

# Collateral risk management at the Bank of England

By Sarah Breedon, Head of the Bank's Risk Management Division and Richard Whisker of the Risk Management Division.<sup>(1)</sup>

In response to the financial crisis the Bank of England has expanded the range of collateral accepted in its market operations to include private sector assets, notably asset-backed securities and covered bonds. Such assets have different risk characteristics to the forms of collateral previously accepted, presenting new risk management challenges. This article sets out how the Bank of England undertakes collateral risk management, highlighting in particular the significant degree of protection taken by the Bank in its operations.

## Introduction

In response to the financial crisis the Bank of England, along with other authorities, acted to underpin confidence in the banking system. As part of this response the Bank, in common with other central banks, expanded some of its existing operations and introduced new facilities to provide liquidity insurance to the banking system. In particular, the Bank broadened the range of collateral accepted in these facilities to include certain forms of high-quality private sector assets, notably residential mortgage-backed securities (RMBS) and covered bonds.

When the Bank lends funds in its operations, it does so against collateral in order to protect itself against counterparty credit risk: whenever funds are lent, the lender takes on the risk that the borrower may not repay. But it is not part of the Bank's objectives to take on credit risk via its operations, and the consequence of a significant loss could harm its credibility, threaten its independence and impair its ability to discharge its statutory responsibilities. Although the credit risk in lending can never be zero, by taking collateral of sufficient quantity and quality, the Bank is able to significantly reduce the risk of a material loss arising in the event of a counterparty default.

This article sets out how the Bank undertakes collateral risk management in order to demonstrate how it protects its balance sheet. The Bank does not publish the detailed risk information used as inputs in determining the valuations and haircuts applied to individual items of collateral taken, not least because of practical and legal constraints. Instead, this article sets out the high-level principles that drive how the Bank approaches risk management, outlining the policies and procedures through which it protects its balance sheet. The Bank forms its own independent view of the risks in the collateral taken. It supplements this analysis with various

sources of information, including the rating agencies, but the Bank does not rely on such ratings.

As background, the next section describes the Bank's liquidity insurance operations and the principles underlying its collateral policy. The article then describes how the Bank undertakes collateral risk management through the three basic tools of eligibility, valuations and haircuts, illustrating that risks would only crystallise in very extreme stress scenarios.

## Liquidity insurance and collateral policy

The Bank's provision of liquidity insurance contributes to the stability of the financial system. Commercial banks and building societies provide important services that benefit the economy, providing payment services and transforming short-maturity deposits into longer-maturity loans to households and businesses. But this exposes the banks to liquidity risks, for example if a sudden loss of confidence leads to depositors withdrawing their deposits at short notice. To help contain the costs to the wider economy of a crystallisation of these liquidity risks, the Bank provides liquidity insurance by being prepared to lend to banks against good-quality collateral.

The Bank's liquidity insurance operations have been at the heart of the Bank's response to the financial crisis.<sup>(2)</sup> **Table A** provides an overview of the key features of these operations. Of these, the Special Liquidity Scheme (SLS) and US dollar repo operations are temporary additional facilities, introduced

(1) The authors would like to thank Neil Shah and Rajib Alam for their help in producing this article.

(2) For a more detailed description of these operations, as well as the Bank's implementation of monetary policy throughout the crisis, see Cross *et al* (2010). It should be noted that operations designed to implement monetary policy also provide some liquidity insurance — for example through the provision of reserves accounts — even though that is not their primary objective.

**Table A** Summary of liquidity insurance operations in which extended collateral is accepted

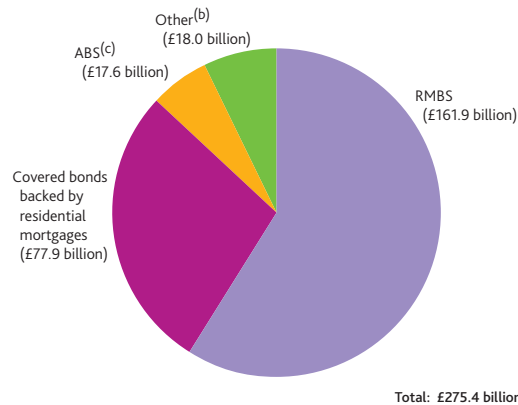
Operation/facility	Type of operation	Cost of borrowing	Collateral accepted	Date introduced	Date facility closes	Peak value of lending outstanding
Extended-collateral long-term repos	Auctions of sterling cash at term of three months. New auction design (including auctions at six-month maturity) to be implemented in 2010, with the operations to be termed 'indexed long-term repos' — for details see the box on pages 90–91 of this <i>Bulletin</i> .	Rate paid depends on bids received, with different rates paid on borrowing against 'narrow' and 'extended' collateral.	'Narrow' (sovereign and supranational) collateral plus 'extended' collateral, including AAA-rated RMBS, covered bonds and certain asset-backed securities (ABS); widened further in September 2008 to include securitisations of commercial mortgages and corporate bonds and loans.	December 2007.	Permanent.	£180 billion, 9 January 2009.
Special Liquidity Scheme	Facility to allow counterparties to swap illiquid assets for liquid UK Treasury bills for a term of up to three years.	Three-month Libor minus the three-month general collateral gilt repo rate, subject to a floor of 20 basis points.	Extended collateral, including AAA-rated RMBS, covered bonds, and credit card ABS; assets must have been held on the counterparty's balance sheet at end-2007.	April 2008.	Drawdown period closed end-January 2009; last swaps will terminate end-January 2012.	£185 billion, 30 January 2009.
US dollar repo operations	Lending of dollar cash at terms of 7, 28 and 84 days.	Variable-rate auctions of fixed size (up until October 2008); fixed-rate tenders of unlimited size thereafter.	Same as for ELTRs.	September 2008.	Closed end-January 2010; reintroduced on 10 May 2010.	\$86 billion, 17 October 2008.
Discount Window Facility	On-demand bilateral facility to lend gilts (or, exceptionally, cash) at a term usually of 30 days.	Rate charged depends on amount borrowed and type of collateral provided.	Narrow collateral plus broader range of extended collateral than accepted in ELTRs, including ABS rated higher than A3 provided they were rated AAA at issue. The Bank has proposed to extend further the range of collateral to include unsecuritised loans.	October 2008.	Permanent.	Zero usage up to 31 December 2009 (the Bank publishes DWF usage with a lag).

to address specific market dislocations.<sup>(1)</sup> Other new facilities — the extended-collateral long-term repos (ELTRs) and Discount Window Facility (DWF) — will be permanent, as described in detail in the October 2008 consultation paper (Bank of England (2008)). In addition to these public facilities, the Bank also provided bilateral emergency liquidity assistance (ELA) to some institutions, as described in more detail later in the article.

Prior to the financial crisis, the Bank accepted as collateral in its operations only certain highly rated sovereign and supranational debt — which we will refer to as 'narrow' collateral. One of the biggest changes to the Bank's provision of liquidity insurance was the broadening of the collateral accepted to include private sector assets — 'extended' collateral.<sup>(2)</sup> As shown by **Chart 1**, the majority of such collateral has been in the form of RMBS and covered bonds. In response to the financial crisis some other central banks, such as the Federal Reserve in the United States, also introduced new facilities in which a broader range of collateral was accepted. Others, such as the European Central Bank, entered the crisis already accepting a broad range of collateral in its routine operations, including private sector assets such as RMBS and covered bonds.<sup>(3)</sup>

At times of financial stress, central banks have traditionally been prepared to lend against a wider range of collateral. In launching its new permanent facilities the Bank took the decision that it would be prepared to accept extended

**Chart 1** Extended collateral taken by the Bank<sup>(a)</sup>



(a) Holdings by market value as at 30 January 2009 (which was when the SLS drawdown window closed, and was around the peak of collateral holdings across all operations).  
 (b) 'Other' includes various eligible asset types, such as commercial mortgage-backed securities (CMBS), bank debt guaranteed under HM Government's bank debt guarantee scheme, and debt issued by government-guaranteed agencies.  
 (c) ABS include securities backed by credit card receivables and other consumer debt.

collateral in its liquidity insurance operations in routine fashion. This was aimed at ensuring that the Bank's liquidity insurance framework is consistent through time, by giving the market clarity on the terms on which the Bank will lend, both in normal times and, importantly, in times of stress.

(1) For a discussion of the rationale for the temporary nature of SLS, see King (2010).  
 (2) Extended collateral also includes a broader range of public sector assets than accepted before the crisis, including for example debt issued by government-guaranteed agencies.  
 (3) For a comparison of the collateral frameworks of these central banks, see Cheun *et al* (2009).

The benefits of offering liquidity insurance must be balanced against the cost of reducing incentives for banks to manage liquidity risk prudently, and subject to the need to minimise the risk taken onto the Bank's balance sheet. The design of the Bank's permanent liquidity insurance facilities — crucially, the terms on which it will lend — aims to meet these two requirements as follows.<sup>(1)</sup>

To balance against the cost of creating incentives for banks to take excessive liquidity risk, the prices paid for borrowing are designed to be attractive only in stressed conditions. In this way, the Bank remains lender of *last* resort rather than lender of first resort. For example, in the DWF the rate charged is set at levels that, in normal market conditions, should make banks prefer to find alternative financing arrangements. The rate charged also increases as a bank's borrowing increases and/or is made against less liquid collateral, helping to incentivise banks to manage liquidity risk prudently.

To minimise the risk taken onto its balance sheet, the Bank aims to exclude from its public facilities any bank whose solvency or viability is seriously in question. To protect its balance sheet further, the Bank accepts as collateral only instruments it can risk-manage effectively. In particular, through its collateral valuations and haircuts, the Bank aims to leave the financial risks associated with the collateral with the counterparty, so that the Bank is only providing liquidity against the collateral, and not a subsidy for its underlying credit risk.<sup>(2)</sup>

These principles are in keeping with Bagehot's dictum from over a century ago that, to avert panic, central banks should lend early and freely to solvent firms, against good collateral and at high rates (see Bagehot (1873)).

## Collateral risk management at the Bank of England

The Bank has increased its capacity to manage the new types of risk associated with the broader range of collateral now accepted in its operations. In particular, it has undertaken extensive work to enhance its risk management processes governing the securities accepted as collateral. This has included an increase in the Bank's risk management staff numbers, including hires from the private sector with relevant expertise. The Bank has also drawn on external advice when necessary, for example in advising on the design of an enhanced collateral risk monitoring system.

The Bank has available to it three basic tools with which it can manage the risks associated with the collateral it takes in its operations: (i) eligibility — what collateral the Bank will lend against; (ii) valuations — how much the collateral is worth; and (iii) haircuts — how much the Bank will lend relative to the value of the collateral. The Bank risk manages collateral using

the same principles across all its operations, and aims to treat its counterparties fairly and consistently. The remainder of this section addresses each of the Bank's three risk management tools in turn.

### Eligibility

Eligibility is the highest level risk management tool. Securities whose risk cannot be easily assessed, or managed through valuations and haircuts, are simply made ineligible so they are not allowed to be used as collateral with the Bank.

The Bank publishes high-level collateral eligibility criteria for its operations, which set a baseline for the quality of collateral accepted.<sup>(3)</sup> By restricting eligibility to certain asset types, the Bank accepts only securities whose structures it can understand at reasonable cost, and whose intrinsic risks it can quantify and easily manage. For example, the Bank only accepts commercial mortgage-backed securities (CMBS) that are backed by a sufficiently diversified pool of commercial properties.

The first step in the eligibility checking process is therefore to determine whether a security meets the high-level eligibility criteria. Ratings assigned by the rating agencies play a role in establishing minimum standards of credit quality for the securities accepted, but they are indicative only, giving a public statement about where the Bank's criteria are set. The Bank undertakes its own independent analysis of securities submitted for eligibility checking and may deem a security ineligible even if it has the publicly stated ratings. For example, the Bank may not wish to accept securities with certain structural features, such as where third parties may be able to exercise control of the transaction to the detriment of the Bank's interests. Conversely, in the event of a downgrade of a security below a minimum-rating criterion, the Bank may allow it to remain eligible as collateral if the Bank believes it remains of sufficient quality.

Some of the securities taken as collateral by the Bank during the crisis already existed and were traded in the market. These securities have been 'market tested' and the Bank is just one of many noteholders. Provided the Bank's review of such a security concludes that it meets the eligibility criteria and has a well-understood structure with no unusual features and no concerns over its performance, it is deemed eligible. Ongoing compliance with the eligibility criteria, including current ratings, is checked on a daily basis.

But a large proportion of the securities taken have been created specifically for use as collateral with the Bank by the

(1) For further details of the principles underlying the Bank's collateral policy, see Bank of England (2008) and Tucker (2009).

(2) An additional layer of protection for the Bank's balance sheet is provided in some operations, for example the SLS, by an explicit indemnity from the Treasury.

(3) For details of current eligibility criteria for the Bank's operations, see [www.bankofengland.co.uk/markets/money/eligiblecollateral.htm](http://www.bankofengland.co.uk/markets/money/eligiblecollateral.htm).

originator of the underlying assets, and have therefore not been traded in the market. Such 'own-name' securities accounted for around 76% of the Bank's extended collateral (around the peak of usage in January 2009), and form the overwhelming majority of collateral taken in the SLS. These securities undergo a detailed evaluation, including a committee review process, to determine eligibility. This involves a thorough legal review of the transaction documentation to ensure that the structure is legally robust and at least as sound as that of similar securities that have been issued into the market. Counterparties may be asked to bear the legal costs of such reviews. A detailed assessment of the credit quality of the underlying assets is also carried out, including through the use of stress testing. The Bank only confirms eligibility of a security once it has been issued, but engages with the issuer before issuance to identify any unusual features it is not comfortable with and which may — if not addressed — result in the security being ineligible.

The performance of all eligible securities is monitored on an ongoing basis through investor reports and other sources, including the rating agencies and other data providers. Securities whose performance deteriorates are investigated further to determine if any mitigating action is required. This could include making a security ineligible, in which case any counterparty that has submitted it as collateral has to replace it with alternative eligible collateral. As well as monitoring individual securities, the Bank monitors developments in the broader market, including through market contacts, broker research and other news sources.

The information generally disclosed on asset-backed securities varies considerably, both within and across asset classes, making it difficult to assess ongoing performance. To improve the efficiency of its risk management of these assets, as well as to bring greater transparency to the market, the Bank has proposed to make it an eligibility requirement that issuers disclose more information about them (see Bank of England (2010a)). This would include granular information on the underlying assets, as well as greater transparency around the structure of the securities.

## Valuations

The Bank's valuation of collateral plays a key role in protecting the Bank against loss in the event of a counterparty default. The value assigned to a security, together with the haircut applied, determines how much the Bank will lend against it. If the counterparty then fails to repay when due, the Bank would plan to sell the collateral in due course (subject to market conditions) to make good the loss. It is therefore important that the Bank's valuation of a security reflects as accurately as possible its current market price.

The Bank revalues its collateral on a daily basis to ensure it remains protected in this way. If the aggregate

haircut-adjusted value of a counterparty's collateral falls below the value of liquidity provided, a margin call is made whereby the counterparty is required to either provide more collateral or, if appropriate, return some of the lent funds.

Where available, the Bank uses market prices to value a security, since that is the price at which a market participant has bought, or has indicated that it is willing to buy, the security. The market price must be from a publicly available source that is reliable and independent of the counterparty delivering the security. The Bank uses a range of pricing data sources, which it keeps under continuous review. The Bank may use its discretion to override such prices if it believes they may no longer be accurate. For example, following the announcement that Northern Rock's RMBS programme, Granite, had hit a non-asset trigger,<sup>(1)</sup> the Bank adjusted its prices immediately — based on its analysis and supplemented by discussions with market participants — rather than waiting for observed quoted prices to change.

Where no market price is available or those that are available are judged to be unreliable, for example because they are dated, the Bank calculates a model price to value a security. Given the large proportion of collateral comprised of own-name securities created specifically for use in the Bank's facilities, around 84% of the Bank's extended collateral was model-priced (around the peak of usage in January 2009). To ensure valuation consistency between market and model-priced securities the Bank's internal valuation process is designed to assign a model price that replicates as closely as possible what a market price would be, had there been one.

To model-price a security the Bank uses a standard bond pricing model to discount expected future cash flows using implied market rates.

Securitisations often have uncertain cash flows which must therefore be estimated. For example, 'pass-through' securities are paid down as principal from the underlying loans is received, the timing of which cannot be predicted with certainty (for example, mortgages may be paid off early when borrowers remortgage). The Bank estimates these cash flows on the basis of historical information and performance data (such as loan prepayment rates) provided by the issuer, together with data on similar securities in the market. For securities with call options, the Bank forms its own judgement on whether to give credit to the call in its valuations.<sup>(2)</sup> For own-name securities where the counterparty submitting the collateral is also the originator of the collateral, the Bank will

(1) The non-asset trigger effectively results in a wind-down of the programme, with notes issued from it paid down on an amortising basis (ie as the underlying mortgages pay down). This affects the expected maturity of the notes, and hence their prices.

(2) To give investors greater certainty about the maturity of securities, a common feature of securitisations is a 'call option' whereby the issuer may redeem the bonds on a specified date. This 'call date' is often taken as the expected maturity of the securities, even though the maturity could be longer if the issuer does not exercise the call.

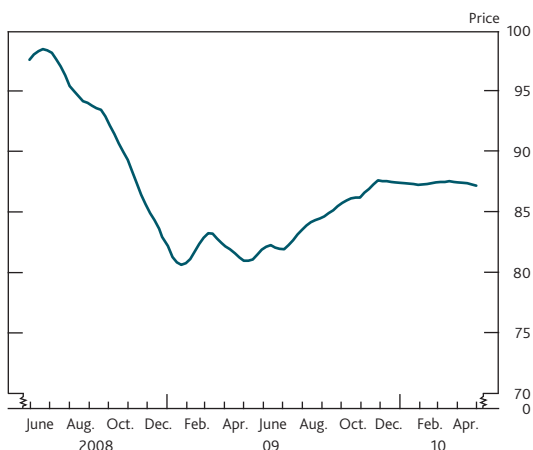
not usually give credit to the call in its model price. This is because the Bank would only have an outright holding of the collateral in the event that the counterparty had defaulted, in which case the counterparty would be unable to exercise the call.

To discount the cash flows, the Bank uses market spreads observed on comparator securities — where possible from the same issuer — that most closely align with the underlying liquidity, maturity and credit risk characteristics of the security being model-priced. If there is a risk characteristic in the model-priced security that is not present in the comparator securities, the spread may be adjusted further to reflect this.

The Bank supplements its valuation process with a number of cross-checks to ensure accuracy and consistency. First, it compares the valuations of securities with similar characteristics. This allows the identification of any securities whose price appears out of line with peers, which can then be investigated further and acted upon if required. These peer group comparisons are performed weekly by a valuations review committee. Second, it supplements its analysis with market research and intelligence gathered from market participants, and has also sought external advice on the valuations assigned to securities.

The Bank does not publish its valuations of securities, because that might risk the Bank being used as a pricing reference source, which could distort the market and hinder the price discovery process. But an indication of the level of prices assigned by the Bank to its collateral during the crisis is shown in **Chart 2**. The chart shows the weighted average price assigned by the Bank to UK RMBS collateral. Prices fell during the second half of 2008 as financial systemic stress intensified. Since mid-2009 prices have risen as the market has recovered.

**Chart 2** Weighted average price of UK RMBS collateral<sup>(a)(b)</sup>



(a) Average prices of UK RMBS held as collateral, weighted by the size of holding.  
 (b) Data points are monthly moving averages. Data are shown up to 30 April 2010.

## Haircuts

The Bank does not lend an amount equal to the full value of the collateral it takes. To take additional protection and reduce the likelihood that the Bank would incur a loss in the event of a counterparty default, the Bank applies haircuts.

Haircuts can be thought of as loan to value (LTV) ratios, analogous to those applied to mortgage lending to protect the lender against falls in house prices. For example, consider a security with a nominal (par) value of 100 — this is what the noteholders should be paid when the bond is redeemed — and a current price of 90. Assume that the haircut applied to that security is 22% (the weighted average haircut applied to the Bank's SLS collateral), which is equivalent to an LTV ratio of 78%. The Bank would then lend up to  $90 \times (1 - 0.22) = 70.2$  against that security. But unlike mortgages, where the maximum LTV ratio of the mortgage is set at origination but is subsequently beyond the control of the lender (for example, the LTV ratio will rise if house prices fall), the Bank's daily valuation and remarking process ensures that it continuously maintains this buffer.

The Bank's haircuts are designed to protect against both market risk and fundamental credit risk. This protection is particularly important for less liquid securities that the Bank might have to hold for a period of time before being able to sell them, as there is then more time for such risks to crystallise.

Market risk would crystallise if a counterparty defaulted and the value of collateral then fell as a result of market movements before it could be sold. The haircut is designed to absorb this potential reduction in value, so that the sale of the collateral at the lower price would still be sufficient for the Bank to recover the amount it is owed.

Fundamental credit risk is the risk that the value of a security may fall because of a deterioration in the credit quality of the underlying assets. For an RMBS security for example, there is the risk that a large number of the borrowers default on the underlying mortgages, which could result in the security incurring a credit loss and noteholders not getting paid back in full. Haircuts are therefore also designed to absorb the potential impact of such underlying credit losses.<sup>(1)</sup>

The total haircut applied to a security is comprised of two elements: (i) a standard 'base' haircut for that asset type, and (ii) haircut add-ons to protect against additional risks, including those that may be idiosyncratic to that security. The Bank may vary haircuts at its discretion, including those applied to collateral it has already taken.

(1) The valuations of securities reflect fundamental credit risk to some extent, but based more on the *expected* performance of the underlying assets, whereas haircuts are designed to protect against fundamental credit risk in *stressed* scenarios.



## Base haircuts

The Bank publishes base haircuts that it applies to different asset types, reflecting their different risk characteristics.<sup>(1)</sup> For narrow collateral, haircuts start at 0.5 percentage points for floating-rate or short-maturity fixed-rate securities. For extended collateral the base haircuts range from 12 percentage points for floating-rate RMBS or covered bonds to 25 percentage points for floating-rate CMBS. For fixed-rate securities the haircuts also increase with maturity to mitigate interest rate risk, which is the risk that market interest rates rise, resulting in price falls for securities that pay a fixed rate of interest.

For narrow sovereign and supranational collateral, the Bank sets its haircuts on the basis of historic price volatility in stressed periods, so that price falls should rarely exceed the size of the haircut. It does this by estimating potential price falls using a Value-at-Risk (VaR) approach, assuming a five-day holding period with a 99% confidence interval. This means that — based on historic price volatility in stressed periods — the fall in value of a security would only be expected to exceed the haircut once in a hundred five-day periods. The Bank uses a five-day holding period as it expects it would be able to sell such collateral within this time frame given its liquidity. The Bank uses at least ten years of price-volatility data and determines the 99% confidence interval based on the most volatile two-year period within that, in order to minimise both the risk of its haircuts proving inadequate, and the likelihood of needing to increase haircuts at a time of market stress.

For extended collateral such as RMBS, the Bank uses stressed-scenario analyses, rather than a stressed VaR approach, to set its haircuts. This is because in the wake of a counterparty bank defaulting, the value of such private sector securities — particularly those associated with banks — is likely to fall by more than historic price volatility might suggest. To estimate market risk in extended collateral the Bank considers the following indicators (illustrated for the case of RMBS):

- observed historical price falls following particular events — to capture the impact of actual events on RMBS prices;
- the difference in price between various eligible RMBS — to measure the range of prices and so estimate how far prices could conceivably fall; and
- changes in the bid-offer spreads on eligible RMBS securities — to measure the illiquidity in the RMBS market.

As noted above, haircuts are also set to protect against price falls resulting from a deterioration of the fundamental credit quality of the collateral. One way the Bank does this is to look at the difference in price between AAA and lower-rated securities of the same issuers, in order to estimate the impact of a material change in the credit risk of a security. A second way the Bank assesses the adequacy of the protection haircuts

provide against fundamental credit risk is through the use of stress tests, as discussed further below.

## Haircut add-ons

The Bank applies additional haircuts to address risks that are not accounted for by the base haircut. These include standard haircut add-ons for:

- non-sterling securities — 6 percentage point add-on to address the exchange rate risk inherent in taking collateral denominated in a different currency to that of the loan;<sup>(2)</sup>
- model-priced securities — 5 percentage point add-on to account for both the risk that the model price may be an overestimate of the true price and the lower liquidity that is implied by the lack of a market price; and
- own-name securities — 5 percentage point add-on to address the correlation risk inherent in accepting securities where the counterparty submitting them as collateral is also the originator of the underlying assets.<sup>(3)</sup>

In addition to these standard haircut add-ons, the Bank may apply further idiosyncratic add-ons to cover additional risks. One example of this would be to account for any additional correlation risks if the counterparty plays other roles in connection with the security, not just that of the originator. For example, the counterparty may provide bank accounts or swaps to the special purpose vehicle issuer of the securities. In the event that the counterparty defaults suddenly, the noteholders could therefore have an exposure to the counterparty, which could result in a loss. The Bank may apply an additional haircut to reflect this risk.

The Bank may also apply idiosyncratic haircut add-ons to mitigate any concerns regarding the credit quality of the assets underlying a security, based on the outcome of stress testing.

## Stress testing

Stress testing plays a key role in assessing the adequacy of the protection taken by the Bank and in determining haircuts. Stress tests are applied to individual securities to determine potential idiosyncratic haircut add-ons that may be required. They are also used to size the base haircuts, which are designed to provide sufficient protection against fundamental credit risk for the majority of securities, with only a few higher-risk securities requiring additional idiosyncratic add-ons. Stress tests are applied on an ongoing basis, for example for securities which are flagged through the Bank's monitoring process as having potential performance issues.

(1) For details of current haircuts applied in the Bank's operations, see [www.bankofengland.co.uk/markets/money/notices.htm](http://www.bankofengland.co.uk/markets/money/notices.htm).

(2) In the US dollar repo operations, this haircut add-on is applied for non-dollar denominated collateral. The add-on for yen-denominated collateral is 8 percentage points (in all operations).

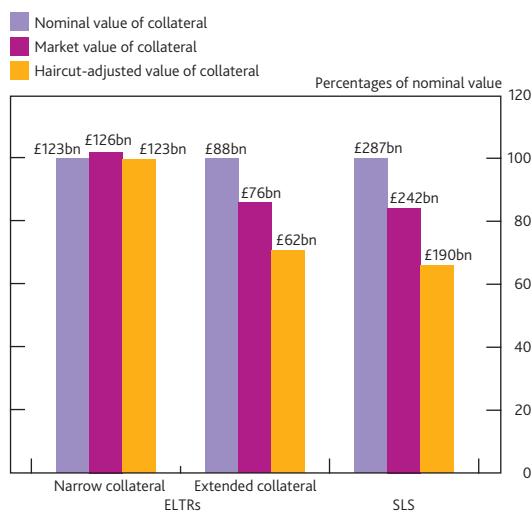
(3) In future, own-name securities will not be eligible for use as collateral in the Bank's long-term repo operations, but will remain eligible for use in the DWF.

The Bank has developed stress tests for different asset classes. These follow the general approach of considering the impact of stressed assumptions for default rates and losses given default on the assets underlying a security. For example, one stress test for RMBS would be to assume stressed house price falls together with additional costs associated with foreclosure. Together with the LTV profile of the pool of mortgages, these assumptions give an estimate of the stressed loss on the pool for a given level of defaults. For different securities, the Bank might seek protection against different levels of defaults, depending on the characteristics of the underlying mortgages and borrowers.

### Protection taken by the Bank

The article so far has discussed the principles that underpin the Bank's collateral risk management procedures. **Chart 3** brings all of these together to show the actual protection taken by the Bank through the aggregate valuations and haircuts applied to collateral in the ELTRs and SLS. By taking a greater degree of protection against riskier, less liquid collateral, the Bank seeks to take no more risk overall in accepting one form of collateral over another.

**Chart 3** Protection taken in the ELTRs and SLS at their peak usage<sup>(a)(b)(c)(d)</sup>



- (a) Data are for the respective peaks of usage: 9 January 2009 for the ELTRs, 30 January 2009 for the SLS. Actual amounts are shown above the bar.  
 (b) Note that the figures for the total haircut-adjusted value of collateral (£185 billion for the ELTRs, £190 billion for the SLS) are slightly higher than the figures for the amount lent in **Table A**. This reflects the fact that counterparties tend to submit slightly more collateral than the minimum required.  
 (c) The majority of the narrow collateral (84%) was sterling-denominated UK government debt.  
 (d) Haircuts for narrow collateral have subsequently been increased (see [www.bankofengland.co.uk/markets/marketnotice090925.pdf](http://www.bankofengland.co.uk/markets/marketnotice090925.pdf)). Haircuts currently applied to narrow collateral range from 0.5% for floating-rate or short-maturity fixed-rate sterling securities to 13.5% for fixed-rate non-sterling securities with greater than 30 years to maturity.

The largest aggregate haircuts are applied to the collateral taken in the SLS: the weighted average haircut is 22%, reflecting the fact that the majority of the collateral is in the form of floating-rate RMBS and covered bonds (12 percentage point base haircut) which are own-name (5 percentage point haircut add-on) and model-priced (5 percentage point add-on). For a practical example of how the various layers of

protection combine to protect the Bank against loss at an individual security level, see the box on page 101.

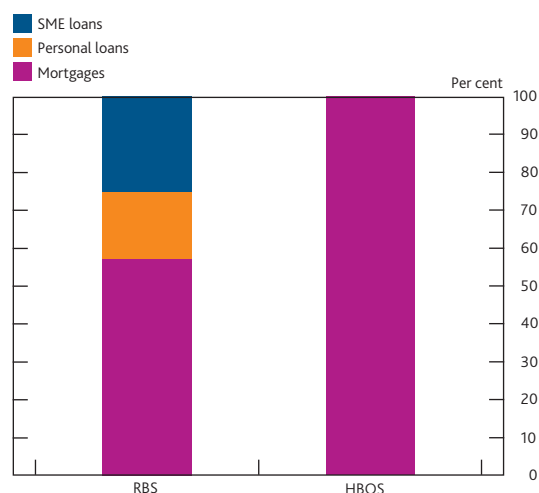
### Emergency liquidity assistance and the risk management of loans as collateral

In addition to providing liquidity insurance through the public facilities described in **Table A**, in exceptional circumstances the Bank can act directly as lender of last resort to commercial banks through bilateral arrangements, in order to prevent a loss of confidence spreading through the financial system. The Bank extended such emergency liquidity assistance (ELA) to two institutions, Royal Bank of Scotland (RBS) and Halifax Bank of Scotland (HBOS), in the autumn of 2008.

ELA was provided to HBOS between 1 October 2008 and 16 January 2009, with use of the facility peaking at £25.4 billion on 13 November 2008. ELA was provided to RBS between 7 October 2008 and 16 December 2008, with usage peaking at £36.6 billion on 17 October 2008. The banks were charged fees for the use of the facilities.<sup>(1)</sup>

The collateral taken by the Bank in respect of this facility included various forms of raw (ie non-securitised) loans, including pools of mortgages, personal loans and loans to small and medium-sized enterprises (SMEs), as shown in **Chart 4**.

**Chart 4** Loan collateral taken in the ELAs to RBS and HBOS<sup>(a)</sup>



- (a) Data are for the respective peaks of usage: 17 October 2008 for RBS, 13 November 2008 for HBOS.

The Bank risk-managed the collateral using the same principles of eligibility, valuations and haircuts applied to the collateral accepted in its public facilities so as to ensure it took an equivalent level of protection. To this end, the Bank accepted as collateral only equivalent types of loan to those accepted in

(1) For further details of the ELAs, including the fees charged, see Bank of England (2010b).

## A practical example of how the Bank is protected against loss

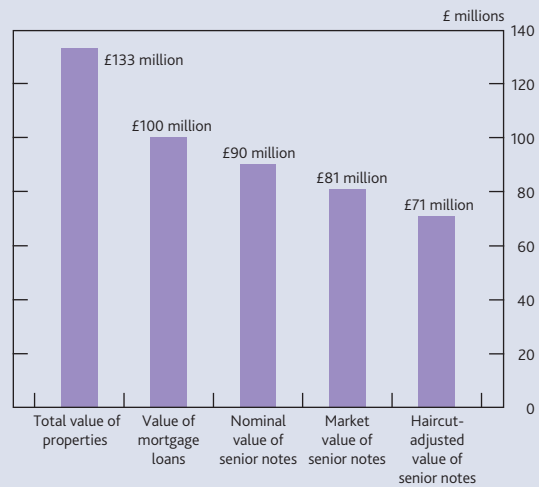
This box uses a hypothetical mortgage-backed security to demonstrate how the various layers of protection combine to protect the Bank against loss. Consider an RMBS transaction backed by a pool of 1,000 mortgages, each of £100,000. In this example, the £100 million pool of mortgages might support the issuance of, say, £90 million of 'senior' notes and £10 million of 'subordinated' notes. This means that the senior notes benefit from credit enhancement of 10% (a typical figure for actual RMBS), so that the first 10% of losses on the mortgages are not absorbed by the senior noteholders, but are absorbed by the subordinated noteholders. It is only the senior notes that would potentially be eligible for use as collateral with the Bank, provided they met the Bank's eligibility criteria, including having been rated AAA at issue.

In addition to this credit enhancement, further protection is provided by the fact that the mortgages are themselves secured loans, backed by properties worth more, in general, than the value of loans. So to suffer 10% of actual losses on the mortgage pool would require more than 10% of the borrowers to default on their mortgages.

**Chart A** illustrates the various layers of protection for this example, assuming that the weighted average LTV ratio for the mortgages is 75% (a typical figure for an RMBS mortgage pool), the price assigned to the security is 90, and the haircut applied is 12%.<sup>(1)</sup> The final three bars are equivalent to the bars shown for the ELTRs and the SLS in **Chart 3** and reflect the protection taken by the Bank through its valuation and haircut. The differences between the first three bars reflect the protection built in to the security itself.

In this case, the Bank would be prepared to lend up to £71 million against the collateral with a nominal value of £90 million and ultimately backed by properties worth £133 million. This means the Bank would be protected against a significant deterioration in the fundamental credit quality of the collateral, so that it would only be at risk of suffering a credit loss under very extreme stress scenarios. For example, consider a simplified stress test with the severely stressed assumptions of a 50% house price fall, and foreclosure costs (including repossession costs and foregone interest) of 40% of the outstanding loan amount. Assume also that every mortgage has an LTV ratio of 75% (in reality, the pool would have a distribution of LTV ratios). Under these assumptions the senior notes would only incur a loss if more than 14% of the underlying borrowers defaulted (**Table 1**). Further, with the additional protection taken by the Bank through its valuation and haircut, the Bank would only suffer a loss if more than 39% of the borrowers defaulted.

**Chart A** Lending against RMBS — an example



**Table 1** Stressed loss analysis<sup>(a)</sup>

Property value:	£133,333
Size of mortgage loan:	£100,000
Value of property after 50% price fall:	£66,667
Recovery from repossession and sale of property, net of 40% foreclosure costs:	£66,667 – £40,000 = £26,667
Loss given default:	(£100,000 – £26,667) / £100,000 = 73%
Senior note protection	Protection against loss: 10%
	Proportion of borrowers that can default given the protection against loss: 10%/0.73 = 14%
Bank's protection	Protection against loss: 29%
	Proportion of borrowers that can default given the protection against loss: 29%/0.73 = 39%

(a) Some calculations affected by rounding.

The Bank's haircuts are also intended to protect against market risk, not just fundamental credit risk. Indeed, following a counterparty default the Bank would plan to sell the collateral in due course (subject to market conditions) rather than hold it to maturity, not least because it is not the Bank's role to provide long-term funding to the economy by holding private sector collateral on its balance sheet. The degree of protection against fundamental credit risk highlighted above implies that the collateral would make an attractive investment to investors. This should help to ensure that the Bank would indeed be able to sell the collateral — at a price at which it would not suffer a loss even if there had been some deterioration in the performance of the underlying assets — so that the Bank would only need to hold the collateral until any period of severe market illiquidity had passed.

(1) 12% is the base haircut applied to RMBS. With haircut add-ons, the total haircut applied to an RMBS security could be much higher. For example, if the security was own-name, model-priced and non-sterling, the haircut would be 28%. But those additional haircut components are designed to protect against specific incremental risks that are not considered in this simple example, which instead just illustrates the protection against fundamental credit risk provided by the base haircut.



securitised format in its public facilities such as the ELTRs. The Bank applied a haircut to each pool of loans comprised of the following three elements, which can be viewed as the equivalent of the steps between the final four bars in **Chart A** in the box on page 101:

- 'AAA haircut' — to replicate the credit enhancement inherent in a typical AAA securitisation of that loan type, to bring the credit protection up to broadly the AAA level;
- 'valuation haircut' — based on the valuations of securitisations backed by similar loans, to replicate the effect of a market price (given that the loans were not tradable instruments they did not have market prices); and
- 'conventional haircuts' — applied based on the haircuts applied to equivalent securitisations in the ELTRs. For example, pools of mortgages attracted the same 12 percentage point base haircut applied to RMBS. Additional haircuts were applied for own-name risk and model-price risk, with further add-ons applied to account for any idiosyncratic risks in the loan pools, such as limited availability of data on the loans. The Bank also used stress tests to ensure the adequacy of the protection provided by the haircuts.

This resulted in total effective haircuts (relative to the nominal value of the loans) across their loan collateral portfolios of 49% for RBS and 48% for HBOS. The total haircut provided a significant degree of protection in both cases, broadly comparable to the total protection taken in the Bank's other operations. In the SLS for example (**Chart 3**), the amount that the Bank would lend (£190 billion) was around 34% less than the nominal value of the collateral (£287 billion). Assuming additional credit enhancement built in to the collateral (ie a 'AAA haircut') of, say, 10%, the nominal value of the loans underlying the collateral securities would have been around £319 billion, so that the equivalent total 'effective haircut' relative to this amount, under that assumption, would have been around 40%.

## Future developments

For liquidity insurance to be effective it is important that the range of collateral accepted is wide enough that the commercial banks have sufficient collateral to borrow against in stressed circumstances. To this end, the Bank has proposed

to extend the range of collateral accepted in the DWF to include loans in addition to securities, so that a significant proportion of banks' assets would in principle be eligible as collateral with the Bank (see Bank of England (2010a)). Even with large haircuts to protect itself against risk, this should help ensure that the Bank can provide the liquidity necessary to support financial stability, including in stressed circumstances.

As described above in the context of the ELA, loans accepted as collateral in the DWF would be risk-managed using the same principles as for securities: the aim would be for the Bank's risk tolerance to be broadly the same for loans as for a securitisation of those same loans, so as not to provide incentives to submit one form of collateral over the other. Indicative haircuts that would be applied to loans accepted as collateral range from 25%–60% depending on the type of loan (see Bank of England (2010a)).

## Conclusion

At times of financial stress, the Bank's provision of liquidity insurance plays a crucial role in containing the impact of stress on the broader economy. But — in keeping with Bagehot — central banks should only provide that liquidity insurance against good collateral and at a penalty rate. That is also consistent with the need to minimise the risk taken onto the Bank's balance sheet.

The Bank's conservative approach to risk management means that it takes a significant degree of protection in its operations. In particular, given its approach to collateral valuations and haircuts, the Bank should be at risk of suffering a loss only under very extreme stress scenarios. Together with the rates paid for borrowing in its facilities (designed to ensure that the Bank remains lender of last resort) they ensure that the Bank does not provide liquidity on generous terms. In particular, given the higher haircuts and rates paid for borrowing against less liquid collateral, the Bank seeks not to provide liquidity against extended collateral on more generous terms than against narrow collateral.

Collateral risk management plays a central role in ensuring the effectiveness of the Bank's liquidity insurance operations. The Bank keeps its collateral policy under continuous review to ensure risks continue to be managed and mitigated, and the Bank's balance sheet protected.

---

## References

**Bagehot, W (1873)**, *Lombard Street: a description of the money market*, Wiley Investment Classics (1999 reprint), pages 196–207.

**Bank of England (2008)**, *The Development of the Bank of England's Market Operations*, available at [www.bankofengland.co.uk/markets/money/publications/condococt08.pdf](http://www.bankofengland.co.uk/markets/money/publications/condococt08.pdf).

**Bank of England (2010a)**, *Extending eligible collateral in the Discount Window Facility and information transparency for asset-backed securitisations*, available at [www.bankofengland.co.uk/markets/money/publications/condocmar10.pdf](http://www.bankofengland.co.uk/markets/money/publications/condocmar10.pdf).

**Bank of England (2010b)**, *Annual Report 2010*, pages 17–18, available at [www.bankofengland.co.uk/publications/annualreport/index.htm](http://www.bankofengland.co.uk/publications/annualreport/index.htm).

**Cheun, S, von Köppen-Mertes, I and Weller, B (2009)**, 'The collateral frameworks of the Eurosystem, the Federal Reserve System and the Bank of England and the financial market turmoil', *Occasional Paper No. 107*, European Central Bank.

**Cross, M, Fisher, P and Weeken, O (2010)**, 'The Bank's balance sheet during the crisis', *Bank of England Quarterly Bulletin*, Vol. 50, No. 1, pages 34–42.

**King, M (2010)**, *Treasury Committee evidence: Bank of England February 2010 Inflation Report*, question no. 22, available at [www.publications.parliament.uk/pa/cm200910/cmselect/cmtreasy/368/368i.pdf](http://www.publications.parliament.uk/pa/cm200910/cmselect/cmtreasy/368/368i.pdf).

**Tucker, P (2009)**, 'The repertoire of official sector interventions in the financial system: last resort lending, market-making, and capital', available at [www.bankofengland.co.uk/publications/speeches/2009/speech390.pdf](http://www.bankofengland.co.uk/publications/speeches/2009/speech390.pdf).