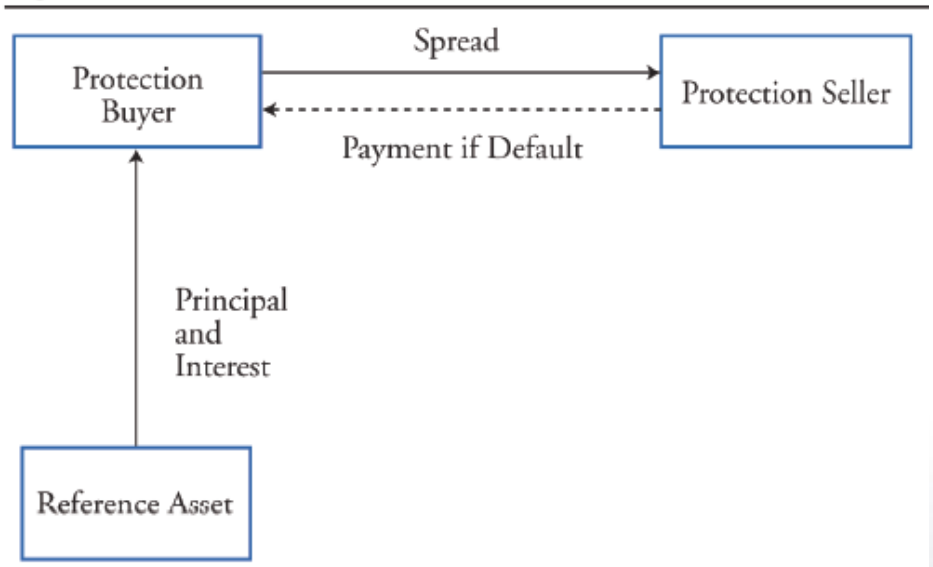
Credit Derivatives and Credit-Linked Notes

信用衍生品和信用连接票据

Credit Default Swap (CDS)

- A **single-name (单一实体，单一参照物)** credit default swap (CDS) is a bilateral derivative contract between a protection buyer and a protection seller. Although named a "swap" the security is a contingent claim and, hence, functions like a put option. The protection buyer will make pre-specified payments to the protection seller over a pre-specified time period and the protection seller is liable for making the protection buyer "whole" if a credit event occurs.
- Hence, a single-name CDS operates essentially as an **insurance contract** but a key difference is that the protection buyer need not actually own the underlying asset. Figure 1 illustrates the mechanics of the single-name CDS.

Figure 1: CDS Structure



Credit Default Swap (CDS)

- It is the responsibility of the protection seller to compensate the protection buyer for a credit event.
- There are two standard settlement methods: **cash settlement or physical settlement**.
  - Under *cash settlement*, the protection seller will make a one time cash payment to the protection buyer in the amount of par minus price after credit event (i.e., *par minus current market price*).
  - On the other hand, if the contract specified *physical settlement*, the protection buyer delivers the underlying reference to the protection seller and receives a cash payment equal to the par value.
  - Note that both methods of settlement are economically equivalent because the protection buyer is made whole.

Credit Default Swap (CDS)

- Alternatively, the protection buyer may enter into a **digital swap** where the payout is binary.
- That is, the payment from a credit event is **fixed and known in advance**, independent of the actual impairment. Therefore, it is possible that the protection buyer will not be made whole . On the other hand, if the post-default amount is sufficiently high, the payout on the digital swap may exceed the economic loss on the bond (par minus price after credit event). Hence, a digital swap is a special type of cash settlement.
- Figure 2 summarizes the relationship between **CDS** and **put options**.

Figure 2: Credit Default Swaps vs. Put Options

	CDS	*Put Option*
Term	known expiration	known expiration
Premium	up front or running	up front
Underlying	reference name	stock, index, etc.
Payment Trigger	credit event	in the money
Payoff	par – market value (standard CDS)	X – S
Fixed Payoff	digital swap	binary option

Portfolio Credit Default Swaps

- Portfolio products, in the most general sense, provide protection against one or more defaults on a pre-specified set of single-name credits. There are several important variations on the portfolio structure depending on whether the protection buyer seeks payout from each default (i.e., basket CDS), only on the *n*th default, only after a certain loss level is breached (i.e., senior basket), or only up to a certain loss level (i.e., subordinated basket).
- In a **standard basket CDS**, the protection buyer will receive compensatory payout for each and every default. Because, in theory, the protection buyer can receive payments equal to the basket size, the spread is likely to be prohibitive (价格过高的). Rather, the buyer will specify some subset of loss events it wants to protect against.
- A common basket structure is the ***n*th-to-default** basket, whereby the protection buyer fully absorbs the first *n-1* defaults and only receives a compensatory payout on the *n*th default. Consider a bank that has set aside capital reserves to cover *n-1* defaults but may seek additional protection by purchasing protection via *n*th-to-default basket.
- In a **first-to-default** basket, the protection buyer will receive a compensatory payment from the first default regardless of the name or size. Because the basket will only pay on the first default, the structure terminates after the first credit event.

Portfolio Credit Default Swaps

- Similarly, the **second-to-default basket** will provide compensatory payment for the second default in the reference names (no payment is made from the first default). This basket structure is much more interesting because of the important role correlation will play in the pricing of the CDS spread. For example, suppose two credits are highly correlated (e.g., from exposure to the same macro industry factor). A default in one credit is likely to be followed with a default in the other credit. Hence, the payoff on the basket is more likely than if all the credits were independent.
- **Senior baskets** and **subordinated baskets** payoff functions are a bit different than the previous basket structures. Whereas the standard and nth-to-default basket payoffs are based on the number of defaults, the senior and subordinated basket payoffs are a function of the cumulative loss level.
  - Specifically, the senior basket will not receive any compensatory payment until a pre-specified loss level is reached. This concept is analogous to insurance proceeds above the deductible in a standard insurance policy.
  - On the other hand, the subordinated basket will receive compensatory payments for cumulative losses below the pre-specified loss level. Hence, the subordinated basket payout represents the deductible in a standard insurance contract.

Portfolio Credit Default Swaps

Example: Basket credit default swap payoffs (Part 1)

High Flying Hedge Fund has bought protection against five single names each with a notional principal of $10 million. The protection will cover the next year and then will expire. Over the next year, assume that each single named credit defaults and all currently trade at 40% of notional value (post default). **Calculate** the payoffs under the following structures: first-to-default, second-to-default, and standard basket CDS (assume the payoffs are settled with cash).

Answer:

Because each credit's post-default price is 40% of notional value, the compensatory payment is: 60% × $10 million = $6 million per credit.

- First-to-default: Because the basket will only pay for the first default, the total payout is $6 million.
- Second-to-default: Under a second-to-default basket the first default is unpaid. On the occurrence of the second default a payment of $6 million is triggered and the structure ends.
- Standard basket: In a standard basket, all defaults are paid so the total compensatory payment = 5 × $6 million = $30 million.

Portfolio Credit Default Swaps

Example: Senior and subordinated basket payoffs (Part 2)

Suppose High Flying Hedge Fund is considering both a senior and subordinated basket with loss level set at $20 million. **Calculate** the payoffs of these two structures, assuming the same default pattern occurs as displayed in the previous example.

Answer:

Subordinated basket: A subordinated basket will pay a maximum of $20 million in payments. Because the total portfolio loss exceeds $20 million, the cap is reached and High Flying will only receive the maximum $20 million amount.

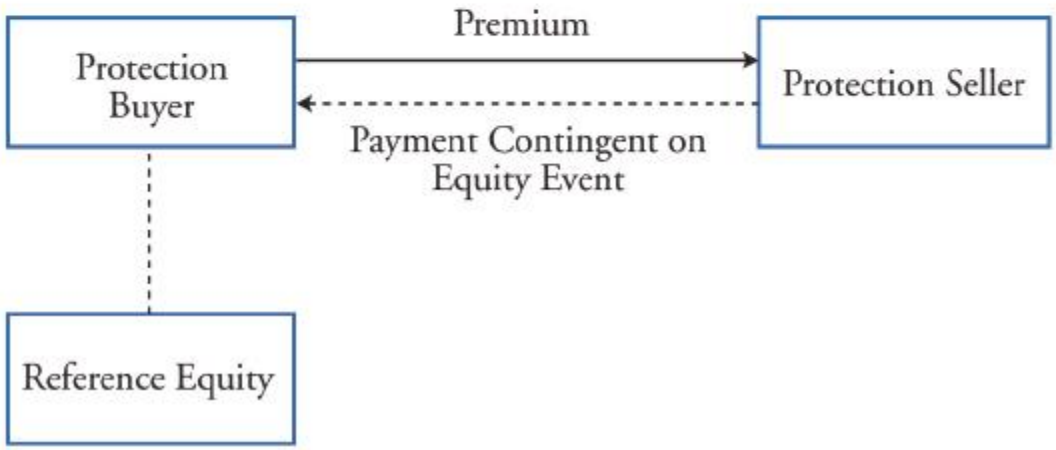
Senior basket: The senior basket structure triggers a payment once the loss level is exceeded. Because the total loss for the portfolio is 5 × $6 million = $30 million, the basket will receive a compensatory payment of $10 million, the excess loss above the threshold ($20 million).

Variations of Credit Default Swaps

An **asset default swap** functions as a single-name CDS where the underlying reference is an asset-backed security (ABS) as opposed to a specific reference. The market for ABS CDS has increased substantially as of late.

An **equity default swap** clearly implies that the buyer is seeking protection on an equity security. Of course, equity cannot default by definition, but rather the security provides a compensatory payout if the stock value falls below a pre-specified level (e.g., 70% of current value). Hence, the equity default swap closely resembles a deep out of the money put. Alternatively, the payout could be binary, effectively fixing a recovery rate of X%. For example, if the fixed recovery rate is 40%, then (100 – 40)% will be the compensatory payment in an equity event.

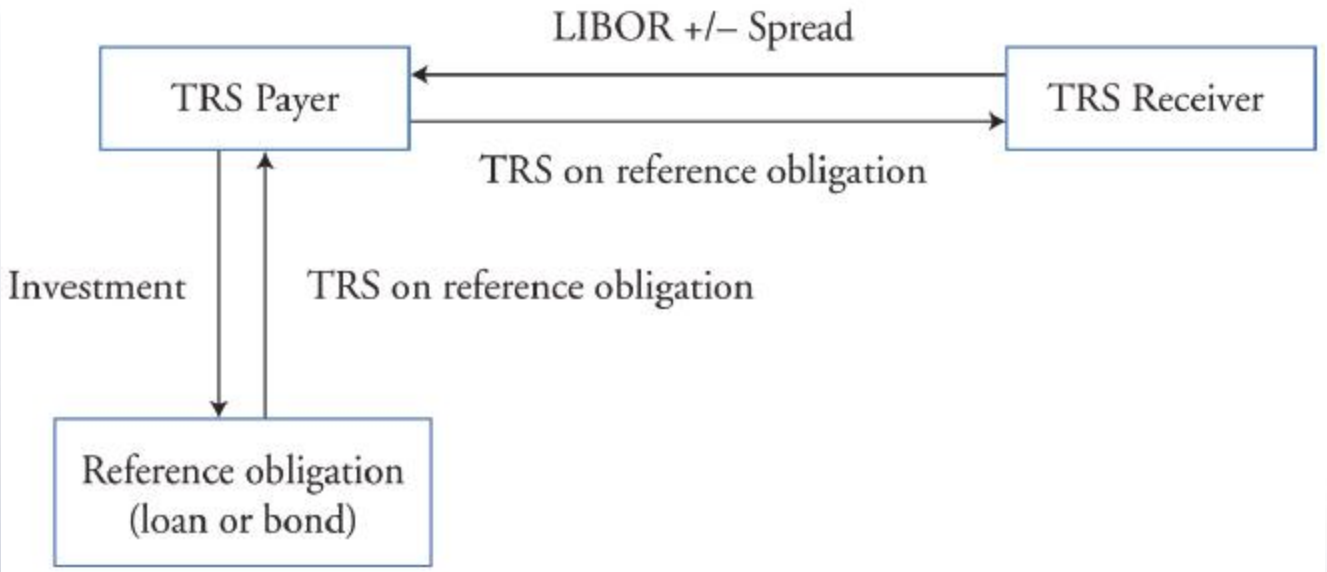
Figure 3: Equity Default Swap Structure



Variations of Credit Default Swaps

- In a **Total Return Swap**, one party will typically pay LIBOR plus a spread in exchange for the total return on an asset or reference portfolio for a stated notional principal (see Figure 4). *The total return consists of all cash flows (dividends, coupons, etc.) and the percent change in asset value*. Intuitively, if the protection seller is receiving all of the associated return with the reference asset(s), it must also be bearing all of its risk. Unlike a CDS where the protection seller is liable for credit events only, the total return swap receiver bears all risks (downgrade, market risk, interest rate risk, etc.), not just credit risk.

Figure 4: Total Return Swap Structure



Total Return Swap Payoff

High Flying Hedge Fund will enter into a $100 million total return swap on the S&P 500 Index as the index receiver (i.e., total return receiver). The counterparty (i.e., total return payer) will receive 1-year LIBOR + 400bp. The contract will last two years and will exchange cash flows annually. Given the following information, **determine** the cash flows at contract initiation, in one year, and in two years. Assume LIBOR remains flat.

- Current LIBOR = 5%.
- Current S&P 500 value = 1,000.
- S&P 500 in 1 year = 1,200.
- S&P 500 in 2 years = 900.

Answer:

Similar to other over-the-counter (OTC) contracts such as swaps and forwards, no cash flows are exchanged at initiation.

Over the next year, the S&P 500 Index will increase by 20%. Hence, the index receiver (High Flying) will receive $20 million from the index payer and will pay $9 million (LIBOR = 5% + 400bp) to the counterparty. Therefore, the net cash flow will be $11 million to High Flying.

Between years 1 and 2, the S&P 500 Index will drop 25%. Now, High Flying as the total return receiver must *pay* 25% to the counterparty in addition to the 9% floating rate. Hence, the total outflow from High Flying to the counterparty is $34 million.

Variations of Credit Default Swaps

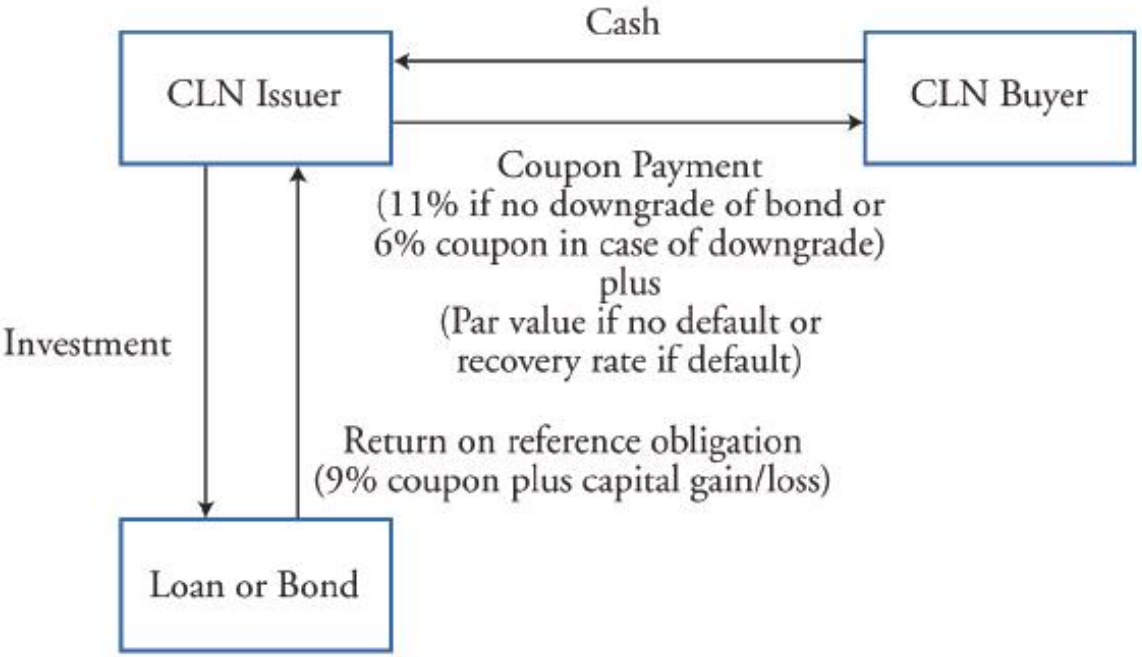
- The final structure discussed here is the **Credit-Linked Note (CLN)**. The easiest way to understand a CLN is to view it as a straight bond with an embedded credit default swap on the bond issuer. Hence, the issuer of the CLN is the protection buyer, and the note holder is the protection seller. In return for bearing the credit risk, the note holder receives an enhanced coupon. However, if a credit event occurs, the issuer may withhold interest and/or principal.

- The CLN is fundamentally different from the single-name CDS contract because the note holder has already advanced the funds to the protection buyer via the principal payment. In addition, the CLN is still a bond and must be marketed to investors via a formal procedure.

Credit-Linked Note (CLN)

The structure of a CLN is best understood by reference to the example in Figure 5. In Figure 5, the CLN issuer has bought a bond that pays a coupon of 9%. The issuer then pays a coupon of 11% to the CLN buyer in return for a cash investment. The 11% coupon is in effect unless there is a credit downgrade. In the event of a downgrade, the CLN issuer pays a lower coupon of 6% to the CLN buyer. If there is no default, the issuer pays par at maturity of the note. If there is a default, the issuer pays the recovery rate (the amount recovered from the issuer of the defaulted note).

Figure 5: The Structure of a Credit-Linked Note



Example

1. You are currently long $10,000,000 par value, 8% XYZ bonds. To hedge your position, you must decide between credit protection via a 5-year CDS with 60bp annual premiums or digital swap with 50% payout with 50bp annual premiums. After one year, XYZ has defaulted on its debt obligations and currently trades at 60% of par. Which of the following statements is true?

   A. The contingent payment from the protection buyer to the protection seller is greater under the single-name CDS than the digital swap.

   B. The contingent payment from the protection buyer to the protection seller is less under the single-name CDS than the digital swap.

   C. The contingent payment from the protection seller to the protection buyer is greater under the single-name CDS than the digital swap.

   D. The contingent payment from the protection seller to the protection buyer is less under the single-name CDS than the digital swap.

D Choices A and B can be eliminated because payments in default are made from protection seller to protection buyer. The payoff from the digital swap will be 50% of par value while the payoff from the single name will be 40% (i.e., 1 – 0.6) of par value.

Example

2. The Big Bank Corp has securitized a large pool of 100 mortgages as follows: $75 million in senior AAA notes, $20 million in mezzanine BB notes, and $5 million in equity tranche. Big Bank Corp would like to provide a credit enhancement to the issue. Which of the following strategies would most effectively reinforce the credit rating of the AAA notes?

A. 26th-to-default basket.

B. Standard basket.

C. Senior basket with $25 million loss level.

D. Subordinated basket with $25 million loss level.

C The senior basket provides compensatory payouts after $25 million in loss is suffered by the pool. Because the goal is to enhance the AAA notes, $25 million can be absorbed by the mezzanine and equity investors without impairing the AAA notes. Assuming all credits are of equal size, the 26th-to-default basket would provide minimal protection since all defaults above 26 would directly impair AAA claims. The standard basket would provide protection starting with the first default and thus would be very expensive if used to protect the AAA notes.

Example

3. Consider a basket with 10 AA-rated single-name credits, each with $10 million notional principal. Assume the pairwise correlation between each of the credits is zero. Which of the following statements about senior, subordinated, standard, and nth-to-default is most likely false?

A. The senior basket will payoff the smallest amount to the protection buyer.

B. The subordinated basket will provide more credit protection than the senior basket.

C. The standard basket will provide the most credit protection.

D. The payoff on the second default will be less than the payout from the first default.

D Statements A, B, and C are most likely true. Because the credits are uncorrelated, it is extremely unlikely that the loss level will exceed the threshold for a senior basket. Similarly, with relatively few expected defaults, the subordinated basket will provide more credit protection than the senior basket. The standard basket will pay each default without limit so this will provide the most credit protection. Statement D is false because the impairment, hence payout, for each default is expected to be the same because each credit covers the same notional principal.

Example

4. Which of the following statements about credit-linked notes is true?

A. The borrower receives an enhanced coupon.

B. The borrower receives a reduced coupon.

C. The lender receives an enhanced coupon.

D. The lender receives a reduced coupon.

C In a credit-linked note, the lender (note holder) receives an enhanced coupon as compensation for bearing the credit risk of the issuer.

真题回顾

- A bank holds USD 60 million of 10-year 6.5% coupon bonds that are trading at a clean price of USD 101.82. The bank is worried by the exposure due to these bonds but cannot unwind the position for fear of upsetting the client. Therefore, it purchases a total return swap (TRS) in which it receives annual LIBOR+100 bp in return for the marked-to-market return on the bond. For the first year, LIBOR sets at 6.25%, and by the end of the year the clean price of the bonds is at USD 99.35. The net receipt/payment for the bank in the total return swap will be to

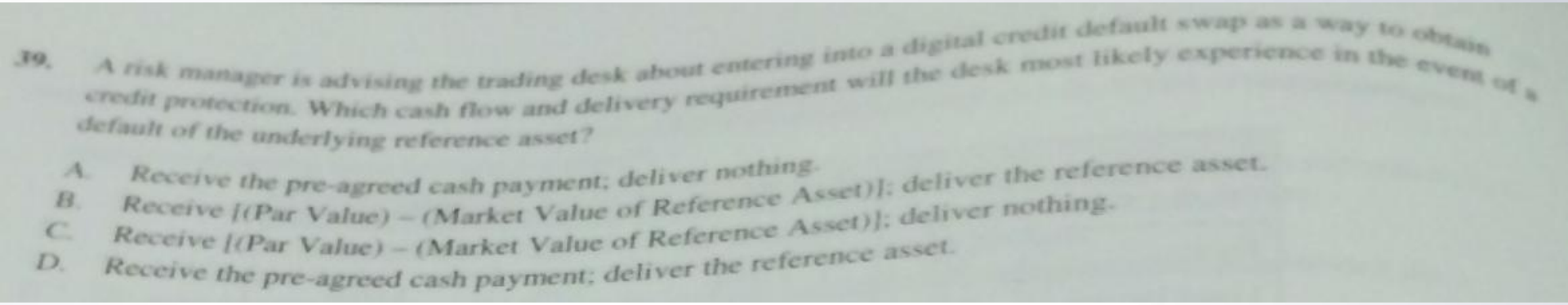
A. Receive USD 1.93 million

B. Receive USD 2.23 million

C. Pay USD 2.23 million

D. Pay USD 1.93 million

a. On the LIBOR leg, the bank receives 7.25. In exchange, it pays the return on the bond, which is the coupon of 6.5% plus the relative return of $(99.35 - 101.82)/100 = -2.47\%$. This gives a receipt of $\$60 \times (7.25 - 6.5 + 2.47)/100 = 1.932$.


39. A risk manager is advising the trading desk about entering into a digital credit default swap as a way to obtain credit protection. Which cash flow and delivery requirement will the desk most likely experience in the event of a default of the underlying reference asset?

A. Receive the pre-agreed cash payment; deliver nothing.
B. Receive [(Par Value) – (Market Value of Reference Asset)]; deliver the reference asset.
C. Receive [(Par Value) – (Market Value of Reference Asset)]; deliver nothing.
D. Receive the pre-agreed cash payment; deliver the reference asset.

39. A risk manager is advising the trading desk about entering into a digital credit default swap as a way to obtain credit protection. Which cash flow and delivery requirement will the desk most likely experience in the event of a default of the underlying reference asset?

A. Receive the pre-agreed cash payment, deliver nothing.

B. Receive [(Par Value) – (Market Value of Reference Asset)]; deliver the reference asset.

C. Receive [(Par Value) – (Market Value of Reference Asset)]; deliver nothing.

D. Receive the pre-agreed cash payment, deliver the reference asset.

Answer: A

201405真题讲解

62. Which of the following types of credit derivatives creates the least counterparty credit exposure for the protection buyer?

A. Total return swap
B. Equity default swap
C. Credit-linked note
D. Senior basket credit default swap

Answer: C

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