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Mitigating Collateral Damage

Current themes in managing and mitigating counterparty credit risk for OTC derivatives

Executive Summary

- **The financial crisis re-emphasized the importance of counterparty credit risk.** The subsequent industry-led program of reform has addressed many of the shortcomings of the OTC market.
- **The current regulatory focus is standardization of OTC derivatives and migration to central clearing.** While this should increase transparency, reduce counterparty credit risk and allow better regulatory oversight, concerns remain over loss of flexibility, increased cost of financing positions, management of exposure across multiple systemically important venues and disruption over the transition period.
- **Despite the crisis, OTC derivatives are here to stay.** Over 80% of the survey respondents reported stable or growing OTC derivatives activity. At least 30% of OTC derivatives (and most complex and bespoke contracts) will continue to trade on a bilateral basis for the foreseeable future.
- **Just under 40% of institutions surveyed do not have an internal OTC derivatives pricing capability.** Robust independent pricing is key to validating collateral demands effectively.
- **Only 10% of participants report use of best-practice Potential Future Exposure (PFE) calculations for counterparty credit risk measurement.** The 90% majority continue to use current mark-to-market valuation, which has no forward-looking capability.
- **Over 75% of the survey group does not rehypothecate securities collateral.** Insurance and pension fund institutions that are able to pool collateral actively re-use securities collateral. Most asset management institutions are unable to pool collateral and see little value in re-use as a result.
- **Just under 50% of survey participants have outsourced their collateral management processes.** A further 25% have deployed vendor collateral management solutions internally, with the remainder reliant on bespoke applications or spreadsheets.
- **Industry best practice guidance has focused on banks and broker-dealers rather than institutional investors.** The key requirements for a buy-side institution are to ensure that documentation is up-to-date and comprehensive, that OTC derivatives positions are priced and exposures calculated in a systematic manner, and that robust portfolio reconciliation and collateral management processes are in place.
- **The investment required to implement best practice operational and risk management processes is substantial.** However, buy-side institutions can create meaningful value by exceeding client requirements, maximizing the efficiency of collateral deployment and improving terms of business with counterparties.

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I. Introduction

The 2011 BNY Mellon White Paper 'Mitigating Collateral Damage', coauthored with InteDelta, is designed to provide a snapshot of current counterparty credit risk management policies and processes across a representative sample of asset management, insurance and pension fund institutions.

The impact of the 2008 financial crisis and the extent to which complex and opaque over-the-counter (OTC) derivatives contributed to the vulnerability of interconnected systemically significant institutions have been extensively analyzed and documented. As we will discuss, there has been a substantial industry-led response, the roots of which in fact pre-date the crisis. The extent to which the industry's efforts can placate governments and head off potentially punitive regulatory reform has yet to be fully established, but the broad form and content of the key legislative measures that represent the political response to the crisis and its long-term effects reflect similar themes; standardization and simplification of OTC derivatives contracts, greater market transparency through establishment of trade repositories, migration of OTC derivatives business to central counterparties, and improved operational efficiency and risk mitigation processes required of market participants.

A large and growing body of best practice guidance has been assembled by the International Swaps and Derivatives Association (ISDA) and the Operations Steering Committee (OSC) consortium as the commitments made by the industry to regulators to deliver a more robust market system have been progressively delivered. Substantial quantitative analysis of the OTC derivatives market is also readily available.

Relatively little attention has been paid to the challenges faced by buy-side OTC market participants, despite the fact that they are often substantial players. Many institutional investors were materially affected by the crisis, and counterparty credit risk processes were shown to be deficient in many firms.

The challenges facing buy-side institutions are complex. What are the essential elements of best practice that are relevant for my particular scale of OTC activity? What products and services are available in the market to assist me with the creation of a robust counterparty credit risk management framework? How are my peer firms approaching the issues that I face?

This survey was designed to provide qualitative insight into these issues, supplementing existing sources of data and, hopefully, encouraging collaboration, information-sharing and co-operation as a contribution to one aspect of the reshaping of the post-crisis financial system.

The White Paper is set out in four parts. Section I is the Introduction. Section II provides an overview of the key issues associated with the operational management of OTC derivatives and the counterparty credit risk management challenge. The impact of the financial crisis of 2007-8 is discussed, and the responses of the industry and governments reviewed. Section III sets out the detailed findings of the Market Intelligence survey carried out by InteDelta in partnership with BNY Mellon. A cross-section of buy-side institutions was approached to discuss their particular challenges, responses and expectations for the future. Section IV concludes and offers a summary of current market practice amongst buy-side institutions for each of the essential components of a comprehensive counterparty risk management process.

II. Global Context: Crisis and Response

OTC Derivatives and Counterparty Credit Risk

Buy-side institutions that engage in bilateral OTC derivatives transactions with broker-dealers face the risk that their counterparty may be unable to make payments or fulfil contractual obligations in the event of bankruptcy or broad financial instability. Many OTC derivatives instruments are complex and create substantial nominal exposure with little or no up-front payment. The combination of opacity and leverage demands that both parties to an OTC trade pay close attention to their exposures at both individual trade and aggregate counterparty levels. Risk management on the buy-side has traditionally emphasized the analysis of market risk as an input to the portfolio construction process. Counterparty credit risk was rarely a focus, even as buy-side usage of OTC derivatives instruments increased.

Why are OTC derivatives used by asset managers and other institutional investors? They offer great flexibility in implementing investment strategies and managing risk, if controlled correctly. The traditional core of the industry, providing long-only relative-return products across the various asset classes and regions, came under increasing competitive pressure from two directions; from hedge funds offering attractive absolute-return driven strategies, and from passive index-replication products, increasingly packaged as low-cost exchange-traded funds (ETFs). Core-satellite investment mandates became the trend, with hedge funds and investment boutiques providing alpha and index-replication vehicles delivering beta at low cost.

Traditional institutional investors responded to this challenge in a number of ways, but key to competing effectively was the ability to offer innovative products based on the alternative investment techniques used by the hedge funds. Many large institutional investment companies launched their own range of hedge funds and enhanced products such as 130/30 funds, liability-driven investment vehicles, guaranteed return funds and protected-capital structures, all designed to stem the flow of assets to the emerging competition and to command higher fees as the profitability of core products was squeezed.

The use of OTC derivatives was essential for the effective implementation of many of these investment strategies. Dynamic asset allocation became possible with interest rate swaps (IRS) and total return swaps (TRS). Credit default swaps (CDS) could be used to take long or short positions in less liquid credits with minimal market impact. A much wider range of risks could be hedged effectively using often highly bespoke contracts crafted by broker-dealers. Regulatory changes such as the UCITS III rules in Europe permitted alternative investment products to be marketed to a much wider audience of potential investors.

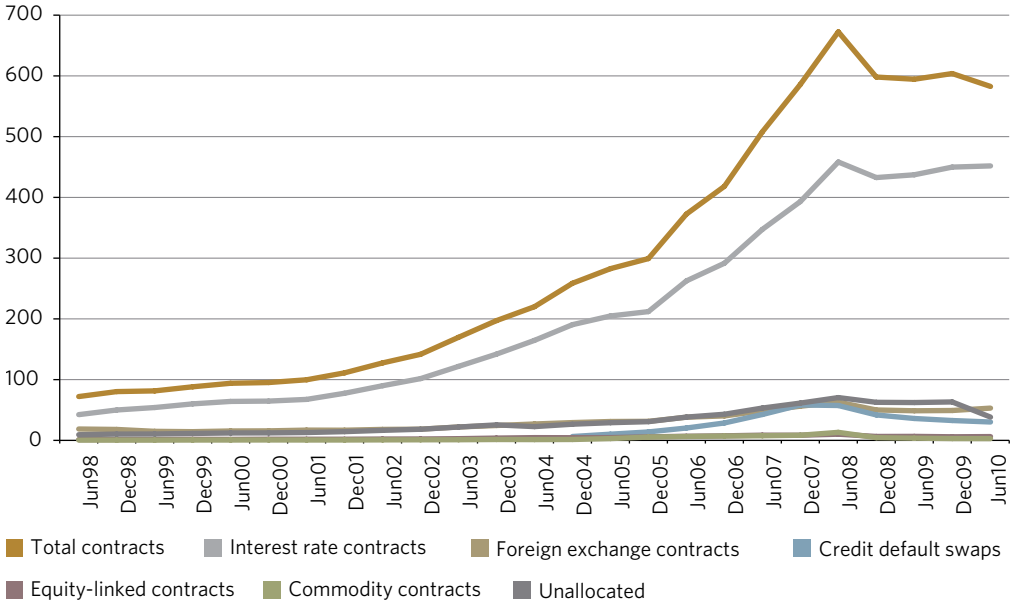
However, flexibility was matched by complexity. Investment in the operational capacity required to manage OTC derivatives did not keep pace with the acceleration of their use in the front office. Core technology and processes for trade management and fund accounting lagged behind, forcing many middle and back office processes to be implemented on a tactical basis. The documentation governing OTC derivatives counterparty terms was often deficient, favoring the broker-dealer counterparty at the expense of the client fund. Data and analytical tools for effective risk management were insufficient to provide a clear view of all possible risks. Finally, many buy-side firms maintained a very small number of OTC derivatives counterparties, resulting in significant concentration of counterparty risk.

Effective counterparty credit risk measures were available however, and indeed many buy-side firms did have adequate controls in place for their OTC derivatives activities. The key risk mitigants used in respect of OTC derivatives are the following:

- Effective documentation, generally based on ISDA Master Agreement templates with additional Credit Support Annexes (CSAs) where exposures are collateralized;
- Independent pricing of OTC derivatives positions;
- Effective quantification and reporting of counterparty credit risk;
- Establishment and application of appropriate counterparty credit limits to control concentration;
- Regular, frequent portfolio reconciliation with OTC derivatives counterparties;
- Bilateral exchange of collateral, whether securities or cash, in respect of OTC derivatives exposures.

While each of these counterparty credit risk mitigants are individually important, an effective collateral management process is key. Led initially by the broker-dealers, the value of collateral in circulation tracked the rapid rate of OTC derivatives growth from the late 1990s, as shown in Figures 1 and 2.

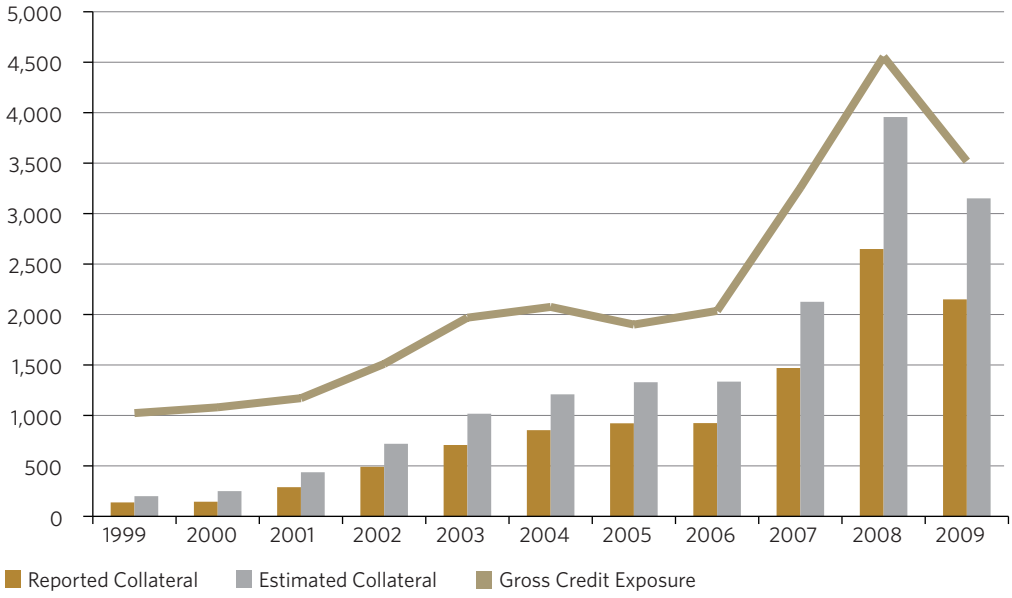
Figure 1: OTC Notional Amounts Outstanding ($ trillion)



Source: BIS Quarterly Review September 2010

Interest rate contracts continue to dominate the OTC derivatives market. Of note is the decline in notional exposure of CDS contracts from $57.4 trillion at June 2008 to $30.2 trillion by June 2010; this reflects post-crisis portfolio compression and tear-up initiatives designed to eliminate economically redundant trades, reduce operational risk and increase market transparency.

Figure 2: OTC Gross Credit Exposure and Collateral in Circulation ($ billion)



Source: ISDA Margin Survey 2010, BIS Quarterly Review June 2010

Collateral in circulation is a useful indicator of the total amount of collateral used to mitigate the credit risk of OTC derivatives. Having grown to just under $4.0 trillion during 2008, collateral in circulation fell back to $3.2 trillion by the end of 2009. The reported decline in collateral in circulation is consistent with the 23% year-on-year decline in gross credit exposure in 2009 to $3.5 trillion, reflecting the post-crisis fall in volatility and reversion to more normal interest rates and credit spreads.

Crisis

The financial crisis, which began in August 2007 and escalated through 2008 as severe credit losses spread through the financial system, demonstrated forcefully that counterparty credit risk is real. The near collapse and subsequent emergency resolution of Bear Stearns in March 2008 was a warning. When Lehman Brothers filed for bankruptcy in September 2008, it had notional OTC derivatives exposure of $800 billion and held $40 billion in client assets.

While many institutions including money market funds were directly exposed to Lehman Brothers' paper, many other buy-side firms had large OTC derivatives positions with Lehman Brothers and were faced with the challenge of unwinding their exposures and extracting their collateral. The complexity of the liquidation was compounded by the fact that $22 billion of the $40 billion of client assets held by Lehman Brothers had been used as a source of finance through the rehypothecation process, creating complex and sometimes lengthy counterparty chains. At a minimum, the process of recovering assets was an inconvenience, but in many cases, it was much more serious, resulting in substantial direct and indirect losses.

The interconnectedness of the broker-dealers, to which OTC derivatives exposures were a contributory factor, led to the near failure of several major institutions. In the immediate aftermath of the Lehman Brothers collapse, the insurance company AIG was also saved from bankruptcy by emergency support from the Federal Reserve and US Treasury; AIG was a substantial participant in the CDS market.

While the failure of a major broker-dealer will inevitably cause difficulties for its counterparties, weak counterparty credit risk management undoubtedly exacerbated the impact on buy-side institutions with exposure to Lehman Brothers. The events of September 2008 demonstrated that it is possible for a major market participant to fail. While extensive government intervention in markets and distressed institutions arrested the contagion, persistent uncertainty over whether the issues of systemic financial instability have been adequately addressed, and whether such support for distressed systemically significant institutions would even be politically or fiscally feasible in the future, suggests that counterparty credit risk management should be a top priority for users of OTC derivatives.

Regulatory response

The scale of central bank and government response to the crisis was unprecedented. The outcome was a massive transfer of private sector debt onto public balance sheets. This generated the political impetus for sweeping reform of the financial system, covering bank capital requirements, extension of regulation to the shadow banking system, changes to market structures and an overhaul of regulatory institutional structure and approach.

The regulatory response to the perceived contribution of OTC derivatives to financial instability in the crisis has focused on standardization and transparency as key objectives, and seeks to reduce counterparty credit risk and improve the ability of regulators to perform their prudential oversight function.

The G-20 leaders agreed in 2009 that: *'All standardized OTC derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties by end-2012 at the latest. OTC derivative contracts should be reported to trade repositories. Non-centrally cleared contracts should be subject to higher capital requirements'* (EC 2010). These principles are increasingly reflected in national legislation as the regulatory response to the crisis is implemented. The Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) was signed into law by President Obama on July 21, 2010. Title VII of the Dodd-Frank Act focuses on the regulation of swaps markets, requiring the reporting of swaps trades to either a trade repository or the relevant regulator and clearing of swaps through a central counterparty. The Dodd-Frank Act also introduces capital, initial and variation margin requirements for OTC derivatives trades not cleared through a central counterparty.

The implementation of the principles set out in the Dodd-Frank Act is delegated to the key regulatory agencies, namely the Commodity Futures Trading Commission (CFTC) and the Securities and Exchange Commission (SEC). These agencies are directed by the Dodd-Frank Act to adopt rules by July 2011. At the time of writing, considerable ambiguity remains in many key areas of the regulatory program.

On September, 15 2010, the European Commission (EC) adopted a Proposal for a Regulation on OTC derivatives, central counterparties and trade repositories. The Proposal reflects many of the G-20 principles and the Dodd-Frank Act measures. The eligibility of OTC derivatives instruments for clearing will be determined by the European Securities and Markets Authority (ESMA). ESMA will also have a role in coordinating the criteria applied by national regulators for the approval and regulation of central counterparties and trade repositories.

Both the Dodd-Frank Act and the EC Proposal require counterparties that enter into an OTC derivatives contract not cleared by a central counterparty to report the trade to an approved trade repository and to meet minimum standards for the regular reconciliation of portfolios, daily mark-to-market valuation of exposures and timely exchange of collateral.

A joint statement issued by CFTC Chairman Gary Gensler and European Commissioner Michel Barnier in November 2010 emphasized the degree of cooperation between supervisory authorities that can be expected in the implementation of the new regulatory and market framework, as national regulators seek to impose reform and prevent regulatory arbitrage.

Industry Response

There has also been significant industry-led reform in the OTC derivatives market. The Operations Management Group (OMG) was established in December 2007, bringing together the G14 broker-dealer institutions, major buy-side OTC market participants and trade associations. The OMG presented a series of commitments to the Federal Reserve Bank of New York on measures designed to reduce counterparty risk and increase transparency, addressing key operational issues such as client on-boarding, documentation standardization, centralized trade reporting, expansion of electronic trade matching, reduction of confirmation backlogs, trade compression, bilateral collateral management and the establishment of a central counterparty for CDS.

The July 2008 OMG letter noted a commitment by the G14 broker-dealers to implement best practice guidance for collateralized portfolio reconciliation, published by the International Swaps and Derivatives Association (ISDA 2008). By June 2009, the broker-dealer members of the consortium, which had by now been renamed the Operations Steering Group (OSG), committed to perform daily electronic portfolio reconciliation on intra-dealer transactions and to establish a market standard for the resolution of disputed margin calls; this initiative evolved into the ISDA Dispute Resolution Procedure.

The 2010 ISDA Operations Benchmarking Survey shows that 77% of interest rate and 99% of credit OTC derivatives trades are now confirmed electronically, while electronic confirmation rates have also risen sharply for equity and commodity products. In total, 81% of eligible OTC derivatives trade volume is now confirmed electronically, with the balance of confirmations remaining paper-based. Over 70% of electronic confirmations for interest rate and credit OTC derivatives and almost 90% of electronic confirmations for currency OTC derivatives are now dispatched on trade date, a marked improvement on 2009.

ISDA published its Market Review of OTC Derivative Bilateral Collateralization Practices in March 2010, which examined progress made towards the commitments made by the OSG and the wider industry. The review found that 97% of all credit derivatives and 78% of all derivatives of any underlying type are collateralized. In terms of collateralization of exposures with buy-side counterparties including insurance companies and asset managers, the review found that 73% of exposures with institutional investor counterparties were collateralized. The reasons cited by broker-dealers for not collateralizing such exposures included:

- Fund counterparties are regarded as very creditworthy;
- Fund counterparties reported that other broker-dealers did not call for collateral;
- System limitations;
- Operational burden;
- Regulation prevents collateral transfer (e.g., Spain);
- Limited eligible liquidity.

The results of the industry's response to the crisis have been substantial, and will be a key input into the process by which national regulators implement the requirements of the Dodd-Frank Act, the EC Proposal and other national legislation.

Best Practice

In light of the crisis, and the subsequent industry and regulatory response, what constitutes best practice for counterparty credit risk management?

Most of the available analysis focuses on the banks. Certainly banks hold the bulk of OTC derivatives exposure and therefore offer an insight into how counterparty credit risk and collateral management should be organized. As discussed above, a substantial and growing body of documentation offering guidance on best practice has been accumulated under ISDA's auspices.

The core elements of banks' counterparty credit risk processes are the following:

- Detailed documentation, where possible, implemented as standard ISDA Master Agreements with CSAs;
- Comprehensive measurement and reporting of OTC derivatives exposures using best practice techniques;
- A robust credit limits framework, ideally implemented in the bank's trading systems to support pre-trade compliance checking;
- Daily portfolio reconciliation with larger counterparties using one or more of the multi-lateral reconciliation platforms;
- Dedicated collateral management margining systems, whether internal builds or vendor products. The key vendor products in the OTC derivatives collateral management market are Algorithmics Algo Collateral, Omgeo ProtoColl, Lombard Risk Colline and Sungard Adaptiv. InteDelta estimates that these vendors have approximate market share of 65%, 15%, 15% and 5% respectively. A few of the large broker-dealers still use internally built collateral management platforms, but these are being gradually superseded by vendor solutions;
- Daily margin call processing to adjust collateral for incremental changes in exposure;
- Substantial straight-through processing, from the sourcing of trade valuation data necessary to calculate exposures and margin calls through to the instruction and settlement of collateral movements;
- Some degree of active inventory management to ensure that maximum financing potential is extracted from available collateral assets;
- A robust dispute resolution process with a clearly defined escalation path, probably based on the ISDA Dispute Resolution Process.

The above summary view of the core elements of an effective counterparty credit risk process represents a substantial investment in people, processes and systems. Such an investment may be essential for banks that manage several thousand OTC counterparty agreements and process several hundred margin calls each day, but may be challenging or disproportionate for a buy-side institution with a modest OTC book. However, even with relatively low volumes, the fragmented nature of most buy-side institutions in terms of the manner in which assets are segregated into portfolios that are distinct legal entities means that even with relatively low volumes, the operational overhead can be substantial.

The key requirements for a buy-side institution are to ensure that documentation is up-to-date and comprehensive, that OTC derivatives positions are priced and exposures calculated in a systematic way and that robust portfolio reconciliation and collateral management processes are established. While daily margining represents best practice, for certain investment managers it may be appropriate to align the margin call process with net asset value calculations, which take place daily or weekly. Comparable requirements exist for securities lending and repo business.

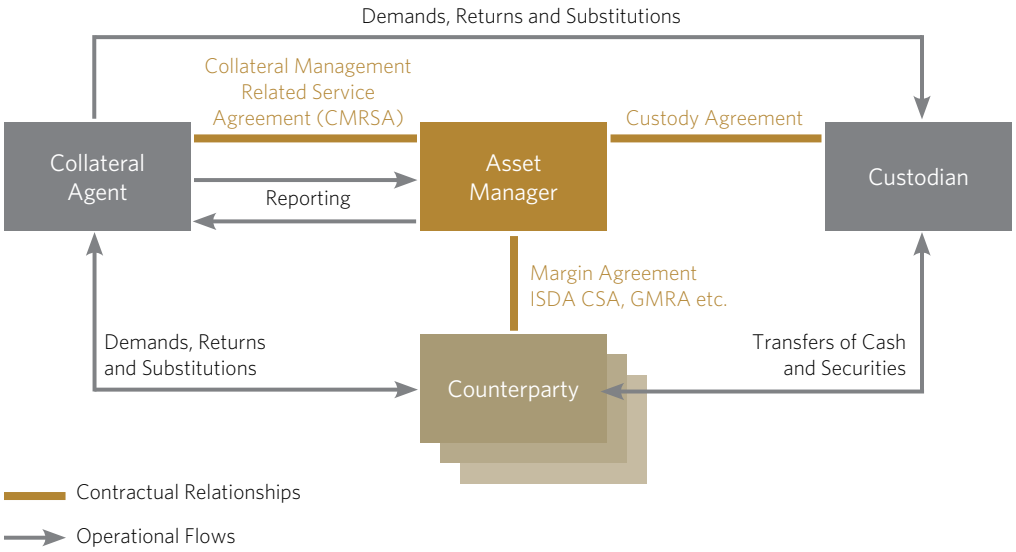
Two principal approaches are available to deliver the collateral management aspect of the overall counterparty credit risk framework; implement a collateral management system (whether by selecting a vendor product or building a bespoke solution) or outsource all or part of the collateral management process.

Several of the large asset servicing banks provide outsourced collateral management services. In the outsourced model, the buy-side institution retains the bilateral relationship with its preferred counterparties. The collateral agent receives (or calculates) valuations, calculates margin calls and processes the resulting movements of collateral assets on behalf of the buy-side institution.

Outsourced collateral management services typically offer access to market-leading practices for exposure calculation, margining and reconciliation, and relieve much of the operational burden of the collateral management process. Additional benefits include the efficient allocation of collateral inventory and rich reporting.

A high-level schematic representation of the outsourced collateral management process is shown in Figure 3 below:

Figure 3: Outsourced Collateral Management



Source: ISDA Market Review of OTC Derivative Bilateral Collateralization Practices, 2010

The decision to build, buy or outsource will ultimately reflect the nature and extent of an institution's counterparty credit risk created by its OTC derivatives, repo or securities lending activities, its internal technology capacity, its relative expertise and understanding of the key methodologies and processes, and its wider operations strategy. An institution that has already outsourced elements of accounting may see an outsourced collateral management process as a logical next step, while an institution with the capacity to manage a substantial system selection and integration exercise may prefer to retain collateral management in-house.

The objective of the survey of buy-side institutions carried out by InteDelta and BNY Mellon in July-October 2010 was to establish how such institutions are addressing the challenges of counterparty credit risk management in general and collateral management in particular. The findings of the survey are presented in the following section of this paper.

III. Survey Findings

OTC Derivatives Activity

- **Asset managers use a broad range of OTC derivatives instruments for both efficient implementation of investment strategies and for hedging and risk control.**
- **Key drivers of increased OTC derivatives use have been the commoditization of traditional investment products, increasingly sophisticated client demands and a generally supportive regulatory framework.**
- **The principal operational obstacles faced include the adaptation of legacy transaction processing and fund accounting systems and processes to cope with more complex OTC derivatives positions.**

What is the scope of your OTC derivatives activities for which counterparty credit risk is an issue? How has this evolved in the past three years? How is this expected to develop in the future? What are the key drivers of the expansion of these activities?

In the opening section of the survey, participants were asked to describe the composition of their OTC derivatives activities and to offer some insight into the objectives of their OTC strategies. The results are presented by segment.

Asset Management Institutions

The asset management institutions that participated in the survey employ a wide range of techniques with OTC derivatives to achieve tactical and strategic investment objectives, including alpha generation, tactical asset allocation and hedging. The survey sample provides a good cross-section of the overall asset management sector. Assets under management ranged from over $1 trillion to less than $10 billion and are managed on behalf of a range of institutional, high net worth and retail clients. The firms surveyed also varied markedly in terms of their relative degrees of specialization in particular asset classes and in the regional markets addressed.

The surveyed firms reflect a spectrum of OTC derivatives use driven principally by the managers' respective product sets. The larger institutions offer a range of specialist equity and fixed income products that make extensive use of IRS, TRS, portfolio and basket swaps, swaptions and OTC options for both asset allocation and hedging purposes. Contracts for Difference (CFDs) are widely used in the UK.

Specialist TRS are frequently used to address particular market segments such as real estate and commodities, or to gain access to restricted markets in some Emerging Markets mandates.

CDS are widely used, with asset managers both buying and selling protection. The flexibility and ease of gaining a desired exposure using single-name CDS relative to the frequently illiquid cash market was cited. For example, one US manager described how a perception of value in the loans market could be exploited by writing CDS protection on a suitable index rather than by evaluating individual loans. Index CDS are also widely used for hedging purposes.

All of the participants engage in currency hedging to greater or lesser degrees, with OTC FX forwards and options the most popular methods of implementing flexible hedges.

Liability-driven Investment (LDI) strategies have seen substantial growth in recent years, particularly for large pension mandates. These investment strategies are heavy users of interest rate and inflation swaps as tools to protect the value of future distributions to scheme members.

Guaranteed return structured products for high net worth and retail clients have been a popular product since the crisis of 2007-8 and were cited as a key driver of growth by several asset managers.

A number of the respondents noted the increasing adoption of 'alternative' investment strategies by well-established asset managers responding to demand for absolute return and enhanced products alongside their traditional vehicles. In some cases, alternative products have been developed organically, but in other cases, asset management institutions have acquired investment boutiques to gain alternative investment capabilities and credibility.

This shift represents the desire to diversify away from increasingly commoditized long-only relative return products under pressure from low-cost passive index tracking strategies and ETFs and to capture higher fees on the hedge fund model. The UCITS III regulations were cited as having spurred activity in OTC derivatives as it became possible to capture new assets by delivering alternative strategies to a much broader market of investors.

Insurance Companies

A number of large US insurance companies were included in the survey. While there is substantial overlap between insurance and asset management activities, it is interesting to consider some of the insurance investment strategies in isolation.

The insurance companies surveyed use a wide range of OTC derivatives instruments, including IRS, fixed income and equity TRS, equity index options, single-name and index CDS. A frequently recurring theme was the use of OTC derivatives instruments to hedge the guaranteed minimum returns in variable annuity products. One company stated that its OTC derivatives activity has doubled in the last two years in response to rapid growth in its variable annuity business.

Pension Funds

The pension fund participants in the survey share many characteristics with the asset managers to whom pension assets are often delegated. However, pension fund institutions have particular objectives that drive OTC derivatives use.

The majority of pension fund institutions interviewed segregate their assets into two broad categories. The first pool of assets is managed on an LDI model with the objective of hedging the fund's assets against fluctuations in interest rates and inflation to ensure that the fund's actuarially-forecasted liabilities can be met into the future. A second pool of assets is managed with the objective of generating capital growth. The relative balance between LDI and growth portfolios is dynamic, and depends on key characteristics of the scheme such as maturity and the level of funding as well as on economic and market expectations. In most cases, some or all of a pension fund's assets may be delegated to specialist asset managers, but the pension fund will retain overall control over asset allocation and risk management.

Pension funds are therefore extensive users of OTC derivatives within the LDI portion of their assets, particularly focusing on the use of IRS and inflation swaps. As LDI mandates are generally heavily invested in fixed income instruments, extensive use of CDS is made as a means of efficiently implementing strategies or hedges. Pension funds (or their delegated managers) are regular buyers and sellers of CDS protection.

The pension funds surveyed also use OTC derivatives to manage concentrations across their delegated portfolios and to manage the transition process when assets are moved from one manager to another. OTC derivatives allow asset allocation decisions to be implemented very quickly and efficiently. Longer-term asset allocation changes may be executed in OTC derivatives initially using IRS or TRS for example, then the transition to cash securities holdings can be made over time while adjusting the corresponding OTC derivatives exposure to minimize market impact and cost of implementation.

Growth Drivers

Despite the sharp contraction in OTC activity immediately after the 2007-8 crisis, over 80% of the survey participants reported that OTC derivatives activity was stable or growing in volume and value terms. Key drivers cited were the need to support product innovation, respond to client demands and improve the efficiency and speed with which investment views or risk control measures can be implemented.

Particular investment product types are major drivers of OTC derivatives activity, notably LDI mandates for pension assets, annuity products with guaranteed capital protection or minimum return features and absolute return investment products.

Several countervailing growth-retarding issues were discussed. In the majority of cases, operational constraints were cited with, in some cases, quite extensive manual workarounds needed to address the functional gaps in core accounting, transaction life cycle and payment processing platforms, particularly for more complex non-standard contracts.

The challenges associated with valuing complex OTC derivatives in a robust way were also cited as an obstacle to growth. While many larger or specialized buy-side institutions have put in place the internal processes and systems necessary to value their OTC derivatives positions, many other institutions are forced to rely on costly third-party pricing provision or restrict the scope of their OTC activities to relatively vanilla products, for which prices may be readily derived or sourced.

One large institution noted that CDS volumes had declined sharply in the immediate aftermath of the Lehman Brothers failure in September 2008, but that activity is growing once again. Other institutions did discuss post-crisis concerns around counterparty credit risk as it became apparent that many of the large broker-dealers were undercapitalized and vulnerable. These concerns materialized in much tighter control over counterparty exposure limits, increased focus on risk mitigation through collateral management and the implementation of much more rigorous due diligence processes to secure approval to use new types of OTC derivatives instruments.

More recently, as the regulatory response to the crisis has taken shape, some participants have adopted a wait-and-see approach before substantially increasing their OTC derivatives capabilities.

What is your approach to measurement of liquidity of OTC instruments?

Participants were asked to describe how they address the issue of liquidity for OTC derivatives instruments. This question elicited a range of responses; a substantial proportion of respondents did not consider liquidity explicitly for OTC derivatives instruments as an issue of concern due to the relatively modest volumes transacted.

Some of the participants that trade larger OTC volumes focus on liquidity to a greater degree, evaluating the cost of transacting by seeking a range of competitive quotes from broker-dealers. Incoming Bloomberg and other communications from brokers can also provide a sense of market depth.

One participant observed that liquidity in the swaps market is often superior to that in the associated cash market. OTC liquidity is reflected in spreads; trading teams monitor spreads between the cash and swaps markets as an indicator of liquidity.

Survey participants generally echoed wider industry expectations that the transition to central counterparties for standardized contracts will increase liquidity, improve price transparency and drive volume growth.

OTC Counterparty Documentation

- **ISDA and bilateral CSA documentation is the dominant standard for OTC derivatives counterparty documentation.**
- **Documentation terms have become more standardized post-crisis as both buy and sell-side counterparties sought to improve risk controls. However, smaller buy-side institutions and certain fund types face tighter terms based on the credit ratings assigned by their broker-dealer counterparties.**
- **Most buy-side institutions use a combination of cash and securities collateral, but regional variations exist. Some institutions do not deliver cash collateral to avoid distorting portfolios. Broker-dealers note growing volumes of securities collateral.**
- **Initial margin for OTC trades has been the exception rather than the rule, but broker-dealers are increasingly demanding initial margin in documentation negotiations, particularly in the US.**

Survey participants were asked to discuss various aspects of the legal documentation that govern their OTC counterparty relationships. The dominant form of documentation is the ISDA Master Agreement with Credit Support Annex (CSA) where collateral is to be exchanged. The failure of Lehman Brothers prompted many buy-side institutions to address their counterparty documentation which in many cases was deficient. Post-crisis, the survey illustrates the trend towards much greater standardization of documentation terms, driven to a large degree by ISDA. However, there is evidence that broker-dealers are also imposing more stringent conditions in new agreements.

The evidence of the survey suggests that larger asset managers have substantial leverage when negotiating their documentation terms with potential counterparties and have been able to achieve a high degree of standardization. However, broker-dealers often apply variable criteria to different fund types to reflect their view of greater credit risk, for example in the case of leveraged funds. While agency ISDA agreements can be established where an asset manager has a number of similar funds, segregated funds usually require their own ISDA documentation to be in place. Larger buy-side institutions, or those with a variety of fund types, therefore face the challenge of managing a range of umbrella and entity-specific agreements.

Smaller asset management institutions typically have less leverage in legal negotiations with broker-dealers and therefore generally face tighter terms.

How many OTC derivatives counterparties do you have? Under what documentation are OTC counterparty relationships managed?

The survey results suggest that the majority of buy-side institutions trade OTC derivatives with between five and 20 OTC counterparties, principally made up of the large broker-dealers. In some cases, most business is done with a core set of around five to 10 key counterparties, with other relationships in place to accommodate non-standard trades or to ensure keen pricing.

The ISDA 2010 Margin Survey confirms that buy-side institutions' OTC counterparty credit exposure is concentrated with the largest 14 broker-dealers. Each of these institutions has over 3,000 OTC agreements in place, of which 41% are with institutional investors and a further 26% are with hedge funds. For medium-sized banks, defined as having fewer than 3,000 but more than 100 OTC agreements, the percentage of agreements with institutional investors and hedge funds is only 13% apiece (ISDA, 2010 p.11).

Without exception, all of the survey participants have standard ISDA and CSA documentation in place for most of their counterparty relationships. The majority in fact use ISDA and CSA documentation exclusively for OTC business, but in some European countries (notably France) and Latin America, local agreements are often preferred. These are generally very similar to standard ISDA documentation, but may be easier to implement with local counterparties.

A few participants continue to use long form confirmations but generally as a temporary measure only, pending negotiation of regular ISDA documentation.

The age of ISDA documentation can be significant, as agreements that substantially pre-date the crisis may not have a CSA attached. The renegotiation of dated ISDA agreements will typically result in CSA documentation being put in place to govern the bilateral exchange of collateral. In general, most buy-side institutions have revisited their documentation in the light of the crisis and have tightened terms where necessary to ensure an appropriate degree of risk control.

What are the terms of collateral support documentation? Are collateral agreements generally bilateral or unilateral?

Within the survey group, almost all OTC collateral agreements are bilateral. Three exceptions are notable. Certain classes of Spanish mutual funds are not permitted to deliver collateral, and are accommodated by their broker-dealer counterparties on a unilateral basis. In France, certain guaranteed return products, which are structured using an OTC asset swap to lock in a specified minimum value, do not deliver collateral. In this case, it appears that the low risk profile of the fund enables counterparties to write the asset swaps without collateral. Finally, one participant noted that certain supranational clients insisted on unilateral agreements, but that these relationships were very few in number.

Several participants referred to legacy agreements negotiated before the 2007-8 crisis which were unilateral in favor of the broker-dealer. However, all such agreements have been renegotiated.

The mix of eligible assets that are delivered and received as collateral by buy-side institutions is relatively narrow, but there are notable differences by region. In Europe, there is a greater emphasis on the use of cash to collateralize OTC exposures whereas in the US there is wider use of securities for collateral. However, it is not possible to identify definitive patterns as preferences vary from institution to institution.

A broader range of securities is also used in the US, with agency bonds, municipal bond and MBS supplementing more standard Treasury bonds, T-bills and highly-rated foreign government bonds.

Separate InteDelta analysis suggests that broker-dealers expect the use of securities to collateralize OTC derivatives exposures to increase from the current level of approximately 20% of all OTC derivatives collateral (InteDelta, 2010). There are two key drivers; the first is the alignment in many banks of the collateral management processes for securities borrowing and lending (SBL), repo and OTC derivatives business. OTC derivatives exposures have traditionally been collateralized with cash, whereas securities collateral is more commonly used for repo and SBL exposures. A second driver is the preference on the part of buy-side institutions to deliver securities from their funds' inventory as collateral.

However, as one survey participant noted, the application of haircuts to securities used for collateral means that buy-side institutions that prefer to deliver securities may be significantly over-collateralizing their broker-dealer counterparties, creating a further source of counterparty credit exposure.

This trend was reflected in the survey. While most participants simply noted that they had the capability to use either cash or securities, around 25% of respondents explicitly stated that they do not or prefer to not deliver cash as collateral. This preference reflects the fact that holding cash specifically for use as collateral can distort the portfolio management process. In some cases, securities held in the fund are used in the repo market to raise cash for margin calls, but in general, the best approach is to deliver securities from inventory as collateral. This has implications for the broker-dealer counterparty which, as outlined above, needs to process securities collateral from its buy-side counterparties.

One participant stated a strong preference for not receiving cash collateral; this policy is designed to avoid the operational overhead of accruing and paying interest on collateral cash balances to the collateral provider.

In terms of Minimum Transfer Amount (MTA) and threshold terms, the larger institutions in the survey show a high degree of consistency, with zero threshold and MTA in the region of $250-500k representing market standard terms. A significant proportion of European agreements have larger MTAs in the €1-5M range. Some older agreements have higher threshold amounts and MTAs, but these have been progressively tightened and brought into line post-crisis. Several of the buy-side institutions in the survey have attempted to negotiate looser thresholds and MTAs, but have generally found broker-dealers unwilling to accede.

Some smaller asset managers may face more stringent terms. A number of the smaller asset managers interviewed reported zero thresholds and low MTAs. More granular discrimination between particular fund types is also common, based on the bank's internal credit rating models which take aspects of each fund's investment strategy into account.

Figure 4 presents a summary analysis of the threshold and MTA terms of agreements between counterparties using the BNY Mellon DM Edge® outsourced collateral management service to collateralize OTC exposures.

Figure 4: BNY Mellon DM Edge® Outsourced Collateral Threshold and MTA Analysis

An analysis of threshold and MTA terms in collateral agreements between participants in BNY Mellon's DM Edge® outsourced collateral service yielded the following results:

Threshold by Agreement Currency (% of Agreements)

USD		EUR		GBP	
Zero	51.5%	Zero	87.4%	Zero	96.6%
$30M	23.8%	€1M	9.7%	Other	3.4%
$15M	10.9%	Other	2.8%		
Other	13.8%				

Zero thresholds dominate in all regions, while just over a third of the sample of agreements in the US, typically between larger buy-side institutions and their broker-dealer counterparties, have substantial thresholds in place.

MTA by Agreement Currency (% of Agreements)

USD		EUR		GBP	
$500k	66.3%	€1M	24.1%	£100k	24.2%
$250k	19.4%	€250k	18.6%	£1M	24.2%
Other	14.3%	€5M	16.2%	Zero	21.2%
		€100k	15.8%	£250k	15.2%
		€500k	15.0%	Other	15.2%
		Other	10.3%		

While $500k is the market standard MTA in the US, a significant proportion of European agreements have larger MTAs in the €1-5M range.

Source: BNY Mellon, November 2010

Is initial margin pledged or received? Do you require that initial margin be segregated?

A 66% majority of participants are not required to deliver initial margin for OTC trades. Some funds classified by their counterparties as having hedge fund characteristics may be liable for initial margin, but most institutional funds are not.

However, approximately 33% of respondents noted that they were required to pay initial margin for certain IRS, CDS and commodity contracts under newly-signed agreements, or that broker-dealers had requested in negotiations that initial margin be paid. All of these participants were US based, which suggests that the trend is driven by the Dodd-Frank legislation and anticipation of central clearing.

Only 25% of the participants that are required to pay initial margin for some of their OTC derivatives activities specified that they required initial margin to be segregated. As noted above, it is unusual for initial margin to be demanded in respect of OTC derivatives trades, although there is evidence that broker-dealers are increasingly demanding initial margin for certain trade and counterparty types. Separate InteDelta analysis indicates that broker-dealers who have implemented initial margin segregation as a service to clients have seen low take-up of the option to date. Similarly, the 2010 ISDA Margining Survey notes that 82% of initial margin received is commingled with variation margin with the balance segregated either in the books and records of the broker-dealer, at the custodian or with an outsourced provider (ISDA, 2010 p.8).

Hedge funds are generally required to pay initial margin by their broker-dealer counterparties. Many hedge funds have used custodians to house initial margin on a tri-party basis to ensure adequate segregation. This is an approach that may appeal to institutional investors as the demand for initial margin increases.

OTC Derivatives Operations

- **System and process workarounds are commonplace, particularly for more complex OTC derivatives operations.**
- **While some asset management firms are fully independent in terms of pricing, most use counterparty marks to validate their own valuations and may use counterparty valuations directly for more complex instruments.**
- **While industry best practice is daily reconciliation on one of the multilateral vendor platforms, the majority of asset managers continue to reconcile using trade files provided by their counterparties.**

Participants were asked to discuss aspects of their OTC derivatives operations, focusing in particular on pricing, accounting and reconciliation. The rate at which OTC derivatives evolved has made it difficult for core systems to keep pace, and tactical workarounds are common. An alternative approach to supporting operations in-house is to outsource to an asset servicing provider. All of the large asset servicing providers were referenced by participants within the survey group.

Accounting and Life cycle Management

Approximately 33% of the survey group has outsourced all or part of core accounting operations to third-party asset servicing providers. In many cases, these providers also provide valuation, reconciliation and collateral management services.

The majority of the survey group therefore retains fund accounting as an in-house function. In almost all cases, tactical builds and manual workarounds have been implemented to manage accounting for OTC derivatives instruments. In two cases, a separate OTC accounting platform is used which feeds core data into the principal accounting platform. Several participants noted the importance of close engagement with their internal technology partners or external accounting platform vendor to specify and prioritize OTC-related enhancements.

It is not clear whether the standardization of OTC derivatives activity will drive further outsourcing. As contracts, documentation and processes converge, the incremental value from retaining accounting processes in-house may erode. However, simplification should allow fund accounting platform vendors to support a greater proportion of overall processes, reducing the need for risky workarounds.

Pricing and Valuation

Robust, independent pricing is a core element of an effective counterparty risk management process. The UCITS III/IV directives specifically require the managers of UCITS funds to perform daily, independent valuation of OTC derivatives positions. Article 50(1)(g)(iii) of the UCITS IV directive (Directive 2009/65/EC) requires that *'OTC derivatives are subject to reliable and verifiable valuation on a daily basis and can be sold, liquidated or closed by an offsetting transaction at any time at their fair value at the UCITS' initiative'* and Article 51(1) adds that the investment manager *'shall employ a risk-management process which enables it to monitor and measure at any time the risk of the positions and their contribution to the overall risk profile of the portfolio....it shall employ a process for accurate and independent assessment of the value of OTC derivatives'.*

Just over 60% of institutions in the survey group maintain an independent internal pricing capability. In some cases, particularly for larger or specialist asset managers, pricing teams use internal models to price their positions. In a few cases, internal pricing teams are capable of pricing all instruments in which the institution is active. Many pricing teams perform pricing for vanilla instruments internally, and source independent prices from market data vendors or from the market, particularly for relatively standardized FX forward contracts and CDS.

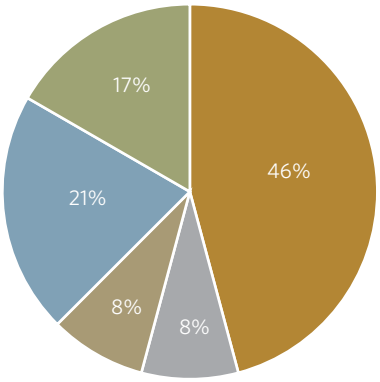
In general, pricing teams validate their valuations by comparison with those provided by their counterparties. In less than 10% of cases, the counterparty provides all valuations to the asset manager's pricing team.

The need to align OTC derivatives pricing with the fund valuation cycle was cited by several participants as particularly challenging.

Portfolio Reconciliation

Portfolio reconciliation is a key risk management process, and is generally managed as an integral part of the collateral management process. Figures 5 and 6 illustrate the patterns of approach to portfolio reconciliation and frequency of portfolio reconciliation across the survey group.

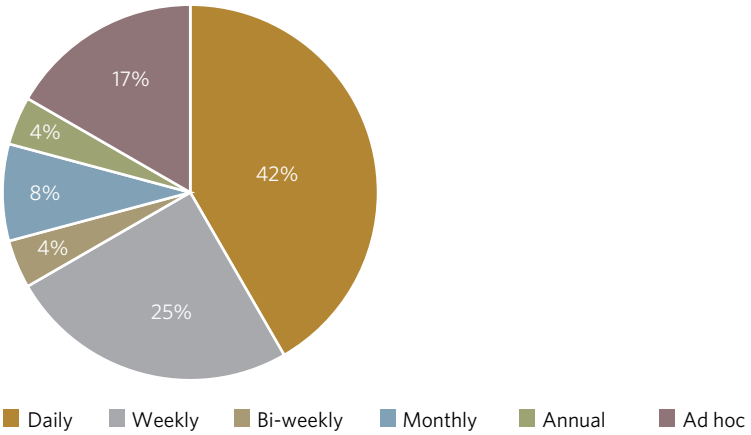
Figure 5: Portfolio Reconciliation Approach



Internal manual Internal application Vendor application Multilateral platform Outsourced

Source: BNY Mellon and InteDelta Analysis, 2010

Figure 6: Portfolio Reconciliation Frequency



Source: BNY Mellon and InteDelta Analysis, 2010

Three broad categories of buy-side institution were evident in the survey findings.

The largest category, into which 62% of the survey group falls, receives trade files from their counterparties. These may be files generated automatically by an institution's accounting or collateral system, but could also be partially automated or manually generated spreadsheets. Reconciliation is then performed internally. One-third of institutions in this category perform reconciliation daily, one-third weekly or biweekly, with the remaining one-third only formally reconciling their OTC positions with counterparties in the event of a collateral dispute.

The second category is made up of the 21% of participants that use centrally-hosted multilateral reconciliation platforms including TriOptima, Omgeo CrossCheck and MarkitServ to support the portfolio reconciliation process. These institutions are amongst the largest OTC derivatives users in the survey group. Four-fifths of these institutions perform reconciliation daily, while the remaining institution reconciles on a weekly cycle but expects to move to daily reconciliation in the near future. While TriOptima dominates large inter-bank portfolio reconciliations, other providers may be preferred by buy-side institutions for cost reasons or because a particular vendor reconciliation service is better aligned with an institution's collateral management systems infrastructure.

The third category is made up of those institutions that have outsourced portfolio reconciliation as part of a wider collateral management outsourcing initiative. Around 17% of the survey group falls into this category.

The broad range of approaches to reconciliation reported in the survey is reflected by the pattern of portfolio reconciliations reported by the G14 broker-dealers in the 2010 ISDA Margin Survey. These institutions reconcile 56% of all trades daily, 5% weekly, 3% monthly and the remainder on an ad hoc or dispute-driven basis. Within the G14, the percentage of trades reconciled daily on multilateral platforms is close to 100%. The frequency of reconciliation for buy-side counterparties that do not use multilateral platforms is driven by perceived counterparty risk, taking into account the number and value of trades in the counterparty's portfolio and the bank's internal counterparty credit rating.

While the use of one of the hosted multilateral reconciliation platforms represents industry best practice, cost considerations may lead buy-side institutions with relatively few OTC derivatives trades to conclude that internal reconciliation processes based on trade files provided by counterparties remains the most appropriate option, provided that the frequency of collateral disputes caused by trade mismatches is not excessive.

Measurement and Mitigation of Counterparty Risk

- **In general, mark-to-market exposure is the key metric used to quantify counterparty credit risk.**
- **Mark-to-market exposure is variously calculated and reported on gross and net basis at the counterparty level.**
- **Mark-to-market exposure is generally reported gross and net of collateral.**
- **Mark-to-market exposure takes no account of potential future changes in exposure through the life of a contract. Potential Future Exposure (PFE) provides a forward-looking measure at a prescribed confidence interval that is more suitable for use in monitoring and limiting counterparty exposure.**
- **Most buy-side institutions have credit limits in place, which are adjusted to reflect changes in credit ratings, CDS spreads and subjective perceptions of risk.**
- **While stress testing of portfolios is common, stress testing with an explicit focus on counterparty credit risk appears rare.**

Survey participants were asked to describe how they measure and report OTC derivatives exposure and the various processes for the control of counterparty credit risk. While the main focus was on collateral management policies and processes, participants were also asked about due diligence, counterparty limits management and stress testing.

How do you calculate and report your counterparty exposure? What is your approach to netting of exposures? How is collateral incorporated into exposure calculations?

Almost all of the institutions surveyed calculate and report gross and net mark-to-market exposure by position and at aggregated counterparty level for each fund. In general, netting can only take place at the individual fund or legal entity level, and in many cases scope for substantial netting of offsetting exposures is limited. Collateralized and uncollateralized exposure is also generally reported; some participants specifically define exposure as the uncollateralized portion of the overall mark-to market valuation. In a few cases, the gross notional exposure of OTC derivatives positions is also reported.

Approximately 10% of the survey group has implemented, or are exploring the use of, more advanced counterparty credit risk management measurement techniques. For example, one of the participating insurance companies has recently implemented a Monte Carlo PFE calculation to support its counterparty limit process, and two of the asset management participants also calculate PFE for certain trade types. A brief overview of the calculation and application of PFE is provided in Appendix A (page 34). The adoption of PFE represents a significant step by buy-side institutions towards current best practice for counterparty credit risk management as performed by large banks and broker-dealers.

How are counterparty credit limits defined and managed? Are counterparty exposures stress-tested?

All of the participants made reference to credit limits, although in general the calibration and management of these limits falls within the purview of the Credit Risk team rather than with the Operations supervisors that made up the majority of the survey respondent group.

For some fund types, counterparty concentration limits are specified either within the investment mandate or by the regulator. For example, UCITS funds are limited to 10% of the fund's asset value for any OTC position when the counterparty is an approved credit institution, and to 20% aggregate exposure to a single counterparty.

Credit limits are set and monitored by Credit or Asset and Liability Management (ALM) teams and in many cases are codified for implementation in pre-trade compliance checks. Many of the participants leverage their internal financial institution credit analysts to monitor counterparties in addition to monitoring changes in counterparties' credit ratings and CDS spreads. In most cases, aggregate counterparty exposures are reviewed on a monthly basis to ensure that internal limits are being observed and to make any adjustments to limits that might be seen to be necessary. Adjustments can also be made on an ad hoc basis to reflect developments that might indicate a change in the financial condition of a particular counterparty.

Fewer than 10% of the institutions surveyed described stress tests that were specifically focused on counterparty credit risk, although stress testing is a widely-used portfolio management technique. One asset management participant described how margin requirements are modelled to establish what would happen in the event of the asset manager being downgraded.

Another survey participant described a detailed approach to stress testing of its collateral capacity under various scenarios. The stressed exposure amounts generated by the scenarios are compared to the availability of eligible unencumbered collateral. The market values and rating migrations of eligible securities are also stressed to provide a robust analysis of the firm's ability to meet likely margin calls.

Collateral Management

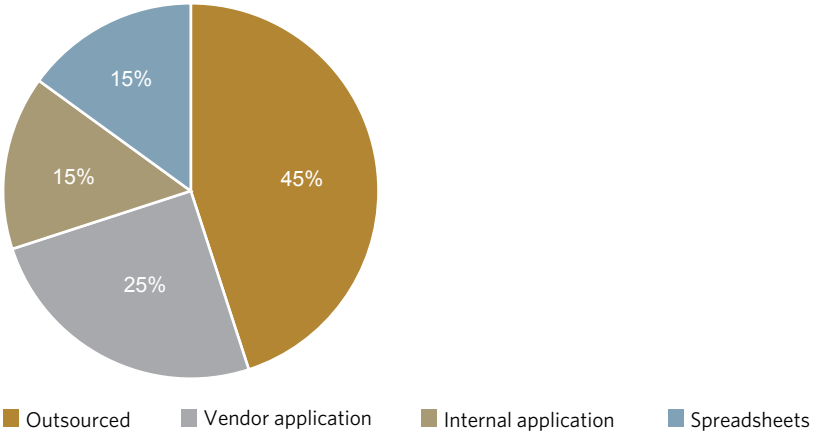
- **Since the 2007-8 crisis, many buy-side institutions have elected to either outsource their collateral management operations or to implement vendor collateral management solutions.**
- **All but one of the surveyed institutions call collateral from OTC counterparties, but reuse of collateral inventory is rare because of requirements for transparency and because collateral must be allocated at legal entity level, making rehypothecation or other reuse impractical.**
- **The exceptions to the preceding point are certain insurance and pension funds, where relatively large collateral pools allow profitable rehypothecation and lending of securities.**
- **In general, portfolio managers have the responsibility to ensure that eligible cash or securities are available to meet margin calls.**
- **Initial margin is unusual but is being requested more frequently. However, only 8% of participants insist on segregation of initial margin.**

Collateral management is one of the principal risk mitigation processes available to buy-side institutions. The survey group shows a cross-section of collateral management practices. The implementation of effective collateral management became a priority for many buy-side institutions after the failure of Lehman Brothers in 2008, and bilateral collateral management under standard ISDA and CSA documentation is now considered to be best practice.

Substantial variations remain in collateral management policy and implementation; these will be discussed in the following sections. To a large degree, this reflects differences in the scope and scale of OTC derivatives activity in which participants in the survey are engaged. One of the largest institutional asset management companies processes several thousand margin calls per month. Other asset managers, with much more modest OTC activity, may process fewer than 50 margin calls per month.

Initially, survey participants were asked to describe their collateral management process and the supporting infrastructure. The responses are summarized in Figure 7 below.

Figure 7: Approach to Collateral Management



Source: BNY Mellon and InteDelta Analysis, 2010

Just under half of the survey participants have chosen to outsource their OTC collateral management process to one of the large asset servicing providers; this includes some of the larger institutions engaged in extensive OTC derivatives activities. In some instances, collateral management is one aspect of a broader outsourcing strategy including core accounting. However, several institutions have outsourced collateral management on a standalone basis.

The remainder of the survey group manages their OTC collateral management processes in-house. In 25% of cases, vendor collateral management applications have been implemented or are under evaluation. The specialist vendor products that dominate the OTC derivatives collateral management market are Algorithmics Algo Collateral, Lombard Risk Colline and Omgeo ProtoColl. All three are used by at least one of the institutions that participated in the survey. However, many vendors of portfolio management and investment accounting solutions are introducing collateral management functionality into their offerings. For example, one of the institutions in the survey group manages collateral processing on its Murex platform, another is extending an implementation of Calypso to incorporate collateral management and a third is working with SimCorp, its portfolio management and accounting platform provider.

The two groups of vendors have different value propositions, requiring a trade-off to be made between breadth and sophistication of functionality on one hand with cost-effectiveness and ease of implementation on the other. The specialist collateral management vendors excel where there are multiple front and middle office systems, interfaces and complex work flows to draw together; this is typical of large banks. In buy-side institutions, there are likely to be fewer front office systems, and there are clear benefits to managing collateral on the same platforms that hold transactions and positions data, interest rates, securities prices and portfolio valuations.

Implementing a collateral management system can be challenging and expensive. Outsourced collateral management services address all of the key processes including administration of documentation, valuation of positions and calculation of margin requirements, processing of optimal collateral movements, reinvestment of collateral inventory and reporting, and offer access to market-leading collateral management technology and best practice business processes without substantial implementation overhead, removing the need to trade off sophistication for cost in the selection of a vendor solution for internal deployment as described above. Outsourced collateral management services are therefore an attractive option for those buy-side institutions that require a capable and robust process but which do not generate the volume of trades necessary to justify the considerable investment required to deliver a dedicated technology infrastructure as well as for institutions of all sizes that outsource operational processes as a matter of strategic preference.

A further 15% of the survey group uses collateral management applications that have been developed and enhanced in-house. In general, the trend is towards the replacement of such bespoke systems, whether through the transfer of margin processing and collateral management to an outsourcing partner or the selection and implementation of a vendor solution.

The remaining 15% of the survey group uses spreadsheets to perform the key processes of comparing counterparty exposures with collateral balances in order to calculate margin calls. In general, the institutions that continue to use spreadsheets to manage collateral processes are those that have relatively little OTC derivatives activity. Where a buy-side institution is processing fewer than ten margin calls per week, there is little benefit to be gained by incurring the cost of implementing a dedicated collateral management application.

Do you receive collateral? How is received collateral managed? Can received collateral be invested or re hypothecated?

All of the institutions surveyed call their counterparties for collateral to cover OTC derivatives exposures. This was not always the case until quite recently, as discussed below.

The participants all described their processes for calculating and issuing margin calls to their counterparties. In most cases, the frequency with which collateral is called is aligned with funds' valuation frequencies which may be daily, weekly or monthly.

Figure 8 on the following page illustrates the spectrum of collateral received by buy-side institutions from their broker-dealer counterparties. The upper bar for each institution represents collateral assets received from counterparties. The chart reveals that, in general, European asset management institutions receive a greater proportion of cash collateral than their US peers, although there are variations by country. There is no clear relationship between an institution's assets under management and its preferred collateral type, although larger US asset management institutions appear better able to impose their preference for securities on their counterparties. One US asset manager strongly prefers not to receive cash collateral in order to avoid the operational burden associated with processing interest payments.

Just under half of the institutions surveyed reinvest cash collateral received from counterparties, usually in approved money market vehicles.

Figure 8: Collateral Received and Delivered by Survey Group

Survey Respondents	Region	AUM (USD) Category
Asset Mgr.	Europe	AUM > $750 Bn
Asset Mgr.	Europe	AUM < $100 Bn
Asset Mgr.	Europe	AUM < $100 Bn
Asset Mgr.	UK	AUM > $750 Bn
Asset Mgr.	Europe	$250 Bn < AUM < $750 Bn
Asset Mgr.	UK	$250 Bn < AUM < $750 Bn
Insurance Co.	US	$100Bn < AUM < $250 Bn
Asset Mgr.	Europe	AUM < $100 Bn
Asset Mgr.	US	$250 Bn < AUM < $750 Bn
Asset Mgr.	Europe	$100Bn < AUM < $250 Bn
Asset Mgr.	US	$100Bn < AUM < $250 Bn
Insurance Co.	US	$100Bn < AUM < $250 Bn
Asset Mgr.	US	$100Bn < AUM < $250 Bn
Insurance Co.	US	AUM < $100 Bn
Asset Mgr.	UK	AUM < $100 Bn
Pension Fund	UK	AUM < $100 Bn
Asset Mgr.	US	$250 Bn < AUM < $750 Bn
Insurance Co.	US	$100Bn < AUM < $250 Bn
Asset Mgr.	US	AUM > $750 Bn
Asset Mgr.	US	AUM > $750 Bn
Asset Mgr.	UK	$100Bn < AUM < $250 Bn
Asset Mgr.	US	AUM < $100 Bn
Pension Fund	Europe	AUM < $100 Bn
Pension Fund	Europe	AUM < $100 Bn

Collateral received Collateral delivered

For comparison, large broker-dealers report the following mix:
Collateral received: cash 82%, government bonds 10% and other 7%
Collateral delivered: cash 82%, government bonds 14% and other 3%
Source: BNY Mellon and InteDelta Analysis, 2010

Unlike a bank, which is able to pool received securities collateral and can therefore readily reuse it to realize value, the majority of the institutions in the survey have limited scope for the reuse of received collateral. The principal reason for this is that collateral has to be allocated to legal entity i.e. portfolio level, and collateral is typically delivered to a dedicated sub-account for each portfolio. This fragmentation of collateral inventory makes rehypothecation or other reuse of collateral assets such as repo trading or stock lending impractical unless individual funds are sufficiently large. Many hedge funds and other buy-side institutions found that multiple layers of rehypothecation rendered certain counterparties unable to return collateral during phases of the 2007-8 crisis, and have therefore decided as a matter of policy not to engage in rehypothecation and in some cases to prohibit their counterparties from re hypothecating assets delivered as collateral.

Over 75% of the institutions surveyed do not engage in rehypothecation, although several institutions noted that their documentation permitted them the discretion to reuse collateral. Two asset management institutions stated that they would like to rehypothecate in principle but that the fragmentation of collateral makes it impractical.

The evidence of the survey suggests that large pension and insurance funds actively rehypothecate collateral, both in the US and in Europe. These are institutions where the collateral pool is less fragmented, making reuse of collateral a more attractive proposition from an operations standpoint. Securities may either be re hypothecated or used in lending programs to generate income. In either case, the institutions emphasized the processes to ensure that re hypothecated assets can be tracked and recalled as required.

How is collateral funded? Do you have a cross-portfolio process for collateral inventory management and optimization? Who is responsible for nominating assets for collateral?

All of the institutions surveyed deliver collateral to counterparties to secure negative OTC mark-to-market exposures. Two specific exceptions were identified; certain Spanish mutual fund products that are not permitted to deliver collateral and French guaranteed return funds where asset swaps are used to hedge potential losses have unilateral collateral agreements with broker-dealers.

In almost 90% of the institutions surveyed, the portfolio manager is responsible for ensuring that eligible assets are available in the fund to deliver as collateral in the event of a margin call being received. In many cases, buy-side institutions expressed a preference to deliver securities collateral from inventory in order to avoid distorting portfolio composition by having to raise more cash than would otherwise be held.

Figure 8 on the previous page illustrates the spectrum of collateral delivered by buy-side institutions to their broker-dealer counterparties. The lower bar for each institution represents collateral assets delivered to counterparties. As for received collateral discussed above, European asset management institutions deliver a greater proportion of cash collateral than their US peers. Once again, there is no clear relationship between an institution's assets under management and its preferred collateral type. One US asset manager explicitly does not deliver cash. Also notable are two large European pension fund institutions that exclusively deliver securities as collateral from their very large inventories of high-quality government bonds.

While cash has typically been the default form of collateral, and remains the dominant form exchanged in the inter-dealer market, it may not be the optimal collateral asset for buy-side institutions. The requirement to fund margin calls may force a portfolio manager to maintain higher levels of cash than desired, distorting investment strategy. Some funds have explicit restrictions on the amount of cash that can be held. An alternative approach is to enter the repo market to raise cash secured by portfolio inventory, but this introduces another source of counterparty credit risk and

may result in additional margin requirements. Depending on the haircuts applied to the securities collateralizing the repo and the cost of the financing trade, the repo market may be an inefficient means to generate cash.

The need to deliver cash to meet margin calls has the potential to cause liquidity problems in times of financial stress, particularly as the manager may also be required to fund redemptions. The crisis saw many hedge funds impose gates to restrict investor redemptions, but this is not a practical approach for mainstream funds.

The survey found little evidence of efforts to systematically optimize collateral; typically the portfolio manager nominates eligible assets on an ad hoc basis. There is considerable interest in the bank sector in collateral optimization as financing teams seek to extract the maximum value from their collateral inventory by applying business rules that apply a hierarchy of collateral assets to each counterparty's eligibility criteria. Typically, such a process would ensure that those assets with the lowest value as collateral would be allocated first where eligible, thus saving assets with superior eligibility characteristics for situations where they are needed. Outsourced collateral agents are generally able to provide some degree of collateral optimization as part of their overall customer proposition.

One survey participant did comment that it would be useful for portfolio managers and traders to understand the impact of buying or selling a security on the portfolio's overall collateral capacity. For example, if a portfolio manager chooses to increase the duration or lower the credit quality of a portfolio in order to implement an investment view, the collateral capacity of the portfolio would be reduced because of the inferior eligibility characteristics of longer duration and lower credit quality securities.

In two of the largest asset management institutions, separate teams have discretion to select securities for delivery. In one case it is the securities lending team that performs this function, although the portfolio manager retains ultimate oversight and responsibility. In the other case, a dedicated middle office team selects securities from portfolio inventory. In general, securities from larger positions are used to reduce the incidence of collateral recalls and substitutions.

How has your collateral policy evolved since 2007? What is your strategy for meeting your collateral management objectives?

The events of 2008, and in particular the emergency resolution of Bear Stearns and the later failure of Lehman Brothers, dramatically emphasized the importance of robust collateral management processes. Without exception, all the survey participants have implemented changes to their processes, ranging from fundamental overhauls to relatively minor adjustments.

Some institutions found that their collateral processes were deeply deficient, and took rapid action to put themselves on a more sound footing. Several institutions have outsourced part or all of their collateral management operations to third parties, while others have selected and implemented vendor collateral management applications to quickly reach market standards.

Almost all institutions have revisited their collateral management documentation since the crisis, and have renegotiated terms where necessary. In some cases, legacy agreements with provision for unilateral collateral in the broker-dealer's favor have been replaced with standard bilateral terms. There is also evidence of a general tightening and standardization of thresholds and MTAs.

Around 30% of institutions in the survey stated that their collateral management processes were essentially sound and performed adequately throughout the crisis. Even in these instances, documentation has been reviewed and greater emphasis has been placed on comprehensive and timely reporting.

Central Clearing

- **The Dodd-Frank Act and equivalent European Union and national regulations all mandate the migration of substantial segments of the OTC derivatives market to central clearing.**
- **While central clearing should increase transparency and liquidity and reduce counterparty credit risk, it will also increase the cost of implementing certain strategies due to initial margin requirements.**
- **Clearing brokers are likely to pass on the cost of reduced rehypothecation benefits and other services such as initial margin segregation to their buy-side counterparties.**
- **Collateral management operations may become more complex as counterparty relationships fragment along product lines.**
- **The scale of change is likely to be disruptive and expensive to absorb.**

Many of the survey participants identified forthcoming regulatory changes to the structure of the OTC derivatives market as a key issue. Both the Dodd-Frank Act in the US and the EC Proposal mandate central clearing of many types of derivatives that are currently traded OTC.

Clearing of certain CDS and IRS contracts is already provided by central clearinghouses such as ICE, LCH.Clearnet, CME and Eurex, although many institutions are currently engaged on a pilot basis only. Buy-side participation to date has been modest, and is likely to remain so until central clearing is required by regulators.

It is unlikely that any but the very largest buy-side institutions would become Direct Clearing Members of derivatives exchanges and clearinghouses. The majority of buy-side institutions will use clearing brokers to execute trades. While clearing brokers will be responsible for margin and collateral processing on behalf of their buy-side clients, buy-side institutions will need to be able to monitor their exposures and validate daily margin demands across multiple clearing brokers for different execution venues.

The expectation of regulators is that a high proportion of OTC derivatives are sufficiently standard in form to be suitable for central clearing. In response to questions during his January 2010 testimony before the Financial Crisis Inquiry Commission, JP Morgan Chase Chairman and CEO Jamie Dimon estimated that 70 to 80% of OTC credit derivatives will migrate to central clearing (Financial Crisis Inquiry Commission, January 2010).

Although the Dodd-Frank Act was signed into law in July 2010, much of the detail of implementation of its provisions is delegated to regulatory agencies to implement. Many key details therefore remain unresolved; for example, the definition of a 'Major Swap Participant' (MSP) under the Act is somewhat ambiguous but is critically important to buy-side participants that may be classified as MSPs in terms of the potential capital and compliance requirements that they could face.

In general, survey participants expect central clearing to increase price transparency, liquidity and volumes and to reduce counterparty credit risk. However, a number of potential objections were also raised.

Several participants were concerned that the cost of implementing strategies using contracts moving from an OTC to a centrally-cleared model will increase because of the requirement to pay initial margin. The 2010 ISDA Margin Survey provides an illustration; the large broker-dealers reported collateralization levels (measured as value of collateral divided by net exposure) of 73% for institutional investors compared to 146% for hedge funds. The higher hedge fund figure is due to the requirement for initial as well as variation margin. On this evidence, there would be scope for a doubling in collateral requirements faced by institutional investors, although higher creditworthiness compared to the broad hedge fund category should mitigate the increase somewhat.

Higher margin requirements are likely to weigh more heavily on buy-side participants, as these institutions are more likely to take directional positions that minimize scope for netting of exposures, compared with the balanced-book approach of broker-dealers (Risk Magazine, April 2010). Further, collateral eligibility in the centrally-cleared model is likely to be conservative, emphasizing cash and selected government securities. Where major-index equities are accepted, minimum haircuts currently range from 35% (LCH.Clearnet SA) to 50% (Eurex). Such restrictive eligibility criteria will force portfolio managers to either hold higher levels of cash, potentially distorting the implementation of investment strategy, or to raise cash in the repo market. Clearing brokers are likely to pass on the cost of reduced rehypothecation benefits and other services such as initial margin segregation to their buy-side counterparties.

Most of the survey participants were sanguine about the standardization of contracts such as CDS and IRS to allow them to be traded on-exchange. One large user of OTC derivatives commented that over 80% of positions were in 'vanilla' contracts that are expected to be eligible for clearing. However, some institutions such as pension funds running LDI mandates fear the loss of flexibility to specify highly bespoke contracts that they currently enjoy in the OTC market.

Most of the institutions surveyed use between five and 20 OTC counterparties, but volumes are concentrated with a small number of key broker-dealers. This allows significant scope for efficient bilateral netting of offsetting exposures. As the various types of OTC contracts are standardized and migrate to a series of different execution facilities, buy-side institutions may be forced to interact with more counterparties rather than fewer, with higher overall collateral requirements due to the loss of netting opportunities and higher operations costs as the collateral management process fragments along product lines (Gregory, 2010 p.6).

Due to the continuing uncertainty over how exactly central clearing will evolve, several institutions commented that they are delaying investments in their collateral management processes until there is greater clarity. A common theme was that the operational and legal overhead associated with the migration process and the associated overhaul of counterparty documentation are likely to be highly disruptive and expensive for all market participants.

IV. Conclusions

Market Direction

The Market Intelligence survey revealed a spectrum of approaches to OTC derivatives operations and counterparty credit risk management, but also highlighted areas in which the post-crisis drive towards standardization has already delivered results.

OTC derivatives offer great flexibility in taking dynamic positions and hedging risks. Their widespread adoption enabled buy-side institutions to bring innovative products to their institutional, high net worth and retail clients.

The opacity of many OTC derivatives and the challenge of ensuring that operations kept pace with the rate of adoption of new instruments left many institutions vulnerable to counterparty credit risk. When the crisis broke, many of the buy-side institutions that were active participants in the OTC derivatives market had deficient control and risk management processes.

The crisis in general, and the failure of one of the largest OTC derivatives broker-dealers (and near failure of several more) in particular, dramatically emphasized the importance of counterparty credit risk with respect to OTC derivatives exposures. The subsequent industry-led program of reform has addressed many of the shortcomings of the OTC market, and legislative and regulatory measures seem set to further transform how derivatives business is conducted.

The key thrust of both the Dodd-Frank Act and the EC Proposal is to enforce the standardization of as many OTC derivatives instruments as possible so that they can be migrated to a central counterparty or exchange-traded model. While this should increase transparency, reduce counterparty credit risk, decrease the degree of interconnectedness that causes contagion in times of crisis and allow better regulatory oversight, buy-side observers have several reservations:

- Loss of flexibility in access to bespoke OTC contracts for complex strategies, notably for large LDI mandates;
- Increased cost of financing positions due to requirement for independent amount / initial margin and likely tightening of collateral eligibility criteria;
- Operational overhead of administering and validating daily margin processes with multiple clearing brokers;
- Bifurcation of counterparty exposure and operational effort across multiple different product venues, and associated loss of netting benefits;
- Disruption over the implementation period.

One impact of the drawn out regulatory process has been to hold up institutions' investment in the collateral management process and systems improvement as they quite reasonably adopt a wait-and-see approach.

Next Steps

Much of the industry response to the crisis has been driven by the banks, and it is instructive to look to the actions taken by banks to establish a best practice benchmark.

A bank's best-practice checklist for OTC counterparty credit risk management includes the following key items:

- Effective counterparty credit risk governance structure with senior management accountability within the wider risk management framework;
- Up-to-date and consistent legal agreements, preferably based on ISDA/CSA standard documentation;
- Effective counterparty on-boarding processes;
- Comprehensive independent valuation and liquidity monitoring capability;
- Effective aggregation of valuation and reference data to support forward-looking exposure calculations, taking into account appropriate netting and collateral balances;
- Stress-testing process to permit analysis of the institution's counterparty credit risk profile under stressed scenarios;
- Robust framework of counterparty credit limits tested against forward-looking exposure measures. Limits should be embedded in pre-trade checks, and should be subject to rigorous review on a regular basis and whenever credit extensions are requested;
- Established Credit Value Adjustment (CVA) and Debt Value Adjustment (DVA) framework for the active pricing of counterparty credit risk, combining exposure and default probability analysis to allow the cost of counterparty credit risk to be explicitly considered in the pricing of trades;
- Daily portfolio reconciliation for significant counterparties, ideally using one of the established multi-lateral reconciliation services;
- Dedicated collateral management platform, supporting key exposure and margin calculations, daily margin call workflow and interest processing;
- Daily, and potentially intra-day, margining to adjust collateral for changes in exposure;
- Established dispute resolution process with formal escalation framework;
- Straight-through processing of cash and security collateral movements;
- Effective process for management of collateral inventory, observing client-imposed and regulatory constraints where appropriate;
- Engagement with regulatory and industry developments as the shift to central clearing evolves.

One of the main problems faced by buy-side institutions when engaging with their broker-dealer counterparties is information asymmetry. The broker-dealer will typically have more sophisticated valuation capabilities, particularly for more complex OTC derivatives instruments. This makes it difficult for any but the most sophisticated buy-side institutions to validate and, where necessary, challenge the valuation generated by the broker-dealer. This problem is exacerbated by the lack of transparency and liquidity that typifies much OTC derivatives activity.

For smaller buy-side institutions, the terms of business of their counterparty relationships may also be skewed in favor of the broker-dealer. Although unilateral agreements are now relatively rare, in many cases the broker-dealer demands less onerous terms than are applied to the buy-side counterparty. Taken together with the challenge of verifying valuations, the result can be a systematic over-collateralization of broker-dealers' exposure to the buy-side and a corresponding under-collateralization of buy-side exposure to broker-dealers.

Broker-dealers have a clear interest in applying rigorous terms of business; they must manage their credit risk, particularly with less creditworthy clients. However, they clearly benefit from their ability to pool and re-use accumulated collateral through rehypothecation, repo and lending activities, which provide an inexpensive source of funding.

It may be argued that the ability of the major broker-dealers to dictate favorable terms of business has actually increased since the crisis, with the further concentration of OTC derivatives business amongst a few key players. A Bloomberg article focused attention on the net long collateral positions of major broker-dealers; for example:

'Goldman Sachs....collected cash collateral that represented 57 percent of outstanding over-the-counter derivatives assets as of December 2009, while it posted just 16 percent on liabilities, the firm said in a filing this month. That gap has widened from rates of 45 percent versus 18 percent in 2008 and 32 percent versus 19 percent in 2007, company filings show.' (Bloomberg, March 2010)

To overcome these information asymmetries, buy-side institutions need to look to banks' processes and identify opportunities to adopt best practices. The process deficiencies evident in buy-side institutions relative to industry best practice are summarized in Figure 9 below:

Figure 9: Observed Process Deficiencies and Steps to Industry Best Practice

Observed process deficiency	Industry best practice
Generally inadequate counterparty credit risk governance	Increase management focus on counterparty credit risk. Extend risk committee oversight to focus on counterparty credit risk. Invest in counterparty credit risk mitigation measures such as best practice exposure measurement, daily portfolio reconciliation and robust collateral management processes.
Weak documentation	Renegotiate counterparty agreements, migrating to ISDA/CSA best practice documentation or regional variants. Focus on key terms of business including collateral eligibility, MTA and thresholds. Work with broker-dealer counterparties to ensure completeness of information at on-boarding.
Extensive manual workarounds for trade management and accounting	Work with system vendors to accommodate derivatives instruments in core trade processing and accounting platforms. Formalize control over workaround processes. Consider outsourcing non-core operations. Standardization of OTC derivatives moving to central clearing should ease operational complexity.
Dependency on counterparty valuations	Establish and resource internal pricing teams to provide an independent pricing capability. Expand use of third-party independent valuations.

Observed process deficiency	Industry best practice
Limited capacity to accurately quantify counterparty exposures and concentrations	Review exposure calculation methodologies and consider adoption of PFE as a forward-looking exposure measure. Follow best practice for quantification and reporting of exposure, netting of positions and reflection of collateral. Improve monitoring of counterparties, focusing on due diligence, credit ratings and CDS spreads. Implement stress testing of counterparty exposures.
Deficient counterparty credit limits framework	Formalize due diligence framework for setting of counterparty limits and ongoing monitoring of counterparty condition using credit ratings, CDS spreads etc. Establish periodic review of credit limits, and respond to changes in counterparty condition on an ad hoc basis as required. Ensure that counterparty credit limits framework is robust and rigorously applied, preferably in pre-trade checks. Ensure that requests for limit extensions are rigorously evaluated before approval. Consider adopting bank best practice by implementing a CVA counterparty credit risk pricing process.
Infrequent portfolio reconciliation	Increase frequency of portfolio reconciliation process, ideally to daily. Consider use of multilateral reconciliation services or formalize internal process and systems.
Limited capacity to call collateral from counterparties	Ensure documentation requires bilateral exchange of collateral. Implement robust margin calculation process, whether supported by an internal build or vendor solution. Extend straight-through processing (STP) through collateral process from sourcing of valuations through exposure and margin calculation to instruction and settlement of collateral movements. Consider outsourcing collateral management to leverage best practice tools and process. Consider active management of cash and securities inventory available for use as collateral. Enforce zero tolerance for failed collateral deliveries.
Margin requirements distort portfolio strategy	Consider potential for increased use of securities as collateral to reduce distortions introduced by allocation of cash for margin calls. Evaluate ability to support funding of cash margin calls by repo of portfolio securities inventory. Consider opportunities for reinvestment of held cash collateral and re-use of held securities collateral where portfolio size and/or pooling opportunities exist.
Weak dispute resolution process	Dispute frequency should decline markedly as valuation capability and portfolio reconciliation processes are developed. Establish escalation framework for aged disputes to minimize risk of under-collateralization.

Source: BNY Mellon and InteDelta Analysis, 2010

It is desirable that buy-side institutions engage with supervisory authorities as the body of regulation to implement the requirements of the Dodd-Frank Act and the EC Proposal evolves. One survey participant commented *'The buy-side is less involved in the consultation processes; the rules are shaped by banks. We need to ensure that buy-side interests are protected'.* A degree of engagement is taking place; in the US, the Securities Industry and Financial Markets Association (SIFMA) Asset Managers Forum (AMF) is active in co-ordinating a response to proposals for the central clearing of derivatives, and acts as an interface to the key regulatory agencies.

While the investment required to implement best practice operations and risk management processes is substantial, it should be possible to realize additional benefits than simply being better prepared for the next crisis.

Several survey participants noted that current and prospective clients are taking a much more active interest in risk management processes, demanding evidence of process integrity and much more granular risk reporting. Some plan sponsors were criticized for not having performed adequate due diligence over managers to whom assets were delegated. To protect existing mandates and win new business, it will be essential for buy-side institutions to be able to demonstrate robust controls and procedures. One of the survey participants commented that *'...clients want to see a robust counterparty credit risk process...you don't want to have to show them a spreadsheet'.*

A second benefit of a robust risk management approach should be to improve the internal ratings applied to the institution and its funds by its broker-dealer counterparties. Such internal ratings systems are required by regulators, and govern how the broker-dealer should manage the counterparty from a risk perspective. Counterparties are rated on some internal scale in the first instance, based on parameters such as assets under management, revenue, ownership, jurisdiction, longevity and so on. Fund ratings are then set with reference to the manager's rating, with rules-based or subjective adjustments to reflect non-typical fund types, leverage etc. There is a subjective element to the rating process, and a buy-side institution that can demonstrate strong risk and control processes should benefit in terms of the ratings applied to its funds. A higher rating should deliver business benefits, such as more favorable collateral terms and higher credit limits.

Such considerations help to make the cost benefit case for investing in portfolio reconciliation, collateral management and the associated operations processes, but ultimately each institution must take a view on the appropriate investment to make. Prioritization should be established by the scope and scale of OTC derivatives business and expectations for growth, the extent of other activities that create counterparty credit risk such as securities lending and repo, and the degree to which the current processes are deemed to put the institution and its clients at unacceptable risk.

When designing a target counterparty risk and collateral management infrastructure, several strategic options are available to buy-side institutions. The market is increasingly well-served by solution vendors and service providers, making large scale internal development unattractive unless particular requirements exist. The key decision is whether to retain processes in-house, to outsource collateral management, or to fully outsource some or all of investment operations, valuation, reconciliation and collateral management processes.

In any event, considerable effort will be required to ensure that the end-to-end design of data, business processes and systems infrastructure are fit for purpose and flexible enough to adapt to what seems certain to be a fluid market and regulatory environment for the foreseeable future.

Appendix A: Measuring Potential Future Exposure

A buy-side institution is exposed to counterparty credit risk if it has an open trade that has a positive mark-to-market value or could achieve a positive mark-to-market value over the remaining time to maturity of the contract. If the counterparty defaults before the trade settles, the positive mark-to-market value of the trade to the buy-side institution is lost. Counterparty credit risk can be mitigated by calling for collateral, but it remains necessary to monitor uncollateralized exposure to a counterparty to ensure that it does not become excessive.

Simple mark-to-market exposure potentially understates a fund's counterparty credit risk as it takes no account of future changes in the contract's value. Potential Future Exposure (PFE) represents the maximum possible exposure of a trade measured to a given level of confidence over the lifetime of a contract. Several approaches can be taken to calculating PFE; the choice is driven by the need to balance computational complexity with consistency and accuracy of results:

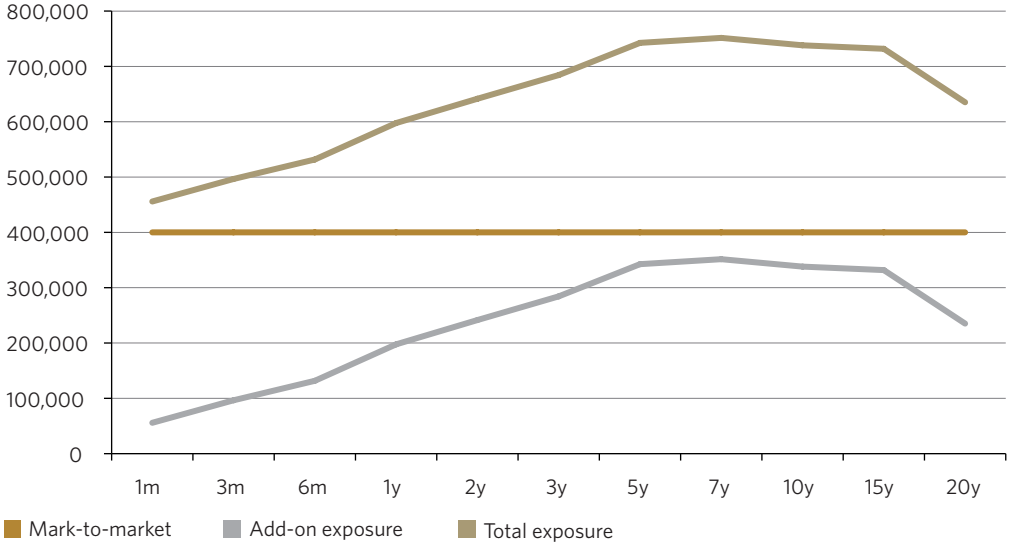
- Simple add-ons;
- Add-ons with portfolio effects;
- Monte Carlo simulation.

Add-on factors are calculated by modelling the evolution through time of the key risk factors (interest rates, FX rates etc.) that determine the price of an instrument using stochastic techniques. Add-on factors represent an estimate of the potential future distribution of mark-to-market valuations based on the time horizon of the instrument, the volatility of the underlying asset and the type of transaction. They are usually quoted as a percentage which is multiplied by the notional value of the contract to generate an incremental exposure which can be added to the current mark-to-market value of the contract to calculate an overall PFE. The add-on factors reflect both the increase in risk associated with future uncertainty and the offsetting effect of cash flows throughout the lifetime of many financial derivatives instruments.

In the example shown in Figure 10, on the following page, an IRS with a notional value of $1 million has a positive mark-to-market value of $400,000 and 20 years to maturity. The current mark-to-market value is illustrated by the flat gold line. A table of add-on factors for a generic USD IRS is used to calculate the appropriate add-on within each time segment from the present to maturity. The grey line shows the profile of add-ons over the remaining life of the trade and the green line shows the PFE profile of the trade, which is the sum of the current mark-to-market and the add-on exposure within each time segment.

By combining PFE estimates for different periods within the overall tenor of the trade in this way, a PFE profile can be constructed and used as a basis for validating a proposed trade against counterparty credit limits.

Figure 10: Example PFE Profile Generated Using Add-ons ($)



Currency	USD	1m	3m	6m	1y	2y	3y	5y	7y	10y	15y	20y
Tenor	20	5.58%	9.65%	13.17%	19.76%	24.15%	28.43%	34.25%	35.15%	33.81%	33.18%	23.51%

Source: InteDelta, 2010

In the simplest approach, the exposures calculated for each discrete position are totalled to arrive at an overall portfolio exposure. This is a computationally straightforward but crude measure. Simple aggregate exposure can be refined by considering portfolio effects. For example, simultaneous long and short positions in the same or similar instruments cannot simultaneously move into the money. Scenario consistency is an approach in which aggregated exposures are calculated for different scenarios. The final aggregate PFE will be the maximum potential exposure calculated across all scenarios.

To fully recognize portfolio effects such as cross-product netting and collateralization, a Monte Carlo approach is required. This generates the potential exposure distribution by running many different simulations across the selected time period and aggregating the results.

The key advantages of the add-on approach to the calculation of PFE are that it is easy to implement, does not require detailed transaction data, has low ongoing maintenance requirements, has low processing requirements and the results are easy to explain. These advantages are offset by the disadvantages that, relative to a Monte Carlo approach, transaction modelling is less accurate, portfolio effects may not be fully recognized and consequently overall exposures are likely to be higher, which may unduly restrict the portfolio manager in the allocation of OTC derivatives transactions.

The Monte Carlo approach offers more accurate modelling of transactions with portfolio effects fully taken into account and hedges fully recognized. However, it is substantially more complex to implement, processing can take several hours for large portfolios and the process may be considered a 'black box' yielding results that are difficult to interpret.

There is some contention over the appropriate approach to calculation of exposure for counterparty credit risk management. For example, the Technical Advice consultation document issued by the Committee of European Securities Regulators (CESR) in July 2009 explicitly addressed OTC counterparty credit risk and made recommendations for the appropriate approach for UCITS funds. CESR proposed that the simple positive mark-to-market exposure measure should be used:

'Counterparty risk exposure measures how much a UCITS could lose if their OTC counterparty defaults. The additional safeguards required by the UCITS Directive that mitigate this risk exposure (such as daily valuation of OTC contracts, independent verification of such valuations, the requirement that OTC contracts are fully liquid and requirements on the credit quality of the OTC counterparty) should be taken into account in determining an appropriate methodology for calculating counterparty risk exposure across all Member States.

Due to the existence of these compensating controls and requirements in the UCITS Directive, CESR considers that the "add-on" for future credit exposure is not necessary as this inflates the risk exposure in a subjective manner. CESR also proposes that the use of risk-weightings should not be permitted. This approach greatly simplifies the calculation of counterparty risk while also recognizing that the amount calculated represents the full current amount at risk.

It is therefore recommended that the counterparty risk associated with the use of OTC financial derivatives should be calculated as the positive MtM of the OTC contract.'

In our view, the 'additional safeguards' referred to do not guarantee that OTC derivatives exposures can be costlessly unwound, particularly in times of financial stress when the issue of counterparty credit risk becomes critical. Several of the institutions that responded to the July 2009 CESR consultation noted that add-ons represent an effective way of capturing risk associated with future market movements and should be mandated.

The UCITS IV documentation (Directive 2009/65/EC) itself also prescribes measurement techniques for the global exposure (i.e., market risk) of UCITS funds, presenting alternative commitment-based and Value-at-Risk approaches. The principles for calculating global exposures should *'take into account the current value of the underlying assets, the counterparty risk, future market movements and the time available to liquidate the positions.'* This is a sound approach, and should also be applied to the measurement of counterparty credit risk by calculating PFE.

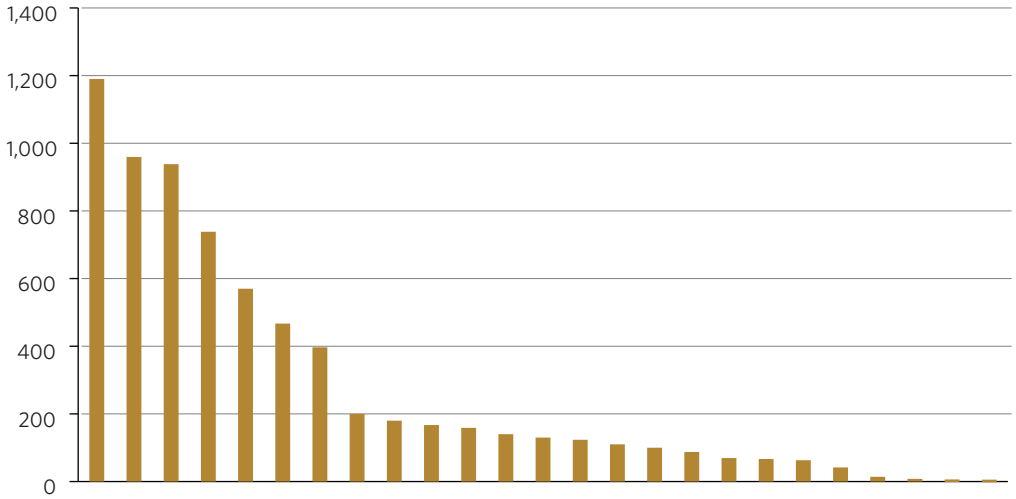
The implementation of PFE strengthens the credit risk management process by explicitly considering the future evolution of a trade rather than simply the current mark-to-market exposure. PFE is the preferred measure for banks with sophisticated counterparty credit risk processes and represents best practice for the implementation and management of counterparty exposure limits.

Appendix B: Survey Methodology

In contrast to market surveys that use highly structured questionnaires to capture primarily quantitative data, the objective of this survey was to provide qualitative analysis of key trends in the use of OTC derivatives by buy-side institutions and the associated counterparty credit risk management policies and processes. The data and analysis that support this paper were gathered in a series of face-to-face and telephone interviews conducted between July and October 2010.

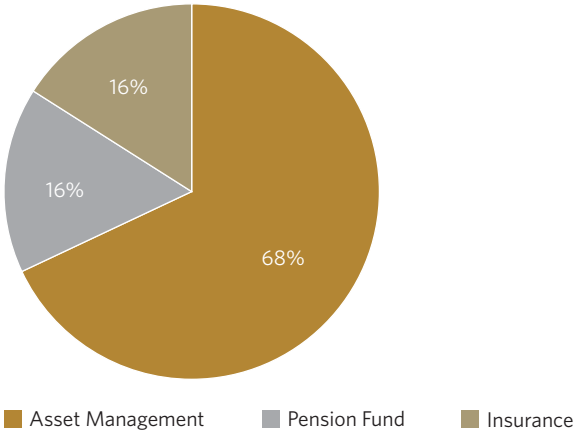
The final survey group consisted of 24 asset management, insurance and pension fund institutions with a wide range of investment strategies, products and business models. The survey group manages aggregate assets of $6.8 trillion; individual institutions' assets under management ranged from over $1 trillion to less than $10 billion. The profile of the survey group is illustrated by Figures 11 and 12 below.

Figure 11: Survey Respondents by Assets under Management ($ billion)



Source: BNY Mellon and InteDelta Analysis, 2010

Figure 12: Survey Respondents by Segment



Source: BNY Mellon and InteDelta Analysis, 2010

By engaging a representative cross-section of buy-side institutions in this way, there is greater flexibility to respond to and explore particular issues of interest with each survey participant and therefore to develop a deeper understanding of the challenges faced by buy-side institutions in adapting to fundamental changes to market structure, regulation and practice in the post-crisis world.

The findings of the survey highlight current market practice for OTC derivatives operations and counterparty credit risk management, and can be used by buy-side institutions to benchmark their policies, processes and infrastructure, identifying relative strengths and weaknesses and prioritizing enhancements where necessary.

InteDelta has undertaken comparable survey exercises for the major banks and broker-dealers that are the counterparties of the target audience of this paper; by taking an industry-wide view, it is possible to draw conclusions as to what constitutes best practice for the design and management of collateral with respect to OTC derivatives exposures and to provide thought leadership on these business-critical issues.

This White Paper also seeks to reflect current thinking at a cross-section of buy-side institutions with respect to emerging trends in the OTC derivatives market, and it is hoped that it will stimulate further debate and sharing of information to help the spread of best practice throughout the industry.

Appendix C: Acknowledgements

The contribution and insight of the following participants in the Market Intelligence survey is gratefully acknowledged.

Respondent	Title	Institution
Jean-Marie Dumas	Euro Fixed Income & Credit	Amundi Asset Management
Cécile Falcon	Chief Operating Officer	Amundi Finance
Jan Drewes	Head of Securities and Derivatives Operations	ATP
Oliver Jackson	Hedge Funds and Derivatives Co-ordinator	Aviva Investors
Philippe Pauchont	Head of Middle and Back Office	Carmignac Gestion
Jason Ward	VP Fixed Income Trade Operations	Fidelity Management & Research
Rob Smith	Senior Investment Officer - Fixed Income	Florida State Board of Administration
Steve Wisneski	Director of Global Trade Operations and Derivatives Operations	Franklin Templeton
Wylie Tollette	SVP Risk Management	Franklin Templeton
Mary Stone	VP Global Trading Operations	GE Asset Management
Jennifer Katona	Middle Office Team Lead	Genworth Financial
Aurelien Dunet	Head of Operations	Ikano Fund Management
Robin Claessens	Chief Executive Officer	Invensys Pension Scheme
Jeffrey Andrews	Global Head of Portfolio Operations	Invesco Global
Jim Schultz	Director, Investment Accounting	Jackson National
Mike Costello	AVP, Investment Accounting	Jackson National
Bob Vance	Derivatives and Cash Bonds Middle Office	Nationwide Mutual Insurance Company
Jack Monts de Oca	Derivatives and Cash Bonds Middle Office	Nationwide Mutual Insurance Company
Anthony Migliaccio	Group Manager Investment Operations	Northwestern Mutual
Grant Grothman	Collateral Supervisor	Northwestern Mutual
John Ruigrock	Supplier Manager	Stichting Pensioenfonds Hoogovens
Ross Nightingale	OTC Operations Manager	Western Asset Management (WAMCO)

A number of respondents contributed on an anonymous basis; their contributions are also gratefully acknowledged.

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