Basel Committee
on Banking Supervision

Fair value measurement and modelling: An assessment of challenges and lessons learned from the market stress

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I. Introduction

Under both International Financial Reporting Standards (IFRS) and US Generally Accepted Accounting Principles (US GAAP), banks and other companies have a wider range of financial instruments using fair values. Fair value measures also have been applied to increasingly complex, less liquid financial instruments. This complexity, along with the growing importance of fair value measures, means that it is critical that banks implement and maintain robust risk management and control processes around the measurement of fair values and their reliability.

Recognising the critical importance of sound valuations to risk management, financial reporting and regulatory capital adequacy, in early 2007 the Basel Committee on Banking Supervision (the Committee) initiated a project to gain a deeper understanding of approaches used to determine valuations of complex financial instruments. Within the context of existing accounting standards, the Committee's work focused on the use of valuation methodologies for risk management and financial reporting purposes. It also assessed the related control, audit and governance practices surrounding fair value measurement. In response to the market turmoil that emerged during mid-2007, the scope of the work was subsequently expanded to include coverage of how banks responded to the market stress and initial lessons learned.

Drawing on the work of the Committee's Accounting Task Force (ATF) and Risk Management and Modelling Group (RMMG),[1] this paper summarises the initial assessment of valuation practices, and presents the key findings and follow-up actions. In the following section, we briefly discuss valuation shortcomings that were exposed during the market turmoil. In section III, we present the key findings and discuss a number of challenges in the valuation process. Section IV concludes with a summary of the Basel Committee's plans for further work to promote sound valuation practices at banks.

II. Valuations in the context of the market turmoil

The recent market stress revealed a number of issues related to the valuation of complex products. As liquidity evaporated quickly in the markets for many complex structured products and primary and secondary transaction prices became unavailable, some banks responded by switching from valuation methods based on observable prices (or indices) to methods that relied more on modelled valuations. In other cases, model-based valuations required more extensive use of unobservable inputs.

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[1] The ATF and RMMG, which were jointly tasked by the Committee to undertake this work, met with industry representatives from six organisations in June 2007, surveyed around 30 banks late in 2007, and organised a follow-up meeting with bankers in February 2008. In addition, national supervisors and members of the ATF and RMMG have also shared perspectives gained from meetings with bankers, banking industry groups and accounting and auditing standard setters.

Banks that relied predominantly on a single or narrow range of information sources for valuation encountered greater difficulties than those banks that considered a wide variety of information in their valuation processes and that had more robust internal processes and methods for understanding the inherent risks of complex products, especially when market prices disappeared.

In some cases, products were valued on the basis of their price at the time of origination or based on trading prices for similar transactions. In other cases, valuations were determined by using generic credit spreads based on the product's assigned rating. Moreover, some banks assumed that primary market prices were good indicators of secondary market value or liquidity. When primary markets dried up, banks with no contingency arrangements in place were left exposed and for them the valuation of secondary market products became a serious problem.

For some transactions (eg asset swaps and negative basis trades)[2] valuation methodologies did not always incorporate all market factors and risks. Some banks tended to focus mainly on the credit risk assessment of the underlying asset (sometimes based on the rating), while overlooking or underestimating other factors, such as market liquidity and counterparty credit risks. The lack of timely assessment of market factors and counterparty credit risks had an adverse impact on the effectiveness and cost of hedging strategies. In some cases, banks failed to appropriately recognise basis risks as well as correlations between the quality of underlying assets and the counterparty risk of the seller of credit protection. A notable example of this was seen in the case of monoline insurers selling protection on tranches of collateralised debt obligations (CDOs).

In many cases, banks underestimated the impact of funding risks on their trading portfolio. As investor confidence in a wide range of structured securities waned, some banks were forced to retain exposure in warehouse portfolios longer than expected. As a consequence, some banks were forced to sell other financial assets to increase liquidity, creating downward pressure on the value of similar instruments. Tools such as liquidity planning and stress testing were utilised though they did not always capture the potential liquidity needs resulting from trading book transactions in times of stress (eg increased funding requirements related to margins on exchange-traded derivatives and collateral against OTC transactions).

During the turmoil banks had difficulties in selecting appropriate valuation inputs. In particular, it was necessary to assess whether observable inputs were reliable and did not represent distressed sales, and more generally whether there was a need to shift to model-based valuations.

From a financial reporting perspective, an increase was observed in the proportion of instruments valued based on so-called Level 2 or Level 3 inputs[3] (in the latter case from a relatively low base). The reasons for the percentage increase in items in the Level 2 and Level 3 valuation categories differed across banks. In some cases, the increase in Level 3 valuations was due to transfers from higher levels of the fair value hierarchy, while in other cases it reflected changes in business mix (eg new business or settlements). Moreover, the

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[2] A negative basis trade is where a trader buys a bond and credit default swap (CDS) protection on the same name. If the CDS spread is less than the bond spread, the basis is negative and the trader can earn a profit on a hedged credit risk position (ignoring other risks such as counterparty risk).

[3] For example, US GAAP distinguishes among three levels of market participant assumptions, which depend on the use of observable market inputs when determining fair value estimates for financial reporting purposes. Level 1 contains instruments with quoted market prices in active markets, Level 2 includes observable market inputs for similar or related instruments and Level 3 includes unobservable, entity-specific inputs.

classification of items in the fair value hierarchy may be ambiguous in some cases. However, valuations based on models, whether Level 2 or Level 3, remained sensitive to market factors. The market turmoil also revealed that some banks were not prepared to deal with the additional valuation challenges associated with instruments classified as trading when the markets for those instruments became illiquid.

As a result of adverse market conditions banks applying fair value measurement to a growing portfolio of assets were forced to do so in an environment of declining market liquidity and difficult price discovery. For example, warehoused exposures that banks had initially planned to securitise or distribute to investors were usually retained in the *trading* accounts, although some banks classified such exposures in *available for sale* portfolios (which are also fair valued). In the area of leveraged lending where banks experienced difficulty selling or syndicating financing commitments, those commitments that could not be distributed were in most cases also categorised as trading assets. Additionally, in certain instances, banks felt compelled for reputational reasons to buy back securities from and provide other forms of support for sponsored conduits, structured investment vehicles (SIVs) and asset management funds, typically holding these exposures at fair value in the trading book.

In summary, the market turmoil highlighted the difficulties in estimating fair values due to the lack of liquidity in the markets, the complexity of some financial instruments, and the shift by some banks to more model-based methodologies which increased the use of unobservable inputs. Taken together, these factors strained the capacity of business units and control functions tasked with the necessary verification and validation and led to delays in producing valuations. Moreover, with the need for "rapid roll-out" of some new valuation models and the extension of other existing models to a broader range of products than originally intended, the usual degree of internal scrutiny was not applied in all cases. Banks that had made earlier investment to develop more rigorous valuation and governance processes, and that utilised a diverse range of valuation approaches and information sources, were better positioned to deal with valuation uncertainty when market liquidity dried up.

A variety of approaches to valuation, lack of disclosure about how they were undertaken, inadequate governance and controls around fair value measures in some banks, and an unforeseen level of stress compounded losses at a number of banks and contributed to the loss of confidence in disclosures for certain complex products. Moreover, prior to the crisis, in some banks, insufficient resources were allocated to understanding, valuing and controlling risks in products that were complex, arguably contributing to a build up of excessive concentration in such products in the first place.

III. Challenges in the valuation process and key findings

The introduction of new instruments is an essential part of financial innovation and will often involve a degree of initial valuation uncertainty. At the same time, many characteristics of complex products and transactions make them inherently difficult to value. These challenges stem from the absence of active and liquid markets for the products, the complexity of the payoff structures and the links between valuations and underlying risk factors. The absence of a price from a liquid and actively traded market means that the valuation must rely on models or proxy-pricing methodologies as well as on expert judgment. The outputs of such models and processes are highly sensitive to the inputs and assumptions adopted, as well as being subject to estimation error and uncertainty. Moreover, calibration of the valuation methodologies is often complicated by the lack of readily available benchmarks. Finally, the liquidity of the markets varies over time, introducing further variability to the estimation of the fair values for financial instruments.

It is therefore critical that banks have robust valuation and accounting classification processes in place to address the challenges that arise from valuing products that are either inherently complex or illiquid. In this section we present our assessment in four key areas where practices can be improved: (i) governance and controls; (ii) risk management and measurement; (iii) valuation adjustments and uncertainty; and (iv) financial reporting.

a. Governance and control processes

Strong governance and control procedures are needed to address the difficulties associated with valuations of complex and illiquid products; potential conflicts of interest between front-office (traders) and back-office staff (risk management, financial control, and accounting specialists); and the linkage between accounting and risk management perspectives. Furthermore, they are needed to ensure that senior management is able to communicate (both internally and from a transparency perspective) its tolerance for valuation uncertainty to the banks' business units, and to monitor compliance with its overall policy settings at an aggregate firm-wide level.

Although firms had in place overall governance and control procedures, the market stress revealed a range of weaknesses around the rigour of these processes, especially as applied to more complex structured products or to less liquid instruments. In particular, many banks did not anticipate or have in place clear policies or contingency plans for dealing with situations in which market conditions deteriorated and observed market prices become unavailable. In addition, some banks did not allocate sufficient resources to effectively understand and manage the risks associated with complex products. Instead, they reverted to overly simplified valuation approaches that should have attracted greater scrutiny from senior bank management. In contrast, leading practice banks emphasised the importance of a diversity of approaches and opinions in the valuation of complex products and had in place a range of mechanisms to cross check valuations.

b. Risk management and measurement

Banks generally try to be consistent in their treatment of valuations used for the management of risk and those used for financial reporting purposes. Such an approach is based on the objectives of maintaining consistency between internal risk management and external reporting, maximising operational efficiency, and ensuring that a broad range of information and perspectives within the firm (eg traders, accounting and risk management specialists, senior management) play an active and significant part in the valuation process.

Although it is typical for banks to use common measurement approaches for both risk management and financial reporting purposes, there is clearly divergence across banks in how effectively this has been implemented. The over-reliance by many banks (and other market participants) on a single information source (typically ratings) to determine value was revealed by the market turmoil as a fundamental weakness in risk management. Banks that encountered difficulty included those that relied predominantly on a single or narrow range of information sources for valuation. This is in contrast to banks that considered a wide variety of sources in their valuation processes. These banks had more robust internal processes and methods for understanding the inherent uncertainty embedded in the risks and values of complex products, especially when market prices disappeared.

The assumption by some banks that primary market prices could be relied upon to proxy secondary market trading values did not hold up under stressed conditions. Many products that proved difficult to value during the market turmoil were not at any stage actively traded in liquid secondary markets. Moreover, given the bespoke nature of many of these products, secondary market liquidity was never likely to be deep. Risk management practices often failed to account for the illiquidity of these products and the further illiquidity they would likely face under stressed conditions. In some cases, banks applied valuation methodologies mechanically and without recognising their limitations.

c. Valuation adjustments and dealing with uncertainty

Uncertainty in valuations generally is greater for products that are less standardised, less frequently traded, and more complex and opaque. Financial reporting and risk management specialists within banks recognise and attempt to address these issues using similar tools and approaches. Their perspectives, however, are different. For reporting purposes, the aim is to produce valuations which reflect a range of risk factors as permitted by, and within the constraints of, accounting standards. Risk management on the other hand focuses on uncertainty around values, the likelihood of future values occurring, and on how the risk surrounding changes in value can be managed. Our initial assessment of these issues has highlighted the need for banks to understand and manage these differing perspectives.

With respect to reporting requirements, there is general consensus around the broad types of adjustments that banks need to make to account for valuation uncertainties. Beyond these adjustment categories (eg liquidity and model uncertainty), however, there is a much wider range of practice when determining appropriate valuation adjustments.

Valuation adjustments may be made to account for a range of factors as well as for the lack of market liquidity for the items valued. However, some potential adjustments to reported figures may not be permitted by accounting standards. Therefore, these valuations may not consistently reflect the full range of adjustments envisaged under the Basel II prudent valuation adjustments for calculating regulatory capital.

Leading practice banks attempted to address these challenges through a variety of approaches. They examined the sensitivity and uncertainty surrounding their valuations by:

- using a variety of inputs and assumptions;
- stressing model inputs;
- comparing outputs from different models/methodologies (including cash-flow analysis) and;
- using prices of other related items, quotes solicited from other market participants, information supplied by consensus pricing services, and relevant collateral valuations as points of reference.

Consensus pricing services are viewed as a useful benchmarking tool. In fact, there is evidence that these services, particularly those that are broad-based and cover “vanilla” products, operated as intended, showing in some cases a widening in the dispersion of reported quotes. By contrast, services covering niche areas or providing customised, model-based valuations experienced more difficulties in maintaining an adequate service during the turmoil. It should be noted that banks, in some instances, may have discarded previous valuation methodologies based on consensus pricing services and switched to internal methodologies, due to the increasing dispersion of contributed spreads and prices.[4]

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[4] The heterogeneity of the underlying exposures (even within a single category of CDO) – such as the particular vintage of each subprime ABS – together with the specific features of each structure are additional factors that

Recognising that banks may undertake some internal assessment of valuation uncertainty and take some steps to limit it, there is room for firms to improve their processes to comprehensively assess, internally report and effectively manage the degree of remaining uncertainty. This not only applies to modelling uncertainty, but also to the treatment of liquidity and counterparty credit risk associated with certain hedging strategies. Currently there is no systematic framework, guidance or industry consensus regarding how these assessments of valuation uncertainty should be translated into valuation adjustments or how they can be most effectively communicated across the institution or externally.

d. Financial reporting

There are a wide range of practices implemented by banks to determine reported fair values under accounting standards, particularly for complex and illiquid products. This range of practices may reflect a number of factors, including the rapid pace of product innovation, the development of proprietary models to value complex and opaque products, the relatively recent introduction of internationally accepted, principles-based accounting standards, and insufficient opportunities and/or legal restrictions to information sharing among market participants.

Specifically, the market turmoil revealed significant uncertainty in banks around how to value products for reporting purposes when markets become distressed or illiquid. Secondly, as liquidity dried up for certain products and banks shifted towards greater reliance on model-based valuations, uncertainty emerged around how to allocate instruments across the fair value hierarchy, with practices across banks clearly differing. For example, banks took differing views on the observability of given inputs and on the treatment of consensus prices.

Auditors have a critical role to play in improving consistency in the application of fair value accounting standards. Papers published during the market turmoil by the Center for Audit Quality[5] and Global Public Policy Committee[6] were welcome and useful in this regard. Nevertheless, greater clarity in how auditors interpret and how banks apply standards will help to improve consistency across banks.

The wide range of banking practices points to a need for more rigorous disclosure. This could include more detailed quantitative disclosures; greater qualitative disclosures around modelling assumptions and processes used to determine financial results; articulation by senior management of their risk tolerance with respect to valuation (including information related to the range of uncertainty within estimates); and discussion of how management would react given stress conditions. The recommendations for enhanced valuations and disclosures in the *Report of the Financial Stability Forum on Enhancing Market and Institutional Resilience* are an important step, and as noted in that report, more thought needs to be given about how best to convey the difficulty of valuing complex or illiquid products and the potential uncertainty around such estimates.

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hinder accuracy in the valuation of these complex instruments. These same factors hinder the development of liquid secondary market trading.

5 The Center for Audit Quality is a US-based, autonomous, non-partisan, non-profit group based in Washington, DC. It is represented by leaders from the public company auditing firms, the American Institute of Certified Public Accountants and the investor and issuer communities.

6 The GPPC is comprised of the six largest international accounting networks: BDO International; Deloitte; Ernst & Young; Grant Thornton International; KPMG; and PricewaterhouseCoopers.

IV. Further work

To strengthen practices and promote greater transparency over valuation processes, the Committee is working to develop guidance that supervisors can use to assess the rigour of banks' valuation processes and promote improvements in risk management and control practices. The Committee will also work with accounting and auditing standard setters and auditors to promote standards and practices that enhance the reliability, verifiability and transparency of fair value estimates. These initiatives will build off existing Basel Committee and industry guidance. They are also part of a broader effort by the Committee and national supervisors to strengthen firm-wide risk management practices.

a. Supervisory assessment tools

The Committee will develop guidance that supervisors can use to assess the rigour of banks' valuation processes. Such guidance will cover, among other things:

- valuation governance and controls;
- the quality of banks' measurement tools and the appropriate use of a diverse set of valuation measures;
- the capacity to produce valuations during periods of stress and the associated decline in the availability of inputs;
- the robustness of banks' assessments of valuation uncertainty (especially related to availability and observability of model inputs, model risks, liquidity and the use of consensus pricing); and
- the quality of internal and external transparency.

This guidance will apply to all fair valued positions, whether trading, available for sale, or using the fair value option (FVO). It will draw on the Committee's existing trading book and FVO guidance, and existing industry guidance (such as the Group of Thirty's 17 best practices for ensuring more reliable fair value estimates).[7]

b. International accounting and auditing standard setters

The Committee's ATF will work with accounting and auditing standard setters to promote enhanced guidance on fair value estimates for financial reporting purposes and their verification by auditors. In particular, the ATF should pursue enhancements in the following areas:

- further guidance to promote reliable fair value estimates;
- greater scope to use valuation adjustments to arrive at appropriate fair value estimates;
- identifying characteristics/criteria of observability of inputs, active and liquid markets, and day-one revenue recognition;

[7] See the Committee's July 2005 paper titled, *The Application of Basel II to Trading Activities and the Treatment of Double Default Effects,* the Committee's June 2006 publication, *Supervisory guidance on the use of the fair value option for financial instruments by banks*, and Chapter 2 of the 2003 report *Enhancing Public Confidence in Financial Reporting*

- improvements to consolidation and de-recognition accounting treatments and related disclosures;
- enhanced transparency around different valuation classifications, measurement approaches used and uncertainty around estimates; and
- enhancements, where necessary, to auditing practices for fair value estimates.