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Perspectives on bond lending and specialness

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Resumé

Dette papir giver en grundlæggende indføring i markedet for udlån af obligationer og gennemgår de væsentligste resultater fra den akademiske litteratur på området. Disse resultater sammenholdes med aktuelle prisdata på obligationsudlån i det amerikanske og europæiske marked for perioden 3. marts 2003 til 14. maj 2004.

Tre specifikke områder inden for obligationsudlån gennemgås derefter. Først undersøges forskellene mellem obligationsudlåns-markederne i USA og Europa og en række faktorer der kan forklare denne forskel identificeres. Dernæst undersøges de cykliske bevægelser i priser på obligationsudlån i det amerikanske marked og endeligt gennemgås sammenhængen mellem likviditet og obligationsudlån.

Papiret afsluttes med en gennemgang af potentielle investeringsstrategier til udnyttelse af strukturelle forhold i obligationsudlånsmarkedet.

Abstract

This working paper provides a basic introduction to bond lending and reviews the main results from the academic literature. These results are compared with actual price data on bond lending from the US and European markets for the period from 3 March 2003 to 14 May 2004.

Three specific issues regarding bond lending are subsequently discussed. Firstly, the differences between the markets for securities lending in the US and in Europe are explored and a number of factors that explain this difference are identified. Secondly, cyclical movements in the prices for borrowing bonds are explored. Thirdly, the relationship between liquidity and bond lending is reviewed.

The last part of the working paper discusses investment strategies to exploit the structural relationships in the bond lending market.

Perspectives on bond lending and specialness[1]

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Executive summary

Securities lending is basically a way to borrow cash against collateral. By collateralizing the loan with securities with certain characteristics, it is possible to borrow cash at a prevailing market rate. This rate is called the General Collateral (GC) rate, and is typically lower than the rate on unsecured deposits, reflecting the lower credit risk.

If a security for some reason is scarce, a counterpart may be willing to lend cash at a rate lower than the GC rate given that the specific security is used as collateral. The cash obtained can subsequently be placed in the market at the GC rate. The difference between the interest rate received (GC rate) and the interest rate paid (so called specials rate) is the fee for lending the specific security. A security that can generate such a fee when lent is said to be trading special.

In order to understand what drives the level of specialness, we take a closer look at the drivers of demand and supply of securities in the lending market. The demand is mainly driven by the desire of some market participants to go short in a specific asset, for instance to benefit from price declines. After going short, market participants will typically borrow the security, to be able to deliver, and thereby increase the demand for borrowing. The degree of short selling in a specific security is mainly driven by interest rate risk management and delivery obligations in futures contracts. The supply of securities available for borrowing is driven by such factors as bond investors' internal guidelines for securities lending and transaction costs.

After short selling a security, market participants will typically borrow the security to be able to deliver. The cost of not delivering a bond is in most cases equal to the GC rate. Thus under normal circumstances, the fee that bond owners can earn from lending a security is less than or equal to the GC rate.

Our access to a data set for the period March 2003-May 2004 with special rates on US Treasury bonds and German government bonds facilitates a comparison of the two markets. It is clear from the data, that the absolute number of bonds trading special and the level of specialness are significantly lower in German government bonds. In this paper, a number of structural differences, that appear likely to explain this, are pointed out. The differences include the issuance policy of reopening existing issues in Germany, the existence of a pre-trade market in the US, the large issuance of corporate bonds and mortgage-backed securities in the US relative to Europe, different levels in interest rate volatility, and the fact that European bonds are mostly traded with three days to settlement whereas bonds in the US market are mostly traded with only one day to settlement.

In Keane (1996) it is demonstrated that the specialness of the US treasuries follows a predictable pattern over the treasury issue cycle. The most recent issued bond tends to be trading more special than older issues. Interestingly however, within a cycle, a bond is normally trading more special during the period just before a new issue is auctioned than was the case just after its own issuance. A reason for this could be that gradually more investors hold the bond with the intention of keeping it to maturity and may be less active in the lending market. Another reason

could be that market makers go short in the old bond as the new bond is sold in the "when-issued" market[2], in order to hedge interest-rate risk.

As demonstrated in Duffie(1996), securities that are trading special during their lifespan, trade at a higher price than identical non-special securities. If not, it would be possible to generate arbitrage profits, as the price differential should equal the value of the expected future return generated from the specialness over the lifespan of the security.

The existence of a liquidity premium, that is the perceived value of holding a liquid security over a less liquid security, may however also lead to a price differential. The liquidity premium in a sense represents a non-pecuniary feature of the bond, as the bond typically will be characterized by a lower bid/ask-spread, which explains why investors prefer holding the more expensive of two otherwise identical issues.

Duffie(1996) demonstrate, that the most liquid securities tend to be the most special securities. Hence the liquidity premium and the specials premium seem to be present at the same time and as the most liquid securities tend to be newly issued, the two premia are therefore likely to be at its highest immediately after the bond has been issued and then decrease over time.

With considerations about the relationship between liquidity and specialness in mind, we have a theoretical basis for discussing the optimal strategy in portfolio management with regard to specialness. When investing in bonds that trade special, the costs and benefits should be weighed against each other. If an investor fails to exploit the specialness of bonds in his portfolio, he will be less well off, compared to a strategy of holding bonds that are not on special, unless the cost of not exploiting this is less than the value of other non-pecuniary factors such as high liquidity.

It could be considered to segment the portfolio into parts where different degrees of liquidity is needed. The part of the portfolio that has a lesser need to be liquid could contain bonds that generally do not trade special. This reduces the need for bond lending activities. The part of the portfolio that needs to be more liquid could contain liquid securities that are more likely to be on special. This part of the portfolio should of course be lent when the fee exceeds the cost of doing so.

In order to exploit the specialness of bonds held in the portfolio, it is necessary to be active in the lending market. A potentially cost-efficient lending strategy is to use an agent, although this is clearly dependent on the internal costs related to bond lending. When using an agent for securities lending, the construction of a good contract should be considered. Under the assumption that the future levels of specialness were certain (or the agent was risk neutral)[3], the optimal contract

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[2] The ”when-issued” market is a market in Treasury bonds that are still not issued. The seller of a “when-issued” is obliged to deliver the bond, once it is issued.

[3] If the future level of specialness were certain, the value of the fees collected in the future would be known. In that case there would be no risk involved in making a contract based on a fixed fee. If the future value were uncertain, the risk arising from the contract would normally have to be compensated by a risk premium. However, if the agent is risk neutral, he is by definition only concerned with the expected value and will not demand a risk premium.

would give the investor a fixed fee. This would maximize the income of the marginal effort for the agent. If the assumption does not hold, the agent would demand a risk premium for paying a fixed fee. Depending on the size of the risk premium and the risk aversion of the investor and the agent, instead, it may be optimal for the investor to divide the lending fees. However, if the income is divided, the optimal split will depend on the agent's marginal cost on lending bonds from the portfolio.

1. Introduction

The working paper is one of the results of an internal project in Danmarks Nationalbank aimed at increasing our practical knowledge of bond lending markets, primarily to increase the return on our lending activities on the foreign exchange reserve[4]. The inquiry into bond lending markets, however, proved to be somewhat broader than our original intentions and our interest in the theoretical aspects of bond lending markets led us to write this working paper.

The first aim of this paper is to provide insight to selected parts of the theoretical literature on security lending in order to increase the understanding of these markets. The results from the theoretical literature are compared to a data set with special rates on bondlending obtained from Citigroup. The driving forces behind specialness are analysed and three topics of specific interest are chosen for further analysis:

- The institutional differences between the bond lending market in Europe and the US and their impact on specialness
- Cyclical movements in specialness during the issue cycle
- The link between liquidity and specialness.

Finally, investment strategies related to bond lending activities and market segmentation are discussed.

The structure of the working paper is as follows. Section 2 covers the basic functioning of the repo market. Section 3 is devoted to the dynamics of the specials market as well as discussing the level of specials rates, i.e. the rate at which specials are lent. Section 4 explores a dataset provided by Citigroup and a number of summary statistics are subsequently discussed in the light of the discussions in section 2 and 3. Section 5 takes a closer look on the three above-mentioned topics. Section 6 discusses investment strategies that can be used to exploit the characteristics of bond lending markets found in previous sections.

4 A securities lending programme exists on the domestic side as well. This programme is set up in order to enhance the functioning of the domestic bond market rather than to generate return. Therefore, this programme is not considered here.

2. The repo market

This section gives a general introduction to bond lending and the repo market. First the transactions in a repurchase agreement are explained, and the determinants of the degree of specialness are discussed.

A repurchase (a repo) agreement is an agreement where investor A agrees to sell a security today and to buy it back at a fixed price on a future date. Investor A thereby receives cash in return for the security but keeps the market risk on the security. The buy back price is set to reflect a market rate on the cash received – i.e. the investor has "repo'd out the security".

It is also possible to do the opposite, i.e. a reverse repo. In a reverse repo, investor A agrees to buy a security and to sell it back at a fixed price on a future date. The investor has "reversed in the security". The investor thereby lends cash at a market rate but also receives collateral for the loan. An excellent introduction to securities lending can be found in Faulkner (2004).

The transactions are illustrated in Chart 1. Since there are only two parties involved in the transactions, investor A and investor B, it is called a 2-party repo. Often a third party is used for the custody of the collateral. This is called a tri-part repo agreement. When investor A makes a repo with investor B, investor B makes a reverse repo and vice versa.

A repo transaction is in a legal sense a sale and a repurchase of securities. It is legally treated as a single trade, a sale of securities and an obligation to repurchase the same security.[5] Economically repo agreements are equivalent to a collateralized or secured cash loan since the lent securities can be thought of as collateral for the borrowed cash.

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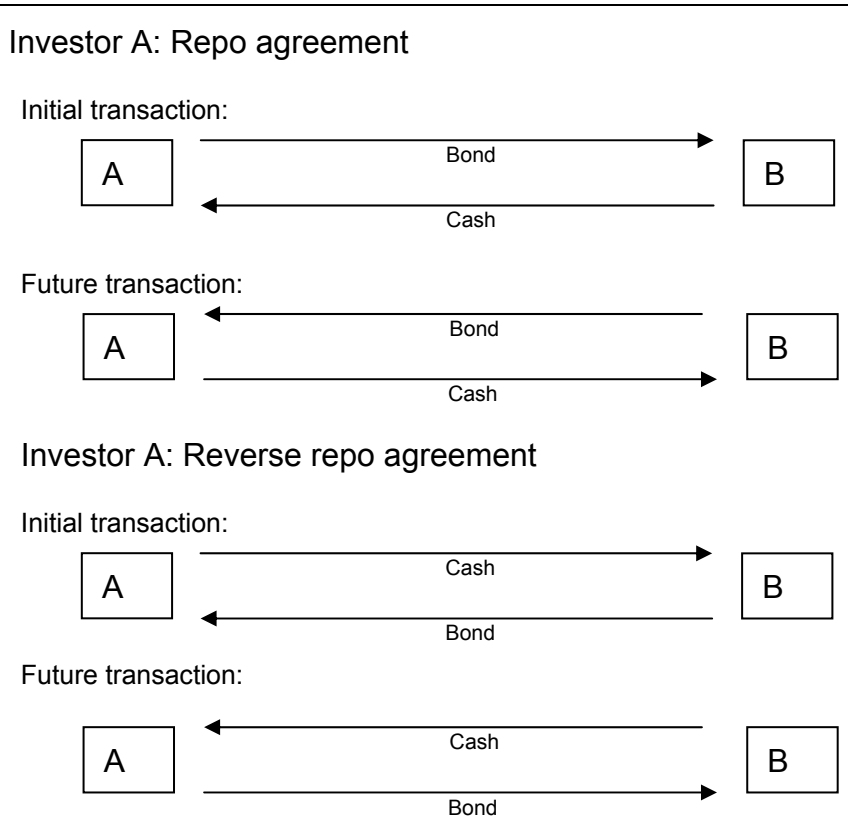
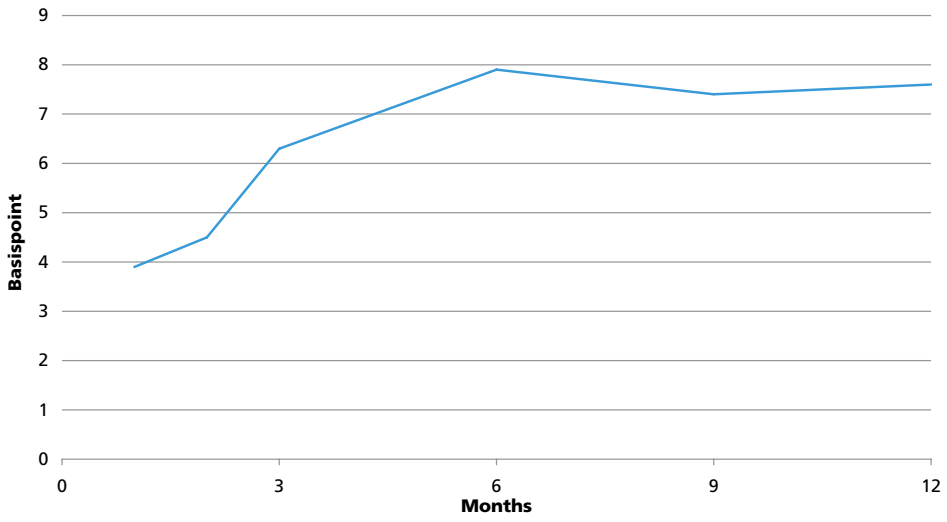
[5] Other types of lending of securities to counterparties against collateral (secured lending, sell-and buy-backs) may have different legal characteristics. Master agreements (EMA and GRMA) are the typical legal framework for repo transactions and for some secured lending and sell-and-buy-backs as well. The legal characteristics of those three types of securities lending are different, but from an economic point of view they are equivalent.

A REPO AGREEMENT AND A REVERSE REPO AGREEMENT Chart 1



As shown in the graph below, there is a difference between the repo rate, also known as the General Collateral (GC) rate, and the rate on an unsecured loan (here LIBOR).

DIFFERENCE BETWEEN THE DEPOSIT RATE AND REPO RATE Chart 2



Note: Data is for the European market on 13 August 2004.
Source: Bloomberg.

The difference between the secured and the unsecured rate can be viewed as the price of credit risk. The longer the maturity of the loan, the higher the credit risk tends to be, cf. Chart 2. The graph is based on European interest rates, but the relationship is the norm in most markets although the spread might differ across countries.

The repo market is attractive for both investing and funding as investors can avoid counterparty/credit risk on the borrower. Owners of assets may place these assets as collateral for a loan and thereby obtain a low financing cost as the credit risk on the loan is eliminated. This allows borrowers access to funding at levels which they would not otherwise have obtained.

A repo/reverse transaction can also be used to lend out securities, as the lender of cash obtains securities. Thus, the repo/reverse transaction may also be an instrument for bond lending.

There is extensive literature on the repo markets. For an introduction to repo transactions, see for instance Cook and Laroche (1993), Chapter 6. In Box 1 the quantitative importance of the repo market is documented.

All in all, the characteristics of the repo/reverse market make it an essential part of the financial markets. It can be used to reduce credit risk on loans, to obtain cheaper financing and as a vehicle for bond lending.

THE SIZE OF THE REPO MARKET — Box 1

A report on the repo market is compiled semi-annually by the International Securities Market Association (ISMA). In the report from March 2004, see ISMA (2004), the results of a survey on the repo markets from December 2003 is presented.

The survey is in some ways incomplete as it does not cover all financial institutions. Furthermore, only financial institutions in Europe or European branches of international financial institutions were surveyed. Nonetheless the survey still has value as it covers a large proportion of the European market.

The survey showed that as of 10 December 2003, the total value of repo contracts outstanding was EUR 3,788 billion. Of this 72.7 per cent was denominated in EUR, 10.3 per cent in GBP, 10.6 per cent in USD, and the rest in other currencies.

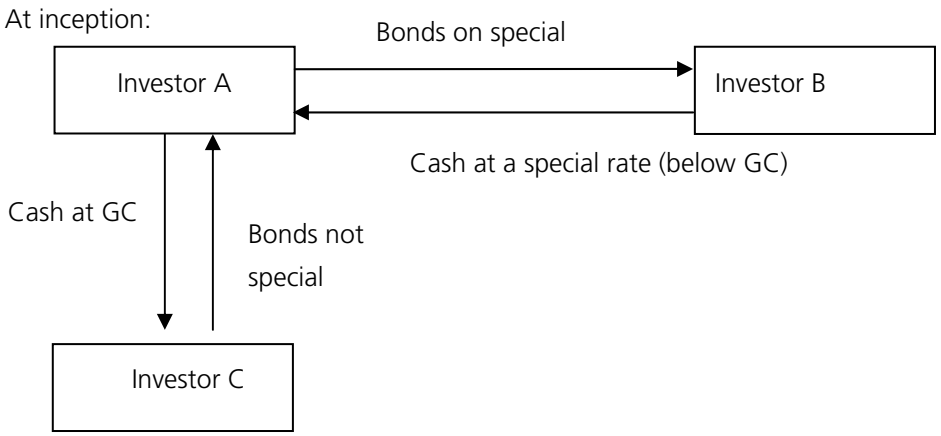
Most repo contracts had a maturity of less than 1 month (63.8 per cent). Only 11.2 per cent of the repos were tri-party repos.

3. The specials market

In some cases, specific securities are in particular high demand, and some market participants are willing to lend money at a rate below the market rate if the high-demand asset is placed as collateral. When this happens, the asset is said to be "special". By supplying the asset as collateral and obtaining funds at a rate below the market rate, a profit is gained by placing the obtained funds at the market rate.

It is common that the obtained funds from the bond lending transaction are placed in a repo transaction with non-special issues as collateral. Hereby the bond lender earns the spread between the standard GC rate and the specials rate, i.e. the rate at which an investor can borrow against posting the special as collateral, cf. Chart 3. The special spread (or premium) is the income/profit of lending specials, i.e. the difference between the GC rate and the specials rate.

CAPTURING THE SPECIAL SPREAD (SPECIAL PREMIUM) Chart 3



Note: At the expiration of the repo agreement, the bonds are returned together with the cash and accrued interest. Investor B and C is often the same investor.

The relationship between the price and specialness of a bond is described in the academic literature. Duffie (1996) shows that specialness increases the equilibrium price for the underlying bond by the present value of savings in borrowing costs associated with the repo specials. This is the case since an arbitrage profit could be made if the security on special had the same price as an otherwise identical security not on special.

The theoretical model of Duffie (1996) is empirically tested in Jordan & Jordan (1997) which confirms the model. Specialness is priced into cash prices, and on-the-run securities[6] do trade at higher prices (lower yields) due to a higher specialness compared to off-the-run securities. However, they cannot exclude the presence of an additional liquidity premium. A simple model to describe the relationship between specialness and the cash market is shown in Box 2.

[6] On-the-run securities are the most recently issued securities while off-the-run issues are "older".

RELATION BETWEEN SPECIALNESS AND THE PRICE IN THE CASH MARKET — Box 2

Notation:
P = Price of a Treasury note that is not special
P' = Price of an identical note that is on special
GC = General Collateral rate (simple interest per day)
SR = Special rate (simple interest per day) and
m = Number of days the issue will be on special

An investor, who owns the note on special, enters a repo agreement for m days at a special rate, SR, per day. This investor receives P' today and agrees to repurchase the security for P' * (1+mSR) in m days. Similarly, an investor, who owns the issue not on special, enters a repo agreement, receives P, and agrees to repurchase the security for P * (1+mGC) in m days. After m days the specialness ends, therefore the price of the two issues must be the same:

$$P \times (1 + mGC) = P' \times (1 + mSR)$$

This can be rearranged to:

$$\Delta P = P' - P = m \times (PGC - P'SR)$$

The equation shows, that the difference is equal to the interest savings per day, PGC – P'SR, multiplied by the number of days m that special financing is available.
The first equation can also be rewritten as:

$$P' = P \frac{(1 + mGC)}{(1 + mSR)}$$

Since GC is higher than SR, P' is higher than P. This leads to the conclusion that specialness in the financing market will be priced in the cash market.

Source: Jordan and Jordan (1997), Duffie (1996).

3.1 What drives repo specialness?

The specials market does not distinguish itself from other markets as it is demand and supply that drive specialness. This section lists some of the forces behind the demand and supply dynamics in the specials market.

The demand for particular securities is typically driven by short selling activities. Many financial market participants are allowed to establish short positions in assets such as bonds or equities. Selling an asset, which is not currently owned, creates a short position. The short sellers of the asset thereby benefits from declining prices, as the asset after a price decline can be bought at a cheaper price and used to cover the short position. On the other hand, any price increase in the asset will result in losses. In general, the possibility of shorting assets increases the manoeuvrability of financial market participants.

It is relatively simple to create a short position, as this just requires selling a security. If the seller wants to avoid failing on the delivery, he will borrow the security. These two transactions need not even be linked. Often an asset is sold before it is borrowed, with the intention to either borrow or buy it later.

There is a cost for the investor failing to deliver the bond to the buyer. The existing of a cost for failing delivery consequently makes the seller willing to pay a premium for borrowing the bonds. This willingness to pay a premium gives rise to specialness of some securities. The determinants of the prices are examined in section 3.2.

In order to understand why some securities trade special one therefore has to examine the causes of short selling. The reasons for short selling are many. Clearly, expectations by some market participants of a drop in prices are obvious reasons to establish a short position. Market participants suggest, that more securities trade special and at a higher spread when there are strong opposing views in the market about the future price of these securities.

In the management of interest-rate risk, short selling is an essential tool for many market participants. Market makers of securities are obliged to sell and buy securities. This obligation may result in short positions if customers keep buying the security in which the market maker trades. At some point, the market makers inventory of the security is sold but as the obligation to sell the asset remains, further demand for the security will result in a short position, and possibly a demand to borrow the specific security.

Market makers can, on the other hand, accumulate a long position, if customers keep selling an asset. As the market maker typically does not want to have unlimited interest-rate risk, the market maker must find another way to shed interest-rate risk outside the accumulated asset. This can be done by short selling a different asset, which is viewed as a substitute for the long position in the market maker security. Short selling can therefore be used to lower the overall risks of a portfolio with long positions in other assets.

Interest rate risk management is not only restricted to market makers. Other asset managers also benefit from short selling as a risk management tool. One example is an asset manager, with a diversified portfolio of less liquid bonds, who has decided to reduce overall interest-rate risk. The asset manager has a choice between selling the less liquid bonds directly or short selling a liquid substitute. If an outright sale of the bonds is preferred, this is very likely to result in a relatively high transaction cost, due to the large bid-ask spreads, which is seen on lesser liquid securities. Short selling a liquid bond may reduce overall transaction cost as it will allow the asset manager to sell the less liquid bonds over a longer period of time and gradually remove the short position used as a hedge.

Another case where short selling can be used as a risk management tool is when new securities are auctioned. For example, if a short position is established in close substitutes to those on auction, there is room for the investor to buy the new security at the auction without exceeding the desired level of risk.

More speculative investors, such as hedge funds (e.g. the former Long Term Capital Management), may use short selling as an instrument to exploit arbitrage opportunities in the market. In some cases, two identical securities may trade at a marginally different price, for instance equity traded at two different exchanges. By short selling the more expensive of the two and buying the cheaper asset, a

speculator can speculate in a convergence of the two prices[7]. Convergence trades may therefore also lead to short selling.

The existence of bond futures contracts may also give rise to repo specialness. At the expiration of a futures contract, the seller of a future must deliver a bond to the buyer of the futures contract. As only certain bonds can be delivered, a seller of a futures contract may be unable to deliver the required bonds. As a large fine will be issued if the seller fails to deliver into the futures contract, the borrower therefore will be willing to borrow the security at almost any cost. Consequently, the failure to deliver the specified bonds gives the seller of the futures contract the incentive to borrow the security.

Finally, short selling may also be used to increase risk by leveraging across markets as the cash received by short selling may be used to invest in a different market. For instance, if an investor believes that equities are likely to fall but bonds are likely to rise, the investor can short sell equities and use the cash received to invest in bonds. The bonds can then be used to obtain a secured loan at the repo rate. Thus, a speculative position can be created with a small capital base. Clearly such strategies are high-risk and can be complex, but they enable speculative investors to create leveraged positions.

As demonstrated above, the use of short selling can be a powerful tool, both as an instrument to lower but also to increase risk. A market for securities lending facilitates short selling as it reduces the risk of failing to deliver a security and thereby reduces the potential costs of short selling. In other words, an efficient lending market is likely to reduce the cost of interest-rate risk management.

The demand for specials is thus largely determined by the amount of short selling in the market. As discussed above, there may be many different reasons for short selling. Therefore the demand dynamics are not easily modelled.

On the supply side of the bond lending market, one finds asset managers of various sorts, including insurance companies, pension funds and central banks. The supply of a given asset is not equivalent to the outstanding amount. Many asset managers are restricted by guidelines to engage in securities lending activities. The distribution of ownership of the issue is also important in the model presented by Duffie (1996). For example, if an issue is largely held by investors who do not need financing and thus do not generally participate in the repo market, the available supply for repo transactions will be reduced.

The supply of assets is also dependent on the specials rate. Some securities lenders require a minimum spread in order to lend securities. Others restrict the supply when the specials rate is close to zero (the fee is close to GC), as they fear their counter parties will fail to deliver the bonds, when the bond lending contracts mature.[8] The supply dynamics is not easily predicted, as it is often driven by internal guidelines at the securities lenders.

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[7] Whether this is a true arbitrage opportunity, can be questioned as differences in the prices may be attributed to less measurable characteristics, such as differences in liquidity.

[8] See Fleming & Garbade (2002) for an example related to the 9-11 terrorist attacks.

A case of increased supply of Treasury bills, notes and bonds is examined in Moulton (2004). It is documented that the change in Federal Reserve's securities lending programme which led to a larger supply of bonds available for lending[9], led to overall lower specials rates. The consequences of the changes to the program could be seen in all segments of the yield curve.

Governments' issuance policy is also important for potential specialness. For example, the use of either tap issuance or auctions for bond sales influences the expected supply of bonds. By tap sale there is ongoing issuance in the same series which means that extra demand can be met by extra supply. Thus, tap sales will – compared to auctions – lead to less specialness.

To summarise, it is very difficult to predict the supply and demand dynamics of the specials market. However, there are some characteristics, summarised in Chart 4, which drive the market for specials.

WHAT DRIVES REPO SPECIALNESS? Chart 4

Demand factors	Supply factors
Opposing views on the future price of a security (and positioning according to those views)	Issuance policy
Market making	Internal guidelines for asset managers
Futures contracts	Administrative costs
Interest-rate risk management	Transaction costs
Delivery-failure cost	

Factors that drive demand are related to demand for short selling, price expectations, market making obligations, and use of future contracts as well as the cost of failing to deliver. Supply is driven by the distribution of bonds among investors (who are more or less willing to lend) and of the cost of lending.

In a paper by Graveline and McBrady (2004), factors driving the demand for short selling are identified and empirically tested. They explore the response of US Treasury special repo rates to a number of economic variables.

They find three important factors that drive short-selling demand and hence specialness. Firstly, increasing mortgage refinancing activity lowers the demand for short-selling. Secondly, increased interest rate volatility increases the demand for

9 See Fleming & Garbade (2003) for a more extensive description of the programme.

short-selling. And thirdly, increased bond issuance activity increases the demand for short-selling.

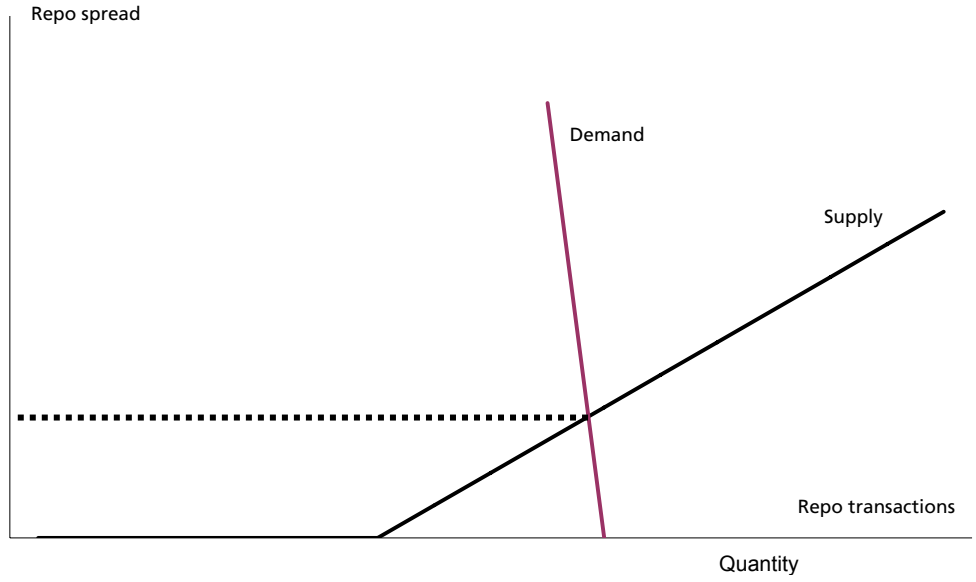
A higher mortgage refinancing implies that the duration in portfolios with mortgage-backed securities is decreasing and hence makes investors add duration to their portfolios. Mortgage investors, will in periods of refinancing activity, therefore be reluctant to engage in short-selling activities. The impact from mortgage investors appears to be so large that it spills into the US Treasury market.[10] This can be considered a variant of the argument regarding interest rate risk management.

Increasing volatility levels can be seen as representing disagreement among market participants on the future level of interest rates. As discussed above, opposing views are likely to lead to short-selling.

Underwriters of debt wish to hedge their interest-rate risk. Greater issuance implies more short selling activity, as they need to lower their overall duration in order to make room for the upcoming bond issuance. This also leads to short-selling activities. Hence interest rate risk management related to bond issuance is found significant.

Chart 5 below demonstrates in a simple model how the repo spread is determined. The supply of repos and the demand for reverse repos determine the repo spread, that is the fee.

AN EQUILIBRIUM REPO SPREAD — Chart 5



Source: Fischer (2002).

[10] This is also in line with Perli and Sack (2003), who find significant effects on the US Treasury market from hedging activity in the mortgage market.

The demand for a special trading bond is rather price inelastic as higher costs for shorting is only likely to deter few investors from entering short positions. The reasons for shorting securities are typically not dependent on the specials rate as short selling is often done before the special rate is set. Even at high special rates an investor might have reasons to short sell the bond on special, for example if the investor expects a significant price fall.

On the supply side, there will always be some securities available as they will be used for collateral on repo transactions traded at the GC rate. More investors will enter the bond lending markets as spreads become wider. This is due to the fact that some bond lenders require a minimum spread. One could argue that supply falls at very high special rates as some bond lenders may fear that they cannot get the bonds back due to a high fail rate on very special bonds, thus exacerbating prices even higher.

If the demand curve intersects the supply curve, where it coincides with the horizontal axis, then the repo spread will be zero (special rate equal to GC).

3.2 The level of the special rate

Specialness typically originates because a market participant has an obligation to deliver a specific security, but does not have the security. To understand the fluctuation band that the special rate moves within, it is therefore crucial to understand the consequences of a failed settlement.

Assume that a seller of a paper cannot deliver the sold bond at the promised date. In this case, the buyer is not obliged to pay for the bond until the bond is delivered. Thereby the money intended for the bond sale is still in the possession of the buyer. By placing the money on a short-term money-market account, the current market rate, e.g. the overnight repo rate, can be earned. As long as the seller of the bond does not deliver, the buyer can earn the current overnight market rate on the money set aside for buying the bond. When the bond is eventually delivered, this is done at the originally agreed price. Therefore the buyer obtains a short-term money-market interest rate in addition to the bond yield until the bond is delivered.

Another way to look at it, is that the seller of the bond looses the current short-term money-market rate. The seller thereby has an incentive to borrow the bond and deliver the borrowed bond to avoid this loss. The seller will be willing to pay a premium up to the level of the money-market rate if he can borrow the specific bond.

Based on the above argumentation, one would expect the specials rate to fluctuate between zero per cent and the overnight repo rate.

The special premium can in rare circumstances exceed the repo rate. If the special premium exceeds the repo rate, it corresponds to a negative specials rate. This can happen when futures contracts expire and failure to deliver causes penalty. The special premium can in such cases in principle constitute the repo rate plus potential penalty due to failed delivery into the futures contract.

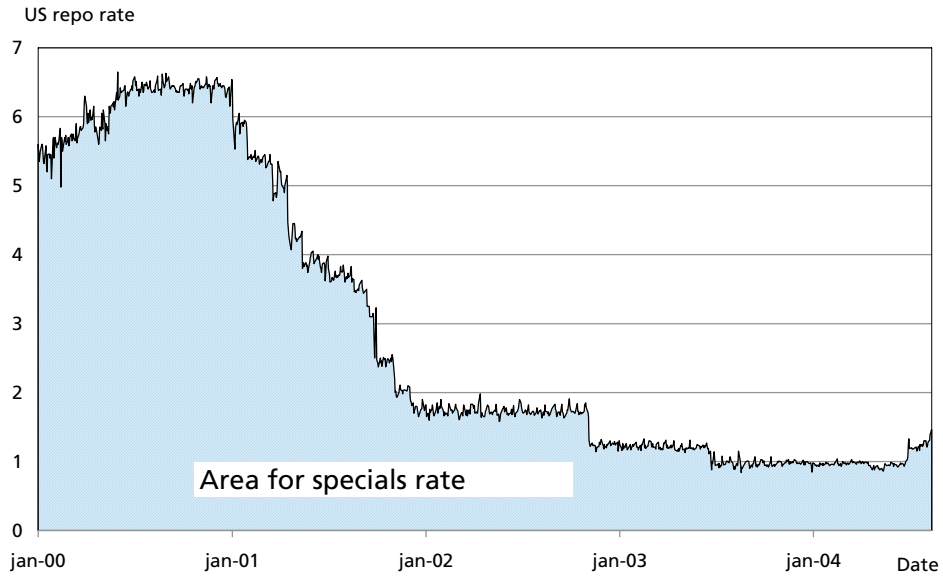
Another case of negative special rates is examined in Fleming & Garbade (2004). This is a case from 2003, with an extraordinarily high demand for short positions in

a 10-year on-the-run Treasury note, in a period with a significant increase in interest rates. The bond traded special with a negative specials rate (i.e. special premium above GC) in some periods with an overall shortage of the bond. The long period of failed delivery imposed other opportunity costs; such as increased back office workload due to the many settlement fails, strain on customer relationships, as the dealers were unable to deliver the bonds they had sold, and increased capital charges[11]. Therefore, dealers became willing to pay negative special rates (very high special premiums).

If the special rate of a specific bond approaches zero (and the premium therefore approaches the level of the GC), the incentive to deliver the bond at the promised date is reduced. The penalty for not delivering becomes close to the cost of borrowing the security, and the likelihood of failing delivery therefore increases with the degree of specialness. This could possibly lead to an unstable situation. Such an unstable situation actually occurred after the 9/11 terrorist attacks. The unstable situation was solved by an extraordinary new issuance to increase the supply of that particular bond, c.f. Fleming and Garbade (2002).

However, the rate for specials would, as mentioned, typically move in the shaded area below the repo rate in Chart 6.

US REPO RATE AND AREA FOR SPECIALS RATE — Chart 6



Source: Bloomberg.

Compared to earlier, the prevailing low interest level has led to declining earnings on specials. High interest rates increase the costs of failing, which increases the incentives to reduce fails, which in turn stimulates the specials market, and gives greater potential for specials rates. Low interest rates have the opposite effect.

[11] The net capital rule of the US Securities and Exchange Commission provides that dealers have to maintain additional capital – that is assets in excess of liabilities – for fails to deliver more than 5 days old and for fails to receive more than 30 calendar days old.

4. Data analysis

The special market can be described empirically. We have studied a data set containing observations of specialness for 71 US treasuries for a period of 14 months (from 3 March to 14 May 2004). The data was provided by Citigroup.

The key figures from the data are shown in Table 1.

'

US TRESURY SPECIALS FROM MARCH 2003 TO MAY 2004 Table 1

	1y	2y	3y	4y	5y	6y	7y	8y	9y	10y	Total
Number of bonds	4	22	9	7	14	3	2	2	2	6	71
on-the-run		15	4		11					5	35
off-the-run	4	7	5	7	3	3	2	2	2	1	36
					Number of observations						
Total	1204	4661	2228	2205	2509	945	630	630	630	1283	16925
on-the-run		329	265		325					319	1238
old-on-the-run		315	195		315					315	1140
old-old-on-the-run		315	129	54	261				54	261	1074
off-the-run	1204	3702	1639	2151	1608	945	630	630	576	388	13473
					Number of special observations						
On-the-run and special		282	247		308					301	1138
Old-on-the-run and special		312	187		311					314	1124
Old-old-on-the-run and special		295	128	54	253				53	257	1040
Off-the-run and special	363	1164	1278	1417	1276	877	440	442	272	386	7915
					Per cent						
On-the-run and special		86	93		95					94	
Old-on-the-run and special		99	96		99					100	
Old-old-on-the-run and special		94	99	100	97				98	98	

Note: A treasury is called on-the-run if it is the most recently issued treasury within the segment. The second most recent issue is called old-on-the-run, and the third most recent is called old-old-on-the-run. The rest is called off-the-run. A special observation arises when the special premium exceeds zero basis points.
Source: Citigroup.

A treasury security is called on-the-run if it is the most recently issued treasury security within the segment. New treasuries are issued in either the 2-, 3-, 5- or 10-year segment.[12] The 2- and 5-year treasury securities are issued each month while the 3- and 10-year treasury securities are issued quarterly.

Each column in Table 1 indicates a segment of maturity from one to ten years. The first three rows show the number of treasuries in each segment, and the number of respectively on-the-run and off-the-run treasuries. The number of on-the-run treasuries is complete, i.e. all treasuries that have been on-the-run during the period are included in the data set. However, this is not the case for the off-the-run treasuries. If an off-the-run treasury during the period has not been trading special at all, the treasury security is not included in the data set. Of the 71 treasuries in

[12] Today also 30-year bonds are issued, however this was not the case in our sample period.

the data set, the 35 have been on-the-run during the period. The remaining 36 treasuries have only been off-the-run in the considered period.

In total, the data set contains 16,925 observations. The observations are divided into four categories, depending on the benchmark status of the treasury when it was trading special for the first time. If a treasury becomes special while being on-the-run, it is put in the on-the-run category. The second most recent on-the-run treasury is called "old-on-the-run". The third most recent is called "old-old-on-the-run". Even less recent on-the-run treasuries all fall in the "off-the-run" category. If a treasury security becomes special for the first time while it is "old-on-the-run", it is put in the "old-on-the-run" category, and so forth.

Firstly, it can be seen from the Table that more than three quarters of the observations are off-the-run treasuries. This illustrates that treasuries are on-the-run for a rather short period, and that specialness continues even after a new note has been issued.

Secondly, it can be seen that treasuries that are either on-the-run or recent on-the-run issues have a very high share of observations trading special. On-the-run treasuries are trading special 92 per cent of the time, and for the old- and old-old-on-the-run the percentage is even higher (98 per cent). The percentage for the off-the-run treasuries is 70, but since not all off-the-run treasuries are included in the data set, this percentage is difficult to interpret and definitely lower than 70 per cent.

From Table 2 below it can be seen that the degree of specialness on average is rather low (due to the generally low interest rate level) and that it varies across the segments of maturity. On average, the general collateral rate during the 14 months was a bit more than 1 per cent. The average special spread was 17 basis points ranging from 0 to 103 basis points. The segments with the highest degree of specialness are the 5- and 10-year segments.

US GENERAL COLLATERAL RATE AND TREASURIES SPECIAL SPREAD Table 2

	1y	2y	3y	4y	5y	6y	7y	8y	9y	10y	Avg.
Average General Collateral rate	1.035	1.013	1.019	1.033	1.008	1.033	1.033	1.033	1.033	1.009	1.020
Average special premium, per cent	0.01	0.12	0.16	0.09	0.24	0.21	0.09	0.07	0.06	0.35	0.17

Note: Data from 3 March 2003 to 14 May 2004.
Source: Citigroup.

By looking at the special spread across the different on-the-run treasuries and off-the-run treasuries, it is obvious that on-the-run treasuries have the highest special spread. Table 3 shows that on-the-run treasuries are more than three times as special as off-the-run treasuries. The older the treasury gets in terms of months since its first issuance, the lower the special spread. In Section 5 we will – among other things – take a closer look at the relationsship between specialness and the issue cycle.

US TREASURIES SPECIALNESS DURING THE ISSUE CYCLE Table 3

	1y	2y	3y	4y	5y	6y	7y	8y	9y	10y	Avg.
On-the-run fee		0.35	0.31		0.46					0.45	0.37
Old-on-the-run fee		0.16	0.26		0.28					0.34	0.25
Old-old-on-the-run fee		0.07	0.20	0.09	0.24				0.10	0.31	0.16
Off-the-run fee	0.01	0.06	0.12	0.09	0.18	0.21	0.09	0.07	0.05	0.30	0.12

Note: Data from 3 March 2003 to 14t May 2004.
Source: Citigroup.

5. Topics of specific interest

The descriptive section above raises further questions. In order to get a better understanding of some key issues, the following specific topics are investigated:

- The institutional differences between the bond lending market in Europe and in the USA and their impact on specials.
- Cyclical movements in specialness during the US treasury issue cycle.
- The relationship between liquidity and specialness.

5.1 Institutional differences between US and Europe repo markets

In the previous section, data from the US special market are analysed. Comparing the US results with results from Europe, reveals significant differences between the specials markets. The European specials market primarily consists of German bonds – there appears to be only a limited demand for other euro area government bonds, such as Italian and French bonds. Table 4 below shows the results for German government bonds.

GERMAN SPECIAL MARKET — Table 4

	2y	3y	5y	6y	9y	10y	Total
Number of bonds	7	2	7	3	2	2	23
Number of observations	1484	634	1757	951	634	545	6005
Number of special observations	336	177	811	58	209	362	1953
In per cent	23	28	46	6	33	66	33
			Interest rates, per cent				
General Collateral Rate, GC	2.10	2.16	2.13	2.16	2.16	2.11	2.13
Special spread	0.05	0.07	0.13	0.01	0.00	0.13	0.09

Note: Data from 3 March 2003 to 14 May 2004.
Source: Citigroup.

Comparing Table 4 with the US market leads to two conclusions. Firstly, the level of specialness is generally higher in the US compared to Germany. This is despite the higher GC-level in Europe for the considered period. The level of specialness for 5 and 10 year German bonds are 13 bp. on average but 24 and 35 bp. in the US market for the two maturities. Secondly, the number of specials is somewhat lower in Germany. This section will analyze the characteristics of the two markets in order to understand the differences.

The market size in the USA and Europe for government securities is roughly the same. The US market for domestic government debt securities is USD 5,022 billion, whereas the equivalent euro market is USD 4,870 billion, according to BIS (2004) statistics. Thus, the difference in specialness does not appear to be founded in differing market sizes for government bonds.

Although the market sizes are the same, there are still significant structural differences, which could explain the difference in specialness. The bullet-points

below list some of the main differences that have been identified. The rest of this section elaborates:

- Reopening of existing issues has traditionally been widely used in Europe and less used in the US.
- Most European bonds are traded with value T+3 whereas most bonds in the US market are traded with value T+1.
- In the USA, there is a pre-trade market, meaning that treasury securities can be traded before they are auctioned.
- Debt issuance is centralised in the USA and decentralised in Europe. This tends to give bigger issues in the US.
- The higher volatility in interest rates in the US market could increase the strength of opposing views on the future price of securities and thereby the demand for going short.
- The large issuance of asset backed securities, mortgages and corporate bonds in the US market increases the potential number of investors willing to enter short positions in treasuries in order to hedge interest rate risk.
- The US markets is a very mature market, where bond-lending activities have played an important role for more than a decade.

One of the biggest differences in the US and European government securities markets is to be found in the issuance policies. US Treasuries are auctioned regularly at specified times – it is only in rare cases, that the auction timetable is broken. One of the few exceptions was after the terrorist attacks on World Trade Center, where a high level of settlement failures became a chronic syndrome, as described in Fleming & Garbade (2002). In Europe the pattern is somewhat different as many existing issues are reopened. The widespread use of reopening of existing issues in Europe, which according to market participants is primarily demand driven by customer flows, limits the degree of specialness. For instance the Italian 10-year benchmark bond (4.25 per cent, August 2014) only had an original issue size of EUR 4 billion and has been reopened several times to bring it to its current size of EUR 21.8 billion. If an issue is trading special, demand for the issue is met through increased issuance rather than through the impact on supply from higher special prices.

Another important difference between the USA and Europe is the time between the trade and the delivery. Most US bonds trade T+1 while most European bonds trade T+3. This implies that in Europe, given the longer time between a short position in a bond is obtained and the bond is delivered, the investor has more time to find somebody who is willing to lend the bond.

It seems likely that the "cost" of declining to borrow a certain bond at a high fee is less because the risk of not being able to deliver the bond is (on average) less eminent in bonds traded with value T+3. In other words, the short investor has more time to find prices and negotiate, and thus the market is in a sense likely to be more 'efficient'. Furthermore, it is possible to argue that with a limited number of bonds available to the market and a certain time used for every clearing cycle, there is an upper limit on the number of short positions that can be covered per time unit. If more clearings are possible for a bond in one day, the supply of that bond on the lending market could be increased. First an investor would borrow a

bond and sell it. The new owner of the bond could lend it to make it possible for somebody else to sell it and so on. The total "lending capacity" of the market can be increased through any of three parameters, i.e. the number of bonds, the time used for one clearing cycle, or the total time available.

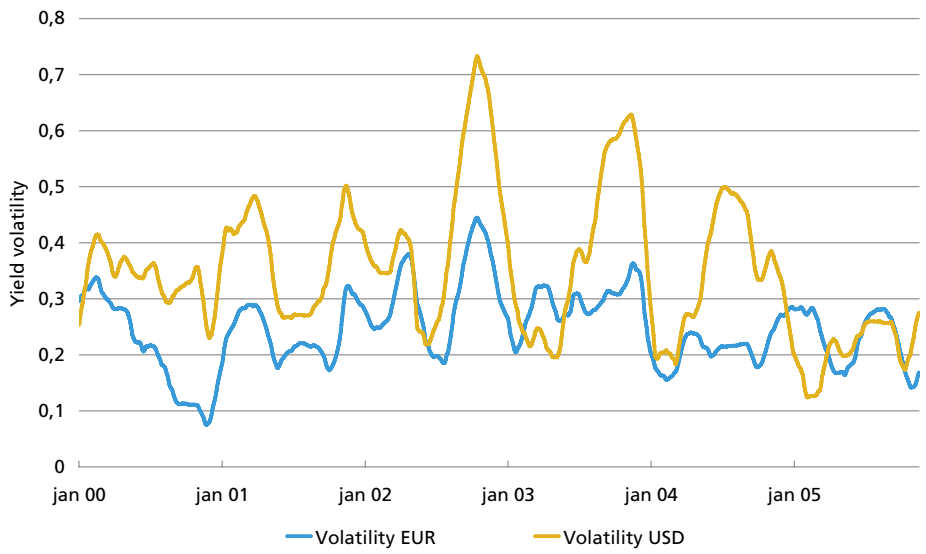
The hypothesis is that the longer time from the trade to the settlement (T+3 vs. T+1) is equivalent to a decrease in the time used on one clearing cycle. According to Duffie (1996) the length of the clearing cycle is important and it should consequently be expected that T+3 settlement increases the supply on the lending market and thereby decreases the level of specialness in general.

The US market is the only market with the existence of a pre-trade market. In the when-issued (WI) market it is possible for market participants to buy or sell the auctioned security up till 8 days before the auction. Note, that the bond is traded with delivery after the auction. This implies that a seller of the bond before the auction is obliged to delivering the bond after the auction. This can be done by buying the bond at the auction or borrowing the bond after the auction. All other things being equal, the WI market raises the demand for this issue on the lending market. The active trading in the WI market before the auction can increase the demand for borrowing the bond just after the auction and hence increases the specialness of the bond.

The existence of a German futures contract increases demand for German securities compared to other euro area government issues. The Schatz, Bobl and Bunds futures contracts are the main futures contract on European government securities and these futures contracts are solely based on German securities. This could be one explanation why Italian government bonds do not trade special as often as German government bonds.

The interest rate volatility in the US market is significantly higher than in the German market. Chart 7 below shows that the realised volatility is generally higher in the US market for the considered period. With higher volatility, investors are more likely to have strong opposing views on the future prices of securities. As discussed earlier, this increases the demand for going short and in turn drives the level of specialness to a higher level.

VOLATILITY CALCULATED ON DAILY 10 YEAR YIELDS ON GOVERNMENT BONDS Chart 7



Source: Bloomberg.
Note: The volatility at any given time is calculated using closing yields on the previous 180 days.

In the US there is a large issuance of corporate bonds and mortgage-backed securities. The investors could have a natural interest in shortening treasuries in order to hedge interest-rate risk on these other bonds. If the market for highly rated non-government bonds is bigger, the need for hedging interest-rate risk is likely to be bigger. In turn that would imply a higher demand for going short and higher levels of specialness. Table 5 below gives an indication of the amount of outstanding AAA rated bonds in US and Europe respectively. The amount of outstanding bonds with that rating is almost four times higher in the USA.

AAA MARKET IN THE US AND EUROPE, USD BILLION Tabel 5

Issue type	USA	Europe
Government guaranteed	1,125	450
Mortgage / Pfandbrief	2,900	575
ABS	1,750	400
Corporate	150	85
Total	5,925	1,510

Note: Amount outstanding is estimated on 21 June 2004.
Source: Morgan Stanley.

The respective features, although far from being a complete listing, provide some good explanations for the relative importance of specials in the two markets.

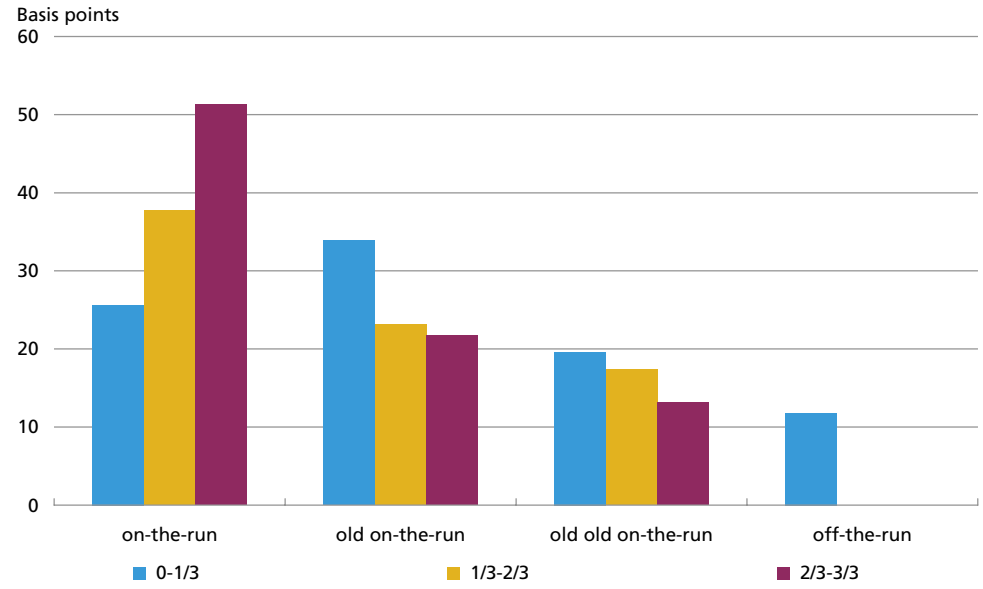
5.2 Cyclical movements in specialness and the US treasury issue cycle

Keane (1996) demonstrates that treasury repo rates follow a predictable pattern based on Treasury auction cycles. There is a strong positive correlation between

repo specialness and the Treasury auction cycle. On average, repo rates for the most recently issued notes become increasingly special until the next issue is announced.

Based on the previously mentioned data set, we have studied the degree of specialness during the lifetime of the US treasury bonds and compared it with the issuing cycles. Earlier, we divided the age of the bonds into four categories: On-the-run, old-on-the-run, old-old-on-the-run and off-the-run. To be able to study how specialness evolves during the periods, we have divided each of the four categories into three sub-periods, each covering one third of the issue cycle. Chart 8 shows the outcome.

SPECIALNESS DURING THE ISSUE CYCLES Chart 8



Note: Data from 3 March 2003 to 14 May 2004.
Source: Citigroup.

If a new 10-year benchmark treasury is issued every quarter, the blue column will represent the 10-year treasury (as well as other bonds) during its first month. Next month it will be represented by the column next to the first, and so forth. This continues until the bond enters the off-the-run status.

The degree of specialness during the issue cycle is increasing during the period where the bond is on-the-run. The maximum degree of specialness is reached in the last and third part of the period just before the bond becomes old-on-the-run and a new issuance is beginning. During the periods of old-on-the-run and old-old-on-the run, the degrees of specialness declines with the issue cycle. As expected, off-the-run bonds have the lowest degree of specialness.

The result of increasing specialness during the period of on-the-run is in line with Keane (1996). Firstly, the increasing specialness during the period of on-the-run has to do with a decreasing supply of bonds. The decreasing supply is due to an increasing percentage of the bonds held by buy-and-hold investors. After the next

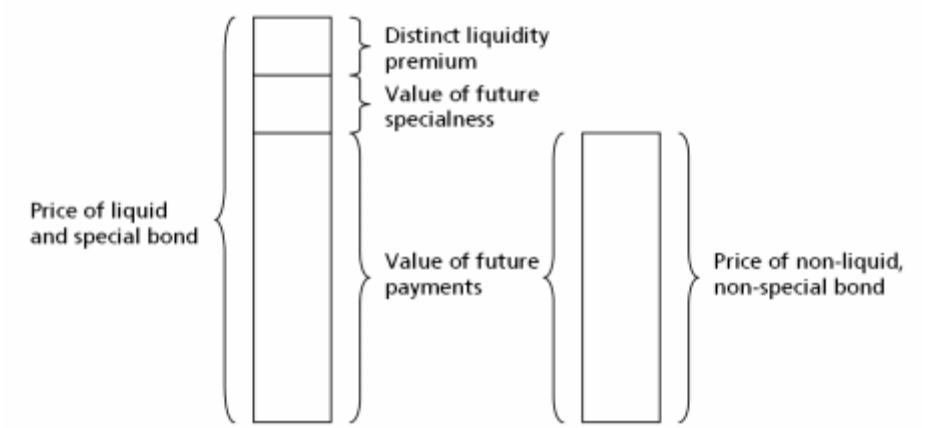
issuance, the trading activity shifts to the new on-the-run bond. With less trading and therefore less shorting, the old-on-the-run becomes less special. Secondly, market makers go short in the old bond close to the auction of new bond, either in the "when-issued" market or simply by freeing up interest rate risk to be able to purchase the new bond on the auction.

5.3 Liquidity and specialness

The most liquid bonds tend to trade at higher prices compared to lesser liquid bonds. The difference in prices between liquid and illiquid bonds is typically called a liquidity premium. For instance, on-the-run securities trade at a higher price relative to off-the-run securities. However, as shown earlier, at least part of the price differential between on-the-run and off-the-run securities can be linked to specialness. This indicates that there is a link between liquidity and specialness, which this section explores.

A way of illustrating the co-existence of a liquidity premium and an expected income related to future specialness is shown in Chart 9 below.

RELATIONSHIP BETWEEN LIQUIDITY PREMIUM, SPECIALNESS AND BOND PRICE Chart 9



Note: For the sake of clarity the proportions of the liquidity premium and specialness may be exaggerated.

The chart illustrates the added price components on liquid and special bonds. Specialness increases the price of the bond, as the return related to bond lending activity increases the value beyond the discounted value of payments from the bond. The liquidity premium is related to the tradability of the bond, something that especially active investors will desire.

The concept of a liquidity premium and specialness may be separated in a theoretical context, but are at the same time likely to co-exist. The liquidity premium arises because active investors are likely to prefer the most liquid bonds, as these reduce the transactions cost related to trading. Active trading, including short-selling activities, should therefore be expected to be concentrated around liquid bonds. At the same time, short-selling activity, as shown in section 3.1, is the main driver of specialness. Specialness and liquidity premiums are therefore likely to co-

exist because liquid bonds are used for short-selling activities, hence the most liquid bonds will tend to be special.

The co-existence of a liquidity premium and specialness is theoretically underpinned by Duffie (1996). In his paper, it is shown that the most liquid of two otherwise identical securities, is most likely to be on special.

The model in Duffie (1996) is empirically tested in Jordan & Jordan (1997). They find evidence that the price difference between two identical securities (except for the degree of liquidity) can mainly be linked to the value of current and expected future specialness. However they cannot exclude the existence of a liquidity premium, i.e. a premium related primarily to the tradability of the securities in the bond market.

It may seem paradoxical that the supply of the most liquid bonds is so scarce in the lending market, and in a sense so illiquid, that the bonds cannot be borrowed without paying a fee. However, one probably has to make a distinction between cash markets (where securities are traded) and the financing/repo market (where securities are lent and borrowed), even though the two markets are strongly connected. A high degree of specialness is an indication that the security is scarce in the financing market, not that it is less liquid (in the traditional sense) in the cash market.

In the Graveline and McBrady (2004) paper discussed in section 3.1, where they regress special repo rates on a number of economic variables, they include a proxy for owning liquid securities, namely the spread between off-the-run treasuries and Refcorps.[13] They find that the Refcorp-spread does not have an explanatory value for specialness, which implies that it is not, as often assumed, the demand for liquid securities that drives the repo spread, but, as discussed earlier, the demand for short selling. Hence the demand for liquid securities in itself does not appear to drive specialness. In conclusion, there is a clear connection between the distinct liquidity premium and specialness through short-selling activities, but not through the demand for holding liquid bonds.

[13] Resolution Funding Corporation (Refcorp) is an US government agency. The bonds issued by Refcorp have the same credit risk as the US government but are less liquid.

6. Discussion of investment strategies and market segmentation

Earnings from investing in and lending specials shall be weighted against the risks and the use of resources compared to alternative investment strategies.

Based on the research of Duffie (1996) and Jordan & Jordan (1997), it appears that there are two methods of exploiting the value of repo specialness. Firstly, it is possible to lend the special bond, which will exploit the value of the bond in the repo markets and thereby compensate for the higher price of the bond. Secondly, it is possible to sell the bond outright and benefit directly from the higher price and buy a non-special bond instead. Both strategies can work equally well as documented by the research.

An investor who buys on-the-run treasuries should clearly be able to exploit the expected specialness of these bonds. If the investor fails to do so, a strategy of buying non-special treasuries will be preferable, unless on-the-run treasuries have other characteristics, such as high liquidity, that outweigh the costs of not exploiting the specialness.

Even if an investor can exploit the value of specials, it is not clear why an investor should buy special bonds. One reason could be that an investor is superior in picking bonds that later will trade more special than currently priced. However, such a strategy does not appear to be more or less likely to succeed than any other investment strategy, such as taking interest-rate bets. A few may "be smarter" than the market but clearly such a strategy will not work for all. Another reason could be that the specials exhibit other characteristics that make them valuable, such as high liquidity, as mentioned before. Thus, investors that engage in specials lending should have superior skills in picking specials, be superior in utilizing special lending or have other motives for buying specials.

Among the typical lenders of specials, one finds pension funds, central banks, insurance companies, mutual funds and custodian banks. They typically lend to earn "extra income", to diversify portfolio income, to offset custody fees, or to finance or leverage a portfolio. However, many lenders do not consider securities lending as a core business. It is considered more like additional income from otherwise dormant assets.

In contrast to this, the typical borrower of specials often considers borrowing as an important business area. The typical borrowers are proprietary dealers, market makers, prime brokers, and hedge funds. As described earlier, their reasons for borrowing are to finance a short position, to avoid settlement failures, or to lend for a spread.

Besides this mismatch between lenders and borrowers perspective, the market of securities lending is characterized by a low degree of transparency. There is no official available information about which bonds are on special or at what level they are special. Thus, lenders must either rely on information obtained from the borrowers or put a lot of effort into market research.

Lenders have the opportunity of hiring an agent to lend securities. Thereby it is possible to increase the lending (and hopefully income) without imposing heavy workloads on staff in the front and back office. An agent is able to match the

lender's portfolio with the agent's own or his customers' demand for specific bonds. To do so, the agent must have a full disposal right of the lender's portfolio or at least part of the portfolio. Under the assumptions that the future levels of specialness are known or that the agent is risk neutral, the optimal contract with an agent will be so that the agent has incentives to maximize his efforts to lend the securities. That would involve an agreement with a high fixed return to the investor, leaving the marginal income of any efforts to the agent. If both of these assumptions do not hold, the agent will demand a risk premium for offering a fixed sum to the investor. If the risk premium is sufficiently large, the investor will be better off accepting to receive a percentage of the total income instead. The optimal split of the income is also difficult to determine as it will depend on the marginal cost of the agent. If the split is not optimised, then the income from securities lending is not optimised either.

There might be good reasons for dividing the portfolio into a buy-and-hold portfolio, which is lent, and an active trading portfolio, which is not lent. If a lender for example needs a highly liquid portfolio, this could be a reason for not lending part of the portfolio.

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