVA Var internally, a standardized formula is provided that uses a simplified approach which specifies a risk weight according to a counterparty's credit rating and estimates the charge using EAD and the notional weighted maturity of the counterparty (see Appendix A).

C. Collateralized Counterparties

Basel II sets a floor of 10 days on the minimum margin period of risk used to calculate the exposure for collateralized transactions that are marked-to-market on a daily basis. Basel III increases it to 20 days for counterparties with large netting sets (greater than 5000 trades) when a transaction is not easily replaceable or where illiquid collateral is used. Not easily replaced OTC transactions are those with illiquid risk positions that are difficult to hedge, such as certain types of correlation risk or long dated volatility skew. Firms required to use longer margin periods when calculating EAD will be affected by the increase in EE that is the basis for the CVA Var charge. The potential cost increase resulting from the lengthened margin period will serve as an incentive for dealers to collapse offsetting risk in their portfolios and to more closely monitor trade and collateral liquidity. A detailed comparison is summarized in Table 3.

D. CCP Risk Weighting

Under Basel II, bank exposures to CCPs are given a zero risk weight. Basel III imposes a 2% risk weight to exposures to qualifying CCPs, which includes trade exposure, initial margin and default fund contributions of CCP members. The risk

Table 3. Collateralized Capital Requirements 10 year IRS.

Credit Rating	10 Day Holding Period			20 Day Holding Period		
	Capital	CVA Charge	Total	Capital	CVA Charge	Total
AAA	17,580	98,069	115,649	26,048	145,309	171,358
AA	17,580	98,069	115,649	26,048	145,309	171,358
A	27,207	112,079	139,286	40,312	166,068	206,380
BBB	56,069	140,099	196,167	83,077	207,585	290,662
BB	86,923	280,198	367,120	128,793	415,170	543,963
B	114,922	420,297	535,219	170,281	622,755	793,035
CCC	181,364	1,400,989	1,582,353	268,728	2,075,850	2,344,578

weighting will be determined by the CCP's compliance with revised Committee on Payment and Settlement Systems (CPSS) and IOSCO guidelines. The 2% risk weight provides a nominal addition to bank capital and is intended to ensure that banks measure and monitor their overall CCP exposure.

E. Financial Correlation Adjustment

Basel III increases the correlation factor "R" used in the calculation of the capital requirement "K" (see the equation above under Basel II) by a multiple of 1.25 for transactions among financial institutions. The correlation increase applies to exposures with financial firms whose total assets are greater than or equal to US $100 billion. It also applies to transactions with any unregulated financial firm. This translates into an approximately 25% corresponding increase in capital for affected transactions.

III. END USER TRANSACTIONS

End users face a significantly different cost structure for OTC derivative transactions under the combined effects of Dodd-Frank and Basel III. Increased capital requirements for dealers and financial institutions and initial margin for both cleared and non-cleared transactions will have a direct impact on end user derivative pricing. Firms will want to evaluate the costs associated with bilaterally executed, non-cleared transactions and compare them with those of a SEF-traded and cleared alternative. Financial end users will face an entirely one-sided cost structure that penalizes customized and discretionary bilateral transactions in favor of cleared vanilla trades. In many instances, customized transactions can be restructured into a combination of centrally cleared and bilateral transactions that require less capital and are less costly to execute.

End users face a tradeoff between efficient, cost-effective risk transfer and the need for hedge customization. The costs implicit in this tradeoff include: regulatory capital, funding initial margin, market liquidity and structural factors. All of these will affect cleared and non-cleared transactions much differently. Dealers and financial participants will be required to hold increased amounts of regulatory capital and higher levels of initial margin against bilateral transactions versus those which are centrally cleared.

Customized swaps, as a result of their unique nature, will not be clearable. While they could theoretically be executed on a SEF, they will more likely trade bilaterally between counterparties, as per current practice. End users are likely to pay a liquidity premium for bilateral execution compared to that on a SEF, where liquidity is likely to be greatest. Structural costs may also exist, to the extent that dealers are unable to find a natural non-cleared hedge for bilateral trades and are left with a structural margin position at CCPs from hedging customers' transactions. The cost of dealers' margin would be passed along to end users adding to the position. End users will want to evaluate the impact of these costs on the incremental risk introduced by each new transaction to both maximize the amount of nettable risk at dealer counterparties and minimize their associated hedging costs.

A. Further Discussion

In the remainder of the paper, we illustrate many of the explicit and implicit costs associated with execution, clearing, and capital that are expected to exist under the framework created by Dodd-Frank and Basel III. We estimate many of these costs for end users according to their credit quality. For non-financial end users, we examine the impact of the framework on the cost of collateralized and non-collateralized trades. For all others, we compare the cost of capital and initial margin for non-cleared bilateral transactions with that of an SEF-traded centrally cleared equivalent. This includes assessing the potential impact of liquidity and structural costs on end user transaction pricing.

B. End User Costs

The additional amount of regulatory capital required for OTC derivatives is one of the more significant changes affecting market participants. Dodd-Frank sets a floor on aggregate bank capital; however, it is not likely to directly alter the marginal cost allocated by dealers to OTC derivative transactions at the counterparty level. This is due to the disconnect between the regulatory formulas under the general rules and market practices for economic and regulatory capital calculations (Basel II and III advanced approach methodologies). Instead, it is likely to be treated as an immediate and interim measure to increase aggregate bank capital while regulators work to incorporate Basel III capital adequacy standards into U.S. regulation. While cleared trades are granted capital relief under both Basel II and III (0% and 2% risk weighting, respectively), the cost of bilateral transactions will increase substantially from the combined effects of the CVA Var charge, financial correlation adjustment, stressed calculations, and potentially longer margin periods of risk. Bilateral trades will be scrutinized for their contribution to credit risk and capital, and dealer prices will reflect their anticipated costs over the life of a transaction.

Funding the collateral required for initial margin is another significant cost facing most participants. Non-financial end users are expected to remain exempt from mandatory margin requirements. Low risk financial end users may also remain exempt below established regulatory thresholds. All other participants will be required to post initial margin for both cleared and bilateral transactions. Bilateral margin is likely to be at least 40% higher than corresponding CCP levels, which should lead to increased trade standardization as participants will be forced to pay more of a premium for customization.

Beyond the cost of initial margin, end users will face an operational cost associated with central clearing imposed by their FCMs. Competition should limit the administrative portion of operational cost to a nominal charge. It will, however, include specific terms dependent on the credit quality of the clearing customer and capital involved. Many clearing customers will face FCM margin requirements that are credit sensitive and exceed those required for CCP members. FCMs are required to comply with existing capital rules under CFTC and SEC regulations, requiring

them to carry capital equivalent to 8% of their customers' initial margin posted for cleared transactions.

End users face potential liquidity driven execution costs in a market that will be split between vanilla SEF-executed trades and customized bilateral transactions. Currently, nearly all interest rate swaps trade bilaterally between participants. Dodd-Frank changes execution by requiring all clearable swaps to trade on SEFs. The concentration of trading on these platforms should lead to increased liquidity among swaps with standard size and tenor. We think this will result in tighter bid-ask spreads for SEF executed transactions than those transactions executed bilaterally. Standard vanilla transactions, traded on SEFs and cleared through a CCP, will become the market convention adopted by participants. Bilaterally executed swaps, whether the result of their customized nature or due to end user discretion, are likely to be priced less favorably, incorporating a concession or liquidity premium, that reflects a decrease in liquidity relative to that available on a SEF.

There is the potential for a structural imbalance to develop in the market that affects end user transaction prices. The market for end user transactions will be segregated between those that are cleared and those that are transacted bilaterally. There is the potential for a risk mismatch to develop within each of these categories. Aggregate risk in the market should be largely offsetting, essentially resembling a matched book. The mismatch would occur if end user non-cleared risk becomes predominantly one-sided and dealers are not able to find a natural non-cleared offset for the risk. Dealers would be left with non-cleared risk positions that are hedged by cleared trades, which would leave them with an aggregate "captive" structural margin position at CCPs. The cost associated with this margin would be passed along to end users adding to the position. It would ultimately lead to a bifurcated market between cleared and non-cleared transactions with a substantial pricing bias. In the near term, it is likely to create greater price variation among dealers and add an additional dimension to the counterparty-specific costs of a transaction.

C. Capital Calculations

In order to illustrate and evaluate the impact of the framework under Dodd-Frank and Basel III on end users and their dealer counterparties, we estimated the capital required for vanilla US $100mm notional, at-the-money 5-year and 10-year interest rate swaps for counterparties of varying credit quality. We modeled forward rates using an initial flat yield curve of 3.00%, with parallel shifts in rates governed by Brownian motion with a constant annual volatility of 30%. Expected exposures were calculated for one year and used to calculate the effective EPE and EAD as per regulatory guidelines. We used PD estimates by rating category taken from Deutsche Bank's Pillar 3 Disclosure in its 2010 Annual Report. LGD was set at 50% for an uncollateralized claim. We calculated capital according Basel II's Advanced IRB Approach.

The CVA Var charge was calculated using the Standardized Method contained in Basel III with the associated counterparty risk weightings. We added the CVA

Var charge to the amount of Basel II default capital to arrive at the total capital required under the new framework. The total capital amount is the capital a firm must hold today against a bilateral swap. To estimate the cost of capital that a firm must hold over the life of the transaction, we assumed a blended dealer cost of capital of 8.0%.

We made several assumptions to arrive at the capital estimates contained in this paper. In aggregate, the assumptions and methodologies used likely result in higher capital calculations and lower margin calculations. Banks calculating the CVA Var charge using an IMM approach may arrive at a smaller charge than under the Standardized Formula due to differences in credit Var parameters. Similarly, exposures calculated with a lagged collateral model are likely to be lower than our estimates. End user clearing costs are likely to be higher than our estimates, which reflect the margin requirement for CCP members. Customer margin requirements are generally higher than those for members and will reflect specific terms agreed with an end user's FCM. The net result is an upward bias in the capital cost estimates and a downward bias in those for clearing cost.

D. Uncollateralized Transactions

Non-financial end users that are not required to implement CSAs for bilateral transactions will face a much more punitive execution cost going forward as a result of the additional capital that must be held by their trading partners. The cost of capital implicit in the price of their transaction is largely unchanged under Dodd-Frank but will increase significantly with the inclusion of the CVA Var charge under Basell III. It is likely that dealers will increase their capital "charge" for a swap in anticipation of the adoption of the new Basel framework. This added charge is expected for hedging transactions with end users who hedge predominantly one-sided risk or long-dated transactions that are likely to remain in place and overlap with the implementation of Basel III.

Non-financial end users have discretion to forgo clearing for vanilla as well as customized trades and execute them bilaterally. They also retain discretion over collateralization. Tables 4 and 5 show the capital required for uncollateralized US $100mm notional, at-the-money 5- and 10-year interest rates swaps for end users according to their credit rating. The current Basel II default capital will increase under Basel III by 400%, as a result of the CVA Var charge.[3]

The magnitude of the CVA Var charge is substantial and its impact will significantly increase the cost for firms operating with and without CSAs. The dealer's capital cost attributed to CCR for a single "A" counterparty on a 10-year swap is $32,660 for the first year of the trade under Basel III and estimated at $140,043 over the life of the trade or 1.63 basis points running (140,043/85,800), of which 80% pertains to the CVA Var charge.

While we assume dealers will charge end users upfront for their cost of capital

3. The CVA Var charge was calculated using the Standardized Method, shown in detail in Appendix A.

Table 4. Uncollateralized 5-year IRS.

Credit Rating	PD	Year One Basel II Capital	Year One Basel III CVA Var Charge	Year One Total CCR Capital	Year One Capital Cost	Capital Cost Life of the Trade
AAA	0.03%	25,814	80,954	106,768	8,541	24,651
AA	0.03%	25,814	80,954	106,768	8,541	24,651
A	0.07%	39,949	92,519	132,468	10,597	30,585
BBB	0.32%	82,329	115,649	197,977	15,838	45,710
BB	1.12%	127,634	231,297	358,931	28,714	82,871
B	3.93%	168,747	346,946	515,693	41,255	119,065
CCC	22.00%	266,308	1,156,485	1,422,794	113,823	328,501

Table 5. Uncollateralized 10-year IRS.

Credit Rating	PD	Year One Basel II Capital	Year One Basel III CVA Var Charge	Year One Total CCR Capital	Year One Capital Cost	Capital Cost Life of the Trade
AAA	0.03%	51,527	287,439	338,966	27,117	115,165
AA	0.03%	51,527	287,439	338,966	27,117	115,165
A	0.07%	79,742	328,502	408,244	32,660	140,043
BBB	0.32%	164,336	410,627	574,963	45,997	201,178
BB	1.12%	254,768	821,254	1,076,023	86,082	372,496
B	3.93%	336,835	1,231,881	1,568,716	125,497	540,434
CCC	22.00%	531,576	4,106,271	4,637,847	371,028	1,562,574

over the life of the trade, Tables 4 and 5 do not include the bank's CVA for the credit risk of the swap. The CVA credit charge is listed in Table 6 using average CDS spreads for corporate firms by rating category, assuming a constant marginal probability of default based on the CDS spread and recovery value applied to the expected exposure of the swaps.

What was previously a costly transaction becomes even more punitive. This should compel most non-financial end users who do not already do so to operate under CSAs.

E. Collateralized Transactions

The current requirement under Basel II, which is carried forward to Basel III, is to model collateralized exposure using a 10-day margin period of risk, during which a defaulting counterparty's position will be re-hedged and its collateral liquidated. Collateralized capital requirements are contained in Table 7 and 8.

F. Central Clearing

Non-financial end users lobbied successfully to be exempted from the requirement to clear or even post initial margin for non-cleared transactions. Cost and capital scarcity were cited as being prohibitive to both growth and investment. The cost to fund initial margin is substantial, particularly for those firms without offsetting risk. Funding costs are computed from aggregate corporate CDS spreads according to rating category.

Non-financial end users have limited outright economic incentive to use CCPs. The cost of funding initial margin outweighs the charge for dealer capital cost. Existence of a sufficiently large liquidity premium or structural charge would alter the economics, particularly for short dated transactions as shown in Tables 11 and 12. The net clearing cost expressed as running basis points represents the aggregate break-even liquidity and structural costs. It is likely that discretionary use of CCPs by non-financial end users will not be driven by cost, but rather by end users' desire to reduce counterparty risk.

G. Financial End Users and Bilateral Margin

Under Dodd-Frank, low risk financial end users are not required to post initial margin for bilateral transactions. They face a similar situation to that of non-financial end users, but if regulated, are required to hold capital for their own capital adequacy. Their internal capital requirements lead to a much closer relationship for the costs of cleared and bilateral transactions, as shown in Tables 13 and 14. We doubled the capital cost estimate as a proxy for the overall cost affecting financial end users. This is admittedly a rough approximation of the cost they will face from dealers plus the cost of their own capital adequacy requirement.

Given the comparable costs for cleared versus non-cleared transactions, financial end users will be more sensitive to potential liquidity and structural costs and their impact on their hedging strategies. The net cost expressed as running

Table 6. Uncollateralized Bilateral CVA Credit Charge.

Credit Rating	CDS Spread	5 Yr Swap Credit Charge	10 Yr Swap Credit Charge
AAA	0.41%	17,665	94,616
AA	0.57%	24,526	131,365
A	0.74%	31,796	170,303
BBB	1.11%	45,547	254,671
BB	2.68%	113,315	606,931
B	4.44%	185,024	991,017
CCC	7.88%	319,254	1,709,967

Table 7. Collateralized Capital Requirements 5 year IRS.

	Year One Capital Requirements			Capital Cost
Credit Rating	Capital	CVA Var Charge	Total	Life of the Trade
AAA	9,445	29,621	39,066	9,020
AA	9,445	29,621	39,066	9,020
A	14,618	33,853	48,470	11,191
BBB	30,124	42,316	72,440	16,726
BB	46,701	84,632	131,333	30,323
B	61,745	126,948	188,693	43,567
CCC	97,443	423,160	520,602	120,201

Table 8. Collateralized Capital Requirements 10 year IRS.

	Year One Capital Requirements			Capital Cost
Credit Rating	Capital	CVA Var Charge	Total	Life of the Trade
AAA	17,580	98,069	115,649	40,204
AA	17,580	98,069	115,649	40,204
A	27,207	112,079	139,286	48,912
BBB	56,069	140,099	196,167	70,330
BB	86,923	280,198	367,120	130,156
B	114,922	420,297	535,219	188,793
CCC	181,364	1,400,989	1,582,353	545,279

Table 9. Five-Year IRS - Cleared Initial Margin.

Credit Rating	CDS Spread*	Year One CCP IM 5 yr Swap**	Year One Margin Cost	Margin Cost Life of the Trade
AAA	0.41%	1,800,000	7,380	17,205
AA	0.57%	1,800,000	10,260	23,919
A	0.74%	1,800,000	13,320	31,053
BBB	1.11%	1,800,000	19,980	46,579
BB	2.68%	1,800,000	48,240	112,462
B	4.44%	1,800,000	79,920	186,318
CCC	7.88%	1,800,000	141,840	330,672

*Moody's.
**Initial margin percentages taken from International Derivative Clearing Group.

Table 10. Ten-Year IRS - Cleared Initial Margin.

Credit Rating	CDS Spread*	Year One CCP IM 10 yr Swap**	Year One Margin Cost	Margin Cost Life of the Trade
AAA	0.41%	3,730,000	15,293	77,173
AA	0.57%	3,730,000	21,261	107,289
A	0.74%	3,730,000	27,602	139,288
BBB	1.11%	3,730,000	41,403	208,932
BB	2.68%	3,730,000	99,964	504,448
B	4.44%	3,730,000	165,612	835,727
CCC	7.88%	3,730,000	293,924	1,483,227

*Moody's
**Initial margin percentages taken from International Derivative Clearing Group.

Table 11. Non-financial End User 5 year IRS Capital vs. Margin.

Credit Rating	Capital Cost Non-cleared	Margin Cost Cleared	Net Clearing Cost (NCC)	NCC Running BP
AAA	9,020	17,205	8,185	0.18
AA	9,020	23,919	14,899	0.32
A	11,191	31,053	19,862	0.43
BBB	16,726	46,579	29,854	0.65
BB	30,323	112,462	82,139	1.78
B	43,567	186,318	142,751	3.10
CCC	120,201	330,672	210,471	4.57

Table 12. Non-financial End User 10 year IRS Capital vs. Margin.

Credit Rating	Capital Cost Non-cleared	Margin Cost Cleared	Net Clearing Cost (NCC)	NCC Running BP
AAA	40,204	77,173	36,969	0.43
AA	40,204	107,289	67,085	0.78
A	48,912	139,288	90,376	1.05
BBB	70,330	208,932	138,602	1.62
BB	130,156	504,448	374,292	4.36
B	188,793	835,727	646,934	7.54
CCC	545,279	1,483,227	937,948	10.93

basis points is the break-even liquidity premium and structural cost for bilateral versus SEF execution. In the case of an A-rated end user trading a five-year swap, if the execution savings on a SEF relative to a bilateral trade is greater than 0.2 bpa running on a swap, it will compensate them for the added cost of clearing margin. These institutions evaluating transactions at the margin will be sensitive to execution and potential structural costs. The economics behind a transaction will likely determine whether it is traded bilaterally as a customized swap or replicated with a combination of cleared and bilateral trades.

High credit quality firms should find comparable costs for clearing margin versus capital, while lower rated firms will find funding costs outweigh capital savings. Structural costs from dealer's margin to hedge bilateral trades could have a significant impact on the economics for AAA-rated through BBB-rated firms. This has the potential to add $23,919 or 0.52 bpa to the cost of a five-year swap and $107,289 or 1.25 bpa to the cost of a 10-year swap, using the margin cost of associated with an AA-rated firm. This is the limit to the charge end users could experience; however,

Table 13. Financial End User 5 year IRS Capital vs. Margin.

Credit Rating	Capital Cost Non-cleared	Margin Cost Cleared	Net Clearing Cost (NCC)	NCC Running BP
AAA	18,040	17,205	(835)	(0.0)
AA	18,040	23,919	5,879	0.1
A	22,382	31,053	8,670	0.2
BBB	33,451	46,579	13,128	0.3
BB	60,647	112,462	51,815	1.1
B	87,134	186,318	99,184	2.2
CCC	240,402	330,672	90,270	2.0

Table 14. Financial End User 10 year IRS Capital vs. Margin.

Credit Rating	Capital Cost Non-cleared	Margin Cost Cleared	Net Clearing Cost (NCC)	NCC Running BP
AAA	80,408	77,173	-3,235	(0.0)
AA	80,408	107,289	26,881	0.3
A	97,824	139,288	41,464	0.5
BBB	140,660	208,932	68,272	0.8
BB	260,312	504,448	244,136	2.8
B	377,586	835,727	458,141	5.3
CCC	1,090,558	1,483,227	392,669	4.6

its combination with potential execution costs could be sufficient to influence highly rated financial end users.

We should point out that the capital calculations do not include the 25% increase to the correlation factor for transactions with large financial counterparties. This would increase the default capital amount (with no effect on the CVA Var amount) and lead to an approximate 5% to 10% increase in the total capital cost amounts listed in the tables.

To this point, we have not mentioned the impact and importance of netting. The numbers in the table assume zero netting benefit and estimate the maximum capital and margin cost associated with a single transaction. The capital and clearing costs (and any structural costs) will decrease with a corresponding increase in risk netting. For the A-rated end user five-year swap with 50% netting benefit, the NCC in Table 13 will drop to 0.1 bpa. As the netting benefit increases, the impact of a liquidity premium will become more significant, since it is based on the total market risk executed by the end user. Even the existence of a very small liquidity premium

between bilateral and SEF execution could be a significant factor in end user transaction cost comparisons. In largely netted portfolios it could overshadow capital and margin considerations.

In the example above, we assumed that the netting benefit is equal for both the customers cleared portfolio and its bilateral portfolio at a particular dealer. Netting and end user portfolio composition will play an influential role in determining the trading counterparty as firms try to minimize the amount of net risk outstanding with each counterparty.

High risk financial end users and all other participants are required to post initial margin for bilateral trades. For these firms, it is not a question of whether or not to use CCPs, but rather one of minimizing bilateral costs. These firms have every incentive to maximize the amount of risk they clear relative to that which is executed bilaterally. They stand to benefit from a reduction in initial margin, 40% by our estimates; minimized Basel II and Basel III default capital (0% and 2% respective risk weighting); avoiding the CVA Var charge, which does not apply to cleared transactions; and avoiding the financial correlation adjustment. They also avoid any potential structural costs and are likely to find better execution. For these reasons many will adopt hedging strategies that allow them to maximize the amount of risk transferred through standardized cleared swaps and minimize that which is traded bilaterally.

IV. HEDGING STRATEGIES

Financial end users stand to benefit most from financial engineering to reduce the impact of these factors affecting their overall transaction cost. We expect them to employ strategies that minimize the amount of risk transferred bilaterally in favor of SEF-executed, centrally cleared transactions. Participants will want to compare the incremental cost of a cleared trade at their FCM and CCP against the incremental cost to their bilateral portfolio at each selected dealer. This comparison will include evaluating the impact of liquidity and structural market costs. We expect many to separate their market risk from customized transactions, execute on SEFs, and use CCPs to the extent possible, limiting the use of bilateral trading primarily for customization.

We have outlined two possible approaches end users may pursue going forward. The first involves replicating a customized hedging trade with a portfolio of vanilla trades for risk transfer and one or more basis swaps for customization that in aggregate will be identical to the customized hedging trade. The vanilla trades can be SEF-executed and cleared, reducing both the capital cost and initial margin required, while the basis swap(s) can be executed bilaterally. The second, albeit similar strategy, is to take the customized hedging trade and subtract a vanilla delta hedge from it and then execute the delta hedge independently on a SEF where it is also cleared. The objective of both approaches is to maximize the portion of the market risk that is SEF-executed, resulting in lower overall cost than an entirely bilateral transaction.

In the example below we take an irregularly amortizing 10-year interest rate swap with a risk profile shown in Figure 1. The current trade would be executed bilaterally and subject to the costs and capital outlined earlier. A replicating hedge portfolio of vanilla trades could be SEF-executed and cleared, leaving a basis swap with minimal delta containing a customizing profile of cash flows. Counterparty risk, margin, and capital are significantly reduced (likely negligible in this instance), while the market risk is transferred in a less costly manner. The customized trade is replaced with 10 vanilla swaps and one customized basis swap that replicates the cash flows, payment dates, and risk of the original transaction.

The less clean but more realistic scenario shown in Figure 2 would be to net a delta hedge from the customized transaction. It could be easily replicated as: [the original trade less a 7 year bullet swap] executed bilaterally plus a 7 year bullet swap executed on a SEF and centrally cleared.

The residual swap has a delta of 7k per basis point and a butterfly risk position that is fairly benign. This leads to significantly smaller expected exposures on the residual bilateral trade. Similarly, the cleared delta hedging trade, with a market risk of 50k per basis point will be risk weighted for a CCP, which saves the participant and its counterparty significant capital and bilateral margin.

The higher costs associated with the original bilateral trade would be reduced for 78% of the market risk and apply only to the 12% remaining on the residual butterfly as shown below:

<u>Delta Hedged Cost:</u>

[Bid/Ask + Liquidity premium] for Residual butterfly
+ Bid/Ask for 7-year IRS
+ Capital charge for 7 yr IRS (2% risk wt.)
+ Capital charge [CVA Var & default] for Residual butterfly
+ Cleared margin for 7 yr IRS
+ Non-cleared margin for Residual butterfly
+ Structural charge for Residual butterfly

versus

<u>Original Customized Trade Cost:</u>

[Bid/Ask + Liquidity premium] for Custom hedge
+ Capital charge [CVA Var & default] for Custom hedge
+ Non-cleared margin for Custom hedge
+ Structural charge for Custom hedge

The same delta hedge approach can be applied to more complex transactions, such as those with non-linear risk profiles, where a portion of the market risk can be hedged in a less costly, more capital efficient manner. It can also be applied in more detail to achieve the desired cleared versus residual bilateral risk positions. The end user is not changing the original customized trade but is instead separating a portion of the market risk to be traded independently and cleared. The amount of cost reduction is determined by the risk remaining on the residual bilateral swap.

Figure 1. Irregular Swap – Perfect Hedge.

Year	Customized Trade Notional (mm)	Risk Sensitivity	Vanilla Hedge Notional (mm)	Hedge Risk Sensitivity	Residual Risk Sensitivity
1	106.3	1,000	10.2	(1,000)	0
2	96.1	1,000	5.2	(1,000)	0
3	90.9	1,000	3.5	(1,000)	0
4	87.4	1,000	2.7	(1,000)	0
5	84.7	2,000	4.3	(2,000)	0
6	80.4	8,000	14.7	(8,000)	0
7	65.7	30,000	47.9	(30,000)	0
8	17.9	10,000	14.2	(10,000)	0
9	3.7	2,000	2.6	(2,000)	0
10	1.2	1,000	1.2	(1,000)	0
Total		57,000	106.34	(57,000)	0

Figure 2. Irregular Swap – Delta Hedge.

Year	Customized Trade Notional (mm)	Risk Sensitivity	Delta Hedge Notional (mm)	Hedge Risk Sensitivity	Residual Risk Sensitivity
1	106.3	1,000	0	0	1,000
2	96.1	1,000	0	0	1,000
3	90.9	1,000	0	0	1,000
4	87.4	1,000	0	0	1,000
5	84.7	2,000	0	0	2,000
6	80.4	8,000	0	0	8,000
7	65.7	30,000	80	(50,156)	(20,156)
8	17.9	10,000	0	0	10,000
9	3.7	2,000	0	0	2,000
10	1.2	1,000	0	0	1,000
Total		57,000	80	(50,156)	6,844

A. Netting

The reduction in aggregate counterparty risk through single and multi-product netting will become even more critical under the capital and margin requirements of Dodd-Frank and Basel III. Risk netting remains one of the principal considerations for participants striving to reduce both risk and transaction cost. Firms will seek to minimize bilateral exposure with each of their counterparties. While the impact of netting is significant for some market participants, particularly banks and dealers, who transact in largely offsetting market and credit risk, it has less of an impact on a subset of end users whose hedging transactions are predominantly one sided. They will experience the largest impact from the marginal costs illustrated. For them, the stand-alone trade analysis provided is a relevant representation of the incremental risk and capital associated with their derivative transactions.

As netting benefits increase due to offsetting risk within an end user's portfolio, the relative costs associated with clearing, capital, and market structure will shrink for end users and their counterparties. Execution cost resulting from a liquidity premium will not, and will play an increasing role in the overall cost of the transaction. End users should gravitate toward those venues providing the best liquidity at the lowest cost.

V. IMPLICATIONS

A. Non-financial End Users

Those firms that do not already do so are likely to trade on a collateralized basis. They are not required to clear standard or customized transactions and, despite the increased capital costs levied on them, by dealers are likely to find bilateral execution less expensive than the use of a CCP. Two things could change this: a sufficiently high structural cost in which dealers charge end users for the captive initial margin on their hedge, or a large liquidity premium for bilateral transactions. Both would have to be substantial to make central clearing economically attractive. Non-financial end users electing to clear are likely to do so purely for the reduction of counterparty risk.

Non-financial end users hedging predominantly one-sided risk will likely seek lower cost hedging alternatives or may choose not to hedge at all. Corporate end users might change the structure of their funding and increasingly issue securities that meet their liability risk targets without the use of a swap. It is possible that some will increase their issuance of floating rate and callable or structured notes. Alternatively, some could shorten the duration of derivatives used for hedging purposes, reflecting the relatively high cost associated with long-dated transactions.

B. Low Risk Financial End Users

Low risk financial end users are likely to remain exempt from posting margin below preset regulatory thresholds. For non-cleared transactions, there is less of a trade-off between margin and capital costs, which will increase the impact of potential

structural and liquidity costs. Financial end users hedging strategies are likely to be driven by the credit quality and size of the organization, trading volume, and risk characteristics. Larger firms with lower funding and capital costs are more likely to benefit from CCP use, as are those with high trade volume and offsetting risk. Smaller institutions may continue to execute bilaterally even if it means at a higher cost to avoid the operational and infrastructure requirements for clearing.

C. High Risk Financial End Users

For all other institutions the equation is very simple. Customized bilateral transactions will face an entirely one-sided cost structure that is significantly higher than achieved with SEF-executed centrally cleared trades. Initial margin is expected to be at least 40% greater. Capital costs for both the end user and dealer counterparty will be much greater that the 2% risk weighting of CCPs, largely due to the CVA Var charge addition to CCR. Transactions may be more costly to execute, incurring a liquidity premium relative to those traded on a SEF. Participants may also face a structural premium for captive dealer margin. In addition, transactions facing large financial institutions will face the additional 25% correlation increase to default capital. All of these should compel participants to reduce the amount of risk transacted bilaterally and increase the risk transferred using vanilla SEF-executed and cleared transactions. Institutions are able to accomplish this is by extracting the market risk from customized transactions or replicating it with standardized trades that can be executed and centrally cleared in a more capital and cost efficient manner. They are likely to continue to trade bilaterally to achieve customization, while minimizing the amount of risk transferred through that medium.

D. Concentration Risk

The increased cost for bilateral transactions makes netting critical for firms wishing to minimize hedging costs. A byproduct of this could be an increase in the concentration of risk for non-cleared trades with a small number of dealers. Firms with offsetting risk will maximize netting among dealers to reduce costs but may ultimately seek to transact with a select group of dealers. It is possible that we could see a much larger percentage of bilateral customer transactions concentrated with a small handful of dealers to maximize multi-product netting.

E. Dodd-Frank Capital Floor

The floor imposed on bank capital under Dodd-Frank reflects the desire by regulators to increase aggregate bank capital and bring it closer to that which is required under Basel III. It serves as an interim measure until U.S. rules are amended to incorporate the new Basel ratios. Regulators have expressed their intention to incorporate the Basel III requirements into U.S. regulations and are expected to begin to draft these rules in 2012. The marginal capital required for OTC derivative transactions under the general rules is generally higher than that which is required for large institutions using the advanced approach methodology, but has little if any

correlation with current risk management practice at most sophisticated financial institutions. Going forward, we do not think it will have any impact on market pricing, which is more likely to reflect the risk sensitive measures detailed in Basel III that more closely coincide with current practice.

VI. CONCLUSIONS

The regulatory framework created by the Dodd-Frank Act and the Basel III accord will significantly change the economics and pricing of OTC derivative transactions. Mandatory clearing and initial margin for non-cleared transactions, combined with increases in regulatory capital requirements, will affect end user transaction costs for both vanilla and customized transactions. Bilaterally executed transactions will become increasingly expensive, which should prompt many participants to adopt hedging strategies that minimize the amount of risk executed in that manner. We have shown how this can be done by replicating customized transactions with a combination of vanilla and customized basis trades.

Firms can significantly reduce their margin, capital, structural, and execution cost by maximizing the amount of market risk transferred through SEF-executed, cleared transactions relative to the amount of risk traded bilaterally. Central to this will be an approach that allows firms to maximize the amount of bilateral netting with dealer counterparties. Those firms able to net significant portions of their incremental risk will be less affected by capital, margin, and structural costs.

They will, however, be increasingly affected by differences in liquidity existing between SEFs and bilateral execution. This is mitigated through the same approach, which separates risk transfer from customization and executes the two separately whenever possible.

Ultimately, we expect many end users to employ hedging strategies that separate risk and execution from customization, enabling them to achieve the most cost effective and capital efficient transaction. This should lead to increasingly standardized SEF-executed transactions for transferring market risk and bilateral basis transactions for customization.

APPENDIX A

In order to illustrate and evaluate the impact on participants and their counterparties, we have estimated the capital charge for vanilla at-the-money 5-year and 10-year interest rate swaps for counterparties of varying credit quality. Future interest rates were modeled by Brownian motion with a constant volatility of 30% and zero drift. Expected exposures are calculated assuming a flat yield curve of 3.00%, with parallel shifts in rates. EEPE is calculated according to the formulas used in the Basel framework and observed for one year to estimate EAD. PD estimates according to rating category were taken from Deutsche Bank's Pillar 3 Disclosure in its 2010 Annual Report. LGD is set at 50%. CVA Var is calculated using the Standard Method from Basel III as listed below. End user funding levels are aggregate CDS spreads for corporate firms taken from Moody's.

EEPE Calculation

Expected exposure as a percentage of notional is calculated in the table below. Forward rates were modeled from a flat interest rate curve of 3.00% using an annualized volatility equal to 30.0%. Expected exposures were calculated by simulation of rates over 1,000 paths.

5 year swap Expected Exposures			**10 year swap Expected Exposures**		
Years	Forward Rates	Expected Exposure	Years	Forward Rates	Expected Exposure
0.25	3.1645	0.72	0.25	3.1645	1.37
0.5	3.2281	0.95	0.5	3.2281	1.85
0.75	3.2896	1.14	0.75	3.2896	2.30
1	**3.3202**	**1.19**	**1**	**3.3202**	**2.47**
1.25	3.3619	1.27	1.25	3.3619	2.73
1.5	3.3956	1.30	1.5	3.3956	2.90
1.75	3.4230	1.29	1.75	3.4230	3.02
	EEPE	**0.80**		**EEPE**	**1.60**

EEPE was calculated as the time weighted average over the first year horizon.

Capital Calculation

Capital was calculated according to the formula contained in Basel II and this paper. PD estimates were obtained from the Pillar 3 Disclosure from Deutsche Bank's 2010 Annual Report. LGD was assumed equal to 50%.

EAD = alpha (1.4) * EEPE			**Capital Requirement: No collateral**	
			Notional	100,000,000
		Maturity	5 year swap	10 year swap
Credit Rating	PD	LGD	**EAD = 0.80**	**EAD = 1.60**
AAA	0.03%	50%	25,814	51,527
AA	0.03%	50%	25,814	51,527
A	0.07%	50%	39,949	79,742

EAD = alpha (1.4) * EEPE			**Capital Requirement: No collateral**	
			Notional	100,000,000
		Maturity	5 year swap	10 year swap
Credit Rating	PD	LGD	**EAD = 0.80**	**EAD = 1.60**
BBB	0.32%	50%	82,329	164,336
BB	1.12%	50%	127,634	254,768
B	3.93%	50%	168,747	336,835
CCC	22.00%	50%	266,308	531,576
	r value	b value	k value	
AAA	0.24	0.32	0.02	
AA	0.24	0.32	0.02	
A	0.24	0.27	0.04	
BBB	0.22	0.19	0.07	
BB	0.19	0.13	0.11	
B	0.14	0.09	0.15	
CCC	0.12	0.04	0.24	

			Capital Requirement: Collateral 10 Day	
			Notional	100,000,000
		Maturity	5	10
			5 yr swap	10 yr swap
Credit Rating	PD	LGD	**EAD = 0.41**	**EAD = 0.76**
AAA	0.03%	50%	9,445	17,580
AA	0.03%	50%	9,445	17,580
A	0.07%	50%	14,618	27,207
BBB	0.32%	50%	30,124	56,069
BB	1.12%	50%	46,701	86,923
B	3.93%	50%	61,745	114,922
CCC	22.00%	50%	97,443	181,364
	r value	b value	k value	
AAA	0.24	0.32	0.02	
AA	0.24	0.32	0.02	
A	0.24	0.27	0.04	

			Capital Requirement: Collateral 10 Day		
			Notional	100,000,000	
		Maturity		5	10
			5 yr swap	10 yr swap	
Credit Rating	PD	LGD	**EAD = 0.41**	**EAD = 0.76**	
	r value	b value	k value		
BBB	0.22	0.19	0.07		
BB	0.19	0.13	0.11		
B	0.14	0.09	0.15		
CCC	0.12	0.04	0.24		

Collateralized Holding Period EE

The EAD for collateralized transactions were calculated as the expected exposure at the end of the collateral holding period ("H") using a scaled volatility (30% × (H/250)^0.5).

CVA Var Charge

The CVA Var capital charge was calculated using the formula listed below. The charge was calculated assuming no CVA hedge, using EADs calculated for uncollateralized and collateralized swaps. The counterparty weights from the standardized formula were used.

CVA Var Charge: Uncollateralized				
Standard method		M =	5	10
		EAD =	1,121,943	2,239,499
		Discounted EAD	992,691	1,762,348
Credit Rating	Basel III Weights		Std CVA Chg (K)	
AAA	0.70%		80,954	287,439
AA	0.70%		80,954	287,439
A	0.80%		92,519	328,502
BBB	1.00%		115,649	410,627
BB	2.00%		231,297	821,254
B	3.00%		346,946	1,231,881
CCC	10.00%		1,156,485	4,106,271

CVA Var Charge: Collateralized 10 day holding period			
Standard method	M =	5.00	10
	EAD =	410,521	764,078
	Discounted EAD	363,227	601,283
Credit Rating	Basel III Weights	Std CVA Chg (K)	
AAA	0.70%	29,621	98,069
AA	0.70%	29,621	98,069
A	0.80%	33,853	112,079
BBB	1.00%	42,316	140,099
BB	2.00%	84,632	280,198
B	3.00%	126,948	420,297
CCC	10.00%	423,160	1,400,989

CVA Var Charge: Collateralized 20 day holding period			
Standard method	M =	5.00	10
	EAD =	608,269	1,132,137
	Discounted EAD	538,195	890,923
Credit Rating	Basel III Weights	Std CVA Chg (K)	
AAA	0.70%	43,890	145,309
AA	0.70%	43,890	145,309
A	0.80%	50,160	166,068
BBB	1.00%	62,700	207,585
BB	2.00%	125,399	415,170
B	3.00%	188,099	622,755
CCC	10.00%	626,997	2,075,850

Standardized CVA risk capital charge:[4]

$$K = 2.33 \times \sqrt{h} \times \sqrt{\left[\sum_{I} 0.5 \times w_i \times (M_i \times EAD_i^{total} - M_i^{hedge} \times B_i) - \sum_{ind} w_{ind} \times M_{ind} \times B_{ind})^2 + \sum 0.75 \times w_i^2 \times (M_i \times EAD_i^{total} - M_i^{hedge} \times B_i)^2 \right]}$$

4. *Basel Committee on Banking Supervision, Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems,* Bank for International Settlements, December 2010 (rev. June 2011).

Where:

• **h** is the one-year risk horizon (in units of a year), h = 1.

• $\mathbf{w_i}$ is the weight applicable to counterparty 'i'. Counterparty 'i' must be mapped to one of the seven weights wi based on its external rating, as shown in the table of this paragraph below. When a counterparty does not have an external rating, the bank must, subject to supervisory approval, map the internal rating of the counterparty to one of the external ratings.

• $\mathbf{EAD_i^{total}}$ is the exposure at default of counterparty 'i' (summed across its netting sets), including the effect of collateral as per the existing IMM, SM, or CEM rules as applicable to the calculation of counterparty risk capital charges for such counterparty by the bank. For non-IMM banks the exposure should be discounted by applying the factor $(1-\exp(-0.05*M_i))/(0.05*M_i^{hedge})$. For IMM banks, no such discount should be applied as the discount factor is already included in M_i.

• $\mathbf{B_i}$ is the notional of purchased single name CDS hedges (summed if more than one position) referencing counterparty "i" and used to hedge CVA risk. This notional amount should be discounted by applying the factor $(1-\exp(-0.05*M_i^{hedge}))/(0.05*M_i^{hedge})$.

• $\mathbf{B_{ind}}$ is the full notional of one or more index CDS of purchased protection, used to hedge CVA risk. This notional amount should be discounted by applying the factor $(1-\exp(-0.05*M_{ind}))/(0.05*M_{ind})$.

• $\mathbf{w_{ind}}$ is the weight applicable to index hedges. The bank must map indices to one of the seven weights wi based on the average spread of index 'ind'.

• $\mathbf{M_i}$ is the effective maturity of the transactions with counterparty "i." For IMM banks, M_i is to be calculated as per Annex 4, paragraph 38 of the Basel Accord. For non-IMM banks, M_i is the notional weighted average maturity. M_i should not be capped at five years.

• $\mathbf{M_i^{hedge}}$ is the maturity of the hedge instrument with notional B_i (the quantities $M_i^{hedge}*B_i$ are to be summed if these are several positions).

• $\mathbf{M_{ind}}$ is the maturity of the index hedge "ind." In case of more than one index hedge position, it is the notional weighted average maturity. For any counterparty that is also a constituent of an index on which a CDS is used for hedging counterparty credit risk, the notional amount attributable to that single name (as per its reference entity weight) may, with supervisory approval, be subtracted from the index CDS notional amount and treated as a single name hedge (B_i) of the individual counterparty with maturity based on the maturity of the index.

The weights are given in this table, and are based on the external rating of the counterparty:

Rating Weight w_i	
External Rating	w_i
AAA	0.7%
AA	0.7%
A	0.8%
BBB	1.0%
BB	2.0%
B	3.0%
CCC	10.0%

Basel III CVA Formula:

$$CVA = (LGD_{MKT}) \cdot \sum_{l-1}^{T} Max\left(0; exp\left(-\frac{s_{l-1} \cdot t_{l-1}}{LGD_{MKT}}\right) - \exp\left(-\frac{s_l \cdot t_l}{LGD_{MKT}}\right)\right) \cdot \left(\frac{EE_{l-1} \cdot D_{l-1} + EE_l \cdot D_l}{2}\right)$$

Where:

- $\mathbf{t_i}$ is the time of the i-th revaluation time bucket, starting from $t_0 = 0$.
- $\mathbf{s_i}$ is the credit spread of the counterparty at tenor t_i.
- $\mathbf{LGD_{MKT}}$ is the market-based loss given default of the counterparty.
- $\mathbf{EE_i}$ is the expected exposure to the counterparty at revaluation time t_i.
- $\mathbf{D_i}$ is the default risk-free discount factor at time ti, where $D_0 = 1$.

APPENDIX B

List of Acronyms

Act	The Dodd-Frank Act
BHC	Bank Holding Company
Board	Federal Reserve Board
CCP	Central Counterparty
CCR	Counterparty Credit Risk

CDS	Credit Default Swaps
CEM	Current Exposure Method
CFR	Code of Federal Regulations
CFTC	Commodity Futures Trading Commission
CME	Chicago Mercantile Exchange
CSA	Credit Support Annex
CVA	Credit Value Adjustment
EAD	Exposure at Default
EPE	Expected Positive Exposure
EU	End User
FCM	Futures Commission Merchant
FDIC	Federal Deposit Insurance Company
ICE	InterContinental Exchange
IDCG	International Derivatives Clearing Group
IM	Initial Margin
IMM	Internal Models Methodology
IOSCO	International Organization of Securities Commissions
IRS	Interest Rate Swap
LCH	London Clearing House
LGD	Loss Given Default
MSP	Major Swap Participant
NCC	Net Clearing Cost
NGR	Net to Gross Ratio
OCC	Office of the Comptroller of Currency
OTC	Over the Counter
PD	Probability of Default
PFE	Potential Future Exposure
SD	Swap Dealer
SEC	Securities Exchange Commission
SEF	Swap Execution Facility
Var	Value at Risk

References

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