

Derivatives

Derivative Instrument and Derivative Market Features



Exam Focus

- Derivatives: types
 - Futures, forwards, and swaps
 - Options and credit derivatives
- Compare OTC vs. exchange traded, pros and cons of derivatives, exposure of parties
- Benefits and risk
- Uses for issuers/investors

© Kaplan, Inc.

Derivatives

- A **derivative** is a security that derives its value from an **underlying**, typically an asset price or interest rate.
- Examples of the underlying
 - Equities and equity indices
 - Bonds, bond indices, interest rates
 - Hard and soft commodities
 - Credit, credit indices

© Kaplan, Inc.

Forward Commitments and Contingent Claims

- **Futures, forward contracts, and swaps** are forward commitments, obligations to perform
- **Options and credit derivatives** are contingent claims because one party's obligation depends on an event:
 - Credit derivatives: borrower credit event
 - Options: exercise by holder (long party)
 - Call $S_T > X$
 - Put $S_T < X$

© Kaplan, Inc.

Exchange-Traded vs. OTC Derivatives

Exchanges

- Contracts are standardized
- **Central clearing:** collateral deposits, mark-to-market, clearinghouse takes the other side of each trade (**novation**); minimizes counterparty risk
- More transparent, more liquid, lower costs
- More efficient clearing and settlement

© Kaplan, Inc.

Exchange-Traded vs. OTC Derivatives

OTC derivatives

- Customizable, less liquid and transparent, higher trading costs
- Many OTC markets now required to have central clearing party and collateral deposits: reduces counterparty risk, similar to exchange-traded derivatives

© Kaplan, Inc.

Exchange vs. OTC: **Example**

Which of the following is a significant difference between exchange-traded derivative (ETD) and over the counter (OTC) derivative contracts?

- A. ETDs create counterparty credit risk for derivative users, while OTC derivatives do not.
- B. ETDs are standardized contracts, while OTC derivatives are customized.
- C. ETDs have higher transaction costs compared to OTC derivatives

-1

© Copyright CFA Institute

© Kaplan, Inc.

Exchange vs. OTC: **Example**

If a corporate issuer enters into a centrally cleared OTC derivative contract, which of the following risks is likely of most concern to the issuer and other participants in this market?

- A. Interest rate risk.
- B. Counterparty credit risk.
- C. Systemic risk.

-1



Solutions

Exchange vs. OTC: Example

Which of the following is a significant difference between exchange-traded derivative (ETD) and over the counter (OTC) derivative contracts?

- A. ETDs create counterparty credit risk for derivative users, while OTC derivatives do not.
- ☒ B. ETDs are standardized contracts, while OTC derivatives are customized.
- C. ETDs have higher transaction costs compared to OTC derivatives

Exchanges standardize contracts to facilitate trading volume. However, users often require specific customized features, and the OTC market can accommodate these needs. A is incorrect because exchanges bear the counterparty credit risk of derivatives. C is incorrect because ETDs have lower transaction costs compared to OTC derivatives.

-1

Exchange vs. OTC: Example

If a corporate issuer enters into a centrally cleared OTC derivative contract, which of the following risks is likely of most concern to the issuer and other participants in this market?

- A. Interest rate risk.
- B. Counterparty credit risk.
- ☒ C. Systemic risk.

Because all the credit risk is taken on by the CCP, all participants in this market are most concerned that the CCP is able to satisfy its obligations to all contracts. A is incorrect because interest rate risk is an underlying risk that can be hedged or managed with certain OTC derivative contracts. B is incorrect because the CCP assumes the credit risk from all parties to the contracts.

-1

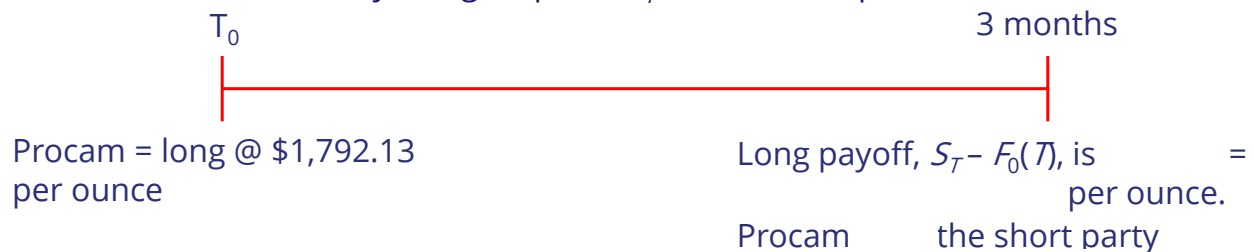
Derivatives

Forward Commitment and Contingent Claim Features and Instruments

Forward Contract: Example

An investor, Procam Investments, enters a cash-settled forward contract with a financial intermediary to buy 100 ounces of gold at a forward price, $F_0(T)$, of \$1,792.13 per ounce in three months.

- Today's spot gold price (S_0) is \$1,770 per ounce.
- At contract maturity, the gold price (S_T) is \$1,780.50 per ounce.



-3

© Copyright CFA Institute

© Kaplan, Inc.

Forward Contract: Example

A. Forward contract purchaser

B. Forward contract seller

C. Neither a forward contract purchaser nor a seller

1. Seeks to benefit from underlying price depreciation
2. Realizes a gain if the initial spot price of the underlying, S_0 , exceeds the forward price of $F_0(T)$
3. Receives a positive payoff at maturity if the spot price, S_T , exceeds the forward price of $F_0(T)$

-3

© Copyright CFA Institute

© Kaplan, Inc. 2

Futures Characteristics

- **Contract specifics:** quality and quantity of good, delivery time, place, manner of delivery
- **Exchange specifics:** minimum price fluctuation (tick), daily price limit
 - Clearinghouse holds other side of each trade
 - Margin posted and marked to market daily
 - Margin is collateral, not a loan
 - Long “buys” and short “sells” the future

© Kaplan, Inc.

Forwards vs. Futures

Forwards

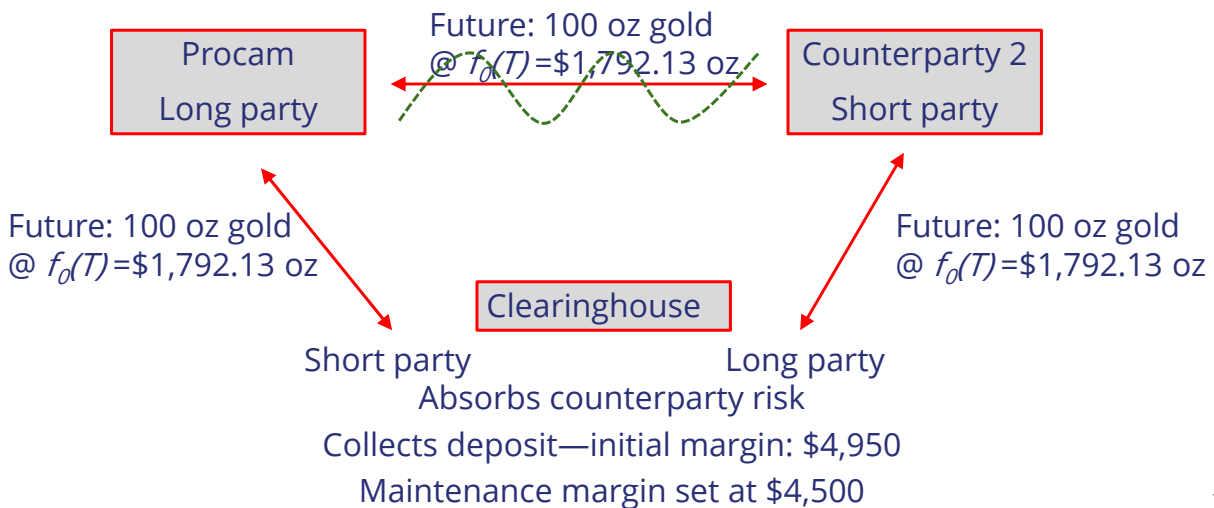
- OTC market
 - Custom contracts
 - Default risk*
 - No margin*
 - Less regulation
- * Unless central clearing

Futures

- Exchange traded
- Standardized
- Guaranteed by clearinghouse
- Margin required
- Regulated

© Kaplan, Inc.

Novation: Example



-4

© Copyright CFA Institute

© Kaplan, Inc.

Futures Margin

- **Initial margin:** deposited before trade occurs by both long and short parties
- **Marking to market** is process of adjusting margin balance in a futures account each day for the change in the futures price (add gains, subtract losses)
- After adjusting margin balance for day's gains/losses, futures price is new settlement price
- **Maintenance margin:** minimum margin that triggers margin call
 - When margin < maintenance margin, must deposit **variation margin** to restore initial margin (or position is closed)

© Kaplan, Inc.

Futures Prices and Spot Prices

- **Settlement price**: average of trades during closing period, used to calculate margin
- **Spot price**: price of underlying asset for immediate delivery
 - **Futures price converges to spot price** over time to contract expiration
 - At expiration, settlement price = spot price

© Kaplan, Inc.

At the Close of Day 1: **Example**

$f_0(T) = \$1,792.13$, at the close of Day 1, gold futures price $f_1(T) = \$1,797.13$

Mark to market:

Procam (long) $f_1(T) - f_0(T) =$ =

Mark-to-market gain = 100 oz × =

Margin account = \$4,950 + =

Counterparty 2 (short) $f_0(T) - f_1(T) =$ =

Mark-to-market loss = 100 oz × =

Margin account = \$4,950 - =

Margin maintenance \$4,500 variation margin payment =

-8

Marking to Market: **Example**

Day	Futures Price \$	Daily Gain or (Loss) \$	Total Gain or (Loss) \$	Margin Balance \$	Margin Call \$
Initial	1,792.13			4,950	
T-5	1,797.13	500	500	5,450	
T-4	1,786.25				
T-3	1,782.19				
T-2	1,777.45				
T-1	1,779.50				
T	1,780.50				

-5

© Copyright CFA Institute

© Kaplan, Inc.

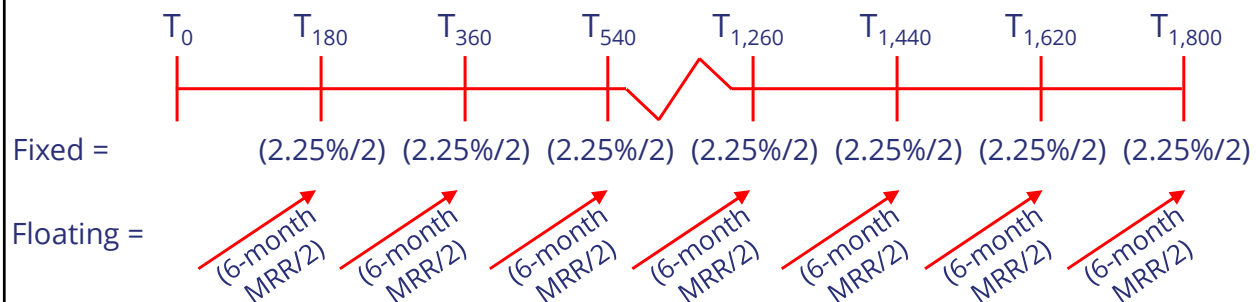
Swaps

- For a notional amount, each party makes periodic payments based on an interest rate, or on the performance of an index/bond/portfolio/commodity
- Payments are typically netted, may or may not require margin, multiple settlement dates
- Custom instruments, equivalent to a series of forwards

© Kaplan, Inc.

Plain Vanilla Interest Rate Swap

- Fixed rate = 2.25%
- Payments: 6 monthly
- Principal = £200m
- Floating = MRR
- Tenor = 5 years



-2

© Kaplan, Inc.

Interest Rate Swap: **Example**

Fyleton Investments has entered a five-year, receive-fixed £200 million interest rate swap with a financial intermediary to increase the duration of its fixed-income portfolio. Under terms of the swap, Fyleton has agreed to receive a semiannual £ fixed rate of 2.25% and pay six-month MRR. Calculate the first swap cash flow exchange if six-month MRR is set at 1.95%.

Interest Rate Swap: **Example**

- The financial intermediary owes Fyleton a fixed cash flow payment:
=
- Fyleton owes the financial intermediary a floating cash flow payment:
=
- The fixed and floating payments are netted against one another, and the net result is that the financial intermediary pays Fyleton:
=

-3

Swaps: **Question**

Identify the interest rate swap participants that correspond to the following statements:

- | | |
|--|--|
| A. Fixed-rate payer | 1. Makes a payment each interest period based on a market reference rate |
| B. Floating-rate payer | 2. May face a positive or a negative mark to market over the life of an interest rate swap contract |
| C. Both a fixed-rate payer and a floating-rate payer | 3. Receives a net payment on the swap for any interest period for which the market reference rate exceeds the fixed rate |

-3

Options Basics

Option buyer (owner, long position)

Pays a premium to purchase the *right* to exercise an option at a future date

Call option = right to buy at strike (exercise)

Put option = right to sell at strike (exercise)

Option seller (writer, short position)

Incurs an **obligation** to perform if owner exercises

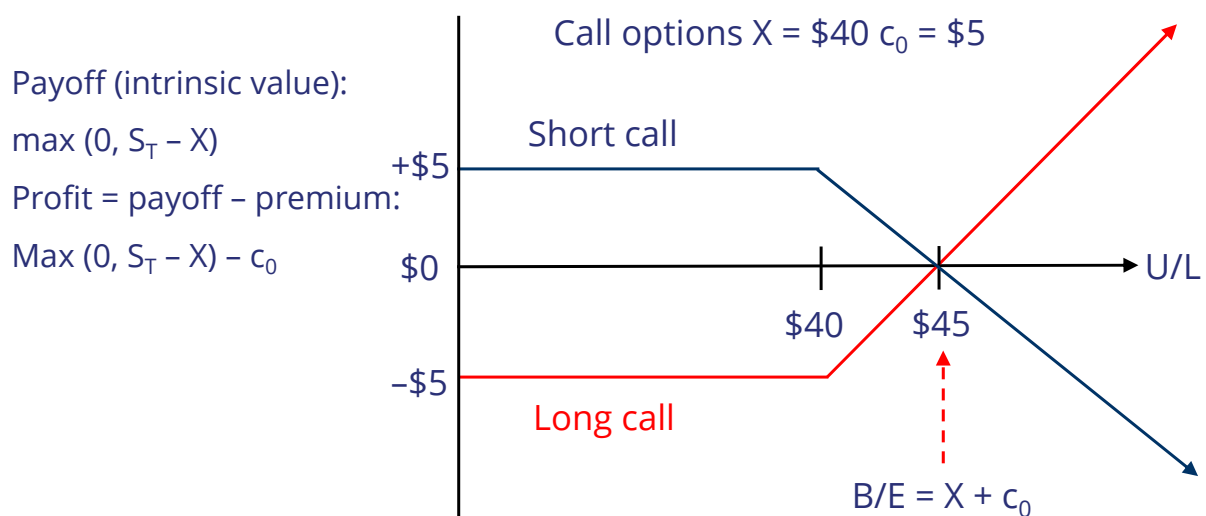
European options can be exercised **only at expiration**

American options can be exercised **any time before expiration**

American options are worth **at least as much** as otherwise-identical European options

© Kaplan, Inc.

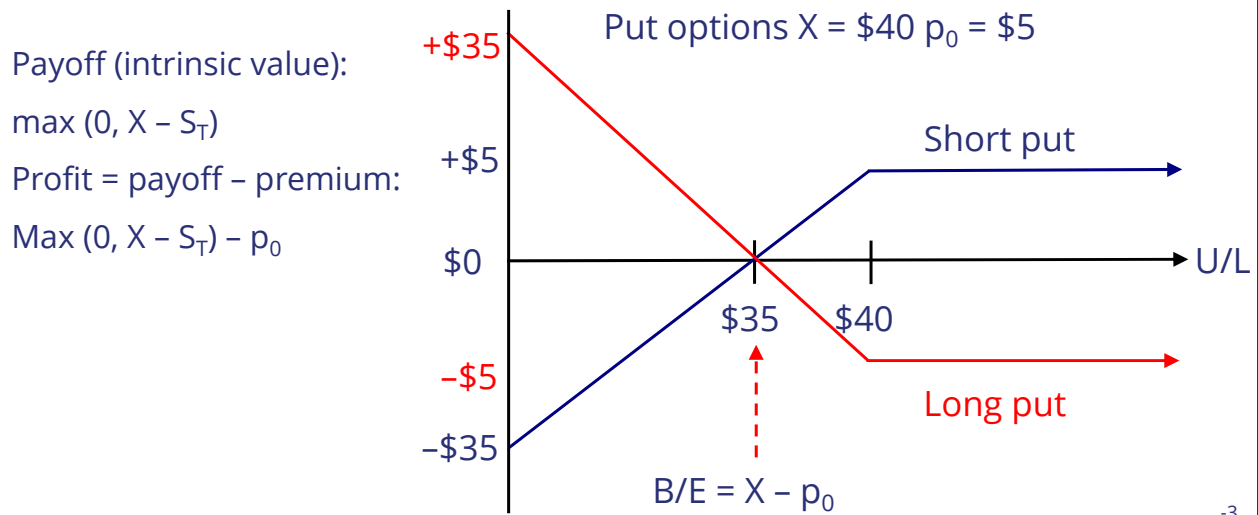
Call Profit/Loss at Expiration



-3

© Kaplan, Inc.

Put Profit/Loss at Expiration

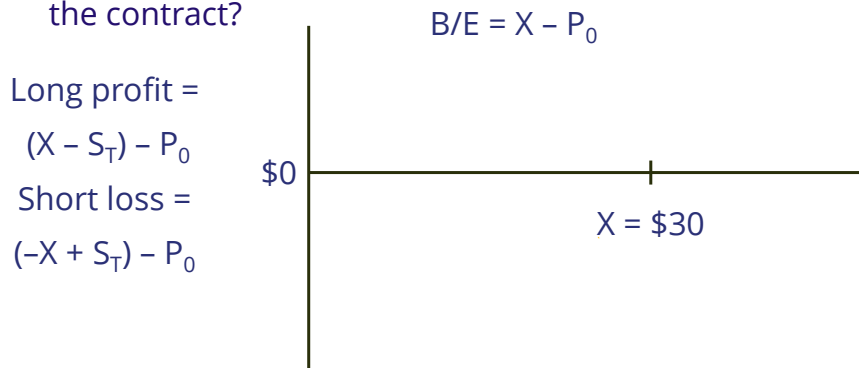


-3

© Kaplan, Inc.

Options: Question

A put option seller receives a \$5 premium for a put option sold on an underlying with an exercise price of \$30. What is the option seller's maximum profit under the contract? What is the maximum loss under the contract?



-5

© Copyright CFA Institute

© Kaplan, Inc.

Options: Question

Identify the option contract participants that correspond to the following statements:

- | | |
|--|--|
| A. Put option seller | 1. Has no counterparty credit risk to the option buyer once the up-front premium has been paid |
| B. Call option seller | 2. Earns a profit equal to the premium if the underlying price at maturity is less than the exercise price |
| C. Both a put option seller and a call option seller | 3. Earns a profit equal to the premium if the underlying price at maturity exceeds the exercise price |

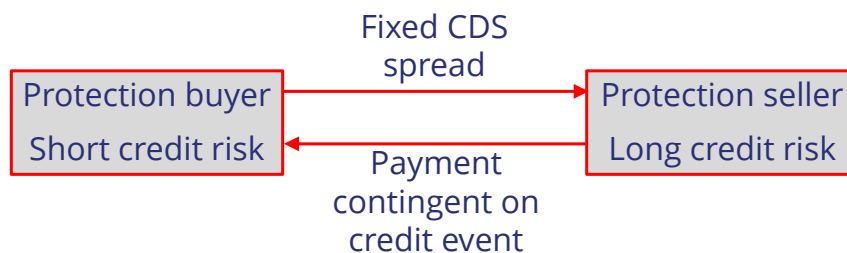
-3

© Copyright CFA Institute

© Kaplan, Inc.

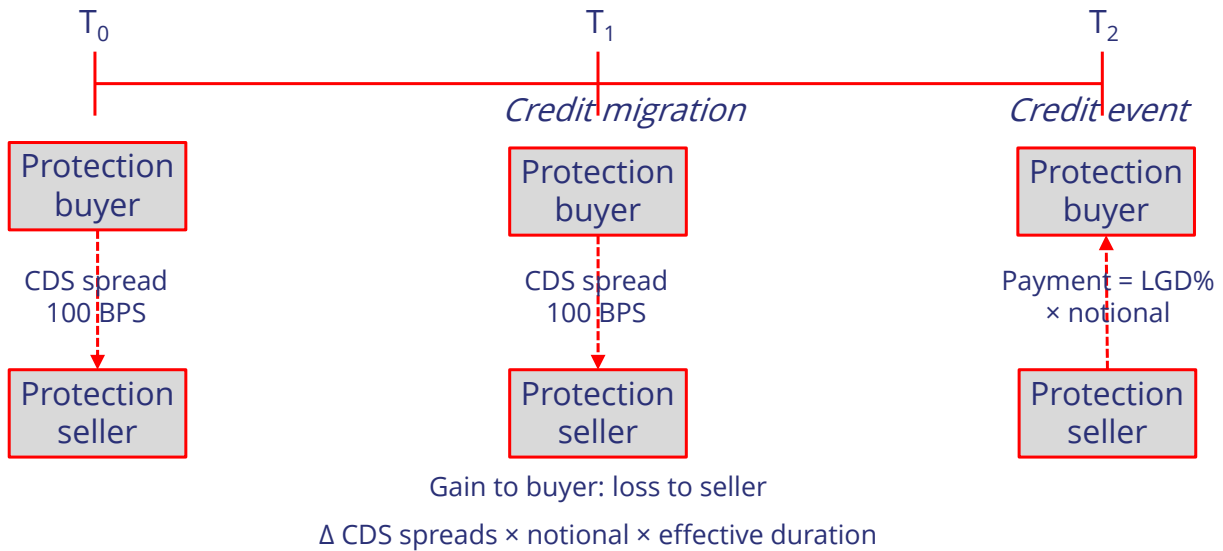
Credit Derivatives

- **Credit default swap (CDS):** protection *buyer* makes periodic payments; protection *seller* pays only if credit event (e.g., default of underlying) occurs
- Greater probability of default or loss given default → larger swap fixed payment (and wider credit spread of the underlying debt)
- CDS used to hedge (or to take on) credit risk



© Kaplan, Inc.

Credit Derivatives



© Copyright CFA Institute

© Kaplan, Inc.

Credit Derivatives: Question

Identify the CDS contract participants that correspond to the following statements:

- | | |
|--|--|
| A. Credit protection buyer | 1. Seeks to gain from higher issuer credit spreads |
| B. Credit protection seller | 2. Enters into a derivative contract that transfers the risk of loss from a credit event of an underlying third-party issuer |
| C. Both a credit protection buyer and a credit protection seller | 3. Faces an MTM gain on the CDS contract if the CDS spread of the underlying issuer falls |

-3

© Copyright CFA Institute

© Kaplan, Inc.

Solutions

Exchange vs. OTC: **Example**

Which of the following is a significant difference between exchange-traded derivative (ETD) and over the counter (OTC) derivative contracts?

- A. ETDs create counterparty credit risk for derivative users, while OTC derivatives do not.
- ☒ B. ETDs are standardized contracts, while OTC derivatives are customized.
- C. ETDs have higher transaction costs compared to OTC derivatives

Exchanges standardize contracts to facilitate trading volume. However, users often require specific customized features, and the OTC market can accommodate these needs. A is incorrect because exchanges bear the counterparty credit risk of derivatives. C is incorrect because ETDs have lower transaction costs compared to OTC derivatives.

-1

Exchange vs. OTC: Example

If a corporate issuer enters into a centrally cleared OTC derivative contract, which of the following risks is likely of most concern to the issuer and other participants in this market?

- A. Interest rate risk.
- B. Counterparty credit risk.
- ☒ C. Systemic risk.

Because all the credit risk is taken on by the CCP, all participants in this market are most concerned that the CCP is able to satisfy its obligations to all contracts. A is incorrect because interest rate risk is an underlying risk that can be hedged or managed with certain OTC derivative contracts. B is incorrect because the CCP assumes the credit risk from all parties to the contracts.

-1

Exchange vs. OTC: Example

Which of the following is a significant difference between exchange-traded derivative (ETD) and over the counter (OTC) derivative contracts?

- A. ETDs create counterparty credit risk for derivative users, while OTC derivatives do not.
- ☒ B. ETDs are standardized contracts, while OTC derivatives are customized.
- C. ETDs have higher transaction costs compared to OTC derivatives

Exchanges standardize contracts to facilitate trading volume. However, users often require specific customized features, and the OTC market can accommodate these needs. A is incorrect because exchanges bear the counterparty credit risk of derivatives. C is incorrect because ETDs have lower transaction costs compared to OTC derivatives.

-1

Exchange vs. OTC: Example

If a corporate issuer enters into a centrally cleared OTC derivative contract, which of the following risks is likely of most concern to the issuer and other participants in this market?

- A. Interest rate risk.
- B. Counterparty credit risk.
- C. Systemic risk.**

Because all the credit risk is taken on by the CCP, all participants in this market are most concerned that the CCP is able to satisfy its obligations to all contracts. A is incorrect because interest rate risk is an underlying risk that can be hedged or managed with certain OTC derivative contracts. B is incorrect because the CCP assumes the credit risk from all parties to the contracts.

-1

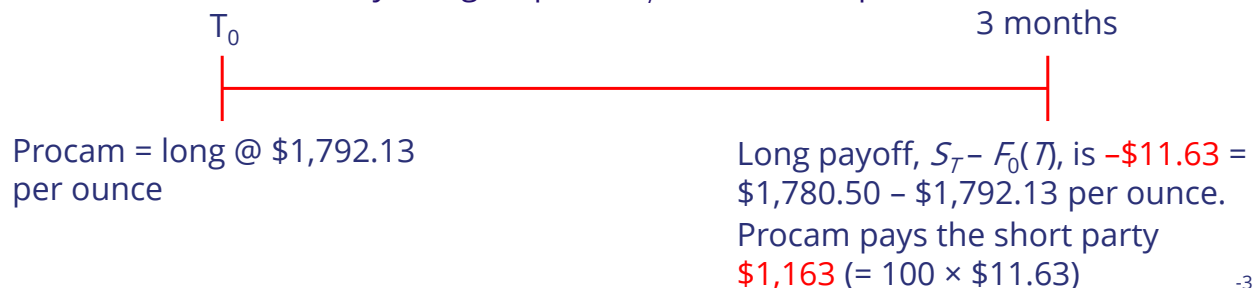
© Copyright CFA Institute

© Kaplan, Inc.

Forward Contract: Example

An investor, Procam Investments, enters a cash-settled forward contract with a financial intermediary to buy 100 ounces of gold at a forward price, $F_0(T)$, of \$1,792.13 per ounce in three months.

- Today's spot gold price (S_0) is \$1,770 per ounce.
- At contract maturity, the gold price (S_T) is \$1,780.50 per ounce.



-3

© Copyright CFA Institute

© Kaplan, Inc.

Forward Contract: Example

- | | |
|--|---|
| A. Forward contract purchaser | 1. Seeks to benefit from underlying price depreciation |
| B. Forward contract seller | 2. Realizes a gain if the initial spot price of the underlying, S_0 , exceeds the forward price of $F_0(T)$ |
| C. Neither a forward contract purchaser nor a seller | 3. Receives a positive payoff at maturity if the spot price, S_T , exceeds the forward price of $F_0(T)$ |
-

-3

© Copyright CFA Institute

© Kaplan, Inc. 2

At the Close of Day 1: Example

$f_0(T) = 1,792.13$, at the close of Day 1, gold futures price $f_1(T) = \$1,797.13$

Mark to market:

Procam (long)	$f_1(T) - f_0(T) = \$1,797.13 - \$1,792.13 = \$5 \text{ oz}$
	Mark-to-market gain = $100 \text{ oz} \times \$5 = \500
	Margin account = $\$4,950 + \$500 = \$5,450$
Counterparty 2 (short)	$f_0(T) - f_1(T) = \$1,792.13 - \$1,797.13 = -\$5 \text{ oz}$
	Mark-to-market loss = $100 \text{ oz} \times -\$5 = -\500
	Margin account = $\$4,950 - \$500 = \$4,450$
Margin < maintenance	$\$4,450 < \$4,500$ variation margin payment = $\$50$

-8

© Copyright CFA Institute

© Kaplan, Inc.

Marking to Market: **Example**

Day	Futures Price \$	Daily Gain or (Loss) \$	Total Gain or (Loss) \$	Margin Balance \$	Margin Call \$
Initial	1,792.13			4,950	
T-5	1,797.13	500	500	5,450	
T-4	1,786.25	(1,088)	(588)	4,362	588
T-3	1,782.19	(406)	(994)	4,544	
T-2	1,777.45	(474)	(1,468)	4,070	880
T-1	1,779.50	205	(1,263)	5,155	
T	1,780.50	100	(1,163)	5,255	

-5

© Copyright CFA Institute

© Kaplan, Inc.

Interest Rate Swap: **Example**

- The financial intermediary owes Fyleton a fixed cash flow payment:

$$(\text{£}200 \text{ million} \times 0.0225 / 2) = \text{£}2,250,000$$

- Fyleton owes the financial intermediary a floating cash flow payment:

$$(\text{£}200 \text{ million} \times 0.0195 / 2) = \text{£}1,950,000$$

- The fixed and floating payments are netted against one another, and the net result is that the financial intermediary pays Fyleton:

$$(\text{£}2,250,000 - \text{£}1,950,000) = \text{£}300,000$$

-3

© Copyright CFA Institute

© Kaplan, Inc.

Swaps: Question

Identify the interest rate swap participants that correspond to the following statements:

A. Fixed-rate payer

B. Floating-rate payer

C. Both a fixed-rate payer and a floating-rate payer

1. Makes a payment each interest period based on a market reference rate
2. May face a positive or a negative mark to market over the life of an interest rate swap contract
3. Receives a net payment on the swap for any interest period for which the market reference rate exceeds the fixed rate

-3

© Copyright CFA Institute

© Kaplan, Inc.

Options: Question

A put option seller receives a \$5 premium for a put option sold on an underlying with an exercise price of \$30. What is the option seller's maximum profit under the contract? What is the maximum loss under the contract?

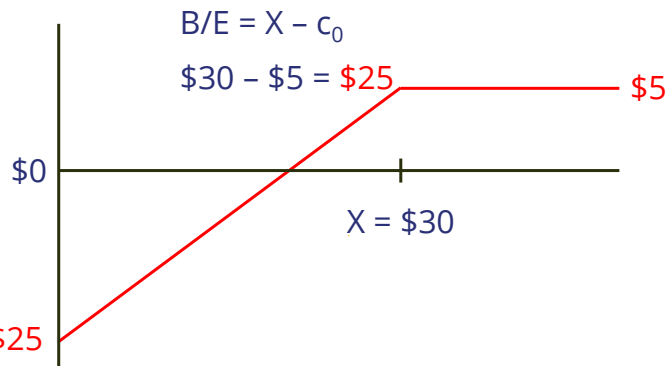
Long profit =

$$(X - S_T) - P_0$$

Short loss =

$$(-X + S_T) - P_0$$

$$(-\$30 + \$0) + \$5 = \$25$$



-5

© Copyright CFA Institute

© Kaplan, Inc.

Options: Question

Identify the option contract participants that correspond to the following statements:

A. Put option seller

B. Call option seller

C. Both a put option seller and a call option seller

1. Has no counterparty credit risk to the option buyer once the up-front premium has been paid
2. Earns a profit equal to the premium if the underlying price at maturity is less than the exercise price
3. Earns a profit equal to the premium if the underlying price at maturity exceeds the exercise price

-3

© Copyright CFA Institute

© Kaplan, Inc.

Credit Derivatives: Question

Identify the CDS contract participants that correspond to the following statements:

A. Credit protection buyer

B. Credit protection seller

C. Both a credit protection buyer and a credit protection seller

1. Seeks to gain from higher issuer credit spreads
2. Enters into a derivative contract that transfers the risk of loss from a credit event of an underlying third-party issuer
3. Faces an MTM gain on the CDS contract if the CDS spread of the underlying issuer falls

-3

© Copyright CFA Institute

© Kaplan, Inc.

Derivatives

Derivative Benefits, Risks, and Issuer and Investor Uses

Derivatives Benefits

- Transfer/manage existing risk
- Easier to get short position (vs. short sale)
- Lower transactions cost compared to cash market
- Lower cash cost/higher leverage
- Greater liquidity
- Improve efficiency of market prices
- Informational discovery
 - Expected volatility
 - Estimates of future prices
 - Expected future interest rates/rate changes

© Kaplan, Inc.

Benefits: Question

Identify the proper derivative market benefits that correspond to the following statements:

A. Price discovery function

B. Operational advantages

C. Risk transfer

1. Futures margin requirements are quite low versus the cost of a cash market purchase.
2. The ability to buy or sell a derivative today eliminates the timing mismatch between an economic decision and the ability to transact.
3. Investors track an equity index futures price to gauge sentiment before the market opens.

-3

© Copyright CFA Institute

© Kaplan, Inc.

Derivatives Risks

- **Transparency**: portfolios and risk exposures not understood by investors
- **Basis risk**: underlying mismatch with hedged risk, or mismatch of expiration date and date of hedged transaction
- **Liquidity risk**: mismatch of derivative cash flows with those of existing risk to be hedged (margin calls)
- **Counterparty credit risk**: depending on derivative position and margin requirements
- **Systemic risks**: excessive speculation may have negative impact on financial markets/institutions

© Kaplan, Inc.

Risks: Question

Match these derivative market risks to the following statements:

A. Liquidity risk

B. Basis risk

C. Systemic risk

1. The risk that excessive risk taking and use of leverage in derivative markets contribute to market stress
2. The risk of a divergence in the cash flow timing of a derivative versus that of an underlying transaction
3. The risk that the expected value of a derivative differs unexpectedly from that of the underlying

-3

© Copyright CFA Institute

© Kaplan, Inc.

Corporate Issuers

- Reduce duration risk of fixed-rate debt with floating-rate payer swap
- Airline can hedge risk for fuel costs by buying jet fuel futures
- International corporation can hedge uncertainty about future payments/receipts in foreign currency with forwards or futures

Fair value hedging:



© Kaplan, Inc.

Corporate Issuers: Hedging

Hedge accounting: gains or losses on derivative offset effects of changing asset and liability values

Cash flow hedge

Removing the variability of cash flows

Examples

- Fixed-rate payer swap to reduce uncertainty about future interest payments
- Currency forward to reduce uncertainty about value of foreign currency payment or receipt

© Kaplan, Inc.

Corporate Issuers: Hedging

Fair value hedge

Derivatives used to offset the fluctuation in U/L fair value

Examples

- Value of gold miner's inventory hedged by selling forward contracts on gold
- Floating-rate payer swap to offset changes in balance sheet value of fixed-rate bond liability

Net value hedge

- Hedging the value of a foreign subsidiary's equity on a parent's balance sheet with currency forwards

© Kaplan, Inc.

Hedge Types: Question

Match these hedge designation types to the following statements:

- | | |
|-------------------------|---|
| A. Cash flow hedge | 1. A derivative used to offset the fluctuation in fair value of an asset or liability |
| B. Fair value hedge | 2. A derivative designated as absorbing the variable cash flow of a floating-rate asset or liability |
| C. Net investment hedge | 3. A derivative designated as offsetting the foreign exchange risk of the equity of a foreign operation |

-3

Investors

Examples

- Speculate on silver by buying forward contract
- Increase (decrease) duration of a bond portfolio by buying/selling a fixed-rate swap

Examples of altering risk of an equity portfolio

- Buy index forward to increase risk exposure
- Sell index forward to decrease risk exposure
- Buy index puts to limit downside exposure
- Buy calls for leveraged long exposure

© Kaplan, Inc.

Investors: Question

Match these hedge designation types to the following statements:

A. Investors

B. Both issuers and investors

C. Issuers

1. They use derivatives to offset or hedge market-based underlying exposures incidental to their commercial operations and financing activities.
2. They tend to transact more frequently in exchange-traded derivative markets.
- 3. They use derivatives to change their exposure to an underlying asset price without transacting in the cash market.

-3

© Copyright CFA Institute

© Kaplan, Inc.

Solutions

Benefits: Question

Identify the proper derivative market benefits that correspond to the following statements:

- | | | |
|-----------------------------|---|---|
| A. Price discovery function | → | 1. Futures margin requirements are quite low versus the cost of a cash market purchase. |
| B. Operational advantages | → | 2. The ability to buy or sell a derivative today eliminates the timing mismatch between an economic decision and the ability to transact. |
| C. Risk transfer | → | 3. Investors track an equity index futures price to gauge sentiment before the market opens. |

-3

Risks: Question

Match these derivative market risks to the following statements:

- | | | |
|-------------------|---|--|
| A. Liquidity risk | → | 1. The risk that excessive risk taking and use of leverage in derivative markets contribute to market stress |
| B. Basis risk | → | 2. The risk of a divergence in the cash flow timing of a derivative versus that of an underlying transaction |
| C. Systemic risk | → | 3. The risk that the expected value of a derivative differs unexpectedly from that of the underlying |

-3

© Copyright CFA Institute

© Kaplan, Inc.

Hedge Types: Question

Match these hedge designation types to the following statements:

- | | | |
|-------------------------|---|---|
| A. Cash flow hedge | → | 1. A derivative used to offset the fluctuation in fair value of an asset or liability |
| B. Fair value hedge | → | 2. A derivative designated as absorbing the variable cash flow of a floating-rate asset or liability |
| C. Net investment hedge | → | 3. A derivative designated as offsetting the foreign exchange risk of the equity of a foreign operation |

-3

© Copyright CFA Institute

© Kaplan, Inc.

Investors: Question

Match these hedge designation types to the following statements:

-
- A. Investors
- B. Both issuers and investors
- C. Issuers
1. They use derivatives to offset or hedge market-based underlying exposures incidental to their commercial operations and financing activities.
 2. They tend to transact more frequently in exchange-traded derivative markets.
 3. They use derivatives to change their exposure to an underlying asset price without transacting in the cash market.

-3