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Collateral Management

*A Guide to Mitigating
Counterparty Risk*

MICHAEL SIMMONS

WILEY

Collateral Management

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For Allyson, Keir and Freya

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Foreword

The collateral management processes rapidly developed during the past decade; after the financial crisis of 2008 there was a significantly greater need to reduce counterparty credit risk in a more efficient way. Not only the market participants but also the regulators expressed this requirement. The G20 summit held in Pittsburgh in 2009 focused on the financial markets and world economy, following which a range of major new regulations were drafted. These were implemented in several phases and are better known as Dodd-Frank and EMIR regulations.

The main reason for a firm to implement a collateral management process is to reduce counterparty credit risk via the exchange of collateral; this is generally achieved via cash or securities. This hasn't changed in essence since the financial crisis; however, the frequency, processes and products covered have changed. The regulations have had a huge impact on the used applications and processes, from additional trade reporting, trade reconciliations, daily margining, lower minimum transfer amounts, same day settlement, through to the exchange of initial margin with central counterparties.

As an industry expert I've experienced these developments directly, this is also the reason why I would like to share my personal view in this Foreword. Where ten years ago the process was executed by almost every market participant in Excel and Access on a weekly to monthly basis, the financial crisis was definitely the catalyst for change. Software vendors started to build systems supporting the gathering and storing of the most crucial information. This developed further to workflow systems with a high STP rate, often connected to trading systems. Connections were established via APIs, S.W.I.F.T. or SFTP with internally used systems, and with banks, custodians and other service software providers. Alongside such developments new systems assisting the workflow became part of the collateral architectural landscape; some generally accepted systems are triResolve and MarginSphere. (These additional applications will become of considerable benefit to the global collateral environment once adopted by a significant portion of market participants.)

Some years ago the collateral process was mainly focused on bilateral OTC Derivatives, with some additional Repo collateralisation. Now we see many different products subject to collateral, all supported by their own legal documents. Examples of the most frequently traded products in addition to those above are Centrally Cleared Derivatives, Mortgage-Backed Securities and Securities Lending. Additionally, the number of parties now required to exchange collateral has drastically increased due to greater regulation.

As author of this book, Michael Simmons has combined his industry knowledge, training experience and work experience with his enthusiastic interest in collateral management. This book will become essential reading for everyone working within collateral management (whether focused on repo, or securities lending, or derivatives – or all three topics), as it touches the necessary level of detail to gain a broad understanding of the products requiring collateral, as well as the collateral management process itself.

Guido Verkoeijen
Team Manager Cash & Collateral Management
APG Asset Management, The Netherlands

Acknowledgements

Once it became clear that the profile and importance of collateral management had risen significantly following the 2008 Global Financial Crisis, I sensed there was a growing need for a significantly greater understanding of collateral management amongst operations (and other) personnel working within the financial services industry.

In order to understand the subject to enable me to write such a book, I needed access to those that had insight on the subject.

In particular, I would like to thank Guido Verkoeijen for his explanations of both concepts and detailed points, and for his care and patience in reviewing a significant portion of the text.

I would also like to thank Hasse R. Brandt for his expertise and perspective on a range of topics, as well as time spent reviewing my draft chapters.

Other people that have contributed significantly are:

- Arthur Thelen
- Neil Schofield
- Quentin Gabriel
- Simon Lee

for which I thank them greatly.

Michael Simmons

About the Author

Michael (Mike) Simmons is an operations specialist, having spent his entire career focused on hands-on tasks, management and education relating to the various post-trade execution processes. Having spent over 20 years within a blue chip investment bank (S.G. Warburg and Warburg Securities) where he was the manager of Fixed Income (Bond) Operations, Mike then began writing and delivering training courses on behalf of a number of organisations, including the International Capital Market Association (ICMA). He is the author of two previous books, namely *Securities Operations* and *Corporate Actions* (both published by Wiley).

Mike's interest in Collateral Management arose as a result of the Global Financial Crisis in 2008, where it became very apparent that the profile of the topic had increased dramatically, compared with pre-crisis. In addition to existing collateral-related transaction types such as repo and securities lending, the introduction of mandatory central clearing for OTC derivatives in all jurisdictions globally meant there was suddenly a hugely increased focus on collateral which impacts both buy-side and sell-side firms, and other organisation types such as central securities depositories, custodians, management consultants and software providers. Under such circumstances, Mike felt there was a real need for education of operations and other personnel in the topic of collateral management.

Today, as a freelance trainer and consultant based in the UK, Mike delivers training courses on a range of operational topics both in the UK and overseas. Courses include collateral management, the securities (equity and bond) trade lifecycle, corporate actions, repo, securities lending & borrowing, and OTC derivatives incorporating both centrally cleared and non-centrally cleared trades. He also wrote and frequently delivers the 5-day Operations Certificate Programme (a 5-day multi-subject examined qualification) for ICMA Executive Education.

Observations on the style and content of this book can be conveyed to the author by email to info@mike-simmons.com.

Introduction

Note: within the main text throughout this book, terms and phrases in *bold/italics* are explained within the Glossary of Terms.

Within the financial services industry, on a daily basis cash and securities are lent to borrowers on a temporary basis. In order to *mitigate* (reduce) the lender's risk of the borrower failing to return the lent cash or securities, other assets of value are given by the borrower to the lender. Such other assets are generically known as '*collateral*'.

Additionally, collateral plays a major role in mitigating counterparty risk associated with *OTC derivative* transactions, in products such as *interest rate swaps* and *credit default swaps*.

Transactions including cash lending, securities lending and OTC derivatives are executed by *buy-side* firms (including pension funds, insurance companies, asset managers and other corporate entities) and *sell-side* firms (including *investment banks* and *brokers*). Consequently, collateral is relevant to both the buy side and the sell-side of the business.

For a number of years prior to the autumn of 2008, collateral had been used for OTC derivatives with the passing of collateral between trading parties occurring, in some cases, weekly or every 2 weeks or even monthly. Up to that point in time, usually only the larger financial services firms identified *exposures* and then gave or received collateral as frequently as daily.

Then came the *Global Financial Crisis* and the financial industry turmoil in October/November 2008. Both during and since the downfall of Lehman Brothers, the profile of collateral management has risen dramatically, and firms of all sizes are now actively using collateral to mitigate exposures as a primary *counterparty risk* mitigation measure, on a daily basis.

The degree of complication within operations departments has consequently multiplied greatly. Successful processing of collateral within an organisation requires knowledgeable staff who understand the component parts that lead to safe and secure processing, and awareness of the pitfalls that can result in unacceptable exposures. The efficient and successful collateral department within a financial services firm demands a highly unusual mixture of knowledge and know-how of a number of connected financial services operational disciplines.

The combination of new players in and the increased frequency of collateral management around the globe means that basic knowledge of the subject is in short supply and in big demand: many of the positions advertised currently by financial services firms are collateral management jobs. Risk management professionals need an excellent understanding of this topic in order to appreciate whether counterparty risk is in fact being mitigated. Lawyers negotiating legal documentation necessary to be signed prior to trading should ideally understand the overall collateral process. Those working within *central securities depositories* and *custodians* should appreciate the topic if they are to understand and comply with the securities and cash movements instructed by their clients. Consulting firms also need to understand the subject if they are to provide expertise into financial services firms. Software firms need to become aware of the topic if they are to provide collateral management systems that meet their clients' collateral objectives.

Collateral management is applicable to financial institutions globally.

TARGET AUDIENCE

This book is targeted towards those wishing to gain an all-round understanding of collateral management, from an *operations* (processing) perspective. Therefore, those that will find this book of value include:

- those that are entirely new to collateral management
- those currently working within a collateral department and who wish to gain an all-round understanding of collateral processes
- existing operations personnel that wish to broaden their all-round knowledge
- staff who instruct the movement of cash and securities collateral
- recipients of instructions to effect the movements of cash and securities assets
- trade confirmation personnel
- static data workforce
- corporate actions personnel
- reconciliation analysts
- risk managers
- credit controllers
- legal document negotiators
- management consultants
- business analysts
- software engineers.

This book describes the essential day-to-day and detailed practices that 1) a collateral professional requires, and 2) are necessary for a firm to achieve counterparty risk mitigation in a secure fashion and without introducing further risks.

Furthermore, this book is designed to enable readers to make a very positive connection between the conceptual need to minimise counterparty risk, and what must be done in practice in order to achieve counterparty risk mitigation.

OBJECTIVES AND STRUCTURE OF THE BOOK

The objective of this book is to demystify the subject of collateral management by breaking the subject into logical components, explaining the issues relating to each component and at the same time conveying the accumulated effect and the overall picture.

In order to aid the reader's understanding, approximately 150 diagrams are contained within the text. Furthermore, the text contains example calculations to facilitate the reader's complete understanding.

Towards the end of the book, the reader will find an extensive Glossary of Terms containing over 600 words and phrases relating to the subject of collateral management.

The book is structured to be read chapter-by-chapter, from the beginning to the end. However, in recognition that some readers may prefer to target certain parts of the book (e.g. Part 3: Securities Lending & Borrowing and Collateral), each Part has been written as a standalone topic.

The book is divided into four parts. Part 1 begins with a number of fundamental but important concepts; firstly, an explanation of elementary collateral principles, following which the features relating to types of collateral are described.

Thereafter, the three main transaction types which necessitate collateral are described, namely:

- Part 2: Sale & Repurchase (Repo) Trades and Collateral
- Part 3: Securities Lending & Borrowing and Collateral
- Part 4: OTC Derivatives and Collateral

Part 4 is significantly larger than Parts 2 and 3, consequently there are three sections to Part 4:

- Part 4a introduces the subject of derivatives in general, OTC derivatives in particular, examples of OTC derivative transaction types, and important characteristics of OTC derivative-related collateral
- Part 4b refers to the legal documentation pertaining to OTC derivatives
- Part 4c explains the OTC derivative-related regulatory requirements which were introduced following the 2008 Global Financial Crisis, and in particular the impact on collateral management.

I have written this book entirely independently; the views expressed within are my own and not the views of any organisation with whom I have been associated, whether as an employee or as a trainer or as a consultant.

Although every effort has been made to remove errors from the text, any errors that remain belong to me. If readers have comments on the content and style of the book, I would welcome such comments; I can be emailed at info@mike-simmons.com.

Michael Simmons

PART

1

Introductory Elements

Fundamental Collateral Concepts

This chapter is designed to provide an overview of many of the essential aspects of collateral and of collateral management – each topic will be expanded and explained fully within the relevant chapter.

What is collateral? Collateral refers to an asset of value that is given by one entity or firm (party A) as security for an amount owed to another entity or firm (party B).

The purpose of collateral is to provide assurance to party B that, in the event that party A does not fulfil its legal and **contractual obligations** relating to an underlying transaction, party B may legally sell the collateral in order to recover the full value owed by party A.

The generic and commonly used terms for such parties are **collateral giver** or **transferor** (party A) and **collateral taker** or **transferee** (party B).

For the collateral taker to be properly secured, the collateral asset must be of recognisable value in the open market place and be highly **liquid**, thereby enabling the collateral taker to quickly and easily convert the collateral to ready cash (should the need arise).

The underlying transactions that give rise to the giving and taking of collateral are many and varied, and in everyday life include, for example, mortgages on residential properties where the lending entity (e.g. a bank) lends cash to the homebuyer with the lender's legal right to take possession of the property should the homebuyer fail to abide by the terms of the mortgage agreement and make the necessary repayments. In this situation, the property itself is the collateral which the lender can sell in order to recover the cash it originally lent plus interest owed.

In the world of financial services, the underlying transaction types that give rise to the giving and taking of collateral fall into two main categories (note: the transaction types listed below are described fully within later chapters):

1. Transaction Types Involving Loaning of Assets

The common theme in this category is the lending of assets by one party to its **counterparty**, where the lender has an immediate risk of not having the lent asset

returned. To *mitigate* the lender's risk, collateral is given by the asset borrower. Such transaction types include:

- *sale & repurchase (repo)* transactions
- *securities lending & borrowing* transactions.

2. Transaction Types That Accumulate Value Over Time

The common theme in this category is that two parties enter into a *derivative* transaction that typically has a duration of many years – up to 50 years is possible. This means that each party has *exposure* to its counterparty on an ongoing basis throughout the transaction's lifetime. It is important to understand the nature of each transaction type in order to appreciate the associated risks, and the role collateral plays. Although each such transaction begins with equal value to both parties, as time passes the value of a transaction at a particular point in time will fall to the advantage of one party and therefore to the disadvantage of the other party. As time progresses, the transaction value can fluctuate significantly, where on a particular day party A will have the advantage and the next day party B will have the advantage. For these transaction types, the disadvantaged (non-exposed) party is required to provide collateral to the advantaged (exposed) party, in recognition of the risk that should the disadvantaged party go out of business during the lifetime of the transaction, the advantaged party will (it is assumed) need to replace the original transaction at 'current' market rates, thereby incurring greater costs compared with the original transaction. Such transaction types are generically known as *OTC derivatives* and include:

- interest rate derivative transactions (e.g. *interest rate swaps*)
- credit derivative transactions (e.g. *credit default swaps*)
- foreign exchange transactions (e.g. *foreign exchange swaps* and *cross-currency swaps*).

OTC Derivative trades have historically been executed directly between the two trading firms, and are said to have been traded on a *bilateral* basis. Another way of describing such transactions is to state they have been *privately negotiated*, rather than being executed via a derivative exchange (as occurs with *exchange-traded derivatives*).

Common to all the above-mentioned transaction types is the fact that collateral is given and/or taken. The type of collateral that may be given and taken is usually documented in a legal agreement between the two trading parties, ideally finalised (signed by both parties) before trading commences. The form that collateral normally takes is cash or *bonds* (debt securities), as such assets are subject to either zero fluctuation in value (cash) or limited fluctuation in value (highly rated bonds). *Equity* securities (shares) are less commonly used as collateral due to their fluctuating and sometimes unpredictable values.

A party that has given cash collateral normally earns an agreed rate of interest on the cash (assuming a *positive interest rate* environment), from the collateral taker.

Both bonds and equity are classified as *securities* which, when given as collateral are usually subject to a *haircut*; having established the *current market value* of a security, the relevant haircut percentage is deducted in order to identify the security's *collateral value*. Conversely, major currencies given as collateral usually have no haircut applied and therefore usually retain 100% of their 'market' value.

It is in a firm's own interest to monitor collateral values on an adequate frequency in order to determine whether a current *exposure* exists; for example, a bond received as collateral yesterday and whose value yesterday covered the lender's risk, may today have a value which is below the value of the lent asset, and the lender now has an exposure. The lender's exposure must be mitigated by the lender requesting additional collateral (a process known as a *margin call*) from the borrower. Conversely, should the value of collateral rise relative to the value of the lent asset, the borrower has an exposure (i.e. too much collateral with the lender) and should make a margin call to request the lender to return the excess collateral.

Securities collateral currently held by the collateral taker may today have been sold by the collateral giver. The collateral giver requires return of the original collateral so as to facilitate settlement of its sale on its due date (*value date*). Under such circumstances the collateral giver usually has the right to substitute the original collateral with one or many replacement pieces of collateral with either securities or cash (dependent upon the transaction type). The collateral taker must ensure it does not become exposed by returning the original collateral without simultaneous receipt of replacement collateral. This process is known as *collateral substitution*.

Securities collateral currently held by the collateral taker may have an *income* payment becoming due; this is known as a *coupon payment* in the case of a bond, and a *dividend payment* in the case of equity. The legal agreement between the two parties usually states that an equivalent payment must be made by the collateral taker to the collateral giver, when the payment falls due.

As exposure will have ceased upon termination of the underlying transaction, any collateral outstanding at that time must be returned to the collateral giver. With this in mind, it is important to appreciate that the tenure (duration) of a transaction can vary significantly dependent upon the transaction type; see the descriptions earlier in this chapter. For example:

1. Transaction Types Involving Loaning of Assets – *repo* transactions and *securities lending & borrowing* transactions are typically short-term, with a usual lifetime of a matter of days or weeks
2. Transaction Types That Accumulate Value Over Time – *OTC derivative* transactions are typically long term, with a lifetime of multiple years in many cases.

For its own protection, a firm involved in any and all such transactions must be prepared to 1) identify exposures and 2) mitigate exposures, at the relevant frequency, through the process of collateral management.

The Nature and Characteristics of Collateral Types

This chapter is targeted at readers that have had no exposure or limited exposure as to how cash and bond assets are handled within the financial services industry. The chapter is designed to provide an overview of the two primary collateral types, namely cash and bonds. In particular, the nature of bonds must be understood in order to appreciate their behaviour as collateral. Furthermore, the way that cash is paid and received and the way that bonds are delivered and received must be well understood in order for a firm to avoid incurring exposures.

The two most common types of collateral used within financial services are cash and bonds.

2.1 CASH COLLATERAL: OVERVIEW

2.1.1 Introduction

The most commonly accepted currencies as collateral are US Dollars (USD), Euros (EUR) and British Pounds (GBP).

If a firm's exposure is in for example USD, and USD cash collateral is taken from the *counterparty*, there is no *foreign exchange* (FX) *risk*, as there is no conversion to be made between currencies. Conversely, if that same firm has the same USD exposure, but receives another currency (e.g. EUR) as collateral, the firm is exposed to FX currency rate movements thereafter and this could result in collateral taken having a lower value than the firm's exposure. Should such exposure occur, the exposed firm would need to make a *margin call* on its counterparty in order to cover the shortfall and *mitigate* its exposure.

To clarify, either the original *collateral giver* or the *collateral taker* could be exposed due to exchange rate movements.

2.1.2 Eligible Collateral

The legal documentation signed between the two trading parties (preferably in advance of executing the first trade between the parties) should specify the currencies acceptable as collateral to each party. Generically, acceptable collateral is known as *eligible collateral*.

If a firm that needs to give collateral attempts to remit a currency outside of the legally documented eligible currencies, the taking firm is not obliged to accept that currency and is within their rights to refuse acceptance.

2.1.3 Haircut

Providing cash given/taken is in an eligible currency, no *haircut* should be applied. For example, if party B has an exposure of USD 5,000,000.00, party A should pay USD 5,000,000.00 of cash collateral, meaning 100% of the exposure amount and no more than that amount should be paid (because zero haircut is applicable).

Therefore, the *market value* of a major currency cash amount is equal to its *collateral value*, providing the exposure and the collateral are in the same currency. (Note: other currencies may be classified as eligible collateral, but the involved parties may have agreed that a certain percentage haircut is to be applied.)

2.1.4 Settlement

Generically, cash payments are made by a firm by initially appointing a *cash correspondent* (or *nostro*) for a particular currency, then issuing a *settlement instruction* to that nostro for individual cash payments.

Deadlines are applied by nostros for the receipt of settlement instructions relative to the due date (or *value date*) of payment. The firm must ensure it meets such deadlines in order to make payment on time. If the deadline is missed, the counterparty (payee) will not receive payment on time; for cash collateral, a late payment means 1) that the exposed party's risk has not been mitigated, and 2) that the legal agreement will have been breached.

In order to facilitate the payment of cash to a counterparty, it is common practice for *standing settlement instructions* (SSIs) to be stored within a firm's *static data repository*. SSIs are a generic name for bank account details, which are effectively standing orders provided by each counterparty to facilitate cash payments; they avoid the paying firm needing to contact the counterparty each time a payment needs to be made. When needing to make a payment, the paying firm simply instructs its nostro for payment to be made to the counterparty's nostro according to the SSI information held within the paying firm's static data.

The issuance of settlement instructions is a highly risky aspect of settlement; if instructions are not issued by a secure mechanism the risk exists that a third party could fraudulently effect payments out of a firm's bank account. The global standard for issuance of secure settlement instructions is *S.W.I.F.T.* which, for those firms that subscribe, provide high levels of message *encryption* designed to prevent third-party deciphering of secret coding structures intended for use only by sender and recipient of settlement instructions.

Note: to avoid any confusion as to the purpose and use of a standing settlement instruction, as opposed to the purpose and use of a settlement instruction:

- a standing settlement instruction is a piece of information containing bank account details and which is held within a firm's static data repository. A firm needs to hold its own bank account details for a particular currency (known as 'our SSI'), as well as bank account details for a particular currency for each of its counterparties (known as 'their SSI'). Such SSI information is used to generate individual settlement instructions in an efficient and (usually) electronic manner
- a settlement instruction is issued to a paying firm's nostro for payment of a particular cash amount, and which needs to contain currency, amount, value date, in addition to 'our SSI' and 'their SSI' (both of which are copied from the payer's static data repository).

It is important to note that the payment and receipt of cash requires no pre-matching of settlement instructions between payer and payee, before payment is actually made. Therefore the risk exists that, should a payer make a mistake when creating a settlement instruction (e.g. cash amount of EUR 10,000,000.00 rather than the correct amount of EUR 1,000,000.00), the payment of the incorrect amount will be made, assuming that adequate balance is held within the payer's account at its nostro. The firm should have internal procedures in place that identify such errors at source and before the settlement instruction is transmitted to its nostro, and post-payment reconciliation that verifies cash amounts that should have been paid versus actual amounts paid by the firm's nostro. It is not recommended that a firm relies on its counterparties to advise them that such errors have occurred.

When a firm is due to receive a payment from a counterparty, its nostro may require the firm to issue a funds preadvice, which advises the nostro to expect receipt of a specific cash amount on a particular value date. Should a payment be made by a counterparty to a firm, but the firm fails to issue a funds preadvice to its nostro (where the nostro requires such advices), although the nostro will have received the funds on value date on behalf of the firm, the nostro is unlikely to credit the funds on value date, and instead apply 'next day' value. This means the receiving firm will 1) not have their exposure mitigated on time, and 2) suffer a loss of interest on those funds for 1 night as a minimum; if the payment due date were a Friday, a minimum of 3 nights' interest will be lost. Under these circumstances, the paying counterparty will not be in breach of the legal documentation as they paid on the due date. It is also important to note that those nostros requiring receipt of funds preadvices for incoming cash also apply deadlines to the receipt of such preadvices.

2.2 BOND COLLATERAL: OVERVIEW

2.2.1 Introduction

AUTHOR'S COMMENT

This sub-section describes a number of important factors that must be taken into account when receiving and delivering bond collateral.

Bonds are classified as *securities* (along with *equity*) and have the following characteristics:

- bonds raise temporary capital for the *issuer* (the issuing entity)
- issuing entities include:
 - governments (e.g. US Treasury, German Government, UK Government)
 - government agencies (e.g. Federal National Mortgage Association)
 - supranational organisations (e.g. World Bank, EBRD, Asian Development Bank), and
 - corporations (e.g. Siemens A.G., IBM, Qantas)
- the issuer borrows cash from investors (*bondholders*)
- the issuer typically pays a *fixed rate* of interest to bondholders as the cost of borrowing capital
- bonds have *maturity dates* typically up to 30 years
- investors typically include:
 - some individuals
 - *institutional investors* (e.g. mutual funds, pension funds)
 - corporations and
 - *investment banks*
- individual *bond issues* are issued:
 - by a particular issuer
 - to raise a specified cash amount (e.g. USD 1,000,000,000.00)
 - for a fixed* annual *coupon rate* (e.g. 4.75%)
 - with coupons payable on specified dates either annually (e.g. 1st October) or semi-annually (e.g. 1st October and 1st April)*
 - for a specified period of time (e.g. 20 years) at which point the bond matures and the issuer repays the capital to the bondholders
 - with the price upon issue at (or close to) 100%
 - with capital repayment at (or close to) 100% of original capital borrowed by the issuer

2.2.2 Types of Bond

The type of bond referred to in Sub-section 2.2.1 is commonly known as a *fixed rate bond*. The characteristics of such bonds can be summarised as:

- *Fixed Rate Bonds*
 - bonds issued with a defined (fixed) coupon rate
 - the bond's price will fluctuate according to the laws of supply and demand: please refer to Sub-section 2.2.5 'Market Value of Bonds' within this chapter
 - fixed rate bonds provide investors with a known and unchanging coupon rate throughout the bond's lifetime, as shown in Figure 2.1
 - the issuer determines the coupon payment frequency of a particular fixed rate issue, typically either *annually* or *semi-annually*
 - the first coupon payment date is usually 1 year after the bond is issued (in the case of an annual paying bond), or 6 months after the bond is issued (in the case of a semi-annual paying bond)

* exceptions exist – see later

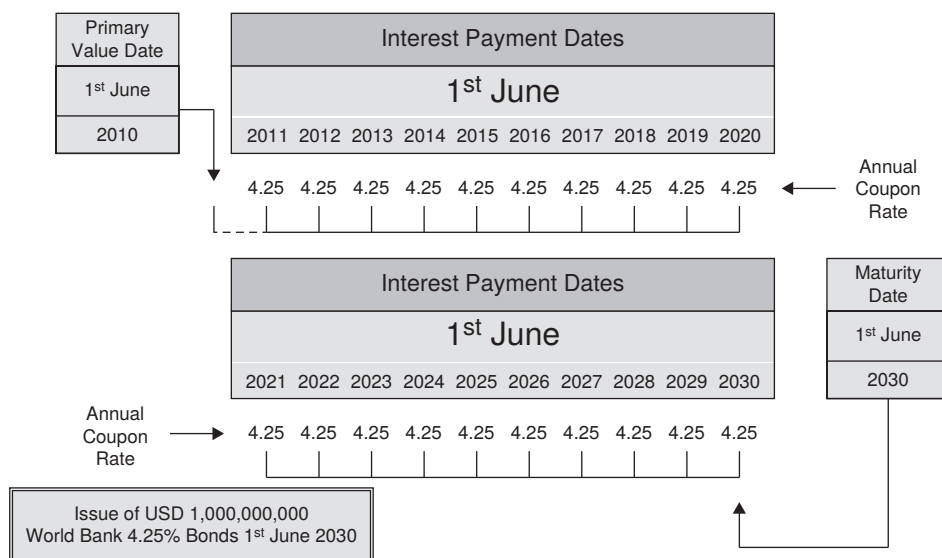


FIGURE 2.1 Example of fixed rate bond showing its coupon payment dates and coupon rates profile

Other types of bond which may be used as collateral are:

- **Floating Rate Notes (FRN)**
 - bonds issued with coupon rates based upon a defined *floating benchmark* rate (e.g. *Libor*)
 - FRNs provide investors with an alternative to fixed rate bonds, as FRNs reflect current interest rates in some cases, and rates of inflation in other cases
 - the benchmark rate is subject to constant change, consequently the FRN's coupon rate will change accordingly as shown in Figure 2.2: for example, the Libor benchmark rate reflects the average borrowing rate as stated by a number of UK-based banks
 - the issuer determines the coupon payment frequency of a particular FRN issue, for example monthly, quarterly, semi-annually
 - usual practice is for coupon payments to be made whenever the coupon rate changes (refixed), although this is not always the case (e.g. monthly rate refixes with quarterly coupon payments)
 - the terms of a particular FRN issue may state that a fixed margin (or spread) percentage is applied to the benchmark rate in order to determine the actual coupon rate: for example, the benchmark rate for a particular period is announced as 2.62%, but to this rate the fixed margin of 0.50% must be added to determine the coupon rate, which in total is 3.12%
 - for a particular FRN issue, the actual coupon rate payable by the issuer is determined and announced by the issuer (or its agent) at the appropriate frequency during the FRN's lifetime. Due to the fluctuating nature of the benchmark rate, there is every possibility that the coupon rate for a particular period is unique and is not repeated for any other coupon period during the FRN's lifetime.

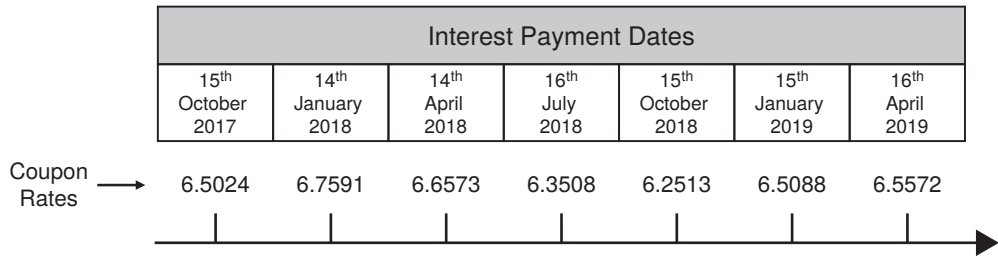


FIGURE 2.2 Example of floating rate note coupon payment dates and varying coupon rates

■ *Zero Coupon Bonds*

- bonds issued with repayment of capital at *par* (100%) and no payments of interest
- unlike most other bond types, this is a non-interest-bearing bond
- such bonds are issued at a price deeply discounted from par, in recognition of the fact that no coupon is payable; see Figure 2.3
- following issuance and as time passes, the bond's market price gradually increases towards *redemption* at par on the bond's maturity date

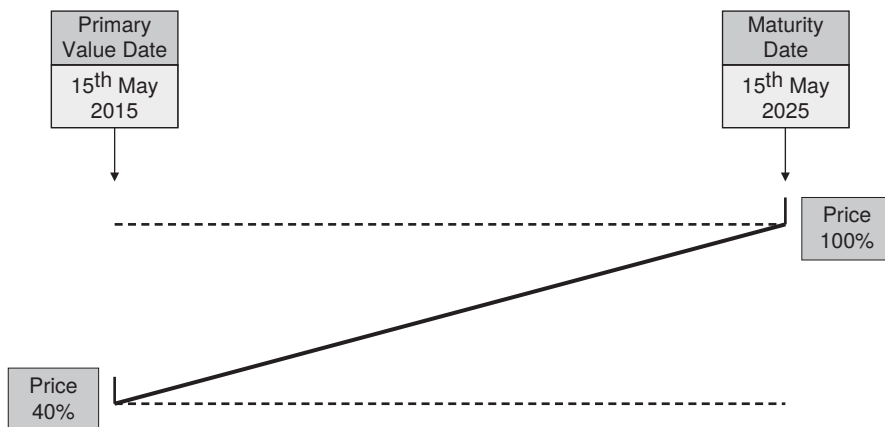


FIGURE 2.3 Example of zero coupon bond price profile, from issue date to maturity date

■ *Convertible Bonds*

- bonds that pay a fixed coupon but with an additional feature: they are issued with the *bondholders'* option to convert the bond (typically) into the issuer's underlying equity on specified conversion terms (e.g. every USD 20,000.00 bonds may be converted into 694 shares)
- such bonds are often regarded as being hybrid securities, as they have the characteristics of bonds but their market value is influenced by the price of the underlying equity

- *Exchangeable Bonds*
 - bonds with a very similar basic structure to convertible bonds, but following a decision to convert/exchange, the bondholder receives equity of an entity associated with the bond issuer (rather than equity of the issuer itself as occurs in conversion of a convertible bond)
- *Mortgage-Backed Securities (MBS)*
 - securities (not necessarily classified as a true bond) issued by a cash lender to investors
 - cash is lent by an entity to homebuyers (e.g. for residential mortgages) with the homebuyers having a commitment to repay the cash borrowing via scheduled regular payments of a fixed cash amount (typically monthly) which is made up of a combination of capital and interest
 - the cash lending entity issues a security that mirrors the scheduled cashflows of interest and capital due from the mortgagees; investors in the bond will receive the same cashflows mirroring the cash receipts from the mortgagees
 - the term given to such MBS are *pass through securities*. A vitally important aspect of such securities is that of *prepayment*: mortgagees are typically allowed to make unscheduled repayments of capital at any time, which impacts the amount of capital outstanding on the security, and which is represented by an adjusting number known as a *pool factor*.

Additional characteristics of bonds include:

- bonds with a call option
 - the right for the issuer to redeem the bonds prior to the bond's maturity date. In some cases a time restriction is placed on the option, so that the bond cannot be called prior to a specified date. Also known as *callable bonds*
- bonds with a put option
 - the right for the bondholder to force the issuer to redeem the bonds prior to the bond's maturity date. Also known as *puttable bonds*
- bonds with graduated coupon rates
 - fixed rate bonds with a different coupon rate for each of two or more specified periods of time during the bond's lifetime. Also known as step up bonds.

2.2.3 Bond Identifiers

The millions of securities (both bonds and equity) that exist around the globe give rise to the possibility of confusion as to which particular security 1) has been traded, and 2) requires delivery.

Particularly in the case of bonds (rather than equity), some issuers have numerous concurrent issues with very similar details. For example, the World Bank (formal name: International Bank for Reconstruction and Development, or 'IBRD'), may have two concurrent bond issues with the same coupon rate and the same maturity date; however, these two bonds are distinguished by their currencies, for example one being issued in USD, the other in GBP. Consequently, there is scope for confusion between two trading parties as to which of these two bonds has been traded and requires delivery.

In order to overcome such potential confusion, a unique code number is allocated to every security in existence and has become the accepted global standard; this code is known as an **ISIN** (International Securities Identification Number). For example, the following bond issue ‘International Bank for Reconstruction and Development 1.375% Notes September 20th 2021’ was allocated the ISIN ‘US459058FP39’.

In addition to the ISIN code for a particular security, a national code exists. For example, for the same World Bank bond issue mentioned earlier, a **CUSIP** code (used in the USA and Canada) of ‘459058FP3’ was allocated. Note: as can be seen, the national code is a constituent part of the ISIN code.

Other national codes are, for example:

- Germany: WKN (Wertpapierkennnummer)
- Switzerland: Valor
- UK: Sedol.

The responsibility for the allocation of ISIN codes is the country’s National Numbering Agency (NNA).

In order for a firm to manage the processing of all transactions which relate to securities (including collateral-related transactions) in the most efficient manner, it is essential that securities static data is set up for each individual security, inclusive of ISIN and national codes.

2.2.4 Bond Denominational Values

Currency notes (also known as bills) are issued in multiple denominations. For example:

- USD notes are denominated in \$1, \$2, \$5, \$10, \$20, \$50 and \$100
- EUR notes are denominated in €5, €10, €20, €50, €100, €200 and €500, and
- GBP notes are denominated in £1, £5, £10, £20, £50 and £100.

Similarly, bonds are issued in specified denominations, known as *denomination values*. For each bond issue, the issuer decides the number and size of denominations. For example, a particular bond issue has a single denomination of USD 10,000, whereas a different bond issue may have a single denomination, or 2 denominations (e.g. EUR 20,000 and EUR 50,000) or 3 denominations (e.g. GBP 5000, GBP 50,000 and GBP 100,000).

From a collateral management perspective, the significance of bond denominational values is that the only valid bond quantities that are deliverable (from collateral giver to collateral taker and vice versa) are a minimum of the smallest denomination, and multiples of the smallest denomination. For example, if a bond has its smallest denomination as EUR 20,000, it is simply not possible for a lesser quantity (e.g. EUR 8,500) to be delivered.

Issuance of a *settlement instruction* containing an invalid bond denominational value will be rejected by the recipient (whether *central securities depository* or *custodian*). The reason for rejection: bond quantity is undeliverable.

The primary internal control which should be adopted by a firm in order to prevent issuance of such invalid settlement instructions is as follows. Upon original setting up of the bond within the firm’s *static data repository*, the denominational value(s) of the particular bond must be identified and set up. Bond denominational values can be

found within the *prospectus* of the particular bond issue. The recording of the required collateral movement within the firm's books & records should utilise the bond denominational values information held within the firm's static data repository; this control should therefore trigger an acceptance or a rejection of the intended delivery quantity.

Note: bond denominational values are applicable to bonds issued in (the current) *global note* form, as well as those issued in (the historic) *bearer* form.

2.2.5 Market Value of Bonds

As mentioned earlier, interest-bearing bonds are typically issued at a price of 100%, and capital is typically repaid at 100% on the bond's maturity date. During the time between issuance and repayment of capital, bond values will fluctuate based upon market forces of supply and demand.

If a cash investor can earn (for example) 4% in the money market, but can earn 4.75% by investing in a particular bond, the bond will be in greater demand and its price is likely to increase beyond 100% (the bond is said to be trading at a premium to par [par = 100%]). If money market rates are above 4.75%, the opposite is probable and the bond's price is likely to fall below 100% (the bond is said to be trading at a discount to par).

However, the actual or perceived *creditworthiness* of the bond issuer may also impact bond prices.

An investor that buys a bond when the bond is first issued is said to have traded in the *primary market*. Once the bond has been issued, it may be bought and sold between market participants in the *secondary market*. Trades executed in interest-bearing bonds in the secondary market attract *accrued interest*, which is the market mechanism by which a seller is compensated for interest earned since the previous *coupon payment date*, up to the *value date* of the trade.

Note: for a full description of the steps involved in the calculation of accrued interest, please refer to *Securities Operations: a Guide to Trade and Position Management* by the same author (ISBN: 978-0-471-49758-5).

From a collateral management perspective, it is important to note that when *interest bearing bonds* are given or taken as collateral, the *current market value* of such a bond includes the current value of accrued interest. Consequently, a collateral giver that fails to take account of accrued interest on interest-bearing bonds will be unknowingly under-valuing the collateral, and therefore at risk of over-collateralisation; that is, delivering a greater market value and collateral value of bonds than is truly necessary to mitigate the counterparty's risk.

It is also important to note that the value of accrued interest associated with a particular bond quantity can be very significant. For example, a bond quantity of EUR 100,000,000.00 with an annual paying coupon and a *coupon rate* of 5% will, towards the end of the coupon year, have an accrued interest value approaching EUR 5,000,000.00.

2.2.6 Bond Holding Locations

Historically, most securities (both bonds and equity) were held in *certificated* form in the offices of *investment banks* and *institutional investors*: see Figure 2.4. Under these circumstances, movements of securities between firms were achieved by physical delivery of certificates between the offices of those firms.

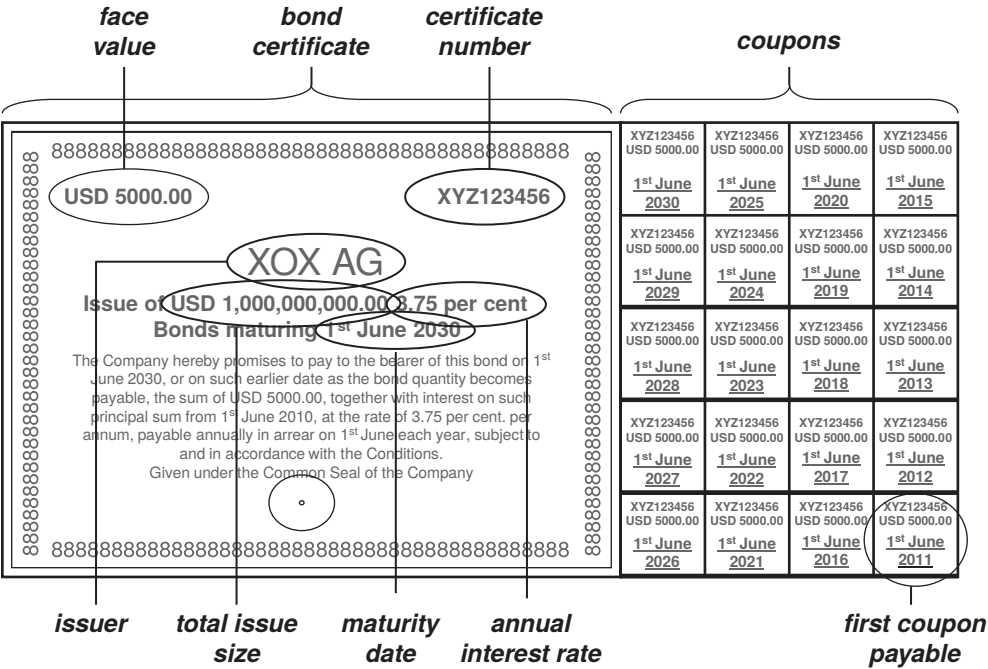


FIGURE 2.4 Representative example of a bond certificate, with coupons attached

By comparison, today securities are typically represented electronically and held at securities ‘warehouses’ known as *central securities depositories* (CSDs). Some firms choose to become direct members of one or more CSD. When a member firm requires to receive or to deliver securities at a CSD, the firm must issue a *settlement instruction* to the CSD. Before *settlement* can occur, it is common practice for the member firm’s settlement instruction to be matched by the counterparty’s settlement instruction. Once the instructions are matched, and the *value date* has been reached, and the deliverer has an adequate quantity of the securities available to achieve delivery, the CSD will effect settlement by a mechanism known as *electronic book entry*, which results in the deliverer’s securities balance being reduced by the appropriate quantity of securities, whilst the receiver’s securities balance is increased by the same quantity. At the close of business each day, the CSD produces statements of securities holdings for each member firm in order to facilitate *reconciliation* by the member firm against their internal *books & records*.

Therefore, the primary location where bonds are held on behalf of investors are CSDs. Bondholders such as *investment banks* typically have securities accounts directly with CSDs, in which their bonds are held.

Two types of CSD exist:

- **National CSDs** (NCSDs) typically provide services relating to securities issued by *issuers* based in the relevant country; usually a country will have one CSD only. Most NCSDs were originally set up for the holding of equity assets following trade execution via the national stock exchange, but in many cases the NCSD has expanded its range of securities products to include bonds

- **International CSDs** typically provide services relating to *eurobonds* and other types of international securities. Servicing of national securities is also achievable in some cases through electronic links with some NCSDs.

CSDs are located in all the major financial centres around the globe. Table 2.1 lists examples of national CSDs located in various financial centres, while Table 2.2 lists the two international CSDs:

TABLE 2.1 Examples of national central securities depositories

Examples of National CSDs	
Country	CSD Name
Abu Dhabi	Abu Dhabi Securities Exchange
Argentina	Caja de Valores
Australia	CHESS (Clearing House Electronic Subregister System)
Brazil	CBLC (Brazilian Clearing & Depository Corporation)
Dubai	Dubai Financial Market
France	Euroclear France
Germany	Clearstream Banking Frankfurt
Hong Kong	CCASS (Central Clearing & Settlement System)
Italy	Monte Titoli
Japan	JASDEC (Japan Securities Depository Center)
Korea	KSD (Korea Securities Depository)
Kuwait	KCC (Kuwait Clearing Company)
Mexico	Indeval
Netherlands	Euroclear Netherlands
New Zealand	NZCSD
Russia	National Settlement Depository
Saudi Arabia	Securities Depository Center
Singapore	CDP (Central Depository Pte. Ltd)
Switzerland	SIX Group (SIX)
UK & Ireland	Euroclear UK and Ireland
USA	DTC (Depository Trust Company)

TABLE 2.2 The names and locations of the two international central securities depositories

International CSDs	
Location	CSD Name
Brussels	Euroclear Bank
Luxembourg	Clearstream International

The range of services provided by all CSDs to their account holders typically includes:

- the safekeeping of securities
- deliveries in/out of securities upon receipt of valid *settlement instructions*
- deliveries in/out of securities against payment/receipt of cash
- deliveries in/out of securities against nil cash (applicable to *margin calls*)
- updating of securities and cash account balances resulting from deliveries
- collection of *income* and processing of *corporate action* events.

Specifically relating to cash, although settlement of purchases and sales means that cash balances will be created on an intraday basis, at some NCSDs overnight cash balances are not allowed and must be zeroised prior to the NCSDs' close of business each day. Conversely, both ICSDs permit overnight cash balances in over 50 currencies.

In addition, both ICSDs provide an automated *securities lending and borrowing* service.

Not all securities investors choose to hold accounts directly with CSDs. Bondholders such as *institutional investors* more often have accounts held with *custodians*, who in turn have accounts at CSDs. Under these circumstances, in order to achieve settlement of 1) securities trades and 2) margin calls using securities collateral, such investors must issue settlement instructions to their custodian. In turn, the custodian will issue its own settlement instruction over the custodian's appropriate account at the relevant CSD; note that the custodian may operate a range of accounts at each CSD, typically for *withholding tax* purposes (due to the various domiciles of the custodian's clients). Figure 2.5 depicts multiple participants with holdings of a particular security at a CSD:

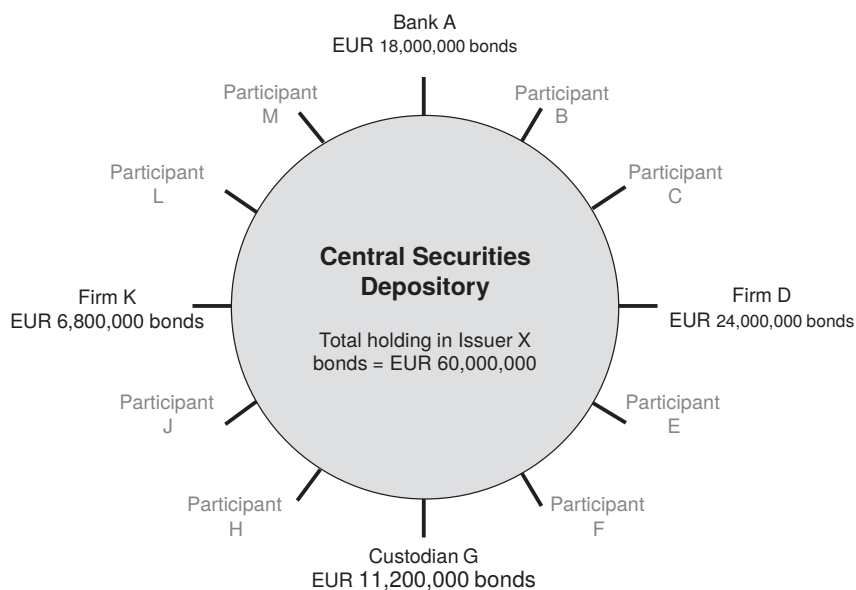


FIGURE 2.5 Participants' holdings at a CSD, including a custodian's holding. (Greyed-out participants have zero holding in Issuer X bonds.)

From a collateral management perspective, where a firm holds its securities has a direct impact on the deadlines by which a firm must operate regarding the issuance of settlement instructions. CSDs publish the deadline by which they must receive settlement instructions from their account holders. If a firm utilises a custodian (rather than a CSD), the custodian's published deadlines will be somewhat earlier than the CSD's deadlines. Collateral Management Departments must remain conscious of such deadlines if mistakes are to be avoided; a failure to deliver collateral on its due date will mean a breach of the contractual arrangements between the firm and its counterparty.

2.2.7 Acceptable Bond Collateral

In the world of collateral management, the types of assets (including bonds) that are generally acceptable as collateral are commonly referred to as *eligible collateral*.

From the perspective of the *exposed* party, whatever the nature of the collateral it is imperative that the collateral received is of sufficient quality and quantity to guarantee that the exposure is fully covered, in the event that the collateral must be *liquidated* due to the counterparty defaulting on its *contractual obligations*.

Consequently, the characteristics of bond collateral that impact perceived quality are those which relate to the likelihood of the bond issuer being able to comply with the terms of the bond issue, particularly *capital repayment* and the payment of *coupons* when falling due. Therefore, such characteristics include:

- issuer type: e.g. government, government agency, supranational, corporate
- issuer rating: e.g. whether the issuer is rated AAA, A or BBB (see Table 2.4)
- asset type: e.g. fixed rate coupon, floating rate note, zero coupon
- *residual maturity*: the length of time from 'today' until the bond's maturity date (the greater the residual maturity, the greater the perceived risk).

In parallel with cash collateral, the legal documentation signed between the two trading parties will specify the bond types which qualify as eligible collateral. For example:

- the highest quality of bond collateral may be defined as bonds issued by:
 - governments and central banks of Canada, France, Germany, the Netherlands, UK and USA – issued in GBP, EUR, USD, CAD
- the next highest quality of bond collateral may be defined as bonds issued by:
 - governments and central banks of Australia, Austria, Belgium, Denmark, Finland, Ireland, Italy, Japan, Luxembourg, New Zealand, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland – issued in domestic currency or GBP, EUR, USD
 - major international institutions, issued in GBP, EUR, USD, CAD, including:
 - African Development Bank
 - Asian Development Bank
 - Council of Europe Development Bank
 - European Bank for Reconstruction and Development
 - European Financial Stability Facility
 - European Investment Bank
 - European Stability Mechanism
 - European Union

- Inter-American Development Bank
- International Bank for Reconstruction and Development
- International Finance Corporation
- Islamic Development Bank
- Nordic Investment Bank.

Note: the above list should be regarded as examples of eligible bond collateral at the time of writing, and is subject to change.

If a firm that needs to give collateral attempts to deliver a bond outside of the legally documented eligible bond types, the taking firm is within its legal rights to refuse acceptance.

2.2.8 Haircut and Bond Collateral Value

The term ‘haircut’ refers to a percentage differential between an asset’s *market value* in order to derive the asset’s *collateral value*: a firm’s exposure is adequately collateralised if the asset’s collateral value is no less than the *exposure* amount.

The purpose of a haircut is to provide a cushion of monetary value, in favour of the exposed party, in the event that the collateral 1) falls in value, or 2) must be sold to cover the exposed party’s loss.

Imagine that Firm A has lent a cash amount of USD 10,000,000.00 to Firm B, for one week; Firm B is required to provide bond collateral to *mitigate* Firm A’s risk (exposure) of not having the cash amount repaid by Firm B. Firm B chooses to provide collateral by delivering to Firm A a quantity of USD 11,000,000.00 World Bank bonds; Firm B needs to ensure that the collateral value of this bond will cover Firm A’s exposure, for which Firm B takes the following steps (please read the following in conjunction with Table 2.3):

- identify the current market price of the bond (98.76%)
- identify the current number of accrued days (282) from which the current value of accrued interest is derived
- the total of the above provides the total market value
- identify the applicable percentage haircut (10%)
- deduct the haircut percentage from the total market value from which the bond’s total collateral value is derived.

TABLE 2.3 The impact of haircut on market value to derive collateral value

Calculating Bond Collateral Values		
USD 11,000,000 World Bank 4.15% Bonds 15th April 2025		
Component	Example	Example Calculation
Current Market price	98.76%	USD 10,863,600.00
<i>add</i> Accrued Interest	282 days	+ USD 357,591.67
Total Market Value		USD 11,221,191.67
<i>deduct</i> Haircut	10%	-USD 1,122,119.17
Total Collateral Value		USD 10,099,072.50

As can be seen from the above example, Firm B (the *collateral giver*) is required to *over-collateralise* the exposure of Firm A (the *collateral taker*) by the value of the haircut percentage. Application of the correct haircut is a valid over-collateralisation.

(For different transaction types, instead of ‘haircut’ the terms ‘margin’ or ‘initial margin’ may be used, although all such terms refer to the differential stated above; such terminology will be highlighted at the relevant points within subsequent chapters.)

Deriving the specific percentage of haircut deductible from the security’s market value can involve a range of factors, including:

- issuer type: e.g. government, government agency, supranational, corporate
- issuer rating: e.g. whether the issuer is rated AAA, A or BBB (see later)
- asset type: e.g. fixed rate coupon, floating rate note, zero coupon
- *residual maturity*: the length of time from ‘today’ until the bond’s maturity date (the greater the residual maturity, the greater the perceived risk).

In general terms, bond collateral issued by stable governments with a short time to maturity date is considered to be of low risk; the lower the perceived risk, the lower the haircut percentage.

Opinions regarding an issuer’s ability to fulfil its *contractual obligations* relating to individual bond issues are made by *ratings agencies* such as Fitch Ratings, Standard & Poor’s and Moody’s Investors Service. Part of the criteria for calculating the haircut applicable to a particular bond is the current rating; it is important to note that *ratings downgrades* and *ratings upgrades* do occur, so it is essential that all firms have access to current ratings. Example ratings and their meaning are shown in Table 2.4:

TABLE 2.4 Typical published ratings classes

Moody’s	S&P	Description
Aaa	AAA	Best quality bonds: extremely strong ability to repay
Aa	AA	High quality bonds: very strong ability to repay
A	A	Upper medium grade bonds: strong repayment ability
Baa	BBB	Medium grade bonds: adequate repayment ability
Ba, B	BB, B	Lower medium grade bonds: repayment ability uncertain
Caa/Ca/C	CCC/CC/C	Poor grade bonds: vulnerable to non-payment

Should the incorrect haircut be calculated on a piece of bond collateral, the collateral giver is at risk of delivering that collateral with a collateral value calculated to be lower than its true collateral value. This miscalculation will result in a greater quantity of bonds being delivered (than is necessary) to cover the counterparty’s exposure; therefore the collateral giver is at risk of (invalid) over-collateralisation.

2.2.9 Settlement

The settlement of purchases and sales of bonds requires the exchange of securities for cash, and are settled in one of two ways, either:

- *Delivery versus payment* (DvP)
- *Free of payment* (FoP).

By far the most favoured settlement method of securities trades (buying and selling) is DvP, as this is the simultaneous exchange of assets between seller and buyer, wherein each party is protected from loss of its asset:

- from the seller's perspective, they will not have the securities removed from their CSD/custodian account until the cash is available to be paid by the buyer
- from the buyer's perspective, they will not have the cash removed from their CSD/custodian account until the securities are available for delivery by the seller.

DvP requires *settlement instructions* issued by the buyer and the seller to be matched before settlement can occur. Such instructions are frequently unmatched due to a difference in one (or more) trade component, such as bond quantity, net cash value and *value date*.

Less favoured is FoP as a settlement method, as settlement is non-simultaneous between buyer and seller, typically requiring one party to make the first move and to go on-risk, by (when selling) delivering its securities prior to receipt of the sale proceeds, or (when buying) remitting the purchase cost prior to receipt of the bonds.

From a collateral management perspective, the nature of the transaction usually determines whether the DvP or FoP settlement method is used. For example:

- *Sale & Repurchase (Repo) trades* (refer to Part 2 for a detailed description):
 - settlement of the *opening leg* of a repo is typically effected on a DvP basis, as both the cash lender and the cash borrower are at risk and the simultaneous exchange aspect of DvP *mitigates* the risk for both parties
- *Securities Lending & Borrowing* (SL&B) *trades* (refer to Part 3 for a detailed description):
 - the settlement method of the opening leg of an SL&B transaction largely depends whether cash collateral or securities collateral is given by the securities borrower
 - if cash collateral, DvP is the usual settlement method
 - if securities collateral, FoP is the normal settlement method.

During the lifetime of a collateral-related transaction, either of the two involved parties could become exposed requiring the *exposed party* to issue a *margin call* to its counterparty. Assuming the *non-exposed party* agrees the margin call, they will decide whether to settle the call with cash or securities (dependent upon the *eligible collateral* stated in the legal documentation). It is important to understand that

settlement of a margin call is directional (from the non-exposed party to the exposed party), therefore:

- margin call settled in cash:
 - requires issuance of a cash settlement instruction by the non-exposed party to its *nostro*
 - this method requires no matching of instructions prior to settlement
- margin call settled in securities:
 - requires issuance of an FoP securities settlement instruction by the non-exposed party to its *CSD* or *custodian*
 - this method requires an equivalent settlement instruction from the exposed party in order to match instructions prior to settlement.

Settlement of margin calls in this way is applicable to the following transaction types:

- OTC Derivatives
- Sale & Repurchase (Repo)
- Securities Lending & Borrowing (SL&B).

Once the giver's and the taker's securities settlement instructions are matched, should either of the parties cancel their instruction, the instruction that remains will revert to a status of 'unmatched'. Assuming that instructions remain matched, settlement is attempted (at the CSD) on *value date*, and not before.

In order for settlement to occur, 1) instructions must be matched, 2) value date must have been reached, and 3) the seller must have the bonds available for delivery. If steps 1 and 2 have been satisfied, but not step 3, settlement will 'fail'. *Settlement failure* means that settlement is delayed, not cancelled. Should settlement failure occur, under these circumstances both the giver's instruction and the taker's instruction will be given a status of 'deliverer insufficient of bonds'; the status of the instructions will remain the same until the collateral giver's account at the CSD is in receipt of an adequate quantity of bonds for the delivery to the collateral taker to occur.

Once settlement has occurred, the CSD/custodian will apply a status of 'settled' to both the collateral giver's and the collateral taker's instructions. This means that a specified quantity of a specified bond has been delivered from one account (the collateral giver's) to another account (the collateral taker's) on a particular *settlement date*.

At this point the collateral giver's obligation to settle the margin call and to deliver collateral to the collateral taker has been fulfilled.

Note: for a full description of the steps involved in the settlement of bonds, please refer to *Securities Operations: a Guide to Trade and Position Management* by the same author (ISBN: 978-0-471-49758-5).

2.2.10 Bond Interest Payments

Bond interest payment dates, commonly known as *coupon payment dates*, are normally scheduled at the point when the bond is first brought to the marketplace, meaning that both the interest rate (on *fixed rate bonds* and *convertible bonds*) and the coupon payment dates are scheduled throughout the bond's life.

Following the purchase of a bond, the *bondholder* (e.g. *investment bank* or *institutional investor*) will normally have their bonds held in safekeeping by a *central securities depository* (CSD) or a *custodian*. Within the *service level agreement* (SLA) signed between the CSD/custodian and its client, it is common practice for the CSD/custodian to include within its services to clients the collection of all income (i.e. *coupon* on bonds, *dividends* on equity), and the protection of clients' interests regarding other *corporate action* events, including:

- on bonds: *bond exchange offers, bond repurchase offers*
- on equity: *bonus issues, stock splits, rights issues*.

Therefore, an existing owner (e.g. a pension fund) of a quantity of USD 5,000,000.00 of a particular World Bank bond with a 4.5% annual paying coupon on 1st August each year until the year 2030, would expect to receive a coupon payment of USD 225,000.00 on (or very shortly after) 1st August each year. The pension fund's custodian will be holding these bonds on behalf of its client, and should be ensuring it receives payment from the relevant CSD (where the custodian has an account), and in turn the custodian should credit the account of the pension fund.

At a more granular level, CSDs typically operate a *record date* system for deciding which of its account holders to credit with the coupon proceeds; such a system of determining which account holders the CSD will pay is necessary due to deliveries of securities close to the coupon payment date. Imagine that a CSD holds a total quantity of USD 106,000,000.00 bonds of the World Bank issue mentioned earlier, and that as at close of record date there are six holders at that CSD, as shown in Table 2.5:

TABLE 2.5 Example of bondholdings at a CSD

Holder	Quantity
A	USD 5,000,000.00
B	USD 15,000,000.00
C	USD 8,000,000.00
D	USD 35,000,000.00
E	USD 25,000,000.00
F	USD 18,000,000.00
<i>Total</i>	<i>USD 106,000,000.00</i>

Assume the pension fund's custodian to be holder A. Two scenarios are possible relating to the holding of USD 5,000,000.00 bonds and subsequently the treatment of the coupon payment:

- scenario #1:
 - providing the bonds remain in the custodian's account and are not delivered out of the account prior to close of business on record date, the CSD will credit the custodian's account with USD 225,000.00 on (or shortly after) coupon payment date. The custodian will, in turn, credit the account of its client, the pension fund

- scenario #2:
 - the pension fund executes a sale & repurchase (repo) transaction in which it borrows an amount of cash from Firm E, and is required to deliver bond collateral to that counterparty to mitigate the cash lender's risk. Both the pension fund and Firm E agree that a quantity of USD 2,000,000.00 of the World Bank bond covers Firm E's *exposure*, and the pension fund issues a *settlement instruction* to its custodian. This results in the following: on the *opening value date* of the repo transaction (assume that date to be the same as the record date), the USD 2,000,000.00 bonds are delivered out of the custodian's account (holder A) and into the account of Firm E. The close of record date position at the CSD will now appear as shown in Table 2.6:

TABLE 2.6 Example of bondholdings at a CSD following delivery of collateral

Holder	Quantity
A	USD 3,000,000.00
B	USD 15,000,000.00
C	USD 8,000,000.00
D	USD 35,000,000.00
E	USD 27,000,000.00
F	USD 18,000,000.00
<i>Total</i>	<i>USD 106,000,000.00</i>

Consequently, the CSD will credit the coupon payment amounts according to this (scenario #2) close of record date position, meaning that the custodian (on behalf of the pension fund) will be credited with the coupon on USD 3,000,000.00 bonds, and Firm E will be credited with the coupon on USD 27,000,000.00 bonds.

Scenario #2 clarifies who will be paid the coupon by the CSD, where delivery of bond collateral occurs prior to the close of record date. However, that scenario raises the following important question: *which party is entitled to the coupon payment on the USD 2,000,000.00 bonds given by the pension fund to Firm E as collateral?* The answer to this question is directly associated with the contents of the legal documentation signed by both parties prior to *trade execution*, and will be explained within the relevant chapters.

Note: the actions of 1) claiming coupon payments from collateral counterparties, 2) making payments of coupon, and 3) dealing with issues such as *withholding tax* differences on such coupon payments – are regarded by some firms as added complications which are best avoided. Consequently, where practical the two firms may agree to perform a *collateral substitution* in advance of the record date.

In the case of *eurobonds* which are typically held at the two *international central securities depositories* (namely *Euroclear Bank* in Brussels, and *Clearstream International* in Luxembourg), the record date is typically (but not always) the close of business on the business day prior to the coupon payment date.

PART

2

Sale & Repurchase (Repo) Trades and Collateral

Sale & Repurchase (Repo) Trades and Collateral – Introduction to Repo

This section is targeted at readers that have had no exposure to or limited exposure to the subject of repo.

Repo trades are a very popular and flexible mechanism by which cash is borrowed against securities collateral delivered to the cash lender.

Along with *securities lending & borrowing* trades, repo trades fall within the general grouping of transaction types known as *securities financing*.

This section describes the reasons for the lending and the borrowing of cash, the benefits to both lender and borrower, the various methods of trade execution and the role collateral plays in such trades.

3.1 INTRODUCTION TO REPO

Definition of a repo trade: the temporary loan of an asset, to a borrower, against receipt of collateral, for return at a specified later date.

A repo is a transaction in which one party lends cash to a borrower at an agreed interest rate, and the cash borrower immediately provides *collateral* in return in order to *mitigate* the cash lender's risk. At the close of the transaction those asset flows are reversed; the cash borrower repays the cash plus interest (in a *positive interest rate* environment), and the cash lender returns the collateral.

Alternatively, with the emphasis on the securities (as collateral), the transaction may be described as follows: the cash borrower sells the securities for immediate settlement against cash and simultaneously agrees to repurchase those same securities for settlement against the same cash amount, plus interest at an agreed rate, for *settlement* on a future *value date*.

Should the cash borrower (the *collateral giver*) default on its obligation to repay the borrowed cash at the close of the transaction, the cash lender (the *collateral taker*) may sell the collateral to recover the cash amount lent.

Investment banks that purchase and hold financial assets, in particular equity and bonds, typically do not possess adequate values of cash in order to pay for such purchases. Such firms need to borrow cash as cheaply as possible, in order to pay for their purchases; such firms are typically cash borrowers in repo transactions.

Firms that are 'long' of cash may choose to lend cash on a secured basis; such firms are the suppliers of cash in repo transactions.

The most commonly used security type in repo transactions are high quality bonds, although collateral in the form of equity is sometimes used.

The cost of borrowing any asset is minimised if the lender's risk (of not having the lent asset returned) is mitigated. The lender's risk is mitigated if the borrower provides an adequate value of high quality collateral to the lender. Generically speaking, such transactions are commonly known as *secured borrowing* or *collateralised borrowing*. Where cash borrowing transactions are executed under the protection of a sale & repurchase legal agreement (known as a *GMRA*), such transactions are called repo transactions.

Repo transactions are generally classified as *money market* transactions, due to their typically short-term nature of collateralised cash lending and borrowing. Therefore, a cash lender may view the execution of a repo trade as a cash loan, for which the lender's risk is mitigated through the receipt of collateral, and for which interest is earned (in a positive interest rate environment).

The interest rate charged by the cash lender is known as the *repo rate*, which is expressed as an annualised percentage and is calculated over the actual number of days over which the cash is lent. The creditworthiness of the bond *issuer* is a factor that influences the repo rate of a particular repo transaction. The cost of borrowing under a repo transaction is typically less than for an *unsecured borrowing*, due to the lender's risk being mitigated.

The type of collateral normally given by the cash borrower to the cash lender is government issued bonds; what constitutes *eligible collateral* in a repo transaction is defined within the legal documentation signed between the two trading parties. It is common to find that *fixed rate bonds*, *floating rate notes* and *zero coupon bonds* are acceptable as collateral.

There are two separate motivations for executing a repo trade; the need to borrow cash (*cash-based repo*), and the need to borrow securities (*stock-based repo*).

Note: some parties are of the opinion that repos should be treated as collateralised cash loans, whereas other parties regard repos as securities transactions.

3.2 PARTICIPANTS IN THE REPO MARKETPLACE

A variety of market participants utilise repo transactions, including investment banks, brokers, institutional investors, supranational organisations and central banks. Electronic trading platforms have also become popular methods by which repo trades are executed.

3.2.1 Institutional Investors

The term '*institutional investor*' is a collective term for organisations that invest in financial instruments (inclusive of equity and debt securities, foreign exchange and derivatives),

but who are on the outside of the financial marketplace and must communicate with those on the inside of the marketplace in order to execute trades. Such firms are considered as ‘end-users’ of financial products, and a collective nickname for such firms is the ‘*buy-side*’.

Encompassed within this category of investor are firms whose business falls under the umbrella of financial services such as mutual funds, hedge funds, pension funds, insurance companies and regional banks. However, non-financial firms such as those large organisations within the textile or oil industries, who are proactive managers of their financial resources, may also be included under this heading.

Such firms need to borrow cash on occasions, and the repo market provides a highly flexible option for borrowing cash on terms tailored to the firm’s specific needs. The repo market enables cash amounts ranging from the relatively small to the very large (in the hundreds of millions in USD, EUR and GBP terms), in a variety of currencies, to be borrowed at interest rates that are lower than borrowing on an *unsecured* basis, over periods of time lasting from overnight to many months. Such firms can utilise their existing holdings of high quality and highly *liquid* bonds in order to secure the cash lender’s risk and thereby keeping borrowing costs at very competitive levels.

Those institutional investors that are ‘long’ of cash are able to lend cash on a secured basis, for periods of time that are tailored to suit the cash lender’s requirement, receiving securities as collateral with, in many cases, a *current market value* of up to 105% of the cash amount lent.

In order to execute a repo trade, institutional investors are typically required to contact an investment bank (or broker), through whom the trade will be executed.

3.2.2 Supranational Organisations

A further type of buy-side institution that typically executes repo trades are *supranational organisations*. Such organisations are often cash long, and become cash lenders (and collateral takers) in repo trades.

3.2.3 Central Banks

The key objectives of national central banks are to control inflation and economic growth. In order to achieve such objectives, central banks typically execute repos via their *open market operations*, thereby applying control over short-term interest rates.

The repo market is the foremost mechanism by which many central banks put into operation their *monetary policy*, as repos are regarded as being a highly flexible transaction type which carries little *credit risk*.

3.2.4 Investment Banks

Generically speaking, investment banks are sometimes referred to as ‘market professionals’. At the time of writing, such firms would include the investment banking division of, for example (in no particular order), Morgan Stanley, Credit Suisse, J.P. Morgan Chase, Nomura, Deutsche Bank, Goldman Sachs, Barclays, UBS and Bank of America Merrill Lynch. Such firms execute repo trades with 1) their clients (the institutional investor community), and with 2) other investment banks. Investment banks are regarded as the ‘*sell-side*’ that provide services to buy-side firms.

Investment banks execute repo trades on a proprietary basis, meaning that they will, for example, borrow cash via repo in order to fund their inventory of securities (equity and bond) positions. Such firms may execute trades in securities with values far greater than the firm's capital, and therefore need to borrow cash at highly competitive rates in order to maximise trading profits and to minimise the negative impact of cash borrowing costs. Conversely, investment banks may choose to lend their excess cash via repo. A further motivation is to borrow specific securities via repo, in order to settle an underlying sale or other transaction.

Many firms operate a repo 'matched book', in which (for example) the cash they borrow from one counterparty via repo is then lent to a different counterparty via repo at a slightly higher repo rate, thereby making a profit on the repo interest differential.

3.2.5 Brokers

In the truest meaning of the term, a broker is an intermediary (or middleman) that having received an *order* from one party to buy or to sell, then attempts to find another party that's willing to fulfil that order which (if successful), results in *trade execution*.

In parallel with other areas within the financial services industry, brokers play a vital role in bringing together parties that have a particular requirement to fulfil, and those that can satisfy that requirement.

Brokers are the essential link between those with a demand and those that can supply the goods or services.

The consistent business model amongst broking firms is their desire to avoid taking a position in a particular asset, whether 'long' or 'short'. For example, taking a long position in a security (whether equity or bond) implies that position will need to be funded, which comes at a cost to the position holder. Furthermore, price volatility in the particular security means that *market risk* exists for the position holder.

In order to avoid such risk taking, brokers act in an *agency capacity* by facilitating transactions between two parties, and charging *commission* to the party placing the order. For repos specifically, their method of operation is typically by the provision of electronic trading platforms, over which firms that wish to execute repo transactions input their requirements (including currency and amount, repo rate, duration of trade and required collateral). Many of the largest firms utilise such platforms, enabling price comparison followed by trade execution.

3.2.6 Electronic Trading Platforms

Compared with the conventional method of executing repo trades (by telephone), automated repo trading platforms exist including:

- GC Pooling
- MTS Repo
- Brokertec.

The method of operation of one such platform, namely GC Pooling, will be explored within Chapter 7, 'Sale & Repurchase (Repo) Trades and Collateral – Repo Trade Variations'.

Sale & Repurchase (Repo) Trades and Collateral – Classic Repo Trades

Definition of classic repo: the temporary loan of an asset to a borrower against receipt of collateral, for return at a later date, in return for cash interest.

A classic repo is one form of repo in which one party executes a repo trade directly with another party, on a *bilateral* basis. Other forms of repo include:

- Buy/Sell-Backs
- Tri-Party Repo
- Delivery by Value
- GC Pooling, and
- RepoClear.

These forms of repo are described within Chapter 7 ‘Sale & Repurchase (Repo) Trades and Collateral – Repo Trade Variations’.

4.1 CASH-BASED CLASSIC REPO TRANSACTIONS

Definition of a cash-based classic repo: the temporary loan of a specific cash amount, to a borrower, against receipt of bond collateral, for return at a later date, in return for cash interest.

This section focuses on one party’s requirement to borrow cash (as opposed to securities); this is known as a cash-based repo.

All repos are two-legged transactions. In a cash-based repo, the opening leg involves the payment of cash from the cash lender to the cash borrower, with bond collateral

passing in the opposite direction. The closing leg involves the return of the cash amount borrowed plus cash interest (assuming a *positive interest rate* environment), against return of the bond collateral. This is depicted in Figure 4.1:

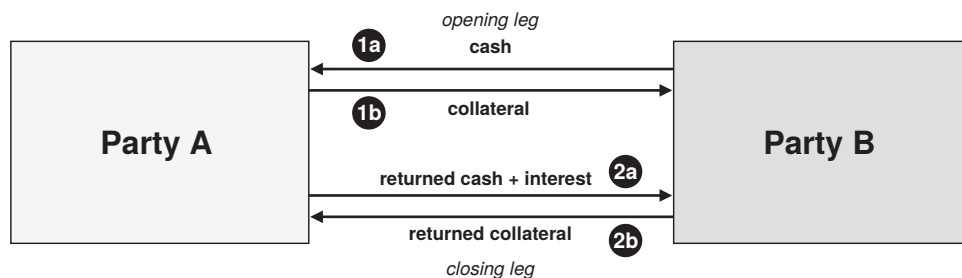


FIGURE 4.1 Repo asset flows on the opening and closing legs

- on the opening leg of the repo:
 - Step 1a: the cash lender pays cash to the cash borrower, and simultaneously
 - Step 1b: the cash borrower delivers bonds (as collateral) to the cash lender
- on the closing leg of the repo:
 - Step 2a: the cash borrower repays the borrowed cash, plus interest, to the cash lender, and simultaneously
 - Step 2b: the cash lender returns the bond collateral to the cash borrower.

Note that a range of terms are used to describe the legs in a repo transaction (see Table 4.1):

TABLE 4.1 Terminology used to describe each leg in a repo

Repo 'Leg' Terminology	
Opening Leg Also Known As	Closing Leg Also Known As
1st Leg	2nd Leg
Onside Leg	Offside Leg
Start Leg	End Leg
Near Leg	Far Leg
Purchase Leg	Repurchase Leg

Note: such a transaction is sometimes described from the primary perspective of the securities. For example, it may be stated that in the opening leg the bonds are sold against receipt of cash, and in the closing leg the bonds are repurchased against return of cash plus interest. In the author's view, it is more intuitive to regard the cash amount as the primary asset (and the primary motivation to execute the trade), with collateral (in the form of a bond) being given to the cash lender in order to *mitigate* the lender's risk.

Specific terms are popularly used to indicate the role of parties to a repo transaction. The cash borrower (and the *collateral giver*) is said to have executed a ‘*repo*’, whilst the cash lender (and *collateral taker*) is said to have executed a ‘*reverse repo*’. To clarify the use of such terms, in one single repo transaction, one party executes a repo whilst its counterparty executes a reverse repo.

4.1.1 The Duration of a Classic Repo Transaction

In terms of tenure of a repo trade, two types exist:

- a repo executed for a fixed period of time, in which the *closing value date* is agreed on trade date, is known as a ‘term’ repo, whereas
- a repo executed without the parties agreeing (yet) to a closing value date is known as an ‘on demand’ (commonly known as an ‘open’) repo.

A term repo typically has the following basic components (from the cash borrower’s perspective) as shown in Table 4.2:

TABLE 4.2 Primary components in a Term Repo

Term Repo	
Trade Component	Trade Detail
Transaction Type	Repo Cash Borrowing
Counterparty	Counterparty G
Currency Amount	USD 50,000,000.00
Repo Rate	3.15%
Trade Date	March 16th
Opening Value Date	March 17th
Closing Value Date	March 24th

Note that:

- the opening value date is also known as the *purchase date*, and
- the closing value date is also known as the *repurchase date*.

At the point of trade execution, the cash lender and the cash borrower agree the specific *closing value date*; the fact that a closing value date has been agreed makes this repo a term repo. The two value dates indicate the dates that the cash (and the collateral) will be moved in either direction. In this trade, the cash is scheduled to be paid by the lender to the borrower on 17th March, and returned 7 days later on 24th March.

Note: since October 2014, the normal *settlement cycle* for repos executed in Europe is T+1; however, this may not suit all firms and so T+2 or T+3 may be negotiated between the two trading firms.

Conversely, an open repo typically has the following basic components (from the cash borrower’s perspective) as shown in Table 4.3:

TABLE 4.3 Primary components in an Open Repo

Open Repo	
Trade Component	Trade Detail
Transaction Type	Repo Cash Borrowing
Counterparty	Counterparty G
Currency Amount	USD 50,000,000.00
Repo Rate	3.15%
Trade Date	March 16th
Opening Value Date	March 17th
Closing Value Date	Open

Unlike a term repo, at the point of trade execution, the cash lender and the cash borrower agree not to define the closing value date (yet). Each day the parties will agree to keep the repo rolling forward, until one of the parties needs to close the trade, at which point the counterparty is obliged to agree to a particular closing value date; such repos are said to be ‘terminable on demand’. The party wishing to close an open repo must communicate their desire to close by an agreed daily deadline (e.g. 13:00 CET), in which case the closing value date will relate to that communication date, where delivery will usually occur either on the same date (T+0) or next day (T+1), dependent upon the market relating to the collateral. An open repo can be closed for its entire value, or for part of its value.

Cash-based repos may have a tenure of overnight (1 day), or any other duration agreed between the two parties. For example, periods of up to 3 months are common, and occasionally up to 6 months or one year can be agreed.

4.1.2 Classic Repo Legal Agreements

In parallel with other types of collateralised transaction (e.g. *securities lending & borrowing*, and *OTC derivatives*), before a firm executes a repo trade, for its own protection (and that of its counterparty) it is essential that an appropriate legal agreement is signed between the two trading parties. Once the legal agreement is in place, each individual repo trade is then executed between the two parties under the protection of the legal agreement.

Over a number of years, as the style and content of repo trades was shaped amongst the repo trading community, a common standard for the content of repo legal agreements was developed.

Today, that standard legal agreement for internationally traded repos is entitled the ‘Global Master Repurchase Agreement’, and is commonly known as the **GMRA**. Various versions of the GMRA have been produced over the years, the latest of which is the 2011 version (at the time of writing).

In essence, the purpose of legal agreements such as the GMRA is to clearly state **contractual obligations** and responsibilities pertaining to both parties. One very important feature of the GMRA is clearly defined **events of default**; if a firm's counterparty has defaulted (or becomes insolvent), the agreement permits obligations relating to all open trades falling under the agreement to be immediately terminated and **set off** against each other, and settled on a net basis. (The right of set off is invaluable to a firm, as without such a right 1) all payment obligations of a firm may be required to be made, without 2) simultaneous receipt of obligations due to the firm. In an insolvency situation, the latter can take an inordinate length of time, in some cases months or years.)

The GMRA additionally contains items such as:

- definitions of terms and phrases (e.g. deliverable securities, **equivalent securities**)
- content of **trade confirmations**
- method of settlement of opening and closing legs
- **margin call** conditions
- **collateral substitution** conditions
- the treatment of income payments (e.g. **coupons** and **dividends**).

Between two parties that intend executing repo trades with one another, the wording within the GMRA is typically not altered. Any specific arrangements between the two parties are documented within the GMRA Annex 1, entitled Supplemental Terms and Conditions, examples of which are:

- **eligible collateral**, whether cash only, securities only, or both are applicable
- for **bond collateral**, the issuer ratings and **haircut** percentages
- the deadline for the **exposed party** making a **margin call**
- whether **collateral substitution** is permitted, or not.

Legal ownership of the bonds is transferred from the **collateral giver** to the **collateral taker** for the duration of the repo trade. From an operational standpoint, however, the giver of the collateral has not sold the collateral, and as such retains all beneficial rights. Whilst the collateral taker is the legal owner, the collateral giver is the **beneficial owner**. Legal ownership is transferred because, under the GMRA, the legal basis on which the collateral is transferred is **title transfer**. The method of transfer of a securities purchase and sale is also title transfer, therefore the collateral taker in a repo has the same (unlimited) rights to the collateral as if that party had instead purchased the securities outright. Consequently, the collateral taker is free to choose whatever it wishes to do with the collateral, including:

- holding the collateral securely within the collateral taker's account at its **custodian**, or
- reusing the collateral in one (or more) of the following ways:
 - selling it, repoing it, lending it or delivering it to satisfy a margin call in (for example) an **OTC derivative** transaction.

Note that, due to title transfer, the collateral giver has no legal right to prevent the collateral taker from reusing the collateral. However, the collateral taker is obliged to

return the *equivalent collateral* to the collateral giver, at the close of the repo trade. The collateral taker must remain aware of this fact, particularly if they have chosen to reuse the collateral.

Each set of legal documents (i.e. the GMRA plus Annex 1) a firm has with each of its repo counterparties is likely to contain different terms and conditions. It is therefore imperative that the repo operations staff carry out their day-to-day responsibilities according to the legal terms defined with each of their counterparties in the appropriate legal documents. If there is a failure to do so, the firm is likely to be at risk as, for example, the firm's exposures with counterparties may not be fully mitigated, and/or counterparty's exposures may be over-collateralised.

In order to view the content of the current GMRA, the complete 2011 version can be found in Chapter 8 'Sale & Repurchase (Repo) Trades and Collateral – The Global Master Repurchase Agreement'.

4.1.3 Collateral in a Classic Repo

In a classic repo trade, the bond collateral serves the purpose of mitigating the cash lender's risk. That risk is that the cash borrower fails to repay the borrowed cash.

From the perspective of the cash lender, at all times throughout the lifetime of a repo transaction, the *collateral value* of the bond must be no less than the cash amount lent. If, during the lifetime of the trade, the collateral value of the bond falls below the cash amount lent, the cash lender has an exposure and should make a *margin call* on the cash borrower for the difference.

Similarly, from the perspective of the cash borrower, at all times throughout the lifetime of a repo trade, if the collateral value of the bond increases beyond the cash amount borrowed, the cash borrower has an exposure and may make a margin call on the cash lender for the difference.

Therefore, the quality of collateral is an essential component of repo trades, from both the cash borrower's and the cash lender's perspectives. The commonly used term for acceptable collateral is 'eligible collateral'.

Eligible Collateral Financial instruments generally considered as eligible collateral are:

- bonds issued by *creditworthy* institutions (such as governments, government agencies, supranational organisations and corporations), including:
 - *fixed rate bonds*
 - *floating rate notes*
 - *zero coupon bonds*
- equity, providing they form a marketplace's primary index, such as the UK's FTSE-100.

From the cash lender's perspective, the two most sought after attributes are that the collateral 1) retains its value due to the ongoing creditworthiness of the *issuer*, and 2) that the collateral is highly *liquid* thereby enabling rapid transformation of the collateral into cash in the event of *default* (non-repayment) by the cash borrower.

In terms of eligible collateral in a classic repo transaction, rather than utilising a predefined list of eligible collateral types, the two parties agree the specific terms of individual repo trades based upon the particular bond issuer and liquidity of the bond.

Eligible collateral is documented within Annex 1 (Supplemental Terms and Conditions) of the GMRA. Types of eligible bond may be listed, including US Government treasury securities, UK Government bonds (*gilts*), bonds issued by *supranational organisations* (e.g. World Bank, EBRD). Ineligible bonds may also be listed, such as Italian Government bonds in which the *withholding tax* on coupon payments makes the use of such bonds as collateral a particular challenge. The minimum credit rating level of bond issuers will also be listed, as will any margin (or haircut) levels; this topic is discussed in this chapter, within Sub-section 4.1.5 ‘Over-Collateralisation: Haircut and Initial Margin’.

Annex 1 may also define deadlines for the receipt of *margin call notifications* by the non-exposed party, following which the collateral giver will offer the exposed party collateral (e.g. a specific quantity of a particular bond), which may be accepted or rejected, as some agreements state that collateral must be ‘mutually agreed’. The type of circumstance in which the offer of collateral is rejected occurs where the bond is eligible under Annex 1, but, for example, the issue may be relatively small with little liquidity.

In a classic repo trade, in order to satisfy the cash lender’s risk a single bond may be given as collateral, or multiple bonds, providing all bonds meet the minimum collateral requirement as stated in the legal documentation.

Concentration Limits Where a firm executes multiple repos concurrently, and where that firm is the cash lender, it is at risk of accepting a disproportionate quantity of the bonds of one single bond *issuer*. Should that issuer default on its financial commitments, the cash lender would be greatly exposed. It is therefore important that incoming collateral is monitored for over-concentration to a single issuer.

Firms should consider setting up internal ground rules for what the firm determines to be a limit to a particular issuer; a firm’s actual exposure in this respect may encompass, for example, collateral received for exposures relating to a range of transaction types in addition to repos, including *securities lending* and *OTC derivatives*.

In general terms, firms should be wary of receiving collateral from a counterparty that is issued by that same counterparty.

Marking-to-Market It is essential that all *non-cash collateral* is subject to frequent revaluation. Bond collateral is subject to daily price (and therefore value) movement, which may be in an upward or downward direction. This means that:

- the cash lender is at risk where bond collateral falls in value, as the cash amount lent is not fully covered by the collateral value
- the cash borrower is at risk where bond collateral rises in value, as the collateral value is in excess of the cash amount borrowed.

Consequently, for the protection of both cash lender and cash borrower, both parties should *mark-to-market* bond collateral at an agreed frequency, preferably daily.

Note that under volatile market conditions, the mark-to-market process may be conducted intraday.

In the mark-to-market process, it is imperative that a firm takes its bond prices from a neutral and independent source, otherwise resultant exposure calculations may prove to be inaccurate leading to disputes with counterparties when needing to mitigate exposures through the margin call process.

General Collateral and Special Collateral In most repo transactions, the bonds in a *cash-based repo* are known as *general collateral* (GC), meaning the cash lender does not require any specific bond to be provided by the cash borrower, although the bonds must be of a certain quality as a minimum, otherwise the cash lender may be at risk. This is significant from the perspective of both parties, because as GC the bonds are solely in the role of providing security to the cash lender.

Conversely, should the cash lender specify a particular bond to be delivered by the cash borrower, the motivation for the transaction is no longer solely the borrowing of cash by the cash borrower, but in addition the cash lender has motivation as it wishes to borrow particular bonds (or equity); this is known as a *stock-based repo*. If the cash borrower is able to deliver the specific bond required by the cash lender, such circumstances mean that the cash borrower is in a position to further negotiate the terms of the transaction, and as a minimum reduce the repo rate. Where the market-wide demand for borrowing a particular security becomes significant, the collateral is said to be *special collateral*.

Consequently, for a GC repo, the repo rate is agreed based upon the quality of collateral being within a specified range, such as US Government-issued bonds with *residual maturity* of up to 5 years. Where a GC repo has been executed, the cash lender may not know from the outset which particular bond issue(s) they will receive from the cash borrower; conversely, the cash borrower must be certain that it can in fact deliver bonds classified as GC.

The repo rate on a special collateral repo is therefore typically lower than for a GC repo due to the higher demand for the particular bond or equity issue; the rates for special repos are issue-specific. From the cash borrower's perspective, giving bond collateral on which there is a greater demand compared with other bond collateral deserves the reward of a lower interest (repo) rate on the cash borrowing. From the cash lender's perspective, special collateral will be utilised beyond solely acting as collateral for the cash loan, and the cash lender is therefore willing to accept a lower rate of return on the lent cash. For example, the cash lender may have *short sold* a particular bond; a failure to deliver the sold bond to the buying counterparty will also mean a failure of the seller (i.e. the cash lender) to receive its sale proceeds at the earliest opportunity, resulting in a loss of cash interest. If the cash lender can (temporarily) acquire an adequate quantity of the same bond issue, that bond may be used (due to the previously mentioned *title transfer* and the change in *legal ownership*) to satisfy the delivery to the buying counterparty whilst simultaneously receiving the sale proceeds. Of course, the cash lender must return the *equivalent collateral* to the cash borrower on the closing leg of the repo transaction. This chain of events is illustrated in Figure 4.2:

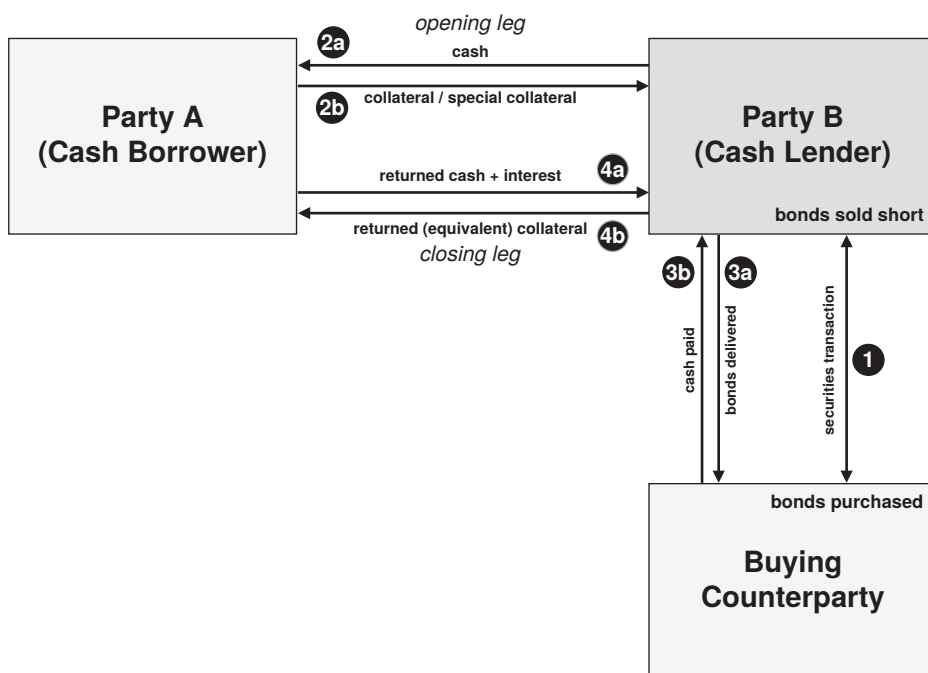


FIGURE 4.2 Example use of stock-based repo and special collateral

- Step 1: Party B executes a (short) sale of a particular bond with a buying counterparty
- Step 2a: Party B executes a stock-based repo transaction with Party A, in which a specified cash amount is lent by Party B, and simultaneously ...
- Step 2b: Party A delivers the specific bond to Party B as collateral for the cash borrowing
- Step 3a: upon receipt of the bond from Party A, Party B on delivers the bond to the buying counterparty, and simultaneously ...
- Step 3b: Party B receives the sale proceeds from the buying counterparty
- Step 4a: on the closing value date of the repo transaction, Party B must return equivalent collateral to Party A, and simultaneously ...
- Step 4b: Party A must return the borrowed cash, plus interest based upon the agreed repo rate.

The above-mentioned use of stock-based repo and special collateral is but one example; another example is the cash lender's requirement to deliver bonds to settle a *futures* contract.

Return of Bond Collateral On the *closing value date* of the repo, the cash lender must return the same bond issue as was received on the opening value date; to clarify, the

same *ISIN* must be returned if it still exists. Conversely, if the *ISIN* that was delivered on the opening value date no longer exists (for example, due to a *corporate action* event such as a mandatory exchange), the replacement *ISIN* must be delivered. To take account of the possibility of such an *ISIN* change, the GMRA describes the securities due to be returned on the closing value date as *equivalent securities*.

Assuming that the cash borrower owns the securities prior to a repo trade being executed, the cash borrower has a position in that security which the cash borrower purchased at a prior point in time. In a repo trade, the cash borrower loses possession of the bond temporarily, but does not lose *beneficial ownership*. Consequently, the same (or equivalent) *ISIN* must be returned to the cash borrower.

4.1.4 Repo Rate Format and Repo Interest Calculation Method

The repo rate is expressed as an annualised percentage (e.g. 3.15%), meaning that, given a cash amount lent of EUR 1,000,000.00 and a loan period of 12 months, the borrower would be required to pay EUR 31,500.00 ($\text{EUR } 1,000,000.00 \times 3.15\%$) of *repo interest* at the close of the borrowing period, in addition to the return of the EUR 1,000,000.00 borrowed.

Where the term of the repo is something less than 12 months, the cash interest owed must be calculated according to the actual number of days for which the cash was loaned, divided by the relevant divisor.

The calculation of repo interest utilises *money market* conventions as used in the calculation of *bank interest*; regardless of currency, the loan period is counted as actual (calendar) days, inclusive of weekends and public holidays. The divisor is based upon the currency in question (either 360 or 365); therefore, an amount of cash borrowed at the same repo rate over the same number of days will, for some currencies produce the same monetary amount of interest, and for other currencies will produce a different monetary amount. For example:

- EUR 1,000,000.00 at 3.15% for 10 days, divisor 360 = EUR 875.00
- USD 1,000,000.00 at 3.15% for 10 days, divisor 360 = USD 875.00
- GBP 1,000,000.00 at 3.15% for 10 days, divisor 365 = GBP 863.01
- AUD 1,000,000.00 at 3.15% for 10 days, divisor 365 = AUD 863.01.

In short, for repo interest the day count is always actual days, and the divisors are simply historic money market conventions; whether 360 or 365, based solely upon the currency in question. Note: the day count and divisor conventions used for the calculation of bank interest (including repo interest) should not be confused with the subject of bond *accrued interest*. To clarify, in a repo trade both bank interest and accrued interest are used:

- the bank interest calculation method is used to determine the amount of cash interest that's receivable/payable on the cash amount lent/borrowed
- the accrued interest calculation method is used (alongside the *clean price* of the bond) to determine the bond's current market value, from which the bond's current collateral value is derived, following deduction of the relevant haircut.

The calculation of repo interest is therefore:

- $(\text{cash amount} \times \text{repo rate} / \text{divisor}) \times \text{days}$.

The days should be counted (*'day count'*) by including the 'from' date but excluding the 'to' date. This is because the first night the lender will be without the cash is the 'from' date (the borrower must start paying interest inclusive of that date), and the date that the lender repossesses the cash is the 'to' date (the borrower will stop paying interest on the 'to' date –1 inclusive). Example calculations are provided in Table 4.4:

TABLE 4.4 Repo interest calculation

Repo Interest Calculation					
Cash Amount	Repo Rate	Borrowing Period	Days of Borrowing	Divisor	Repo Interest
USD 5,000,000.00	2.75%	Mar 01 – Mar 02	1	360	USD 381.94
EUR 15,000,000.00	3.07%	Mar 01 – Apr 02	32	360	EUR 40,933.33
GBP 27,500,000.00	2.45%	Mar 01 – May 10	70	365	GBP 129,212.33

4.1.5 Over-Collateralisation: Haircut and Initial Margin

In repo trades, it is common practice for the market value of the bond collateral to exceed the value of cash by a particular amount. To clarify, the cash borrower is typically required to provide bond collateral that has a market value which is greater than the cash amount borrowed; in other words, the cash borrower is required to *over-collateralise*.

Note: over-collateralisation is common to all collateral-related transactions involving securities collateral, therefore including both *securities lending & borrowing*, and *OTC derivatives* in addition to repo.

The extent of over-collateralisation is dependent upon the risk to the cash lender, in particular the likely collateral value following *default* by the cash borrower. For example, the cash lender will be concerned over the volatility of the collateral's value during the period between agreeing a *margin call* and settlement of that call. Furthermore, a number of factors influence the extent of over-collateralisation, relating to the bond collateral itself and the issuer of the bond, for example:

- type of bond issuer, such as government issuer or corporate issuer
- credit rating: the opinion of the bond issuer's ability to comply with its financial obligations
- residual maturity: the period of time between 'now' and the bond's maturity date
- type of bond issue: such as fixed rate, floating rate, zero coupon.

There are two ways of expressing such over-collateralisation; as a *haircut*, or as an *initial margin*.

Although the calculations differ from one another, the resultant values are very similar (but not identical).

Haircut Haircut is expressed as a percentage and as a low number, such as 2.5%. To determine the cash amount borrowable when a haircut is applicable, the calculation is:

$$\text{market value of bond} \times (100\% - \text{Haircut percentage}) = \underline{\text{cash amount borrowable}}$$

If, for example, the market value of a bond is EUR 30,000,000.00, application of a 2.5% haircut means:

$$\text{EUR } 30,000,000.00 \times (100\% - 2.5\%) = \underline{\text{EUR } 29,250,000.00}$$

Further examples of differing haircut percentages used to derive cash amounts borrowable are depicted in Table 4.5:

TABLE 4.5 Haircut calculation

Haircut	Market Value of Bond	Cash Amount Borrowable
2.5%	EUR 30,000,000.00	EUR 29,250,000.00
6%		EUR 28,200,000.00
15%		EUR 25,500,000.00

Initial Margin Initial Margin is also expressed as a percentage but as a high number, such as 102.5%. To determine the cash amount borrowable when an initial margin is applicable, the calculation is:

$$\frac{\text{market value of bond}}{(\text{Initial Margin}/100)} = \underline{\text{cash amount borrowable}}$$

If, for example, the market value of a bond is EUR 30,000,000.00, application of a 102.5% initial margin means:

$$\frac{\text{EUR } 30,000,000.00}{(102.5/100)} = \underline{\text{EUR } 29,268,292.68}$$

Further examples of differing initial margin percentages used to derive cash amounts borrowable are depicted in Table 4.6:

TABLE 4.6 Initial margin calculation

Initial Margin	Market Value of Bond	Cash Amount Borrowable
102.5%	EUR 30,000,000.00	EUR 29,268,292.68
106%		EUR 28,301,886.79
115%		EUR 26,086,956.52

Note that, although the resultant cash amounts borrowable are broadly similar, as can be seen, a 2.5% haircut does not produce exactly the same result as a 102.5% initial margin.

Haircut and initial margin can be agreed in advance of trading and may be recorded in the legal agreement between parties (i.e. in Annex I of the *GMRA*), or can be agreed ad hoc at the point of trade execution and recorded in the *trade confirmation*. Once agreed for a particular trade, the haircut or initial margin is fixed for the entire term of that trade.

As can be seen from the above examples, haircut and initial margin are usually in favour of the cash lender, where the cash borrower is required to over-collateralise. Under some circumstances however, where a firm has particular anxiety over a counterparty's credit status, application of haircut or initial margin results in under-collateralisation, meaning that the cash amount borrowed is greater than the market value of the bond collateral.

Impact of Haircut and Initial Margin The usual impact of haircut and initial margin in a repo is that the cash borrower receives less cash than the market value of the bond given as collateral. This can result in either 1) the cash amount borrowed being dominant resulting in the bond quantity being increased to account for the haircut or initial margin being deducted from the bond's market value, or 2) the bond's market value being dominant resulting in the cash amount borrowed being reduced by the haircut or initial margin percentage. This concept is represented in Figure 4.3:

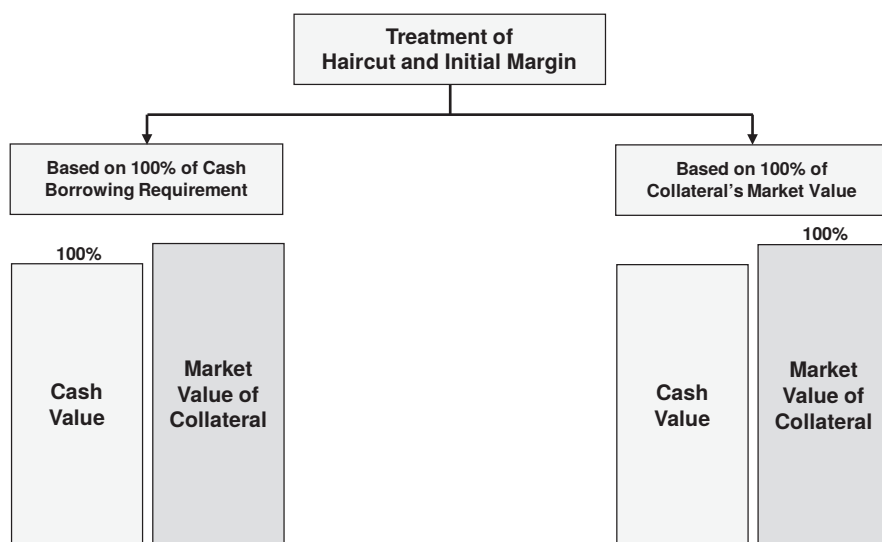


FIGURE 4.3 Treatment of initial margin/haircut on cash amount and bond quantity

The trading parties decide whether haircut or initial margin will be applied in subsequent repo trades (or not), and this is reflected either prior to trade execution within repo legal agreements (Annex 1), or for specific trades at the point of trade execution. The decision as to whether to apply a haircut/initial margin or not is a reflection of the

relative creditworthiness of 1) the trading parties involved, and 2) the bond issuer. If the counterparty has a very good credit rating, and if the bond is of very good quality, then haircut/initial margin may not be applied. It is possible that, between a firm and its counterparty, for some trades a haircut is to be applied, and for other trades initial margin is applicable.

Where haircut/initial margin is applicable in a repo trade, it must be applied consistently including 1) at the opening value date, and 2) throughout the lifetime of the repo.

Example Method of Determining Haircut Percentage To focus on haircut percentages at a more detailed level, the example of the European Central Bank (ECB) will be used, which implemented the following haircut regime, effective 1st January 2011. (Updates can be found at www.ecb.europa.eu/paym/coll/html/index.en.html). A number of factors must be considered to determine the appropriate percentage haircut for a given piece of securities collateral.

Firstly, the issuers of debt securities are structured into 5 categories, as shown in Table 4.7:

TABLE 4.7 Liquidity categories for marketable assets

Liquidity Categories for Marketable Assets				
Category I	Category II	Category III	Category IV	Category V
Central government debt instruments	Local & regional government debt instruments	Traditional covered bank bonds	Credit institution debt instruments (uncovered)	Asset backed securities
Debt instruments issued by central banks	Jumbo covered bank bonds	Structured covered bank bonds		
	Agency debt instruments	Multi-Cedulas		
	Supranational debt instruments	Debt instruments issued by corporate and other issuers		

Note: information listed is at summary level only – please refer to ECB for complete details

To explain the content of each category:

- Category I
 - Central government debt instruments
 - debt issuance by national governments
 - Debt instruments issued by central banks
 - debt issuance by central banks for monetary policy operations and/or for the development of financial markets (where there may be no government bonds in issue)

- Category II
 - Local & regional government debt instruments
 - debt issuance by municipalities, cities, counties/states for the financing of local and regional infrastructure
 - Jumbo covered bank bonds
 - debt issuance by banks in the form of collateralised mortgage bonds raising at least EUR 1,000,000,000 (1 billion)
 - Agency debt instruments
 - debt issuance by a national government agency, such as the Government National Mortgage Association (US), which may be guaranteed by the national government
 - debt issuance by government sponsored entities (US), such as the Federal National Mortgage Association, which are not openly guaranteed by the national government
 - Supranational debt instruments
 - debt issuance by organisations representing multiple countries, such as the International Bank for Reconstruction and Development, and the African Development Bank
- Category III
 - Traditional covered bank bonds
 - debt issuance by banks backed by a pool of assets that secures the issuer's bond commitments if the issuer becomes bankrupt, and which are backed by special laws
 - Structured covered bank bonds
 - as per traditional covered bank bonds, but are backed by general contractual laws
 - Multi-Cedulas
 - debt issuance of mortgages by Spanish regional banks that are pooled together
 - Debt instruments issued by corporate and other issuers
 - debt issuance by corporations for business expansion purposes
- Category IV
 - Credit institution debt instruments (uncovered)
 - debt issuance by banks and savings banks that are not secured by any underlying pool of assets
- Category V
 - Asset backed securities
 - financial instruments issued based upon a specific pool of underlying assets (generally unable to be sold in their own right) which are *securitised* and sold to investors.

In order to derive the appropriate haircut percentage, Table 4.7 (the liquidity category table) must be used in conjunction with Table 4.8 'Levels of haircut percentages applied to eligible market assets'.