
The following is a review of the Financial Markets and Products principles designed to address the learning objectives set forth by GARP®. This topic is also covered in:

BASIC PRINCIPLES OF CENTRAL CLEARING

Topic 47

EXAM FOCUS

This topic covers the principles of central clearing, including the functions and mechanics of a central counterparty (CCP). For the exam, be able to describe these functions and understand the key related terminology. Clearing, novation, netting, and offset are also important concepts for the exam. In addition, understand the advantages and disadvantages of CCPs, and be able to discuss common terms, including offsetting, loss mutualization, moral hazard, adverse selection, and procyclicality.

THE ROLE OF A CENTRAL COUNTERPARTY

LO 47.1: Provide examples of the mechanics of a central counterparty (CCP).

Clearing and Settlement

A **central counterparty** (CCP) plays an important role in the clearing and settlement of transactions following the initial trade execution. **Clearing** refers to the processes (including margining and netting) between the period from trade execution until settlement. This period is typically short (a few days or months) for classically cleared non over-the-counter (OTC) derivatives. In contrast, for OTC derivatives this time period could extend to years or even decades. **Settlement** of a trade occurs when the trade is completed and all payments have been made and legal obligations satisfied.

A CCP's primary function is to simplify the operational processes and reduce counterparty risk that exists in the bilateral market. When a CCP interjects itself as the central counterparty between OTC trades and acts as the seller to each buyer and the buyer to each seller, it reduces the interconnectedness of trades and of participants, and reduces the risk of default or non-payment by a counterparty. At the same time, the process improves trade liquidity and transparency.

Auctions and Loss Mutualization

Key functions of a CCP related to the clearing process include: margining, novation, netting, managing the auction process, and loss mutualization. Margining will be discussed in LO 47.3, and novation and netting will be discussed in LO 47.4.

When a central clearing member defaults, rather than closing out the trades at market value, the CCP typically auctions off the trades to the surviving members through an **auctioning** process. Participating in the auctioning process is in the best interest of the members in order to minimize their losses through lower market prices or through default funds.

Loss mutualization is a form of insurance and refers to members' contributions to a default fund to cover future losses from member defaults. Since all members must contribute to the fund, the potential losses from the default of any given member are contained. When a member does default, any amounts that cannot be covered from the member's own resources are covered from the fund. Given that losses are spread among surviving members, it is possible that a member will suffer losses even if it never traded with the defaulting counterparty or had no positions with the CCP.

Other Mechanics of a CCP

Products

The OTC derivatives markets include a wide range of products ranging from standard to non-standard and exotic derivatives. There are currently four categories of OTC derivatives according to their stages of central clearing history:

1. Products with a long history of central clearing (e.g., interest rate swaps).
2. Products with a short history of central clearing (e.g., index credit default swaps).
3. Products that may soon be centrally cleared (e.g., interest rate swaptions, credit default swaps).
4. Products that are not suitable for central clearing (e.g., exotic derivatives including Asian options, and derivatives with illiquid reference assets).

The following conditions are important for a product to be centrally cleared:

- *Standardization*: Legal and economic terms should be standard.
- *Complexity*: Transactions need to be easily valued for trading and margin purposes, therefore only less complex (i.e., vanilla, not exotic) trades can be cleared.
- *Liquidity*: Cleared products are typically more liquid than OTC products. Liquidity is important for determining market price for initial margin and default fund contributions, and for the auctioning process. CCPs are also reluctant to develop clearing capability for products that could not be properly cleared due to thin trading. Liquidity also allows for easier close out of trades in a default scenario.

Participants

Transacting with CCPs is restricted to clearing members only. Becoming a member includes a number of requirements, including:

- *Admission criteria*: CCPs set different criteria for admission, including restrictions on credit quality (e.g., investment grade only) and size (e.g., minimum \$50 million).

- *Financial commitment:* The primary financial commitment by a member is to contribute to the CCP's default fund.
- *Operational criteria:* Members' operational requirements include posting margin, and participating in "fire drills" to simulate member default and in auctions if default does occur.

These criteria can be onerous, and as a result, only large banks or global financial institutions typically become clearing members. Smaller entities including small banks and financial institutions and some non-financial end users would likely not participate as direct clearing members, but would participate in the clearing process through transacting with a member on a principal-to-principal basis, or on an agency basis. These players would therefore have a bilateral relationship with the clearing member but not the CCP. This clearing process may be similar to the clearing between the member and the CCP, with some differences, including no default fund commitment by the non-member players.

Number of CCPs

A single, large CCP may be optimal given the benefits of offsetting trades and cost minimization through economies of scale. However, it is generally not feasible to have a single CCP for the following reasons:

- *Regional differences:* Regional CCPs may be beneficial to centrally clear trades in the region's currency and under the laws and regulations of the region.
- *Product types:* CCPs often specialize in clearing certain derivatives products.
- *Regulatory reasons:* Regulations may dictate that products be cleared by local CCPs. However, CCPs need not operate in isolation, and CCPs working together may be necessary. It is important to recognize, however, that this may increase systemic risk and the risk of contagion during stress times.

Types of CCPs

Arguments exist for both a utility-driven CCP and a profit-driven CCP. A utility-driven CCP would be focused on long-term stability rather than short-term profits. A profit-driven CCP would be focused on the bottom line in order to attract personnel and build the best systems. Currently, there are stronger arguments in favor of profit-driven CCPs.

Failure of a CCP

While it is an infrequent event, CCPs do fail. However, the failure of a large and systemically important CCP could lead to potentially catastrophic events. As a result, CCPs must maintain sufficient loss absorption methods to withhold large member defaults. The financial trouble of a CCP may ultimately result in liquidity support from a central bank.

CENTRAL CLEARING

LO 47.2: Describe advantages and disadvantages of central clearing of OTC derivatives.

The following table illustrates the primary differences between the OTC derivatives markets and CCPs and exchanges. It should be noted that while the OTC market provides the greater breadth of participants and products and offers customization, the CCP/exchange-based market offers stronger margining and loss buffers and reduced counterparty and systemic risk.

	<i>OTC Derivatives</i>	<i>CCP/Exchanges</i>
Trading	Bilateral	Bilateral / Centralized
Counterparty	Original trade counterparty	CCP (replaces counterparty)
Participants	All	Clearing members (dealers)
Products	All (including non-standard, exotic)	Standard, vanilla
Margining	Bilateral, custom	Full margining set by CCP (initial, variation)
Loss buffers	Margin, regulatory capital	Initial margin, default fund, CCP capital

Advantages of Central Clearing

Central clearing through CCPs has the following advantages:

- *Transparency*: In OTC markets, parties typically do not see all outstanding trades between the various counterparties. CCPs have a consolidated view of trading positions and can therefore better react to extreme events.
- *Offsetting*: By transacting through a CCP, duplicate bilateral contracts can be offset, which improves flexibility for new transactions and reduces costs.
- *Loss mutualization*: A member's losses are distributed among all surviving members, which spread the impact of losses, reduce costs, and minimize market impact and systemic risk.
- *Legal and operational efficiency*: The centralized role of CCPs in the clearing (margining, netting) and settlement process improves operational efficiency while reducing costs.
- *Liquidity*: The daily margining of products in a centrally-cleared market ensures greater transparency in product valuation, which increases product liquidity.
- *Default management (counterparty risk)*: CCPs act as the counterparty to each trade, which reduces counterparty risk. Member defaults are centrally managed through the auction process which minimizes price disruptions.

Disadvantages of Central Clearing

While we noted loss mutualization as an advantage of the central clearing process, it can lead to potential problems, including moral hazard and adverse selection.

- *Moral hazard*: Moral hazard is the risk that one party will take on higher risk knowing that another party bears the costs of this risk. In central clearing, the risk is that members will have less incentive to monitor risk knowing that the CCP takes on most of the risks.

- **Adverse selection:** Adverse selection is the risk that participants with a better understanding of product risks and pricing will trade more products whose risks the CCP underprices, and will trade fewer products whose risks the CCP overprices.
- **Bifurcation:** The separation of trading into cleared and non-cleared products can increase cash flow volatility even for hedged products.
- **Procyclicality:** Procyclicality essentially reflects the downside of margining. It reflects a scenario where a CCP increases margin requirements (initial margin) in volatile markets or during a crisis, which may aggravate systemic risk.

MARGINING

LO 47.3: Compare margin requirements in centrally cleared and bilateral markets, and explain how margin can mitigate risk.

One of the risk mitigation tools employed by CCPs to minimize counterparty and market risk is margining. Margining by CCPs is stricter than in the OTC derivatives markets and it involves posting cash or marketable security collateral for initial margin and variation margin requirements. Initial margin represents cash or liquid assets transferred by a member at trade inception to cover a worst-case loss in the event of a member default. Variation margin is typically cash posted by a member to cover the daily net change of the member's position.

CCPs normally set margin requirements based only on the risks of the members' transactions. For initial margin, the credit quality of the member is typically not a consideration and therefore members with different credit risk may be posting the same amount of initial margin.

NOVATION AND NETTING

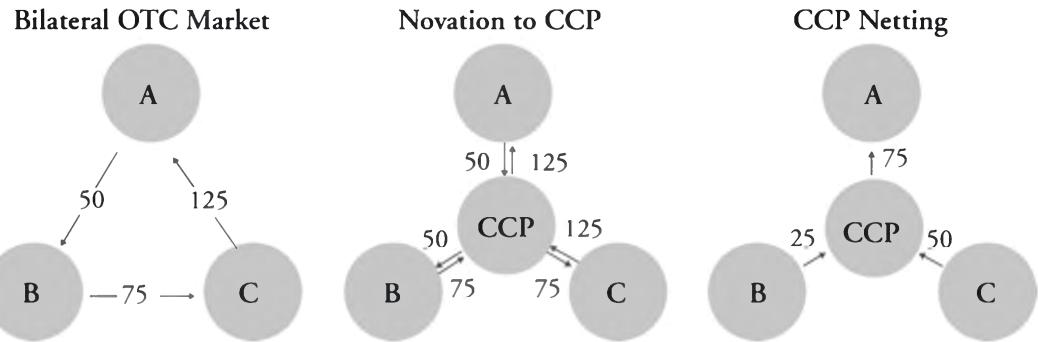
LO 47.4: Compare and contrast bilateral markets to the use of novation and netting.

The legal process of interposing the CCP between the seller and the buyer is called **novation**. Through novation, one contract (the bilateral contract between OTC participants) is replaced with another contract (or contracts) with the CCP. This is important because novation transforms the process from bilateral trading to trading with a CCP, where the CCP is the insurer of counterparty risk. Assuming the legal enforceability of novation, the old contracts cease to exist and the original bilateral parties have no further obligations to each other. At the same time, because all trades are centralized, the CCP maintains a "matched book" of trades with no net market risk. The CCP does have conditional credit risk from a member's potential default.

Market participants often prefer to offset rather than to terminate trades, which creates redundant trades. When trades are novated to a CCP, these redundant trades become a single net obligation between each participant and the CCP. This process is called **multilateral offsetting**, or **netting**. Netting reduces total risk and minimizes the potential of a domino effect stemming from the default of a participant.

The process of moving from bilateral to novation to netted positions is illustrated in Figure 1.

Figure 1: Multilateral Offsetting



IMPACT OF CENTRAL CLEARING

LO 47.5: Assess the impact of central clearing on the broader financial markets.

By now it should be evident that central clearing through a CCP has significant advantages, but it is not without its challenges. When a CCP is included in the clearing process, systemic risk in the financial markets is reduced, but can be increased at the same time. Systemic risk is reduced because CCPs reduce counterparty risk by offsetting positions (novation and netting), they provide transparency for the market, and improve liquidity. However, the potential requirement that members post higher initial margin during times of increased market volatility could increase systemic risk. In addition, concentrating all trades in a single place exposes the market to the risk of CCP failure and heightened systemic risk.

It is worth noting that the protection that CCPs offer for OTC derivatives may come at the expense of other groups. For example, netting and margining protects OTC derivatives participants, but may not benefit creditors. In addition, the long-term maturity of OTC derivatives contracts, often years or decades, also poses challenges for CCPs. It is not yet evident that they are effective in clearing these long-dated, more complex and illiquid trades. Central clearing of exotic or non-standard derivatives may also be problematic.

KEY CONCEPTS

LO 47.1

CCPs play important roles in the clearing and settlement of transactions. Clearing refers to the processes between the period from trade execution until settlement. Settlement refers to the satisfaction of legal obligations and trade completion.

Functions of a CCP include novation, netting, margining, managing the auction process, and loss mutualization. Auctioning refers to selling off the defaulted member's trades to the surviving members through an auctioning process. Loss mutualization refers to members' contributions to a default fund to cover future losses from member defaults.

Other aspects and mechanics of CCPs include:

- *Categories of OTC derivatives products:* (1) long history of central clearing (e.g., interest rate swaps), (2) short history of central clearing (e.g., index credit default swaps), (3) soon to be centrally cleared (e.g., interest rate swaptions, credit default swaps), and (4) not suitable for central clearing (e.g., exotic derivatives).
- *Conditions needed for central clearing:* product standardization, lower complexity, and high liquidity.
- *Participants:* Transacting with CCPs is restricted to clearing members only. Member criteria include admission criteria, financial commitment, and operational criteria.
- *Number of CCPs:* It is generally not feasible to have a single CCP due to regional differences in trades and requirements, differences in product types, and regulatory reasons.
- *Types of CCPs:* CCPs could be utility-driven CCP (i.e., focused on long-term stability) or profit-driven CCP (i.e., focused on bottom line). Arguments generally support profit-driven CCPs.
- *Failure of a CCP:* The potential failure of a large CCP could create a catastrophic event. CCPs must therefore ensure sufficient loss absorption capacity.

LO 47.2

Advantages of CCPs include: transparency, offsetting, loss mutualization, legal and operational efficiency, liquidity, and default management.

Disadvantages of CCPs include: moral hazard, adverse selection, separation of cleared and non-cleared products, and procyclicality of margin requirements.

LO 47.3

Margining includes posting both initial margin and variation margin. Margining tends to be more stringent in central clearing than in OTC markets. CCPs set margin requirements based only on the risks of the members' transactions, and the credit quality of the member is typically not a consideration for initial margin.

LO 47.4

Novation refers to replacing a bilateral OTC contract with another contract (or contracts) with the CCP, where the CCP is the insurer of counterparty risk. The CCP maintains a “matched book” of trades with no net market risk.

Multilateral offset, or netting, refers to creating a single net obligation between each participant and the CCP from the various bilateral OTC trades (which typically include redundant trades). Netting reduces total risk and minimizes contagion from a member default.

LO 47.5

By including a CCP in the clearing process, systemic risk can be both reduced and increased. Systemic risk is reduced because counterparty risk is reduced, and transparency and liquidity improve. Systemic risk is increased because higher initial margin during times of stress would heighten market risk, and the failure of a CCP may lead to a catastrophic event.

CONCEPT CHECKERS

1. Which of the following statements on central clearing is accurate?
 - I. The composition of clearing members typically includes a combination of large global banks and smaller banks and non-financial institutions.
 - II. In the auction process, a CCP normally does not close out trades at their market value.
 - A. I only.
 - B. II only.
 - C. Both I and II.
 - D. Neither I nor II.
2. Alex Dell, a derivatives trader, has some reservations about the central clearing of OTC derivatives with a central counterparty (CCP). Specifically, he is worried that clearing members' willingness to monitor credit risk may decline since the CCP assumes most of the risks, and that CCPs may increase margin requirements during a period of market stress. Which of the following concepts best describe Dell's reservations?

<u>Decline in Willingness</u>	<u>Higher Margin Requirements</u>
A. Moral hazard	Procyclicality
B. Adverse selection	Offsetting
C. Moral hazard	Offsetting
D. Adverse selection	Procyclicality
3. In a recently released report to management, a credit analyst indicates that the level of initial margin set by a central counterparty (CCP) is dependent on the risk of the member that is required to post it, and on the risks of the specific derivatives transactions. The analyst is correct with respect to:

<u>Risk of Member</u>	<u>Risk of Transactions</u>
A. Yes	Yes
B. Yes	No
C. No	Yes
D. No	No
4. Alpha Bank recently noted that its bilateral over-the-counter (OTC) trade obligations with Beta Bank ceased to exist and the bank now directly faces a central counterparty (CCP) for its trade obligations. Which of the following concepts best identify this scenario?
 - A. Netting.
 - B. Novation.
 - C. Margining.
 - D. Multilateral offsetting.

Topic 47

Cross Reference to GARP Assigned Reading – Gregory, Chapter 3

5. Erin Parker and Nate James are analysts at a large financial institution. During one of their recent discussions on OTC derivatives and central clearing with a central counterparty (CCP), Parker states that: “CCPs are beneficial because they convert operational and legal risk into counterparty risk.” James adds to that statement by suggesting: “When requiring higher margin in turbulent times, CCPs reduce systemic risk.”

With respect to the statements made:

- A. Only Parker is correct.
- B. Only James is correct.
- C. Both Parker and James are correct.
- D. Neither Parker nor James is correct.

CONCEPT CHECKER ANSWERS

1. B Clearing members typically include large players only, including large banks and global financial institutions. In the auction process, a CCP normally does not close out trades at their market value. Instead, trades are auctioned to existing members.
2. A Dell's reservations describe moral hazard and procyclicality, respectively. In central clearing, moral hazard is the risk that members have less incentive to monitor risk knowing that the CCP assumes most of the risks of the transactions. Procyclicality describes a scenario where a CCP increases margin requirements (initial margin) in volatile markets or during a crisis, which may aggravate systemic risk.

Offsetting describes the elimination of duplicate bilateral contracts by transacting through a CCP, which improves flexibility and reduces costs. Adverse selection is the risk that participants with a better understanding of product risks and pricing will trade more products whose risks the CCP underprices, and fewer products whose risks the CCP overprices.

3. C CCPs set initial margin requirements based on the risk of the transactions, but not on the risk of the members.
4. B Novation describes the process where one contract (the bilateral contract between OTC participants) is replaced with another contract (or contracts) with the CCP. As a result, counterparties' bilateral obligations with each other cease to exist.

Multilateral offsetting, also called netting, refers to creating, from the various bilateral OTC trades, a single net obligation between each participant and the CCP.

Margining is the process of posting some form of collateral, typically cash or marketable securities, to cover member defaults (initial margin) or security mark-to-market movements (variation margin).

5. D Neither Parker nor James is correct. CCPs convert counterparty risk into operational and legal risk. Also, when CCPs require higher margin in turbulent times, CCPs can increase systemic risk. This risk is known as procyclicality.

The following is a review of the Financial Markets and Products principles designed to address the learning objectives set forth by GARP®. This topic is also covered in:

RISKS CAUSED BY CCPs

Topic 48

EXAM FOCUS

This short and qualitative topic deals with the many risks specific to central counterparties (CCPs). Some of the types of risks such as default, liquidity, and operational risks are common to most entities while others such as settlement and payment risk, and custody risk are more specific to CCPs. For the exam, it is important to have an understanding of the full range of risks faced by CCPs as well as the methods to prevent CCP failures.

RISKS FACED BY CENTRAL COUNTERPARTIES

LO 48.1: Identify and explain the types of risks faced by CCPs.

Default Risk

The default of a clearing member and its flow through effects is the most significant risk for a CCP. Because of a default, there may be the default or distress of other clearing members given that default correlation is likely to be high among over-the-counter (OTC) derivatives market participants.

In the event of a failed auction or an insufficient number of bids, the CCP will be required to pass on the defaulting member's losses through rights of assessment, loss allocation methods, or both. Passing on losses to other clearing members may result in defaults by those members. The loss allocation methods may be considered unfair because some of them, such as variation margin gains haircutting (VMGH) and tear-ups, impose losses on "winning positions." With VMGH, members whose positions increased in value (i.e., they are owed variation margin) will likely not receive the full amount for their gains (i.e., haircutting). Members who instead owe money to the CCP will still be required to pay the full margin amount to the CCP. In a tear-up, the CCP terminates the unmatched position, and may balance resources by drawing from both the defaulter's initial margin and the default fund.

Some clearing members may resign from the CCP after the default of another clearing member. In such instances, the applicable initial margins and default funds must be returned to the resigning clearing member. The initial resignation may result in a negative reputational impact to the CCP as witnessed by further resignations of clearing members.

Model Risk

OTC derivatives are not priced by the market but are instead priced using valuation models that perform the mark-to-market function, which subjects CCPs to model risk. Especially

sensitive to model risk would be a CCP's determination of initial margins. In that context, model risk could arise due to errors pertaining to volatility, tail risk, complex dependencies, and wrong-way risk.

Many models are linear in nature, which means that an initial margin will be adjusted in proportion to the increase in the size of the position. However, for large or concentrated positions, the margin may be too low. The use of a supplement to the computation, such as a margin multiplier, may assist in sufficient coverage of the risk.

Liquidity Risk

There are large amounts of cash inflows and outflows flowing through the CCP due to initial margins and margin calls. As a result, CCPs are exposed to liquidity risk. The CCP attempts to earn the greatest return possible on the funds it holds without incurring too much credit or liquidity risk, thereby most commonly investing in short-term deposits, repos, and reverse repos. Should there be a default by one or more members, the CCP is still required to meet the obligations of the other members.

There is the risk that the CCP's investments are not always quickly and easily convertible to cash, which may require some liquidity support from a central bank. In this regard, a CCP is required to have sufficient liquid resources to meet its obligations in the event of the failure of one or two of its largest clearing members. The Basel III leverage ratio (calculated as the bank's tier 1 capital divided by its exposure) requirements serve to minimize the amount of risk taking. Exposure would include the gross notional amount of centrally cleared OTC derivatives transactions. Overall, regulations have attempted to address a CCP's potential liquidity risks; however, they may reduce the availability of clearing services.

Operational Risk

Due to the centralization of some functions within a CCP to increase efficiency, additional risks arise that affect counterparties due to concentration at the CCP. CCPs face operational risks that are common to all entities such as business interruption due to information systems failures and internal or external fraud. However, a systems failure within a CCP could have a disastrous impact on many counterparties, especially if they hold large positions.

Legal Risk

Legal risks in the form of litigation or claims may arise due to differing laws in different jurisdictions or laws that are inconsistent with the CCP's regulations. A good example would involve the segregation and movement of margin and positions (i.e., netting) through a CCP.

Other Risks

Investment risk refers to the risk of losses of margin funds resulting from investment actions performed within or outside of the stated investment policy.

Settlement and payment risk refers to the risk that a bank no longer provides cash settlement services between a CCP and its members.

Foreign exchange risk refers to the risk of mismatches between margin payments and cash inflows or outflows in different currencies.

Custody risk refers to the risk of loss of securities, margins, or both by a custodian due to its failure, fraud, or negligence.

Concentration risk refers to the risk of clearing members, margins, or both that are located in a single geographic area. Essentially, it is a lack of diversification.

Sovereign risk refers to the risk that a foreign government could default on its debt obligations, thereby causing members to fail. It also refers to any potential loss in the value of sovereign bonds held as margin.

Wrong-way risk refers to the risk that exposure to a counterparty is negatively correlated with the credit quality of the counterparty. In other words, it occurs when credit exposure to a counterparty and the default risk of the counterparty increase together.

Overall, it is probable that the various loss events will be correlated and will impact the CCP at the same time. In the case of a default, there will probably be a major market impact that increases the probability of operational and investment issues. Additionally, in a default scenario, there is usually a wide spread between gain and loss positions that increase legal and fraud risks.

RISKS TO CLEARING MEMBERS AND NON-MEMBERS

LO 48.2: Identify and distinguish between the risks to clearing members as well as non-members.

Non-members face exposure from CCPs, clearing members, and other non-members. If a CCP fails, a non-member may be able to avoid losses so long as its counterparty (a clearing member) is solvent. Unlike clearing members, non-members are not required to contribute to default funds so, therefore, non-members are not exposed to losses that result from CCP failures.

Furthermore, the extent of non-members' losses due to defaults of CCPs and clearing members lies with the initial margins and whether they are segregated, guaranteed, or both. In addition, non-members face the risk of not being able to port their trades should the counterparty member default. As a result, such trades may have to be closed out at a loss.

Finally, one has to consider non-members' liability with respect to CCP loss allocation rules. It is possible that clearing members are able to pass on losses to non-members through VMGH or tear-up, which would reduce the gains of non-members. Clearing members are unable to pass on losses resulting from default fund utilization, rights of assessment, and forced allocation.

LESSONS LEARNED FROM CCP FAILURES

LO 48.3: Identify and evaluate lessons learned from prior CCP failures.

There are five key lessons learned from prior CCP failures:

1. Operational risk must be controlled to the maximum extent possible. For example, information systems should be updated sufficiently to be robust enough to handle unusually high trading volumes and to detect significant price changes.
2. Variation margins should be recalculated often and collected quickly (i.e., multiple times a day in certain cases). Having an information system that allows for automated payments could assist in preventing liquidity shortfalls. In addition, having cross-margining linkage arrangements (offsetting of hedged positions) between CCPs may avoid liquidity problems due to the hedging activities of the various CCPs.
3. Initial margins and default funds should be sufficiently large in order to withstand significant negative asset value declines as well as increased return correlations during a crises. The assumptions behind the initial margin computations need to be amended to account for significant changes in the market.
4. CCPs must actively monitor positions, penalize overly concentrated positions, and promptly liquidate or hedge extremely large positions.
5. CCPs must have one or more external sources of liquidity to avoid default due to illiquidity (even though it is still solvent).

KEY CONCEPTS

LO 48.1

CCPs face five major risks: default risk, model risk, liquidity risk, operational risk, and legal risk. Other risks they may face include investment risk, settlement and payment risk, foreign exchange risk, custody risk, concentration risk, sovereign risk, and wrong-way risk.

The default of a clearing member and its flow through effects is the most significant risk for a CCP. Because of a default, there may be the default or distress of other clearing members given that default correlation is likely to be high among OTC derivatives market participants.

LO 48.2

Non-members face exposure from CCPs, clearing members, and other non-members.

If a CCP fails, a non-member may be able to avoid losses so long as its counterparty is solvent. Non-members are not required to contribute to default funds so they are not exposed to losses that result from CCP failures. The extent of non-members' losses lies with the initial margins and whether they are segregated, guaranteed, or both. Non-members face the risk of not being able to port their trades should the counterparty member default.

LO 48.3

Lessons learned from prior CCP failures include:

- Operational risk must be controlled to the maximum extent possible.
- Variation margins should be recalculated often and collected quickly.
- CCPs should have an information system that allows for automated payments.
- There should be cross-margining linkage arrangements between CCPs.
- Initial margins and default funds should be sufficiently large.
- CCPs must actively monitor positions.
- CCPs must have one or more external sources of liquidity.

CONCEPT CHECKERS

1. Which of the following risks facing a central counterparty (CCP) is most likely to be introduced during a market crisis?
 - A. Default risk.
 - B. Liquidity risk.
 - C. Operational risk.
 - D. Settlement and payment risk.

2. Which of the following statements regarding risks facing a CCP is correct?
 - A. A good example of legal risk would involve netting arrangements.
 - B. Default correlations tend to be low among OTC derivatives market participants.
 - C. Many models for pricing OTC derivatives are linear in nature, which may result in excessive margins for large positions.
 - D. Investment risk refers to the risk of losses of margin funds resulting from investment actions performed outside of the stated investment policy.

3. A non-clearing member would face exposure from defaults by which of the following parties?
 - I. Clearing members.
 - II. Other non-clearing members.
 - A. I only.
 - B. II only.
 - C. Both I and II.
 - D. Neither I nor II.

4. Which of the following losses may be borne by non-members of CCPs?
 - A. Rights of assessment.
 - B. Tear-up.
 - C. Default fund utilization.
 - D. Forced allocation.

5. Which of the following statements regarding lessons learned from prior CCP failures is correct?
 - A. CCPs face the risk of default through insolvency even though they may be liquid.
 - B. In extreme cases, variation margins should be recalculated and collected on a daily basis.
 - C. Initial margins must be sufficient enough to withstand situations of extreme dependency.
 - D. CCPs should actively monitor positions but they need not penalize unintended concentrated positions.

CONCEPT CHECKER ANSWERS

1. D Settlement and payment risk refers to the risk that a bank no longer provides cash settlement services between a CCP and its members. Such risk is not likely to be present during normal periods but is much more likely to be present during crisis periods.

The other risks mentioned are present in both normal and crisis periods. For example, liquidity and default risks are always present but would be exacerbated during a crisis period. Operational risks such as inadequate information systems that give rise to business interruption could be present in a normal period.

2. A Legal risks in the form of litigation or claims may arise due to differing laws in different jurisdictions or laws that are inconsistent with the CCP's regulations. A good example would involve the segregation and movement of margin and positions (i.e., netting) through a CCP.

Response B is not correct, because default correlation is likely to be *high* among OTC derivatives market participants. Response C is not correct, because many models are linear in nature, which means that an initial margin will be adjusted in proportion to the increase in the size of the position. However, for large and/or concentrated positions, the margin may be too low. Response D is not correct, because investment risk refers to the risk of losses of margin funds resulting from investment actions performed *within or outside* of the stated investment policy.

3. C Non-clearing members face exposure from CCPs, clearing members, and other non-clearing members.

4. B Clearing members may be able to pass on losses to non-members through a "tear-up," which would reduce the gains of non-members. Clearing members are unable to pass on losses resulting from default fund utilization, rights of assessment, and forced allocation.

5. C An example of extreme dependency would be the increase in correlation of returns during a market crisis.

Response A is not correct, because CCPs face the risk of default through *illiquidity* even though they may be *solvent*. Response B is not correct, because in extreme cases, variation margins should be recalculated and collected up to several times a day. Response D is not correct, because CCPs should actively monitor positions and penalize overly concentrated positions regardless of whether they were intended or unintended.

The following is a review of the Financial Markets and Products principles designed to address the learning objectives set forth by GARP®. This topic is also covered in:

FOREIGN EXCHANGE RISK

Topic 49

EXAM FOCUS

Exposure to foreign exchange risks is a natural result of the globalization of financial institutions. These risks arise when foreign currency trading and/or foreign asset-liability positions are mismatched in individual currencies. Unexpected volatility can generate significant losses for the firm, which could, in turn, threaten profitability or even solvency. These risks can be mitigated by direct hedging through matching foreign asset-liability books of business, hedging through forward contracts, and through foreign asset and liability portfolio diversification.

SOURCES OF FOREIGN EXCHANGE RISK

LO 49.1: Calculate a financial institution's overall foreign exchange exposure.

LO 49.2: Explain how a financial institution could alter its net position exposure to reduce foreign exchange risk.

LO 49.3: Calculate a financial institution's potential dollar gain or loss exposure to a particular currency.

Large financial institutions (banks) frequently take significant positions in foreign currency assets and liabilities as a result of their foreign exchange trading activities. When looking at such financial institutions' currency trading activities, the aggregate position size in a particular currency may look extremely large; however, since buys and sells will offset one another in terms of exposure, the net exposure to the currency may actually be quite small.

A bank's actual exposure to any given currency can be measured by the **net position exposure**. Net exposure is the extent to which a bank is net long (or *positive*) or net short (or *negative*) in a given currency. For example, a bank's net euro (EUR) exposure would be:

$$\text{net EUR exposure} = (\text{EUR assets} - \text{EUR liabilities}) + (\text{EUR bought} - \text{EUR sold})$$

$$\text{net EUR exposure} = \text{net EUR assets} + \text{net EUR bought}$$

A **positive net exposure** position means that we are *net long in a currency*. In other words, we hold more assets than liabilities in a given currency. In this instance, the financial institution faces the risk that the foreign currency will *fall* in value against the domestic currency.

A **negative net exposure** position means that we are *net short in a currency*. The financial institution faces the risk that the foreign currency will *rise* in value against the domestic currency.

Therefore, if a U.S. financial institution fails to maintain a balanced position in a currency where assets (purchases) are exactly offset by liabilities (sales), the institution will be exposed to variations in the foreign exchange (FX) rate of that currency against the U.S. dollar. The more volatile the FX rate, the more potential impact a net exposure (either long or short) will have on the value of a bank's foreign currency portfolio.

FOREIGN TRADING ACTIVITIES

LO 49.4: Identify and describe the different types of foreign exchange trading activities.

A financial institution's buying and selling of foreign currencies, and hence the institution's position in the FX market, reflects four key trading activities:

1. Enabling customers to participate in international commercial business transactions.
2. Enabling customers to take positions in real or financial foreign investments. Note that a financial institution may also transact in foreign currencies to take positions in real or financial foreign investments for its own portfolio.
3. Offsetting exposure in a given currency for hedging purposes.
4. Speculating on foreign currencies in search of profit by forecasting and/or anticipating futures FX rate movements.

When a bank is buying or selling a foreign currency for the purpose of either allowing its customers to participate in international commercial business transactions or investing in real or financial foreign investments, the bank typically serves as an agent for the customers (receives a fee) and does not assume the FX risk itself.

When a bank is buying or selling a currency for hedging purposes, this will reduce FX exposure.

The fourth activity, trading foreign currencies with the intent to profit by anticipating future foreign currency rate movements, relates to open positions that are taken for speculative purposes and represents an unhedged position in a given currency. These speculative trades are usually made directly with other financial institutions or arranged through FX specialist brokers.

Currency spot trades are the most frequently executed speculative trades. The financial institution seeks to earn a profit on the difference between the buy and sell prices or on movements in the bid-ask spreads over time. Speculative positions can also be taken in FX forward contracts, futures, and options.

SOURCES OF PROFITS AND LOSSES ON FOREIGN EXCHANGE TRADING

LO 49.5: Identify the sources of foreign exchange trading gains and losses.

LO 49.6: Calculate the potential gain or loss from a foreign currency denominated investment.

Most returns on FX trading arise from speculation in currencies or taking an unhedged position in a particular currency. Financial institutions also earn fees as a secondary source of revenues. These revenues are earned from market-making activities and/or from acting as agents for retail or wholesale customers.

MISMATCHED FOREIGN ASSET AND LIABILITY POSITIONS

A financial institution can also have foreign exchange exposure due to mismatches between foreign financial asset and liability portfolios. The following example shows the exposure resulting from such a mismatch.

Example: Foreign investment returns

Figure 1: Balance Sheet

<i>Assets</i>	<i>Liabilities</i>
USD50 million U.S. loans, 1-year maturity, in USD, yielding 8%	USD100 million U.S. CDs, 1-year maturity, in USD, yielding 6%
USD50 million equivalent Swiss loans, 1-year maturity, made in CHF, yielding 13%	

This firm has matched the duration of its assets and liabilities ($D_A = D_L = 1 \text{ year}$) but has mismatched the currency composition of its portfolio. Note that the firm would earn a positive spread of 2% (8% – 6%) from investing domestically. In order to invest in Switzerland, this firm decides to take 50% of its \$100 million and make 1-year Swiss loans while keeping 50% to make U.S. dollar loans. What transactions must the firm undertake to make the CHF-denominated loan (assuming the FX position is not hedged)?

Answer:

1. Sell USD50 million for CHF on the spot currency markets at the beginning of the year. If the exchange rate is USD1.70 to 1 CHF, this yields $\text{USD}50,000,000 / 1.7 = \text{CHF}29,411,765$.
2. Use the CHF29,411,765 to make 1-year Swiss loans at a 13% interest rate.
3. At the end of the one year, CHF revenue from these loans will be $\text{CHF}29,411,765(1.13) = \text{CHF}33,235,294$ (assuming no default).
4. At the end of the year, repatriate these funds back to the United States. In other words, the U.S. bank will sell CHF33,235,294 in the FX market at the spot exchange rate that exists at the end of the year.

In this example, we assume the spot FX rate has not changed over the 1-year period and remains at USD1.70/CHF. The dollar proceeds from the Swiss investment would be:

CHF33,235,294 × USD1.70 / CHF = USD56,500,000, for a return of:

$$\frac{\text{USD}56,500,000 - \text{USD}50,000,000}{\text{USD}50,000,000} = 13.0\%$$

Thus, the weighted return on this portfolio will be:

$$(0.5)(0.08) + (0.5)(0.13) = 0.105 \text{ or } 10.5\%$$

This exceeds the cost of the bank CDs by 4.5% (=10.5% – 6.0%).

Example, continued:

Now, suppose that at the end of the year, the Swiss franc has *fallen* in value relative to the U.S. dollar. If the exchange rate is now USD1.55/CHF, compute what the Swiss loan revenues would be at the end of Year 1.

Answer:

The Swiss loan revenues at the end of one year equal:

CHF33,235,294 × USD1.55 / CHF = USD51,514,706, for a return of:

$$\frac{\text{USD}51,514,706 - \text{USD}50,000,000}{\text{USD}50,000,000} = 3.03\%$$

Thus, the weighted return on this portfolio will be:

$$(0.5)(0.08) + (0.5)(0.0303) = 0.0552 \text{ or } 5.52\%$$

Under this scenario, the bank would actually have a negative interest margin on its balance sheet investments of –0.48% since its cost of funds (COFs) is 6.0%.

Example, continued:

If the Swiss franc had *appreciated* against the dollar over the year, the bank would have generated a double benefit: (1) from the appreciation of the franc, and (2) from the higher yield on the domestic Swiss loans. If the exchange rate is now USD1.82/CHF, compute what the Swiss loan revenues would be at the end of Year 1.

Answer:

CHF33,235,294 × USD1.82 / USD = USD60,488,235, for a return of:

$$\frac{\text{USD}60,488,235 - \text{USD}50,000,000}{\text{USD}50,000,000} = 20.98\%$$

The previous example illustrates an important concept. As with any investment, returns for the bank's portfolio are derived from differences between income and costs. However, foreign investing provides the additional dynamic of having profits or losses affected by changes in foreign exchange rates. There are two principle methods available to control the scale of FX exposure: on-balance-sheet hedging and off-balance-sheet hedging.

BALANCE SHEET HEDGING

LO 49.7: Explain balance-sheet hedging with forwards.

On-Balance-Sheet Hedging

On-balance-sheet hedging is achieved when a financial institution has a matched maturity and currency foreign asset-liability book. Figure 2 is an illustration.

Figure 2: Balance Sheet

<i>Assets</i>	<i>Liabilities</i>
USD50 million U.S. loans, 1-year maturity, in USD, yield 8%	USD50 million U.S. CDs, 1-year maturity, in USD, yielding 6%
USD50 million equivalent Swiss loans, 1-year maturity, made in CHF, yielding 13%	USD50 million Swiss CDs, 1-year maturity, raised in CHF, yielding 10%

Using the data in Figure 2, we can examine the effects of the franc depreciating by the same amount as in the previous example:

1. The bank borrows USD50 million equivalent in Swiss francs for one year at an interest rate of 10%. At the exchange rate of USD1.70/CHF, this equates to $\text{USD}50,000,000 / 1.70 = \text{CHF}29,411,765$.
2. At the end of one year, the bank must pay back the Swiss franc CD holders their principal and interest: $\text{CHF}29,411,765 \times (1.10) = \text{CHF}32,352,941$.
3. If the franc *depreciated* to USD1.55/CHF in the period, repayment in dollar terms would be $\text{CHF}32,352,941 \times \text{USD}1.55/\text{CHF} = \text{USD } 50,147,059$, or a dollar cost of funds of 0.3%.
4. The bank makes CHF29,411,765 in loans at 13% for one year.
5. At the end of one year, the loans are repaid with interest. $\text{CHF}29,411,765 (1.13) = \text{CHF}33,235,294$, but at USD1.55/CHF, this equals only USD51,514,706 for a return of 3.03%.

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Cross Reference to GARP Assigned Reading – Saunders, Chapter 13

At the end of the year, we would have the following.

Average return on assets:

$$(0.5)(0.08) + (0.5)(0.0303) = 0.0552 \text{ or } 5.52\%$$

U.S. asset return + CHF asset return = overall return

Average cost of funds:

$$(0.5)(0.06) + (0.5)(0.003) = 0.0315 \text{ or } 3.15\%$$

U.S. cost of funds + CHF cost of funds = overall cost

Net return:

$$5.52\% - 3.15\% = 2.37\%$$

average return on assets – average cost of funds

By directly matching foreign assets and liabilities, we can lock in a positive return or profit spread if exchange rates move in either direction over the investment period.

Off-Balance-Sheet Hedging

Rather than matching foreign assets with foreign liabilities, we may choose to remain unhedged on the balance sheet. If we do, we could hedge off-balance-sheet by taking a position in the forward market. This hedge would appear as a contingent off-balance-sheet claim as an item below the net income line.

Referring to the previous example, the function of the forward FX contract is to offset the uncertainty of the future spot rate on the CHF at the end of the investment horizon. A forward foreign exchange agreement involves the exchange of a foreign currency at some point in the future at an exchange rate that is determined today. Rather than repatriating CHF and exchanging them for USD at the end of the period at an unknown rate, the bank can enter into a contract to sell forward the *expected* principal and interest on the loan at the current known **forward exchange rate** for USD/CHF, with the delivery of Swiss francs to the buyer of the forward contract taking place at the end of the investment horizon. This method effectively removes the future spot exchange rate uncertainty that is related to investment returns on the Swiss loan. By using the data in Figure 2, we can illustrate how this technique would work.

Example: Hedging with forward contracts

Outline the transactions necessary for the financial institution to use an off-balance-sheet hedge for the asset-liability position described in Figure 2.

Answer:

The following transactions create the off-balance-sheet hedge.

1. The U.S. bank sells USD50 million for Swiss francs at the *spot* exchange rate *today* and receives $\text{USD}50,000,000 / \text{USD}1.7/\text{CHF} = \text{CHF}29,411,765$.
2. Immediately after the sale, the bank lends the CHF29,411,765 to a Swiss customer at 13% for one year.
3. In addition, the bank sells the expected principal and interest proceeds from the franc loan forward for U.S. dollars at today's forward rate (say, USD1.65/CHF) for 1-year delivery: $(\text{USD}1.65 - \text{USD}1.70) / \text{USD}1.70 = -2.94\%$.

The forward buyer of the francs will pay USD54,838,235 to the seller when the bank delivers the CHF33,235,294 proceeds of the loan to the financial institution seller.

$$\begin{aligned}\text{CHF}29,411,765(1.13) \times \text{USD}1.65/\text{CHF} &= \text{CHF}33,235,294 \times \text{USD}1.65/\text{CHF} \\ &= \text{USD}54,838,235\end{aligned}$$

4. At the end of one year, the Swiss borrower repays the loan to the bank plus interest in Swiss francs (CHF33,235,294).
5. The bank gives the CHF33,235,294 to the buyer of the 1-year forward contract and receives USD54,838,235.

By using this method, the bank knows it has locked in a guaranteed return of 9.68% on the Swiss franc (assuming, of course, the loan will not default and the forward buyer does not renege on the forward contract).

$$\frac{\text{USD}54,838,235 - \text{USD}50,000,000}{\text{USD}50,000,000} = 0.0968 = 9.68\%$$

The overall expected return on the bank's asset portfolio would then be:

$$(0.5)(0.08) + (0.5)(0.0968) = 8.84\%$$

Regardless of spot exchange rate fluctuations over the year, the bank has locked in a risk-free return spread of 2.84% (8.84% return – 6% cost of funds) over the cost of funds for the bank's CDs.

LO 49.8: Describe how a non-arbitrage assumption in the foreign exchange markets leads to the interest rate parity theorem, and use this theorem to calculate forward foreign exchange rates.

Because the hedged Swiss loans offer a higher return than the U.S. loans, it makes sense for the bank to focus its activities on making hedged Swiss loans. However, as more is invested in Swiss loans, the bank must buy more Swiss francs. This will continually reduce the forward rate spread until no additional profits could be made by making the forward contract-hedged investments.

As the bank moves into more Swiss loans, the spot exchange rate for buying francs will rise. In equilibrium, the forward exchange rate would have to fall to completely eliminate the attractiveness of the Swiss investments.

This relationship is called **interest rate parity (IRP)** since the discounted spread between domestic and foreign interest rates equals the percentage spread between forward and spot exchange rates. In other words, the hedged dollar return on foreign investments should be equal to the return on domestic investments. IRP implies that in a competitive market, a firm should not be able to make excess profits from foreign investments (i.e., a higher domestic currency return from lending in a foreign currency and locking in the forward rate of exchange).

For the exam, you should know that the exact IRP equation using direct quotes is:

$$\text{forward} = \text{spot} \left[\frac{(1 + r_{DC})}{(1 + r_{FC})} \right]^T$$

where:

r_{DC} = domestic currency rate

r_{FC} = foreign currency rate

If this equality does not hold, an arbitrage opportunity exists. To remember this formula, note that when the forward and spot rates are expressed as direct quotes (DC/FC), right-hand side of the equation also has the domestic (interest rate) in the numerator and the foreign (interest rate) in the denominator.

If we expressed the forward and spot rates as indirect quotes (FC/DC), then the right-hand side of the equation would have the foreign (interest rate) in the numerator and the domestic (interest rate) in the denominator. So it's either domestic over foreign for everything, or foreign over domestic for everything.

IRP can also be stated using continuously compounded rates as follows:

$$\text{forward} = \text{spot} \times e^{(r_{DC} - r_{FC})T}$$

Example: Interest rate parity

Suppose you can invest in NZD at 5.127%, or you can invest in Swiss francs at 5.5%. You are a resident of New Zealand, and the current spot rate is 0.79005 NZD/CHF. Calculate the 1-year forward rate expressed in NZD/CHF.

Answer:

$$\text{forward(}DC / FC\text{)} = \text{spot}(DC / FC) \left[\frac{(1 + r_{DC})}{(1 + r_{FC})} \right] = 0.79005 \left[\frac{1.05127}{1.055} \right] = 0.78726$$

Professor's Note: Notice here that the NZD/CHF rate fell from 0.79005 to 0.78726. This implies that it now takes fewer NZD to buy one CHF. So, in other words, the New Zealand dollar has appreciated relative to the Swiss franc. Consequently, the Swiss franc has depreciated relative to the New Zealand dollar.



DIVERSIFICATION IN MULTICURRENCY FOREIGN ASSET-LIABILITY POSITIONS

LO 49.9: Explain why diversification in multicurrency asset-liability positions could reduce portfolio risk.

LO 49.10: Describe the relationship between nominal and real interest rates.

Our previous examples have used matched and mismatched asset-liability portfolios that involve only one foreign currency. In reality, most financial institutions hold positions in many different currencies in their asset-liability portfolios. Since currencies may be less than perfectly correlated, diversification across several asset and liability markets can potentially reduce portfolio risk as well as the cost of funds. Domestic and foreign interest rates and stock returns generally do not move together perfectly over time. This means that the risks from mismatching one-currency positions may be offset by potential gains from asset-liability portfolio diversification.

Each domestic and foreign nominal interest rate consists of two components. The first component is the **real interest rate**, which reflects a given currency's real demand and supply for its funds. Differences in real interest rates will cause a flow of capital into those countries with the highest available *real* rates of interest. Therefore, there will be an increased demand for those currencies, and they will appreciate relative to the currencies of countries whose available real rate of return is low.

The second component is the **expected inflation rate**, which reflects the amount of compensation required by investors to offset the expected erosion of real value over time due to inflation. Differences in inflation rates will cause the residents of the country with the highest inflation rate to demand more imported (cheaper) goods. For example, if prices in the United States are rising twice as fast as in Australia, U.S. citizens will increase their

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Cross Reference to GARP Assigned Reading – Saunders, Chapter 13

demand for Australian goods (because Australian goods are now cheaper relative to domestic goods). If a country's inflation rate is higher than its trading partners', the demand for the country's currency will be low, and the currency will depreciate.

The **nominal interest rate**, r , is the compounded sum of the real interest rate, *real r*, and the expected rate of inflation, $E(i)$, over an estimation horizon.

$$\text{exact methodology: } (1 + r) = (1 + \text{real } r)[1 + E(i)]$$

$$\text{linear approximation: } r \approx \text{real } r + E(i)$$

KEY CONCEPTS

LO 49.1

Net exposure in a foreign currency measures the extent to which a bank is net long or net short a foreign currency. A financial institution's net currency exposure is calculated as:

$$\begin{aligned}\text{net currency exposure} &= (\text{currency assets} - \text{currency liabilities}) \\ &\quad + (\text{currency bought} - \text{currency sold})\end{aligned}$$

LO 49.2

A net long (short) position in a currency means that a bank faces the risk that the FX rate will fall (rise) in value versus the domestic currency.

LO 49.3

If a financial institution fails to maintain a balanced position, the institution will be exposed to variations in the FX rate. The more volatile the FX rate, the more potential impact a net exposure (either long or short) will have on the value of a bank's foreign currency portfolio.

LO 49.4

A financial institution's buying and selling of foreign currencies, and hence the institution's position in the FX market, reflects four key trading activities:

- Enabling customers to participate in international commercial business transactions.
- Enabling customers (or the financial institution itself) to take positions in real and financial foreign investments.
- Offsetting exposure to gain currency for hedging purposes.
- Speculating on future FX rate movements.

LO 49.5

Most of the profits and losses on FX come from speculation or open position taking. A secondary source of revenue comes from market-making activities and/or agency fees. Mismatches between foreign financial assets and liabilities can create FX risk exposure.

LO 49.6

Returns for the bank's portfolio are derived from differences between income and costs. However, there is an extra dimension of return and risk from adding foreign currency assets and liabilities to a portfolio.

LO 49.7

There are two principle methods of better controlling the impact of FX exposure:

- On-balance-sheet hedging is achieved when a financial institution has a matched maturity and foreign currency balance sheet.
 - Off-balance-sheet hedging occurs through the purchase of forwards for institutions that choose to remain unhedged on the balance sheet.
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LO 49.8

Interest rate parity (IRP) suggests that the discounted spread between domestic and foreign interest rates equals the percentage spread between forward and spot exchange rates. IRP can be stated using continuously compounded rates as follows:

$$\text{forward rate} = \text{spot rate} \times e^{(r_{DC} - r_{FC})T}$$

LO 49.9

Since domestic and foreign interest rates and stock returns do not usually move in perfect correlation, opportunities for potential gains from asset-liability portfolio diversification can offset currency risk.

LO 49.10

The real interest rate reflects a given currency's real demand and supply for its funds. The nominal interest rate is the compounded sum of the real interest rate and the expected rate of inflation over an estimation horizon.

CONCEPT CHECKERS

1. Ion National Bank issues a 6-month, USD1 million CD at 4.0% and funds a loan in Argentine pesos (ARS) at 6.50%. The spot rate for the ARS was ARS2.27 per USD at the time of the transaction. In 6 months, the ARS will have depreciated to ARS2.30 per USD. What is the realized nominal annual spread on the loan?
 - A. -1.07%.
 - B. -0.19%.
 - C. 0.11%.
 - D. 0.13%.
2. With respect to Japanese yen (JPY), a U.S. firm has exchange-rate risk:
 - A. that depends only on its net asset-liability position.
 - B. if its JPY-denominated bonds have greater value than its JPY-denominated loans.
 - C. only if its net JPY position is positive.
 - D. whenever its total JPY assets are not equal to its total JPY liabilities.

Use the following data to answer Questions 3 through 5.

Century Bank issues USD20 million in U.S. CDs to fund its loan portfolio. The following characteristics pertain to the asset-liability position of the bank:

- A promised 1-year rate on the CDs of 7%.
 - It invests 50% of its USD20 million in 1-year U.K. loans at 12% (loans made in GBP).
 - The bank invests the other 50% in U.S. loans at 8% for one year.
 - At the beginning of the year, the bank sells USD10 million for GBP in the spot currency markets at an exchange rate of USD1.42/GBP.
 - The 1-year forward exchange rate is USD1.40/GBP.
3. If the spot foreign exchange rate does not change over the year, the USD proceeds from the U.K. investment will be:
 - A. USD7,040,000.
 - B. USD7,890,000.
 - C. USD11,200,000.
 - D. USD12,000,000.
 4. If the exchange rate falls to USD1.38/GBP, what is the weighted return on the bank's asset portfolio?
 - A. 1.41%.
 - B. 2.82%.
 - C. 5.41%.
 - D. 8.42%.
 5. If the bank hedges its GBP loan in the forward market, what is the return on the bank's loan portfolio?
 - A. 8.37%.
 - B. 9.21%.
 - C. 9.79%.
 - D. 10.11%.

CONCEPT CHECKER ANSWERS

1. B $\text{USD1 M} \times \text{ARS}2.27 \times 1.0325 = \text{ARS}2,343,775 / 2.30 = \text{USD}1,019,033 - (\text{USD}1 \text{ M} \times 1.02) = -\$967.40; -967.40/1 \text{ M} = -0.0009674 \times 2 = -0.19\%$
2. D A firm's exchange-rate risk depends on its net asset-liability exposure and on the volatility of the exchange rate with the JPY. Bonds and loans are only part of the whole JPY-denominated portfolio; forward contracts and currency holdings must be included to calculate the net asset-liability exposure. Either a positive or negative imbalance between JPY-denominated assets and liabilities will expose the firm to exchange rate risk.
3. C $\text{USD}1.42/\text{GBP} = \text{USD}10,000,000 / 1.42 = \text{GBP}7,042,254 (1.12) = \text{GBP}7,887,324 \times 1.42 = \text{USD}11,200,000$
4. D $\text{USD}10,000,000 \times 1 / 1.42 = \text{GBP}7,042,254$
 $\text{GBP}7,042,254 \times 1.12 \times \text{USD}1.38/\text{GBP} = \text{USD}10,884,507$
 $(\text{USD}10,884,507 - \text{USD}10,000,000) / 10,000,000 = 0.08845 = 8.845\%$
 $(0.5)(0.08) + (0.5)(0.08845) = 8.42\%$
5. B $\text{USD } 10,000,000 \times 1 / 1.42 = \text{GBP}7,042,254 \times 1.12 \times \text{USD } 1.40/\text{GBP} = \text{USD } 11,042,254;$
 $(11,042,254 - 10,000,000) / 10,000,000 = 10.42\%; (0.5)(0.08) + (0.5)(0.1042) = 9.21\%$