Trading credit spreads: the case for a specialised exchange-traded credit futures contract

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First draft May 2001
Submitted October 2001
Second draft incorporating Editor's comments January 2002

This article is forthcoming in the *Journal of Derivatives Use, Trading and Regulation*

The authors would like to extend their warm thanks to Professor Steven Satchell at Trinity College, Cambridge, Dr Christine Oughton and Dr Jennifer Piesse at Birkbeck, University of London, Brian Eales at London Guildhall University and Nimish Thakker at LIFFE for review comments on earlier drafts. The opinions stated and any remaining errors remain the responsibility of the authors.

Abstract
The isolation and trading of credit as an asset class in its own right, as interest rates have been for many years, is now well established. It manifests itself in the market in credit derivatives such as credit default swaps, credit options and total return swaps. This market is now sufficiently liquid, and targeted by a sufficiently wide range of participants, to warrant the introduction of a specific exchange-traded futures contract in credit. In this article the authors describe the conditions that suggest a need for such a contract, as well as conditions that would allow dealing in the contract. Specifically, they highlight the popularity and flexibility of OTC credit products, but also their disadvantages. A number of these disadvantages would be avoided if credit was traded as an exchange-traded product. Having considered the market background, the paper then considers the mechanics by which such a contract could be constructed, and puts forward four alternative pricing structures. It also describes an hypothetical benchmark credit index to which the contract might be tied.

I Introduction

This paper puts forward the case for the introduction of an exchange-traded credit contract, termed CreditNOTE. It also presents suggested specifications that such a contract would feature, and the different uses for the contract amongst market participants. It begins by considering the market background and the growth of credit trading. Credit as an asset is traded via credit derivatives, over-the-counter (OTC) bilateral contracts. These are used by a wide range of institutions including banks, fund managers, insurance companies, corporates, utilities and hedge funds to purchase and/or sell credit protection. The isolation of credit has also enabled market participants to derive a term structure of credit rates. Large-scale use of credit derivatives has highlighted the disadvantages and potential risks behind their use, associated mainly with documentation and definitional issues (so-called "operational risk"). These are considered as part of the motivation behind the introduction of CreditNOTE. Section III looks at the concepts behind the trading of credit spreads, while section IV investigates the possible design of the contract itself. In section V we consider a number of applications for the contract. Section VI concludes the paper.

II The market in credit trading

Growth of credit trading

The market in credit trading, manifested most clearly in credit derivatives, has grown rapidly since the mid-1990s and is now well established. The development of credit derivatives has enabled market participants to isolate credit as an asset class in itself, and separate credit risk from other financial risks. Credit derivatives facilitate the decomposition of credit risk into individually-rated categories, thus permitting the construction of a term structure of credit risk. The British Bankers Association (BBA) estimated the notional value of credit derivative contracts of all types to be just under $900 billion in 2000, with a rise to over $1,500 billion expected in 2002. Credit default swaps, total return swaps, and synthetic collateralised debt obligations (CDO) are the largest segments in the credit derivative market.[1] In London there are around 20 banks willing to make markets in these instruments, and market participants forecast large-scale increases in notional volumes over the next five years.[2]

Figure 1 is a breakdown of the different instruments used in the credit derivative market during 2000. Figure 2 shows the growth of the credit derivative market from 1997.

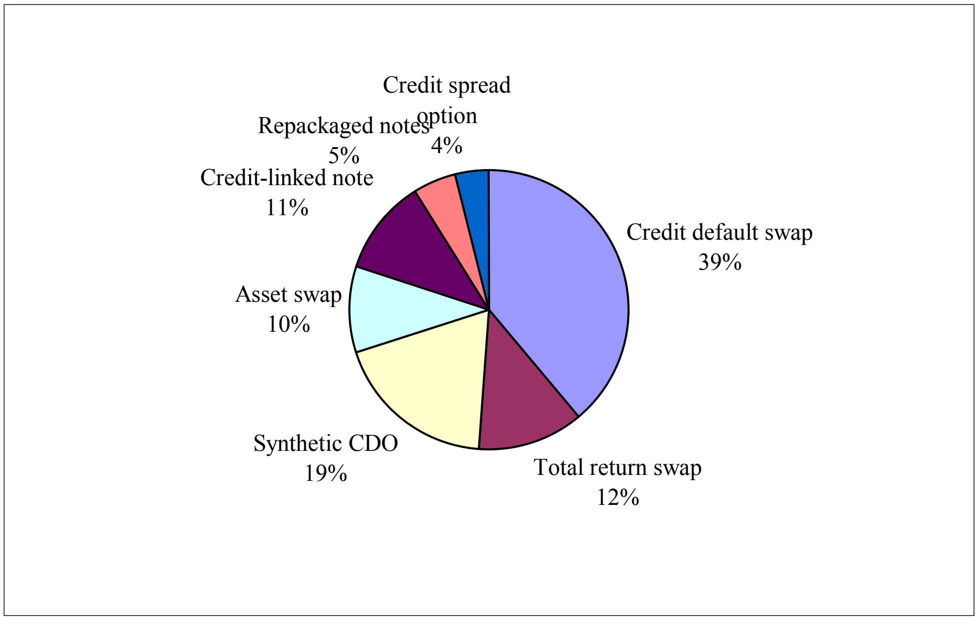
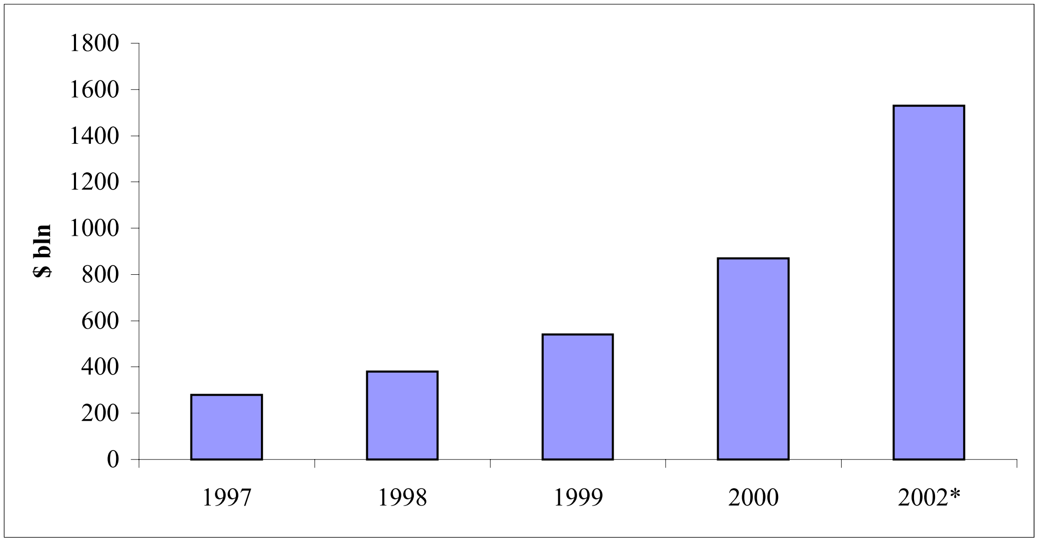


Figure 1 Market breakdown of credit derivatives during 2000 (Source: BBA)

[1] These last are Collateralised Debt Obligations (CDOs), comprised of Collateralised Bond Obligations and Collateralised Loan Obligations, the synthetic variants of which employ credit swaps and credit-linked notes in their structure.

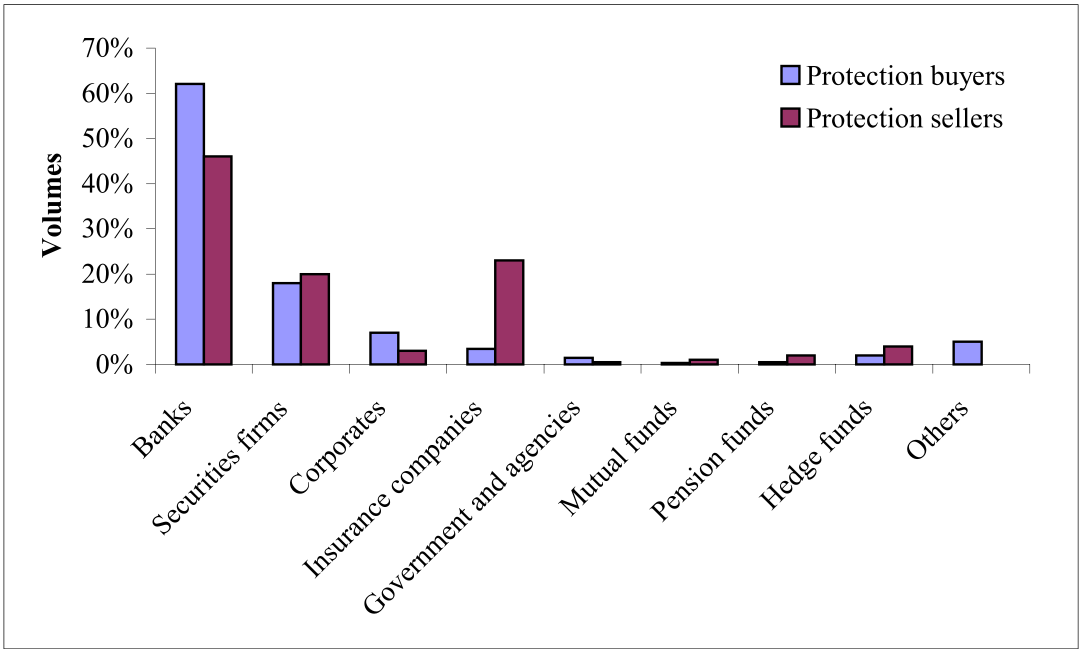
[2] "…credit derivatives could see a growth trajectory similar to…the interest-rate swap market…even a lower growth curve could result in a ten-fold increase over the next five to seven years." Richard Strauss, Jonathan Tukman and David Chamberlain of Goldman Sachs quoted in *Credit Derivatives*, Summer 2000, page 38.



* Forecast
Source: BBA.

Figure 2 Trading volumes of credit derivatives during 2000

The principal participants engaged in credit trading are commercial and investment banks, insurance companies, investment funds, corporates such as energy, utility and transport companies, hedge funds and mutual funds. A breakdown of market users is given in figure 3. The wider accessibility of credit trading products makes it imperative that all market players understand fully the technical background and risks associated with these products.



Source: BBA

Figure 3 Users of credit derivatives in 2000

Credit trading in the cash and derivatives markets has grown for a number of reasons, including the following:

- falling yield levels in developed country sovereign debt markets, caused by falling inflation levels and decreasing levels of government debt issuance, resulting in fund managers investing a greater proportion of their assets in corporate markets that offer higher yields;

- the introduction of the euro, resulting in an homogenous corporate bond and swap curve, making valuation of corporate credits across markets more readily comparable;

- investor demand for matching rates of return to replace maturing fixed-rate debt instruments, resulting in the use of credit derivative instruments in structured credit products such as synthetic CDOs;

- opportunities for banks to unlock returns from their debt portfolios and sell these on to investors in a tradeable form; by using a credit derivative a bank can transfer the return on a reference asset (and its associated credit risk exposure) of a loan book to an investor, without having to sell the loans themselves;

- the ability to isolate and transfer credit risk from an asset, enabling banks and fund managers to manage credit portfolios more efficiently in terms of credit risk exposure. This allows institutions to tailor their credit risk exposure to reflect more accurately their specific risk appetite;

- the adoption by banks of return on economic capital as the principal performance measure for trading desks has led to banks seeking to minimise regulatory capital requirements in order to maximise return on capital; this has been accomplished using synthetic CDOs and credit derivatives, see for example Nasr and Davis (2001).

The development of supporting market infrastructure has also contributed to the rapid growth in credit trading. This includes:

- access to data on credit ratings, credit spreads, default histories and default probabilities from ratings agencies such as Moody's and Standard & Poor's, enabling banks and other financial institutions to price credit risk more effectively;

- introduction of standardised documentation and definitions for credit derivatives by ISDA;

- adoption of regulatory rules relating to credit products by national regulators.

These same circumstances that have lead to development and growth of the credit derivatives market have also had an impact on the cash market in credit. As a result investors have been purchasing lower-rated corporate assets in an attempt to enhance returns. This has in turn led to the growth in credit derivatives as hedging instruments for these assets. However the cash market does not offer the flexibility and bespoke nature of the derivatives market, so that participants frequently turn to the latter to gain synthetically the exposure they require, thereby obviating the need to enter the cash market. That this is a popular and flexible alternative is demonstrated by the rapid growth in the credit derivative market, illustrated above.

Disadvantages in using credit derivatives

Credit derivatives enable market participants to position themselves to exploit particular views on different rated credits. For example if an investor believes that BBB-rated bond yield spreads will widen,[3] it may short one or more BBB-rated bond or purchase a credit default swap written on a specific BBB-rated bond. The first option suffers from liquidity issues, which is a common drawback at various times for all but the largest-issue corporate bonds, while both options require the investor to identify a specific asset of the desired rating. Another alternative is to invest in a synthetic CDO formed from a portfolio of credits structured to produce the required rating, by purchasing the lower-rated credit-linked note piece; see for instance Reyfman and Toft (2001). A synthetic CDO tranche offers investors exposure to a portfolio of reference assets. The tranches are issued as notes or credit default swaps in various ratings from AAA to BBB or

[3] We refer to spreads relative to the government curve.

lower, with the first-loss piece often retained as "equity". The super-senior element is issued in unfunded credit default swap form.

While investment using credit derivatives carries liquidity advantages over investment using cash bonds, it is not without a number of drawbacks, which we highlight below. In addition, it requires the investor to identify either a specific reference credit or specific CDO transaction to invest in, which requires a level of market intelligence that can only be acquired over time, and at significant expense.

Ignoring market risk of the occurrence of a credit event, the primary risk of trading and holding credit derivatives is related to operational and legal factors. This can result in different risk profiles compared to those of an investor holding the cash reference credit itself. Tolk (2001) highlights the unintended risks of holding credit exposures in the form of default swaps and credit-linked notes. Under certain circumstances it is possible for credit default swaps to create unintended risk exposure for holders, by exposing them to greater frequency and magnitude of losses compared to that suffered by a holder of the underlying reference credit. In a credit default swap, the payout to a buyer of protection is determined by the occurrence of credit events. The definition of a credit event sets the level of credit risk exposure of the protection seller. A wide definition of "credit event" results in a higher level of risk. To reduce the likelihood of disputes, counterparties can adopt the ISDA Credit Derivatives definitions to govern their dealings. Tolk (*ibid*, page 13) states that the current ISDA definitions do not unequivocally separate and isolate credit risk, and in certain circumstances credit derivatives can expose holders to additional risks. A reading of Tolk's paper suggests that differences in definitions can lead to unintended risks being taken on by protection sellers.

Specific areas of risk exposure include that of extending loan maturity, as illustrated for example by the case of a corporate entity, Conseco, and the aftermath of its bank debt restructuring in August 2000; and the potential greater risk of holding a synthetic position compared to a cash position in the same reference entity (*ibid*). In the case of Conseco, differences in the definition of "credit event" led to payments being made on a credit default swap for a situation that was not considered by the rating agency Moody's to be a default. In the second case, Tolk's illustration concerns two hypothetical investors in XYZ Limited, one of whom owns bonds issued by XYZ Limited while the other holds a credit-linked note (CLN) referenced to XYZ Limited. Following a deterioration in its debt situation, XYZ Limited violates a number of covenants on its bank loans, but its bonds are unaffected. XYZ's bank accelerates the bank loan, but the bonds continue to trade at 85 cents on the dollar, coupons are paid and the bond is redeemed in full at maturity. However the default swap underlying the CLN cites "obligation acceleration" (of either bond or loan) as a credit event, so the holder of the CLN receives 85% of par in cash settlement and the CLN is terminated. However the cash investor receives all the coupons and the par value of the bonds on maturity.

These two examples illustrate how, as credit default swaps are defined to pay out in the event of a very broad range of definitions of a "credit event", portfolio managers may suffer losses as a result of occurrences that are not captured by one or more of the ratings agencies rating of the reference asset. This results in a potentially greater risk for the portfolio manager compared to the position were it to actually hold the underlying reference asset.

Sandiford (2001) highlights the case of the dispute between UBS and Deutsche Bank with regard to a credit default swap written by the latter on AWI. A corporate restructuring resulted in differences of opinion whether this constituted a credit default, thus requiring a payout under the terms of the swap. The case was eventually settled out of court.

Credit-linked notes issued as part of a synthetic CDO suffer from low secondary market liquidity in the same way as conventional corporate debt. This is because of a lack of market makers, small issue size and consequent wide bid-offer spreads. Certainly the liquidity is lower than those of more established securitised products such as ABS and MBS issues of the same entity or from similar entities (see Reyfman and Toft, page 32). Often the notes are supported only by the original underwriting bank. This is a disincentive to using CLNs to put on a short- or medium-term exposure to a particular segment of the credit curve.

Fund managers may reduce their trading in credit derivatives for these reasons. In many cases an investor will desire an exposure to a generic credit or rating rather than invest in a specific cash bond or specific reference credit swap. The solution suitable for any market participant, whatever its motivations for entering into the market, would be to have a generic instrument that is marked at the yield of a specific credit rating but not a specific reference credit, enabling investors to target specific credit exposures synthetically. This is achieved for interest rates with bond futures, and for the euro interest-rate swap with the LIFFE SwapNote contract. It can be achieved for credit ratings with an exchange-traded credit contract.

III Tracking credit spreads

Background

Investors and other market participants using bond futures to hedge or put on interest-rate exposure can now use either government bond futures or the Swapnote contract. These instruments are pseudo benchmarks for government and interbank interest rate levels respectively, but are also used to hedge corporate credit exposure. However this would be the interest-rate risk represented by the particular reference credit rather than the credit rating itself. To hedge credit risk or to put on a position that reflects a specific view of say, BBB-rated credit spreads, a market participant can trade in the cash instrument (say, a BBB-rated corporate bond) or a credit derivative written on the cash bond. For a number of reasons either instrument may, at any particular time, be experiencing illiquidity. For this reason the market requires a liquid instrument that provides investors with:

- an ability to put on or hedge credit exposures with a liquid derivative instrument that closely correlates with the cash market exposure, and suffering no counterparty credit risk;

- an ability to hedge corporate bond portfolios;

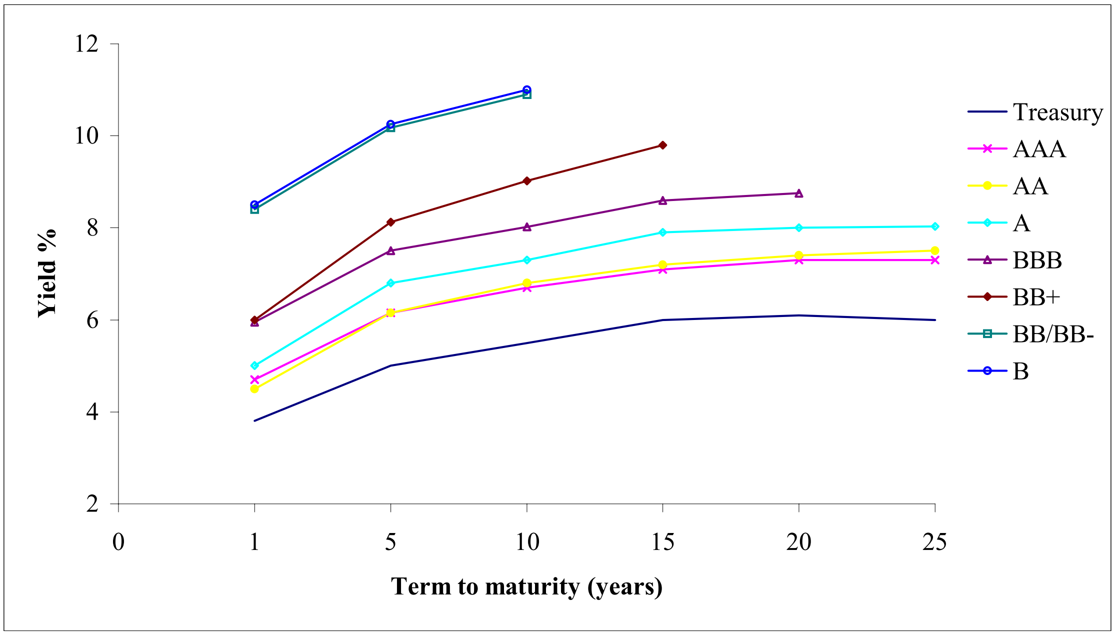
- an ability to trade specific credits along the term structure, say five-, ten- and 20-year terms.

A cash settled futures contract that moves with the specified credit spread will provide this ability. It will also enable participants, for the first time, to trade government versus corporate spreads at any maturity using futures. The exchange clearing house acts as the central counterparty, reducing regulatory capital requirements and eliminating counterparty risk. We consider the proposed contract specifications below. Before that we review the market background that should dictate the final form of the contract.

Market requirements

That investors have an interest in specific sectors of the term structure of credit rates is well documented (see for instance *Bondweek* of 28 May 2001 describing investors demand for B-rated paper). Yield curves for specific credit ratings are published by the ratings agencies and certain banks; for example Standard & Poor's credit indices reflect daily movements in credit spread levels within the US dollar industrial sector. The credit spread indicated by S&P indices is a measure of the market's view of that credit rating's credit risk. S&P reports the daily credit spread above the US Treasury yield for US industrial investment grade and speculative grade credit ratings.[4] The existence of credit indices enables a cash market credit curve to be constructed; an example is illustrated at figure 4.

[4] See Standard & Poor's (1999).

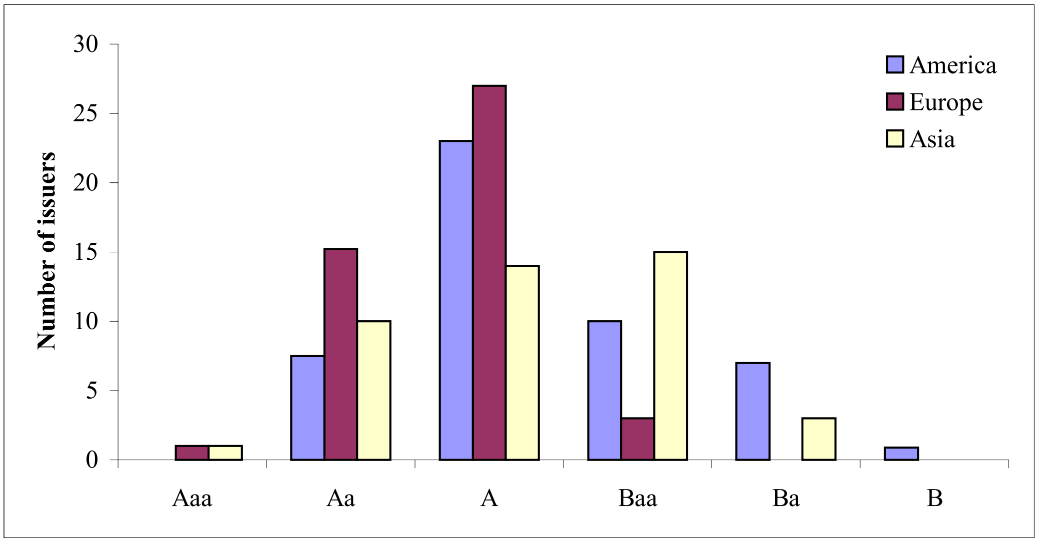


(Source: Bond Week, 4 June 2001)

Figure 4 S&P credit curves

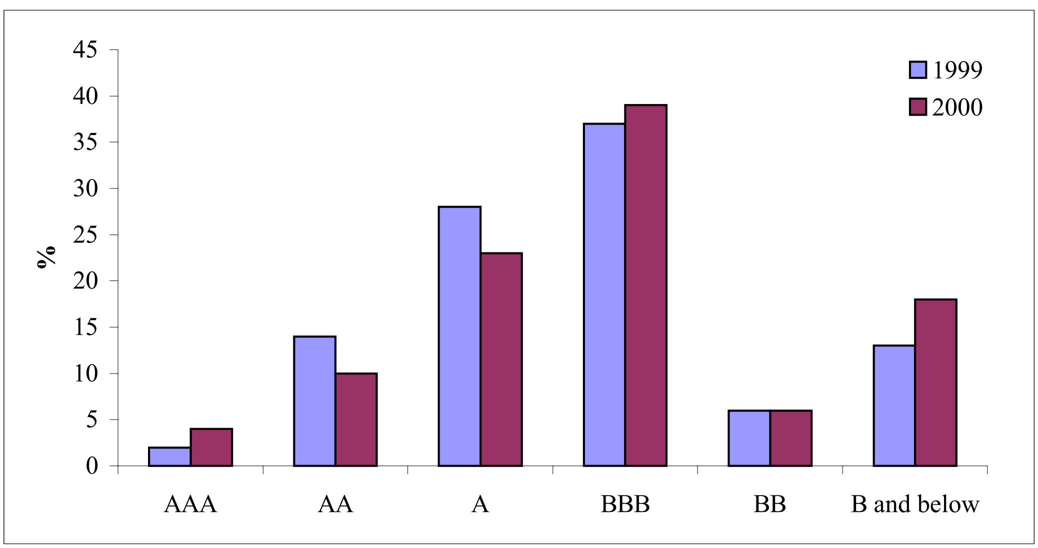
By constructing an appropriate index, viewed as independent and representative by the whole market, and linking this to the credit futures contract, it will be possible to trade credits as an exchange-traded product. The term *benchmark* is sometimes used synonymously with *index*, however while the latter is produced in slightly different forms by a number of investment banks as well as ratings agencies, the former term is reserved for an instrument or measure that is accepted as such by the whole market. Benchmark status of the proposed credit contract can be accomplished by linking it to an independent, transparent reference credit index.

An important consideration is the credit rating that should be reflected by the credit futures contract. Although ideally there would be a contract for every rating, it is unlikely that sufficient liquidity would be available to support such a wide range. It is accepted that credit derivatives such as default swaps have the potential to become the benchmark for credit risk, notwithstanding the credit and liquidity premia that is incorporated in their pricing. Thus we may look at the concentration of trading across specific ratings to be a reliable guide of the market's interest in specific sectors. The distribution of default swaps across the credit spectrum gives an idea of where the pricing of credit risk is concentrating. Figure 5 shows that the most popular reference credits during 2000 in the US and Europe were rated single A, while A-rated credits were the second most popular in the Asian market, and only slightly behind the most commonly protected rating of BBB. In the cash market the most common credit rating of bonds purchased in Europe during 2000 was BBB, followed by A. This is illustrated at figure 6. The results shown will influence the choice of the specific credit ratings that should be represented by the credit futures contract.



(Source: BIS)

Figure 5 Ratings distribution of credit default swaps during 2000. Number of issuers against whom credit default swaps are traded, by credit rating



(Source: Greenwich FI study, Commerzbank Securities)

Figure 6 Credit ratings of bonds purchased by European investors during 1999 and 2000

Market Correlations

Fund managers currently hedge corporate bonds using bond futures, interest-rate swaps (or asset swaps) and credit derivatives such as default swaps and total return swaps. The basis risk associated with using government bond futures as a hedge is well documented, see for example Galitz (1993) and LIFFE (2001). The use of credit default swaps brings with it the operational and liquidity risks noted in the previous section.

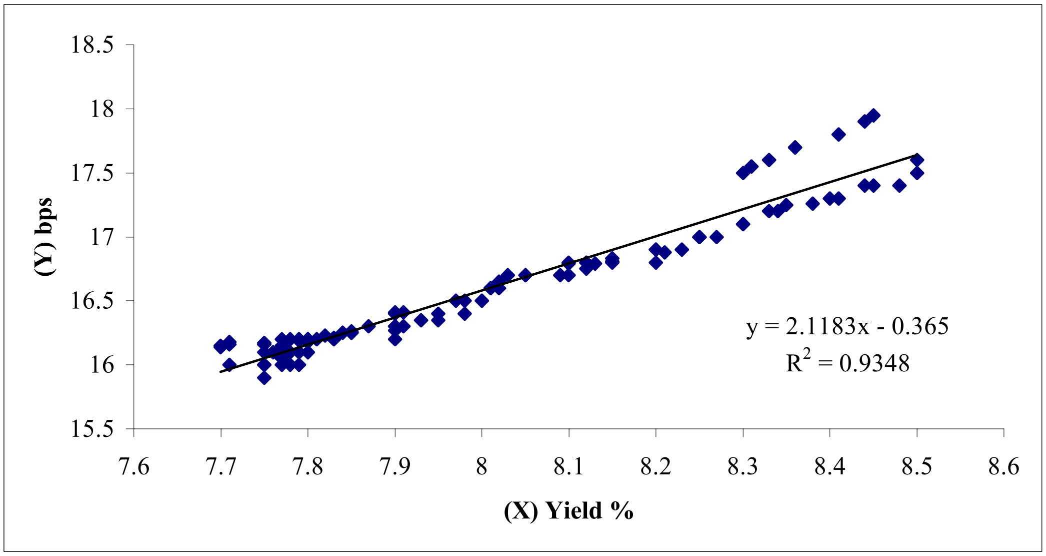
The correlation between corporate bonds and interest-rate swaps is closer, but only for highly-rated non-sovereign debt such as Pfandbriefe. Hedging AAA or AA-rated corporate debt using LIFFE's Swapnote contract reduces administrative burdens associated with using OTC swaps, and also makes the swap curve accessible to smaller size participants at a low bid-offer spread. However the correlation with corporate credit, while closer than that of bond futures, is lower and opens up increased basis risk. This is because the interest-rate swap curve is essentially the yield curve for bonds rated AA-, in other words it is the interbank credit curve which is close to a generic rating of AA-. (See for instance Greenfield (2001)). Although no credit futures contract exists at present, we can use the performance of a credit index as a proxy for its behaviour, to gain an idea of the correlation of its movement to a specific named corporate bond.

Figure 7 shows the historical regression analysis for a specified US dollar corporate bond due 2011 and rated AA-, against a two-year credit default swap that has been written on it. The default swap is valued on the asset-swap pricing basis, and its value measured as the basis point spread to the asset swap. As expected, this shows a high positive correlation, since the default swap will closely track market assessment of the reference credit. Figure 8 shows the regression analysis for the same bond against the movement of a specified investment bank's investment grade industrial bond index.[5] The correlation is materially identical, and suggests that an instrument that tracked the index would also be very closely linked to AA-rated bonds. The close correlation also indicates that such an instrument would present lower basis risk than a government bond futures contract when used for hedging purposes. A contract replicating the price / yield movement of the index would be a feasible hedging instrument for the bond, but additionally featuring the advantages of a centrally-cleared exchange-traded instrument over an OTC derivative. This latter issue is of key importance to market participants.

Figure 9 shows the regression analysis for a ten-year US dollar BBB-rated corporate bond's yield against the interest rate swap rate for the same maturity; this is relevant to practitioners who often hedge lower-rated corporate bonds in the asset-swap market. When compared to figure 10, which illustrates the regression for the same bond compared to the investment grade industrial corporate index, we see that the latter shows

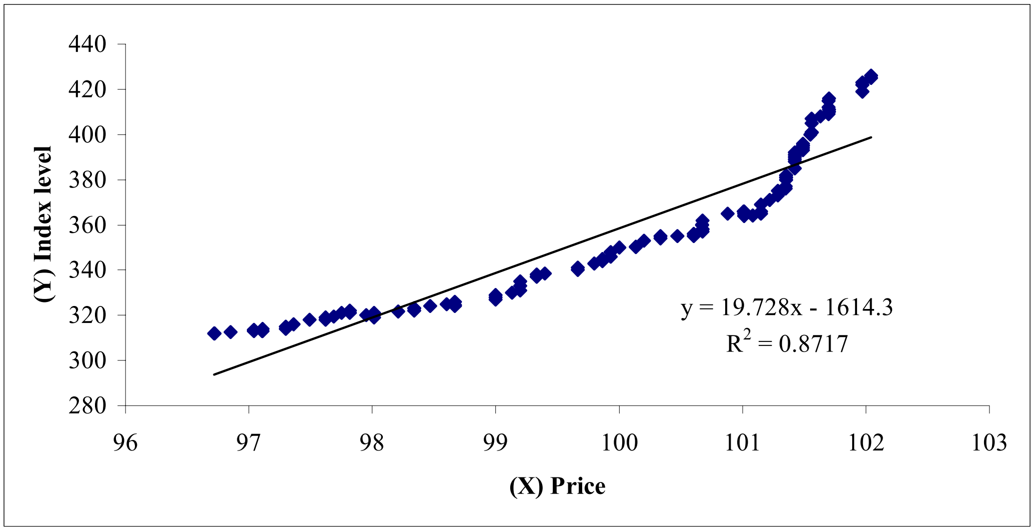
[5] Figure 7 regresses the default swap premium on the bond yield, for figure 8 we regress the index level on the bond price. The index is produced by an unnamed investment bank. For figures 7-10 the data source for prices, yield and interest rate levels is Bloomberg. Data source for index levels is the specified unnamed investment bank.

closer correlation. A liquid contract which tracked or mirrored the BBB-index, would therefore reduce basis risk if used as a hedging instrument in place of the asset-swap.



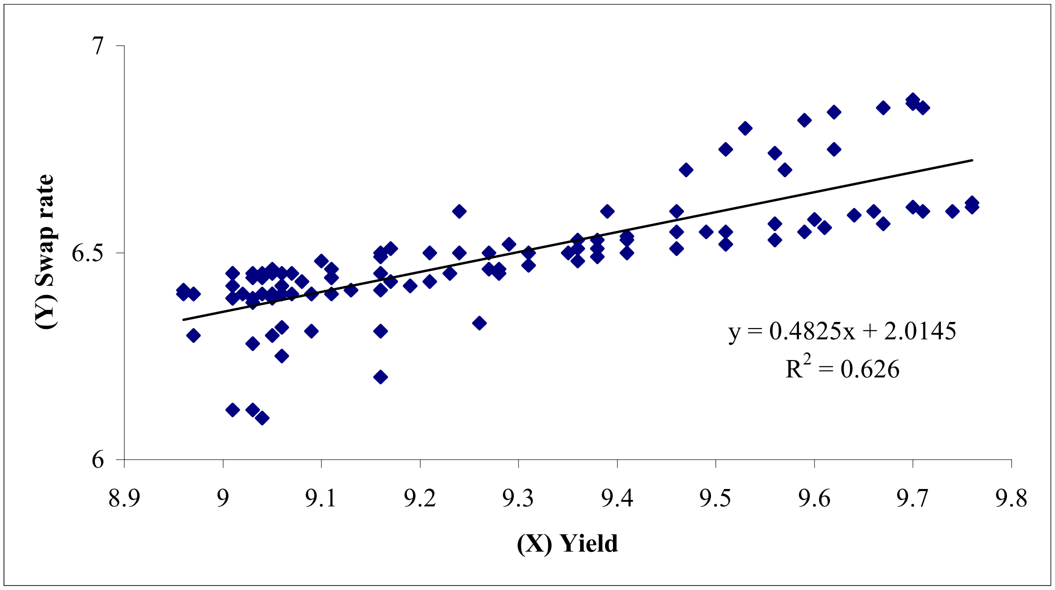
Range	**2 Apr - 31 Aug**
Observations	110
Slope coefficient	2.118287
Intercept	-0.365010
Standard error of slope	0.053831
Standard error of intercept	0.431454
Standard error of y values	0.135819
Ssxy (summed product of observations from means)	28.564671
SSE Residual sum of squares	1.992265
Correlation	0.966851
R^2	0.934802
t-statistic	39.35
F statistic	1548.48

Figure 7 Regression analysis, AA-rated bond and same-reference credit default swap



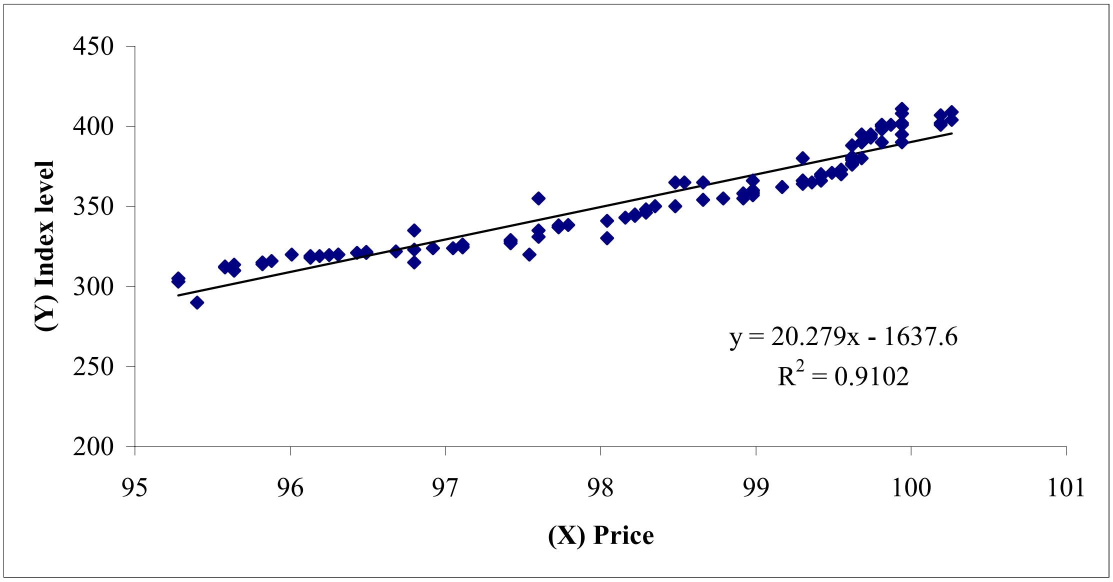
Range	**2 Apr - 31 Aug**
Observations	110
Slope coefficient	19.728062
Intercept	-1614.324
Standard error of slope	0.728204
Standard error of intercept	72.788
Standard error of y values	12.255
SSE Residual sum of squares	16221.05
Correlation	0.933662
R^2	0.871726
t-statistic	27.0914
F statistic	733.94

Figure 8 Regression analysis, AA-rated bond on a selected investment grade corporate bond index



Range	**2 Apr - 31 Aug**
Observations	110
Slope coefficient	0.482495
Intercept	2.014521
Standard error of slope	0.035883
Standard error of intercept	0.332794
Standard error of y values	0.090535
SSE Residual sum of squares	0.885229
Correlation	0.791231
R^2	0.626047
t-statistic	13.4464
F statistic	180.81

Figure 9 Regression analysis, BBB-rated corporate bond yield against the market interest-rate swap rate



Range	**2 Apr - 31 Aug**
Observations	110
Slope coefficient	20.2788
Intercept	-1637.63
Standard error of slope	0.612808
Standard error of intercept	60.243222
Standard error of y values	9.640082
SSE Residual sum of squares	10036.57
Correlation	0.954059
R^2	0.910229
t-statistic	33.09
F statistic	1095.06

Figure 10 Regression analysis, BBB-rated corporate bond price against a selected investment grade industrial index

The Standard & Poor's rating agency reports performance for two US dollar indices, the Industrial Investment Grade credit index and the Industrial Speculative Grade credit index.[6] Figure 11 shows a matrix illustrating correlations between various market sectors and the two indices. These indicate that an instrument that replicated the bond index would match the performance of the BBB-rated sector very closely, and would enable market participants to put on an exposure to this sector synthetically. The ability to effect a synthetic exposure is an accepted advantage in the market, compared to a cash position, for reasons of liquidity and transparency. Within derivatives markets generally, exchange-traded instruments exhibit considerable liquidity and are frequently used to establish fair value for a range of cash market instruments. This liquidity would be expected to be replicated with an exchange-traded credit futures contract.

	IG	SG	10-yr swap	10-yr T	5-yr swap	5-yr T	AA	A	BBB	BB	B	CCC
Investment grade	1.00	0.92	0.38	-0.36	0.69	-0.36	0.96	0.98	0.99	0.89	0.92	0.91
Speculative grade		1.00	0.06	-0.50	0.46	-0.56	0.82	0.87	0.95	0.98	1.00	0.97
10-yr swap spread			1.00	0.43	0.85	0.56	0.57	0.50	0.26	-0.01	0.06	0.12
10-yr Treasury				1.00	0.15	0.97	-0.18	-0.25	-0.45	-0.59	-0.51	-0.35
5-yr swap spread					1.00	0.21	0.79	0.77	0.61	0.41	0.45	0.49
5-yr Treasury						1.00	-0.16	-0.23	-0.46	-0.64	-0.57	-0.42
AA							1.00	0.98	0.91	0.77	0.82	0.81
A								1.00	0.95	0.83	0.87	0.86
BBB									1.00	0.93	0.94	0.92
BB										1.00	0.98	0.92
B											1.00	0.96
CCC												1.00

Figure 11 Correlation matrix, September 2001 (correlation since 31 December 1998)
Source: Standard & Poor's Risk Solutions (used with permission)

Bond indices

The market in fixed income indices is well established. A number of market participants have constructed, and report on, fixed income indices designed to mirror the performance of specified aspects of the market. These include indices produced by JPMorgan Chase, Lehman Brothers, Deutsche Bank and Goldman Sachs, among others, as well as those produced by S&P as noted above. Various sources cite the need for credit indices, observing the rapid growth of the credit market, the popularity of distinct corporate sector credit products, the behaviour of credit markets moving out of line with other markets and the unsuitability of large "broad-based" indices to reflect particular sectors such as industrial high yield. For instance see Goldman Sachs (2001). Bond indices are well developed and their description and construction is covered in existing literature, such as Brown (1994) and Commerzbank (2001). The conclusion from the previous section is that government bonds and interest-rate swaps used as hedging instruments for corporate credit exposure are not without basis risk, and that government

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[6] The methodology used in the construction of these indices is given in the S&P document noted in the reference section.

and swap spreads are not satisfactory indicators of corporate bond performance. Traders may use a specific bond index to hedge market exposure or put on an exposure to the market. However this can only be done by buying (or selling) the underlying bonds of the desired index, which involves high transaction costs, possible liquidity issues such as high bid-offer spreads and greater administrative burden. The alternative is to approach the investment bank that sponsors the index and negotiate a transaction in a structured note or OTC derivative instrument that replicates the index as closely as possible. This is a high-cost solution that also brings with it associated liquidity and tracking risk.

Observations of market indices provides useful indicators for the design of the proposed credit futures contract. For instance S&P investment grade and speculative grade credit indices have effective portfolio durations of ten and five years respectively, equal to the US Treasury benchmark. The indices use multiple price sources to calculate a composite market price based on mid-market prices. Such an approach could be adopted for the credit contract if it is developed as a price-based contract, which we consider in the next section. Fons (2000) describes modelling the term structure of credit risk using default rates, and this approach can be used to construct credit curves. This is an alternative to the yield-based approach. However the advantage of the index method is that it can be calculated on a real-time basis. For instance the Goldman Sachs Euro InvestTop index is priced on a continuous basis using an in-house electronic trading platform. This enables an OTC derivative instrument, or a structured note that has been constructed to provide exposure to the index, to be valued at any time. Such an instrument would be a bespoke bilateral contract between the market making bank and the customer, and would be at risk from the liquidity concerns associated with certain OTC instruments.

Index construction must reflect sufficient diversity and liquidity in the composition of underlying bonds. Diversification is an important element in fund managers and ratings agency analysis. Indices are usually based on a broad investment grade or speculative grade sector. The most concentrated ratings are A or BBB in investment grade indices and BB in speculative grade ratings (see Commerzbank 2001 and Goldman Sachs 2001).

IV The CreditNOTE contract

Use of a credit futures contract of the appropriate credit rating provides an effective hedge at lower administrative and operational risk. We have termed such a contract CreditNOTE. The credit contract also enables market participants to put on an exposure to a credit rating synthetically, which brings with it the well-established advantages of derivative instruments but will also in turn lead to enhanced liquidity in the cash market as a result.[7]

The foregoing has we hope illustrated the attraction of a credit futures contract. The ability to put on exposure to specific credit ratings via an exchange-traded derivative instrument brings a number of advantages over cash and OTC markets. These include:

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[7] This occurred for example in the government bond markets after bond futures were introduced, and had been observed earlier in agricultural commodity markets; see for instance Kolb (2000).

- hedging capability using a derivative that is closely correlated to the cash credit exposure but with added liquidity and lower bid-offer spread than the OTC equivalent;
- access to the full term structure of credit rates for that rating;
- considerably lower administrative burden, typical of exchange-traded contracts, compared to asset swaps when these are used to hedge corporate credits;
- being a cash-settled contract, the removal of delivery considerations that currently exist with government bond futures, which can lead to special status for the cheapest-to-deliver bond and delivery squeezes.

Trading an exchange-traded instrument brings additional advantages associated with its design. These are:

- increased regulatory capital efficiency, in common with all exchange-traded contracts;
- central clearing, leading to collateral and margin netting;
- lower impact of sector lending limits and counterparty credit risk limits;
- lower documentation and administrative burden associated with trading an exchange contract compared to an OTC credit derivative.

A credit contract will also enable market participants to establish synthetically positions in one credit rating against another out to long-dated maturities, which currently can be achieved in either the cash market or OTC market, but which approach suffers from accompanying liquidity and administrative disadvantages.

We now consider four possible contract structures and specifications.

Contract specifications and mechanics

We propose A and BBB-rated euro CreditNOTE contracts of 2-, 5-, and 10-year notional maturities. The contracts would be cash settled and would follow the standard quarterly settlement cycle associated with exchange-traded futures. There are a number of approaches that can be used to construct the contract mechanics, and we examine these here with regard to the 10-year future.[8] More than one of the options would be based on the performance of an underlying index or benchmark, constructed, calculated and reported by the futures exchange. This would ensure independence and more ready

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[8] This is for reasons of space. The mechanics of the two- and five-year contracts would follow similar principles, with relevant adjustments to account for the different maturities compared to the ten-year contract.

acceptance by the market. The index specification, which we have called the CreditNOTE Index, is given in the Appendix.

(1) Price-based contract

Option one is for a price-based, cash-settled contract. The price of the contract is based on the yield given for the ten-year sector of the yield curve constructed using the exchange's two-, five- and ten-year indices. The yield is converted to a price using the standard discounting formula. The contract specification is designed to be similar to other exchange-traded contracts, making it be accessible to users from the inception of trading.

Unit of trading	€100,000 notional amount
Delivery month	March, June, September, December
Delivery day	Last Wednesday of the delivery month
Last trading day	Two business days prior to delivery day
Price quote	Per €100 nominal value, increments of 0.01
Tick value	€10

Under this option the exchange delivery settlement price (EDSP) is the contract price given between specified hours on the last trading day.

The advantage of this approach is that it is conceptually very straightforward and is a transparent snapshot of the market at any time. The disadvantage is that the calculation of portfolio yield (which is used to calculate the price) may not accurately reflect the market, given the assumptions and drawbacks of the standard yield-to-maturity formula.

(2) Index-based contract

Under this option the contract is priced on the level of the index. The index begins at a base of 100 and is then calculated on a continuous basis by the exchange (see the Appendix). The price quote of the contract is the value of the index itself. This is similar to the mechanism used for equity index futures. The contract specification is as follows.

Contract size	Value of €10 per index point (so that value is €7,500 when index is at 750.0)
Unit of trading	€100,000 notional amount
Delivery month	March, June, September, December
Delivery day	Last Wednesday of the delivery month
Last trading day	Two business days prior to delivery day
Price quote	Index points (for example, 750.0)
Minimum price increment	0.5
Tick value	€5.00

The contract is cash settled based on the EDSP. The EDSP is given by the average value of the index between specified hours on the last trading day.

The advantage of this approach is that it is based on well-established principles as used in equity index futures and would be readily understood by market participants. It is also straightforward to follow the market by tracking the contract price, again in similar fashion to an equity index futures contract. The disadvantage is that it is not as transparent when used to determine relative value in the specified rating, or for use in analysis when comparing yields. While there is a tradition in following an equity index as it rises steadily in value over the medium and longer term, this is not the case for bond indices and a price or yield-based mechanism may be preferred for this reason.

(3) Yield spread contract
The index constructed by the exchange may be quoted as basis point spread over the benchmark euro yield curve.[9] This spread is used as the price quotation for the contract. Thus, an increase or decrease of the spread over the benchmark determines the profit or loss from trading the contract. For instance an investor who is bearish of BBB yields will expect the spread to widen (increase) and will therefore buy the contract. The contract specification is based on €100,000 notional amount, and the price quote is in minimum increments of 0.1 basis points.

Unit of trading	€100,000 notional amount
Delivery month	March, June, September, December
Delivery day	Last Wednesday of the delivery month
Last trading day	Two business days prior to delivery day
Price quote	Basis points
Minimum price increment	0.1 basis point
Tick value	€1.00

The advantage of this approach is that quantifies precisely the relative position of the A-rated credit sector vis-à-vis the benchmark yield curve. The disadvantages are that it is an unfamiliar approach and is not as straightforward to follow as a price or index-based mechanism. However it does directly quantify relative value, in the form of the yield spread.

(4) Yield contract
The final option is to trade actual yields. This is similar to the concept used for short-term interest rate futures, therefore the price is:

100 – yield.

[9] Under "normal" circumstances this would be the Bund yield curve. However issues of illiquidity are impacting government bond curves in Europe, and the benchmark may therefore be an alternative instrument such as the euro swap curve or LIFFE's Swapnote contract.

The yield is given by the CreditNOTE index. A trader expecting credit spreads to deteriorate will expect yields to rise, thus exposure is gained by selling the contract. The contract specifications are listed below.

Contract size	As below
Unit of trading	€500,000 notional amount
Delivery month	March, June, September, December
Delivery day	Last Wednesday of the delivery month
Last trading day	Two business days prior to delivery day
Price quote	100 minus yield level
Tick size	0.005
Tick value	€6.25

The EDSP is given by the exchange-determined yield on 11:00 on the last trading day.

The advantage of this approach is that it is an established approach for short-term interest rates and so familiar to money market participants. The disadvantage is that when translated to long-term yields it may not be robust and could lead to transparency issues and convexity bias. In addition it is not as straightforward to follow as the price or index-based mechanisms.

We propose that the sponsoring futures exchange invite comment from the market, potential users and supporting banks in order to develop a consensus on the contract structure.

V Applications

In addition to uses for conventional hedging and speculation purposes in the credit market, the CreditNOTE contract can be used by banks, fund managers and other financial institutions for a number of applications. For illustration we summarise a number of these as follows:

- a fund manager believes that BBB-rated credit spreads (relative to the government curve) will widen and wishes to put on a position that reflects this view. Rather than select a specific bond or bonds, which require the payment of the bid-offer spread and onerous administration, the fund manager buys CreditNOTE contracts at the current spread, with a target sell at [*x*] basis points higher over the government curve;

- a fund manager believes that the A-BBB credit spread will widen in the short term, and wishes to establish a position that reflects this. The selection of bonds in the cash market presents liquidity and other risks as described earlier, and these also exist to an extent in the OTC derivatives market. The fund manager therefore puts on a spread trade in both contracts, buying the A contract and selling the BBB contract. If the spread widens as expected, the fund manager unwinds the position and takes the profit;

- a portfolio manager holds a core position in BBB rated bonds but expects the market to fall in the short term and therefore the spread between BBB and higher rated credits to widen. Instead of selling parts of the portfolio the manager could sell the credit future and, if he is correct about the markets direction, the fall in the portfolio's value should be offset by the profit from the futures trade;

- a hedge fund manager expects the next earnings season to show that the economy is stronger than the market is forecasting. As well as considering stock and interest rate futures he could consider buying the credit future. There is a well established relationship between economic conditions and the markets appetite for lower credit grades and so if the managers judgement is correct the yield spread should narrow creating a profit on the futures trade.

The range of applications for the CreditNOTE contract is extensive and we list only a sample. One further possibility is a single bond future, along similar lines as the universal stock futures on LIFFE, which would be of use to corporate bond portfolio managers. This could be written on liquid benchmark issues such as World Bank, Ford Credit and Pfandbriefe bonds. However the development of such contracts will necessarily await the successful introduction of the standard credit contract we propose here.

VI Conclusions

There is historical precedent where the introduction of an exchange-traded contract has assisted in unifying, to some extent, a previously diverse market. An example is the agricultural commodity market, which varied in quality and accessibility across geographic sectors. It also presented producers with extreme difficulties in hedging their price risk, prior to the introduction of futures in the 19th century. The introduction of exchange-traded futures removed these factors as material issues. Burghardt (1994) notes that wheat is not identical across the United States, and differs according to where it is grown. He cites how the use of wheat futures contracts enables the delivery of different grades of wheat in different locations. Kolb (2000) states that the first organised futures exchanges were established to facilitate commodity trading, and served to deliver "some social purpose". He notes that futures markets have traditionally met the needs of a varied and diverse set of market participants, namely (i) those who wish to ascertain price information, called *price discovery*, (ii) those who wish to protect against a fall or rise in commodity prices or *hedge* and (iii) those who wish to speculate on prices. The bringing together of these parties served to unify the market and facilitated increased volumes of trading in the underlying cash market. This behaviour would be expected to be repeated in the credit market following the introduction of an exchange-traded credit futures contract.

The market in credit has expanded significantly as an asset class and is of undisputed importance to investment managers. This paper has noted the rising popularity of credit derivatives. It considered the most popular areas of the credit curves accessed by institutions, and how credit derivatives were meeting the diverse needs of the market.

Given this increasing use of credit derivatives, the paper noted paradoxically the additional risks associated with these instruments when compared to cash instruments. This led to our conclusion that the introduction of an exchange-based contract would aid the continued development of the credit market. We then considered four possible approaches that an exchange might use when designing the contract. The final solution adopted must reflect market consensus, most importantly of those institutions that undertake to support the contract.

The rapid growth of the credit markets and the use of alternative benchmarks in an environment of falling government debt issue suggest the need to introduce a market-standard credit contract. The lower operational, counterparty and liquidity risk associated with exchange-traded instruments would result in a liquid new instrument that should, as it allows more efficient hedging, result in higher liquidity in the OTC markets.

[Word count 6,375]

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Appendix

The CreditNOTE Indices

It is not proposed to specify the index construction in detail here, rather we provide an overview of the A-rated index design in terms of the basic features. The indices will be calculated and maintained by the exchange or independent third-party sub-contractor. The BBB-rated index will follow identical principles.

The A/A2 Index

The A/A2-rated index would be composed of 100 euro-denominated bonds of between 8.5 and 12 years maturity, with ratings composition of 60% A/A2 and 20% each A+/A1 and A-/A3. Each issue must be of minimum €200 million nominal size.[10] Bonds will be plain vanilla conventional debt securities with no embedded option element, to avoid option-adjusted spread considerations.[11] The index will be rebalanced on a monthly basis and will be comprised of the following sectors:

Financial (banks, non-banks)	12.5%
Consumer (food, leisure, retail, etc)	7.8%
Transport (aviation, etc)	9.9%
Utilities (power, water, etc)	15.4%
Media and Telecoms	6%
Industrial (auto, manufacturing, etc)	23%
Property and real-estate	19%
Technology	6.4%

Market pricing will be sourced from a variety of sources including Bloomberg, Reuters, ISMA, market makers and brokers. The average price of eight specified market makers will be used to determine the market price and compared to the vendor prices; if necessary an average of these two prices will be taken.

The index will have a base of 100.

The total return of the index is given by

$$TR_{Index} = \sum_{i=1}^{N} TR_i \times W_i \qquad (1)$$

[10] An alternative approach is to have issues of equal face amount to avoid weighting considerations.
[11] Alternatively an option-adjusted spread approach, to provide an indication of credit spread for callable, putable or sinking fund binds, can be used if such bonds are included in the index.

where

W_i is the appropriate weighting for each constituent bond

and is given by

$$W_i = \frac{Pd_i \times M_i}{\sum_{i=1}^{N} Pd_i \times M_i} \qquad (2)$$

where

Pd_i is the dirty price for bond i
M_i is the nominal amount of bond i.

The total return of each constituent bond is given by

$$TR_i = \frac{\left(Pd_1 - Pd_0\right) + [C \times \left(1 + r \times \frac{days}{360}\right)]}{Pd_0} \qquad (3)$$

where

Pd_1 is the dirty price of the bond at the calculation date
Pd_0 is the dirty price of the bond at the start of the period
C is the bond coupon
r is the bond repo (financing rate) for the period held

and is made up of changes in price of the bond and the net gain from receipt of coupon during the period.

The constituent bonds can also be used to provide a "portfolio yield" if required to provide a yield or price for CreditNOTE contract, if this approach is adopted. The index is taken to be a "portfolio" and its yield calculated as described below.

The gross redemption yield for a vanilla bond is that rate r where

$$P_d = \sum_{i=1}^{N} C_i e^{-rn}. \qquad (4)$$

The right-hand side of equation (4) is simply the present value of the cash flow payments C to be made by the bond in its remaining lifetime. Equation (5) gives the continuously compounded yield to maturity; in practice users define a yield with compounding interval m, that is

$$r = \left(e^{rmn} - 1\right)/m. \qquad (5)$$

In principle we may compute the yield on a portfolio of bonds exactly as for a single bond, using equation (4) to give the yield for a set of cash flows which are purchased today at their present value. In practice the market calculates portfolio yield as a weighted average of the individual yields on each of the bonds in the portfolio. This is described, for example, in Fabozzi (1996)[12], and the Fabozzi account points out the weakness of this method. An alternative approach is to weight individual yields using bonds' basis point values.

To calculate index yield using market value weighting, we may use

$$r_{port} = \left(\frac{MV_2}{MV_{port}} \right) r_2 + \left(\frac{MV_3}{MV_{port}} \right) r_3 \tag{6}$$

where MV is the market value of the bond or overall portfolio.

If we weight the yield with basis point values we use

$$r_{port} = \frac{BPV_2 M_2 r_2 + BPV_3 M_3 r_3}{BPV_2 M_2 + BPV_3 M_3}. \tag{7}$$

The resulting portfolio yield is then used to give the value of the contract if the yield spread or yield-based pricing mechanisms are adopted for CreditNOTE.

[12] Fabozzi, F., *Bond Portfolio Management*, Chapters 10–14 (FJF Associates, 1996). This reference discusses the measurement of portfolio yield in some depth.