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

HEDGE FUNDS

Topic 71

EXAM FOCUS

The topic examines two decades of hedge fund performance. Significant events that shaped the hedge fund industry are discussed, including the growth of institutional investments. Different hedge fund strategies are explained, along with the continuing growth of assets under management. Performance is analyzed to see if the rewards justify the risks, and performance is compared with the broad equity markets. The performance of top fund managers is also compared to the performance across the hedge fund industry.

CHARACTERISTICS OF HEDGE FUNDS

LO 71.1: Describe the characteristics of hedge funds and the hedge fund industry, and compare hedge funds with mutual funds.

There are important distinctions between hedge funds and mutual funds. Hedge funds are private, much less regulated investment vehicles, not available to the general public. On the other hand, mutual funds are more structured and regulated. Hedge funds are highly leveraged, and managers obtain profits from both long and short positions. Hedge fund managers tend to take large bets based on perceived relative price discrepancies of assets.

Privacy is a hallmark of hedge funds. There is little transparency in the hedge fund industry because managers do not want their methods copied. A hedge fund charges a fixed management fee plus a healthy share of new profits from the fund, generally around 10–20%.

EVOLUTION OF THE HEDGE FUND INDUSTRY

LO 71.2: Explain biases that are commonly found in databases of hedge funds.

LO 71.3: Explain the evolution of the hedge fund industry and describe landmark events that precipitated major changes in the development of the industry.

LO 71.4: Evaluate the role of investors in shaping the hedge fund industry.

Historical data on hedge fund performance was difficult to obtain prior to the early 1990s. In early 1994, dramatic losses triggered by a Federal Reserve change in interest rate policy had a large impact on hedge fund performance reporting. This prompted the development of hedge fund databases so that participants could better obtain and analyze hedge fund performance.

Assets under management have increased 10 times from 1997 to 2010 as the number of funds has quadrupled. There are some hedge funds that do not participate in commercial databases, which impacts aggregate hedge fund performance. Thus, there is **selection bias**, also known as **self-reporting bias**, contained in hedge fund databases.

There is evidence that suggests that selection bias in large hedge fund databases is actually small. The average return of funds-of-hedge funds (FOHF), comprised of managers who theoretically invest across all hedge funds, not just funds reported to commercial databases, is highly correlated to the average return of hedge funds in commercial databases.

However, there are still concerns about possible measurement errors and various biases in reported hedge fund returns. The consensus is that hedge fund index returns became increasingly reliable beginning in 1996. Prior to 1996, looking at the period from 1987 to 1996, 27 large hedge funds substantially outperformed the S&P 500 index. The outperformance is high, which is more than enough to account for any measurement biases.

The collapse of Long-Term Capital Management (LTCM) in 1998 was a watershed event in the hedge fund industry. It was a reminder that higher returns are accompanied by higher risk. The LTCM collapse had a much greater effect on hedge fund performance compared to equity performance.

The time period of 2000 to 2001 brought the dot-com bubble collapse. During this period, the hedge fund industry experienced a 20% net asset inflow and there was a major shift in the hedge fund industry structure. Hedge funds outperformed the S&P 500 with half of the S&P 500 standard deviation. As a result, institutional investors poured money into hedge funds.

From 1999 to 2007, hedge funds' assets under management went from \$197 billion to \$1.39 trillion. Investors in hedge funds thus shifted from exclusively private wealth to institutions, including foundations, endowments, pension funds, and insurance companies. Evidence suggests that these institutional investors were rewarded from 2002 to 2010 with high returns, due in large part to bearing credit and emerging market risks.

ALPHA-BETA SEPARATION

LO 71.5: Explain the relationship between risk and alpha in hedge funds.

Alpha is a risk-adjusted measure of return often used to assess the performance of active managers. It is the return in excess of the compensation for risk. It is important to identify how much of a strategy's return results from risk (i.e., beta) and how much results from active management (i.e., alpha). This is known as **distinguishing alpha and beta**. A manager who uses statistical techniques, quantitative tools, and benchmarking to discern whether high returns are the result of the superior performance of an active manager or a function of bearing high levels of systematic risk is attempting to distinguish alpha from beta.

A hedge fund may attempt to independently manage alpha and beta. The firm may manage beta exposure while separately managing the portfolio's alpha. This is known as **separating alpha and beta**. Managers can use investment tools to pursue alpha while sustaining a target

beta for the portfolio. Managers typically seek to limit beta while trying to optimize alpha. Derivatives are often used to minimize or eliminate undesired systematic risk.

For example, assume a manager's benchmark is the S&P 500. He would like to pursue opportunities that increase alpha, but the result is beta exposure different from the benchmark. He can use futures contracts to hedge all systematic risks other than exposure to the S&P 500 such that the portfolio's beta relative to the S&P 500 is 1.0. He does this while simultaneously pursuing an alpha optimizing strategy. In this way, he is independently managing, or separating, alpha from beta.

HEDGE FUND STRATEGIES

LO 71.6: Compare and contrast the different hedge fund strategies, describe their return characteristics, and describe the inherent risks of each strategy.

Managed Futures and Global Macro

Managed futures funds focus on investments in bond, equity, commodity futures, and currency markets around the world. Systematic trading programs are used which rely on historical pricing data and market trends. A high degree of leverage is employed because futures contracts are used. With managed futures, there is no net long or net short bias.

Many managed futures funds are market timing funds, which switch between stocks and Treasuries. When both short and long positions are considered, the payoff function of this strategy is similar to a lookback straddle, which is a combination of a lookback call option and a lookback put option. The lookback call option gives the owner the right to purchase the underlying instrument at the lower price during the call option's life, while the lookback put option gives the owner the right to sell the underlying instrument at the highest price during the put option's life.

Global macro fund managers make large bets on directional movements in interest rates, exchange rates, commodities, and stock indices. They are dynamic asset allocators, betting on various risk factors over time.

Both managed futures and global macro funds have *trend following* behavior (i.e., directional styles). Global macro funds do better during extreme moves in the currency markets. Both of these strategies are essentially *asset allocation* strategies, since the managers take opportunistic bets in different markets. They also both have a low return correlation to equities.

Merger/Risk Arbitrage and Distressed Securities

Merger (or risk) arbitrage strategies try to capture spreads in merger/acquisition transactions involving public companies, following public announcement of a transaction. The primary risk is **deal risk**, or the risk that the deal will fail to close.

Examining merger arbitrage returns, the largest negative monthly returns in this strategy are after the S&P 500 index has had a large negative return. This equates to being long deal risk. The logic is that when the market has a large decline, mergers have a greater tendency to be called off.

Distressed hedge funds is another event-driven hedge fund style. This strategy invests across the capital structure of firms that are under financial or operational distress, or are in the middle of bankruptcy. The strategy tends to have a long bias. With this strategy, hedge fund managers try to profit from an issuer's ability to improve its operation, or come out of a bankruptcy successfully.

A key feature of the strategy is long exposure to credit risk of corporations with low credit ratings. A good proxy for these types of returns is publicly traded high-yield bonds since the correlation between the DJCS Distress index and high-yield bonds is 0.55.

In sum, both of these event-driven strategies exhibit nonlinear return characteristics, since tail risk appears under extreme market conditions. With merger arbitrage, the tail risk is a large drop in equity investments. With distressed hedge funds, the tail risk is a big move in short-term rates. Unlike trend following strategies, event-driven funds are hurt by extreme market movements.

Fixed Income Arbitrage

Fixed income arbitrage funds attempt to obtain profits by exploiting inefficiencies and price anomalies between related fixed income securities. The fund managers try to limit volatility by hedging exposure to interest rate risk. An example of this strategy is leveraging long/short positions in fixed income securities that are related—mathematically or economically.

The sectors traded under fixed income arbitrage include:

- Credit yield curve relative value trading of swaps, government securities, and futures.
- Volatility trading using options.
- Mortgage-backed securities arbitrage.

A **swap spread trade** is a bet that the fixed side of the spread will stay higher than the floating side of the spread, and stay in a reasonable range according to historical trends. With **yield-curve spread trades**, the hope is that bond prices will deviate from the overall yield curve only in the short term, and will revert to normal spreads over time. **Mortgage spread trades** are bets on prepayment rates, while **fixed income volatility trades** are bets that the implied volatility of interest rate caps have a tendency to be higher than the realized volatility of, for example, a Eurodollar futures contract. **Capital structure or credit arbitrage trades** try to capitalize on mispricing among different types of securities (e.g., equity and debt).

Convertible Arbitrage

Convertible arbitrage funds attempt to profit from the purchase of convertible securities and the shorting of corresponding stock, taking advantage of a perceived pricing error made in the security's conversion factor. The number of shares shorted is based on a delta neutral or

market neutral ratio. The plan is for the combined position to be insensitive to underlying stock price fluctuations under normal market conditions.

The return to convertible arbitrage hedge funds comes from the liquidity premium paid by issuers of convertible bonds to hedge fund managers, for holding convertible bonds and managing the inherent risk by hedging the equity part of the bonds.

Long/Short Equity

Long/short equity funds take both long and short positions in the equity markets, diversifying or hedging across sectors, regions, or market capitalizations. Examples are shifts from value to growth, small- to mid-cap stocks, and net long to net short. Trades in equity futures and options can also take place.

Thirty to forty percent of hedge funds are long/short. Long/short managers are stock pickers with varying opinions and abilities, so performance tends to be very idiosyncratic. Underpriced or under-researched stocks are favored, as are small stocks, on the long side. On the short side, low liquidity makes small stocks and foreign stocks less attractive. Long/short equity funds have directional exposure to the overall market and also have exposure to long small-cap/short large-cap positions.

Dedicated Short Bias

Funds with a dedicated short bias tend to take net short positions in equities. Sometimes the short position strategy is implemented by selling forward. To manage risk, managers take offsetting long positions and stop-loss positions. The returns are negatively correlated with equities.

Emerging Markets

Emerging market funds invest in currencies, debt, equities, and other instruments in countries with emerging or developing markets. These markets are usually identified in terms of gross national product (GNP) per capita. China, India, Latin America, Southeast Asia, parts of Eastern Europe, and parts of Africa are examples of emerging markets. These funds have a long bias because it is more difficult to short securities in emerging markets.

Equity Market Neutral

When reviewing equity market neutral hedge fund strategies, research shows that there is not one common component (or risk factor) in their returns. Different funds utilize different trading strategies, but they all have a similar goal of trying to achieve zero beta(s) against a broad set of equity indices.

HEDGE FUND PERFORMANCE

LO 71.7: Describe the historical portfolio construction and performance trend of hedge funds compared to equity indices.

Twenty-seven large hedge funds were identified in 2000, and research has been done to determine if these hedge funds are truly a separate asset class, not correlated to equity or bond indices. Hedge fund returns were regressed against an 8-factor model used to analyze hedge fund performance. Findings were that hedge fund portfolios had no significant exposure to stocks and bonds. As an equally weighted portfolio, this portfolio of 27 top performing hedge funds had a large alpha of 1.48% per month. There was a persistent exposure to emerging markets, but other factor betas showed a lot of variability. Also, alpha declined over time, and there was not a persistent directional exposure to the U.S. equity market. Measurement bias may have affected these results somewhat.

Alternatively, a strategy of investing in a portfolio of the top 50 large hedge funds was tested using data from 2002 to 2010. Two test portfolios were constructed:

- The first test portfolio attempted to mimic performance of a strategy of investing in the top funds in equal dollar amounts, and rebalancing at the end of each calendar year. The funds were selected based on the assets under management at year-end 2001.
- A similar portfolio was constructed using top funds based on year-end 2010, rather than 2001.

For the first portfolio, the intent was to give a lower and upper bound of performance which investors could achieve, by just following a strategy of investing equally in the top 50 large hedge funds, and rebalancing yearly. The second portfolio was “foresight assisted.”

In evaluating performance characteristics, the first portfolio did not have a significant alpha, while the foresight-assisted portfolio had a monthly alpha of 0.53%, and was statistically significant at the 1% level. Compared to hedge fund returns prior to 2002, the decline in alpha is consistent with the thinking that there is more competition in the hedge fund industry. It should, however, be noted that there is no significant negative alpha.

Looking at the top 50 hedge funds versus all hedge funds, the top 50 portfolios (both versions) demonstrated statistically significant alpha relative to the DJCSI and HFRI hedge fund indices. The strategy of buying large hedge funds appears to deliver superior performance compared to just investing in hedge fund indices.

During the 2002 to 2010 time period, the top 50 hedge fund portfolios (with the exception of the foresight-assisted portfolio), and the two broad hedge fund indices, DJCSI and HFRI, all outperformed the equity market, as measured by the S&P 500 index. In sum, analysis of large hedge funds shows that managers are still delivering alpha return relative to peers, and also have low exposure to the U.S. equity market. These factors continue to attract institutional investors.

CONVERGENCE OF RISK FACTORS

LO 71.8: Describe market events that resulted in a convergence of risk factors for different hedge fund strategies, and explain the impact of such a convergence on portfolio diversification strategies.

Theoretically, diversification among hedge fund strategies should protect investors, but there are certain events that affect all, or mostly all, strategies, as they all undergo stress at the same time. Portfolio diversification implodes, and seemingly diverse hedge fund portfolios *converge* in terms of risk factors during times of stress.

The first recorded major market event for hedge funds was in March and April of 1994 when unexpected changes in interest rate policy were set by the Federal Reserve. This caused two months of losses by seven of the ten style-specific sub-indices in the DJCS family. Exceptions were short sellers and managed futures funds. Merger arbitrage funds earned a positive return in March, while equity market neutral funds had a positive return in April.

Another major event was in August 1998 right before the collapse of LTCM. Eight of the ten niche DJCS style sub-indices had large losses. Short sellers and managed futures funds avoided losses. The losses occurred primarily due to market-wide liquidation of risky assets and the high amount of leverage on LTCM's balance sheet.

With hedge fund investing, leverage has a magnifying effect on gains and losses, and risk is on both sides of the balance sheet. There were events prior to the 2007–2009 financial crisis that illustrated how much a market-wide funding crisis can significantly impair leveraged positions. In August 2007, for the first time, all nine specialist style sub-indices lost money. The only positive return was from short sellers. During the peak of the financial crisis from July to October 2008, July to September brought losses for all hedge fund styles (excluding short sellers). When leveraged positions are forced to liquidate, losses can be high.

The point is that when there is a market-wide funding crisis, it is difficult to mitigate risk by simply spreading capital among different hedge fund strategies. There is significant credit-driven tail risk in a hedge fund portfolio. The use of managed futures may be a partial solution—it has been a strategy with a convex performance profile relative to other hedge fund strategies. Hedge fund investors need to consider portfolio risks associated with dramatic market events.

RISK SHARING ASYMMETRY

LO 71.9: Describe the problem of risk sharing asymmetry between principals and agents in the hedge fund industry.

In the hedge fund industry, risk sharing asymmetry between the principal (investor) and the agent (fund manager) is a concern due to variable compensation schemes.

The problem occurs when the incentive fee that a hedge fund manager is entitled to, typically 15–20% of new profits [profits above a high water mark (HWM)], encourages a fund manager to take outsized risks. This tends to increase the future loss-carried-forward if

and when these bets fail. If the fund fails, the same fund manager can start up a new hedge fund.

However, there is an opportunity cost involved in cases where a hedge fund manager closes a fund. It is costly in terms of harming the track record of the manager and affects reputation risk of both the manager and the fund company. All things considered, this cost does not totally mitigate the basic principal/agent conflict.

Investors may be best served to invest in funds for which the fund managers invest a good portion of their own wealth. As much as this issue has been discussed, the basic structure of how fund managers are compensated has not changed.

IMPACT OF INSTITUTIONAL INVESTORS

LO 71.10: Explain the impact of institutional investors on the hedge fund industry and assess reasons for the growing concentration of assets under management (AUM) in the industry.

As mentioned earlier, beginning in 2000, institutional investor funds flowed into hedge funds, and assets under management in the hedge fund industry grew from \$197 billion at 1999 year-end to \$1.39 trillion by 2007 year-end. Institutional investors were rewarded for allocating capital to a much higher fee environment. Three hedge fund performance databases, DJCS, HFRI, and HFRFOFI, respectively, reported cumulative performance of 72.64%, 69.82%, and 38.18% from the 2002 to 2010 time period, compared to the S&P 500 index return of 13.5%. The S&P 500 index had a 16% standard deviation during that period, versus annualized standard deviations of return of 5.84%, 6.47%, and 5.51%, for the respective hedge fund indices.

With the increase of institutional investment came greater demands on hedge fund management for operational integrity and governance. Some institutional investors were seeking absolute performance, while others were seeking alternative sources of return beyond equities. There is some concern that there is no identifiable alpha associated with hedge fund investing, so it is increasingly important that hedge fund managers differentiate themselves from their peers.

KEY CONCEPTS

LO 71.1

Hedge funds are private investments and have very little financial regulation. They tend to be highly leveraged, and managers make large bets. On the other hand, mutual funds are regulated and more structured.

LO 71.2

There are some hedge funds that do not participate in commercial databases, which impacts aggregate hedge fund performance. Thus, there is selection bias contained in hedge fund databases.

LO 71.3

There have been major events affecting the hedge fund industry, including large losses following a change in Fed policy in 1994, the LTCM collapse in 1998, and the dot-com collapse in 2001.

LO 71.4

From 1999 to 2007, investors in hedge funds shifted from exclusively private wealth to institutions, including foundations, endowments, pension funds, and insurance companies.

LO 71.5

Alpha is the return in excess of the compensation for risk. Beta is a measure of the systematic risk of the security or portfolio relative to the market as a whole. Firms may independently manage alpha and beta. This is known as separating alpha and beta. Managers can use investment tools to pursue alpha while sustaining a target beta for the portfolio.

LO 71.6

Managed futures funds focus on investments in bond, equity, commodity futures, and currency markets around the world. The payoff function of this strategy is similar to a lookback straddle.

Global macro managers make large bets on directional movements in interest rates, exchange rates, commodities, and stock indices, and do better during extreme moves in the currency markets.

Merger arbitrage funds bet on spreads related to proposed merger and acquisition transactions, and perform poorly during major market declines.

Distressed hedge funds invest across the capital structure of firms that are under financial or operational distress, or are in the middle of bankruptcy. The strategy tends to have a

Topic 71**Cross Reference to GARP Assigned Reading – Constantinides, Harris, and Stulz, Chapter 17**

long-bias. These hedge fund managers try to profit from an issuer's ability to improve its operation, or come out of a bankruptcy successfully.

Fixed income arbitrage funds try to obtain profits by exploiting inefficiencies and price anomalies between related fixed income securities. Their performance is correlated to changes in the convertible bond default spread.

Convertible arbitrage funds attempt to profit from the purchase of convertible securities and the shorting of corresponding stock.

Long/short equity funds take both long and short positions in the equity markets, diversifying or hedging across sectors, regions, or market capitalizations, and have directional exposure to the overall market and also have exposure to long small-cap/short large-cap positions.

Dedicated short bias funds tend to take net short positions in equities, and their returns are negatively correlated with equities.

Emerging market funds invest in currencies, debt, equities, and other instruments in countries with emerging or developing markets.

Equity market neutral funds attempt to achieve zero beta(s) against a broad set of equity indices.

LO 71.7

The top 50 hedge funds demonstrated statistically significant alpha relative to the DJCSI and HFRI hedge fund indices. The strategy of buying large hedge funds appears to deliver superior performance compared to just investing in hedge fund indices. Hedge fund managers are still delivering alpha relative to peers, and also have low exposure to the U.S. equity market.

LO 71.8

Diversification among hedge fund strategies may not always be effective due to the convergence of risk during times of extreme market stress. There is significant credit-driven tail risk in a hedge fund portfolio. The use of managed futures may be a partial solution—it has been a strategy with a convex performance profile relative to other hedge fund strategies. Hedge fund investors need to consider portfolio risks associated with dramatic market events.

LO 71.9

In the hedge fund industry, risk sharing asymmetry between the principal (investor) and the agent (fund manager) is a concern due to variable compensation schemes.

LO 71.10

Institutional investors flocked to hedge funds beginning in 2000. With the increase of institutional investment came greater demands on hedge fund management for operational integrity and governance.

CONCEPT CHECKERS

1. What critical shift occurred in the hedge fund industry following the collapse of Long-Term Capital Management (LTCM) in 1998 and the dot-com bubble burst in 2001?
 - A. There was a significant drop in assets under management in the hedge fund industry.
 - B. There was a large influx of institutional investors investing in hedge funds.
 - C. Reporting within the hedge fund industry became more regulated than mutual funds.
 - D. There was a significant increase in hedge fund failures.
2. Which of the following hedge fund strategies would be characterized as an “asset allocation” strategy that performs best during extreme moves in the currency markets?
 - A. Global macro.
 - B. Risk arbitrage.
 - C. Dedicated short bias.
 - D. Long/short equity.
3. Comparing hedge fund performance during the time period 2002–2010 to earlier time periods, how would monthly alpha compare, if looking at large hedge funds?
 - A. Alpha was higher in the 2002–2010 time period.
 - B. Alpha remained constant over both time periods.
 - C. A “foresight-assisted” portfolio did not have a statistically significant alpha during the 2002–2010 time period.
 - D. There was a decline in alpha in the 2002–2010 time period.
4. Jamie Chen, FRM, is considering investing a client into distressed hedge funds. Which of the following investments would serve as the best proxy for the types of returns to expect?
 - A. Convertible bonds.
 - B. Small-cap equities.
 - C. Managed futures.
 - D. High-yield bonds.
5. What would be an ideal approach for a hedge fund investor who is concerned about the problem of risk sharing asymmetry between principals and agents within the hedge fund industry?
 - A. Focus on investing in funds for which the fund managers have a good portion of their own wealth invested.
 - B. Focus on diversifying among the various niche hedge fund strategies.
 - C. Focus on funds with improved operational efficiency and transparent corporate governance.
 - D. Focus on large funds from the “foresight-assisted” group.

CONCEPT CHECKER ANSWERS

1. B During the time period following the dot-com collapse, hedge funds outperformed the S&P 500 with a lower standard deviation, which attracted institutional investment.
2. A A global macro fund does better if there are extreme moves in the currency markets. Along with managed futures, global macro is an asset allocation strategy. Managers take opportunistic bets in different markets. The strategy has a low correlation to equities.
3. D Comparing the two different time periods, there was a decline in alpha due to more competition in the hedge fund industry.
4. D Distressed hedge funds have long exposure to credit risk of corporations with low credit ratings. Publicly traded high-yield bonds are a good proxy for the returns to expect.
5. A The incentive fee structure within the hedge fund industry has not really changed over the years, and there is incentive for managers to take undue risks in order to earn fees. Thus, there should be a focus on investing in funds for which the fund managers have a good portion of their own wealth invested.

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

PERFORMING DUE DILIGENCE ON SPECIFIC MANAGERS AND FUNDS

Topic 72

EXAM FOCUS

This topic emphasizes the reasons investors should perform due diligence on potential investments. It provides a thorough list of items to consider in the due diligence process. For the exam, understand in detail the steps involved in evaluating a manager, a fund's risk management process, and a fund's operational environment.

PAST FUND FAILURES

LO 72.1: Identify reasons for the failures of funds in the past.

Investors should be familiar with the reasons past funds have failed to ensure they can avoid investing in a failing fund. Following is a concise list of reasons past funds have failed.

1. **Poor investment decisions.** Could be a series of decisions ("domino effect") or a very calculated risk on a specific investment that backfired.
2. **Fraud.** Fraud could occur in several forms including accounting (e.g., misstating asset book values or misstating income), valuation (e.g., misstating asset market values), and theft of funds.
3. **Extreme events.** Events occurring that would otherwise occur with very low probability or were unexpected (e.g., market crashes).
4. **Excess leverage.** Related to making poor investment decisions. Leverage goes both ways. That is, it magnifies gains but also magnifies losses.
5. **Lack of liquidity.** Too many capital withdrawals and redemptions to honor at once, thereby creating a squeeze on cash flow and an inability to meet all capital withdrawals and redemptions.
6. **Poor controls.** Closely related to fraud. Lack of supervision could result in excessive risks being taken that lead to losses large enough to bankrupt the fund.

7. **Insufficient questioning.** Often in a committee-style decision-making process, there may be a dominant member who sways the decision and/or members who are afraid to voice any valid concerns over information they have discovered that would question the merits of the investment manager and/or investment. Ideally, all due diligence team members should be encouraged to play the role of “devil’s advocate” when appropriate and raise reasonable concerns as early as possible, especially before they reach the committee stage.
8. **Insufficient attention to returns.** Investment funds attempting to reduce operational risk sometimes overcompensate by implementing excessive controls and may end up bearing too many expenses and not generating enough returns. Ideally, there is a healthy balance between generating strong returns while taking on a reasonable level of risk.

DUE DILIGENCE ELEMENTS

LO 72.2: Explain elements of the due diligence process used to assess investment managers.

Prior to investing, an investor performs due diligence on a potential investment manager, which involves assessing the manager, the fund, and the investment strategy. Information such as the investment background, manager’s reputation (e.g., education, employers), and past performance have always been key considerations but are insufficient on their own.

An additional element of due diligence involves assessing the investment process and risk controls. The starting point is a review of the fund’s prospectus or offering memorandum. Additionally, an attribution analysis could be performed to determine how the returns were generated. Were they generated through the skill and control of the manager, luck, and/or factors beyond the manager’s control? In addition, was the amount of return in line with the amount of risk taken?

Another related element is assessing the fund’s operations and business model. In general, are there internal controls and policies in place to preserve the investors’ funds? Specifically, are the controls in place sufficiently robust to detect and prevent fraudulent activities or are limits imposed on managers to seek higher level approval for transactions exceeding a certain dollar amount or frequency? Is there appropriate segregation of duties between the front office and the back office? What is the process and frequency of asset valuations? What is the fee structure and are there any additional fees after a specific threshold? Are there any limitations or blackout periods on redemptions?

In the end, investors should assess potential managers and their investment strategies with an objective and unbiased mind. They should not get caught up with a manager’s past successes.

MANAGER EVALUATION

LO 72.3: Identify themes and questions investors can consider when evaluating a manager.

Manager evaluation is not a task that should be taken lightly by potential investors. This process can be broken down into four areas including strategy, ownership, track record, and investment management.

Strategy

General questions regarding a manager's strategy may include:

- Does the manager follow a particular investment style (e.g., growth, value)?
- Are there any current “trends” in the fund or specializations in specific securities, industries, or sectors?
- How has the fund changed its investment style or rebalanced its holdings over the past year? What changes are contemplated in light of anticipated market conditions?
- What is the extent of turnover and liquidity in the fund? What market signals are used to determine whether to exit or enter a position?
- What mechanisms are in place to limit any potential losses in the fund?
- To what extent is quantitative analysis and modeling utilized in the investment process? Have any models been developed or tested to date?
- Are short sales used to generate excess profits or to hedge? How successful or detrimental have they been so far?
- Are derivatives used in the portfolio? If so, are they used for hedging or speculative purposes?
- How does the trade execution process work? Does a central trading desk exist for maximum efficiency?
- What is the extent of any investment in private company securities and their role in the overall investment strategy?
- What is the tradeoff between maximizing current returns versus long-term fund growth?
- Has the fund ever been closed or provided investors with a return of capital?

Ownership

Ownership interests often help align the interests of the investment team and the investors. They can be useful in attracting and maintaining quality staff, thereby enhancing and/or continuing to generate strong investment returns for investors.

Therefore, potential investors should inquire as to whether any members of the investment team (e.g., traders, portfolio managers, research analysts) have ownership interests in the firm.

Track Record

Specific questions about the manager's and fund's track records may include:

- How does the past performance of the manager and/or fund compare to its peers and/or funds that follow the same or similar investment philosophy?
- Has past performance been audited or verified by a third party?
- Is there sufficient performance history to perform trend and/or attribution analysis? How did the manager or fund perform during market downturns?
- What were the investment returns relative to the size of the investment assets?
- Are most or all of the staff on the investment team that generated those past results still employed by the firm?

Investment Management

Inquiries during manager interviews may include:

- What is/was the manager's investment strategy for generating excess returns?
- How did the manager cope with tough market periods?

Reference checks on managers could include the following individuals:

- Former employers: Was the manager a leader or follower? Proactive or reactive? A team player or individualist?
- Current and former colleagues, clients, and other independent parties: Ensure consistency but if there are mixed reviews, follow up for explanations and/or obtain clarification from the manager.
- Current and former investors: What good and bad investment experiences did they have with the manager?

Background checks on managers may include the following questions/activities:

- Obtaining comprehensive background check reports on the manager.
- Review the Form ADV filed by the manager with the SEC and state securities authorities. It contains general information about the business as well as more detailed information such as fees, services provided, conflicts of interest, and background of key personnel.
- Has the manager consistently demonstrated herself to be a person of integrity? This could be verified by examining public databases and the SEC website to look for any past or current instances of litigation or criminal behavior.
- Has the manager demonstrated strong personal financial responsibility? This could be verified by examining personal credit reports and bankruptcy reports.
- Are the manager's stated representations accurate? This could be verified by inquiring with auditors and brokers who are currently working with the manager or have worked with the manager in the past.
- What is the extent of the manager's involvement in any related party transactions?

RISK MANAGEMENT EVALUATION

LO 72.4: Describe criteria that can be evaluated in assessing a fund's risk management process.

A proper risk management process should contain an assessment of the following areas: risk, security valuation, portfolio leverage and liquidity, tail risk exposure, risk reports, and consistency of the fund terms with the investment strategy.

Risk

- Assess the applicable systematic risk factors (i.e., regular market risks common to most or all funds) and unsystematic risk factors (i.e., risks specific to the manager, fund, or strategy).
- Determine whether written policies and procedures exist regarding measuring and monitoring risk.
- Determine whether a risk committee exists that would receive such measurements. If so, how often are they reported?
- Evaluate the extent of the risk management culture among the various types of employees. For example, how actively involved are employees with managing and mitigating the firm's risks on a day-to-day basis?
- Assess the information technology resources used to quantify the risks. For example, are they reliable and do they measure items consistently between traders and portfolio managers?
- Identify the existence and structure of any risk models. What are their inputs and assumptions? Have the models been tested and are they robust?

Security Valuation

- Identify the proportion of fund assets that are objectively valued through reliable market prices versus those that are more subjectively valued by the broker or through simulation.
- Examine the independence of valuations. Is valuation performed by the fund administrator (generally more independent) or by the fund manager (generally less independent)?
- Determine if prices may be overridden for valuation purposes. If so, by whom? Is there documentation or an approval process?

Portfolio Leverage and Liquidity

- Assess the sources of leverage as well as the current and historical levels of leverage.
- Calculate the current level of liquidity and observe how it has changed over time. The current level is especially relevant because of the impact on portfolio investment capacity and whether it can take on more investment capital.
- Within a stated investment strategy, excessive leverage and/or illiquidity could generate actual returns that are significantly different than expected (i.e., no longer comparing apples to apples), thereby requiring an adjustment in expected returns.

Exposure to Tail Risk

- Analyze information about the fund to conclude whether the fund's return distribution possesses skewness or kurtosis.
- Discuss the possibility of tail risk with the manager and determine whether the manager has sufficiently mitigated the risk or whether further action is required by the investor.

Risk Reports

- Review risk reports prior to investing in the fund. Investors should receive these risk reports on a regular basis (e.g., monthly, quarterly, annually) whether they are prepared in-house or by a third party.
- Analyze key risk metrics and compare them to other similar funds for benchmarking purposes and for determining if any unusual risks exist in the fund.

Consistency of the Fund Terms with the Investment Strategy

- Examine the general fee structure of the fund and determine whether it is consistent with similar funds.
- Identify the existence of any additional fees after a specific threshold (e.g., high-water mark, hurdle rate).
- Evaluate whether high fees are being paid to managers in search of market alpha (fair) as opposed to beta (unfair).
- Identify the existence of any limitations or blackout periods on redemptions.

OPERATIONAL DUE DILIGENCE

LO 72.5: Explain how due diligence can be performed on a fund's operational environment.

Investors should focus on several key areas when performing operational due diligence on a fund. The focus areas are internal control assessment, documents and disclosure, and service provider evaluation.

Internal Control Assessment

A starting point in due diligence is examining the qualifications and attitudes of the personnel. For instance, does the CEO believe in controls and compliance with the rules? An analyst must also assess whether the internal control staff have sufficient technical and work experience to perform their compliance duties properly. Have they been properly trained and do they continue to expand their skills in compliance? Some assurance may be required regarding whether the back and middle office managers are sufficiently experienced in performing supervisory duties. Finally, background checks on critical internal control staff members might be required.

Examining the fund's policies and procedures may also be useful. Related documents may cover areas such as trading, derivatives usage, and transaction processing. One drawback is that these documents tend to be general and only demonstrate the intention to have a strong control environment. In other words, merely reading the documents provides little assurance that the policies and procedures are actually being followed or are effective. It is

usually a good sign if a fund has been proactive and obtained an audit report and opinion on the effectiveness of its controls. If this report is available, it should be reviewed.

The due diligence process should include an examination of the in-house or outsourced compliance system that is in place. Examples of specific items to consider include the code of ethics (if one exists) and any restrictions on employee trading and related-party transactions.

There should be an investigation into how the funds deal with counterparty risk arising from OTC derivatives and other counterparties. Is such risk mitigated by dealing with more than one counterparty? Are the counterparties monitored for risk on a daily basis?

Finally, there should be an assessment as to the effectiveness of corporate governance. Is it pervasive throughout the organization? Are examples of internal control “breaches” followed up with appropriate actions to remedy and prevent future recurrence?

Documents and Disclosure

As part of the due diligence process, investors must confirm with the fund's legal counsel its involvement in preparing the original version of the fund documents as well as any subsequent revisions. The investor should also confirm if the law firm remains as the fund's legal counsel. A physical check of the documents should be made to look for any changes made after the date indicated on the documents.

The investor should corroborate the terms of the offering memorandum by examining other documents such as the Form ADV, subscription agreement, and investment management agreement. Consistency is important here. Terms relating to fees, redemption rights, liquidity, and lockups should be examined closely and clarified with the manager if required.

Conflicts of interest that are disclosed in the offering memorandum should be scrutinized carefully. Lack of clarity in the disclosure may be a red flag and warrant further discussion with the manager and/or require independent information.

Similarly, lack of clarity or sufficiency in the disclosure of risks may warrant further investigation. The discussion of very general or irrelevant risk factors may be cause for concern.

The focus of any due diligence should be on the manager. As a starting point, the potential investor should determine the extent of the manager's authority. Are the provisions very broad (potentially more risky) or quite specific? Is the manager subject to limitations on the amount of leverage employed or on the percentage of the fund invested in specific securities, sectors, or industries? Can the manager be indemnified for his actions outside of fraud, gross negligence, or malicious intent? Additionally, there should be a consideration of the manager's reporting duties to investors (e.g., audited financial statements, disclosure of the tax treatment of the fund's income and transactions).

In analyzing the financial statements, the investor should begin by ensuring the audit opinion is unqualified (i.e., the auditor believes the financial statements contain no material misstatements). The balance sheet and income statement should be examined for

consistency with the fund's investment strategy (e.g., a high leverage fund should have high interest expense on the income statement and high liabilities on the balance sheet). Any inconsistencies should be discussed with the manager on a timely basis. In addition, the footnotes (which are also audited) should be examined carefully since they provide more detailed information on key items (e.g., contingent liabilities, related-party transactions) than the corresponding financial statements.

Fees paid to the manager by the fund should be scrutinized and recalculated. They should be corroborated with the offering memorandum. Specifically, there should be a check of any incentive fees paid in loss years.

Finally, there should be a check for the level of net contributions to the fund by the general partner. Any fund withdrawals should be questioned.

Service Provider Evaluation

Third-party service providers may be hired by a fund for trade execution, information technology, valuation, verification, and asset safeguarding purposes.

A starting point for assessing the actual service providers is to examine the internal control letters issued by its auditors and its audited financial statements. Further due diligence could be performed through in-person discussions regarding the service provider's role.

BUSINESS MODEL AND FRAUD RISK

LO 72.6: Explain how a fund's business model risk and its fraud risk can be assessed.

In addition to the previous due diligence, potential investors need to closely examine the fund to ensure that the risks associated with its business model and potential fraud are not excessive.

Business Model Risk

Evaluating business model risk requires assessing whether managers know how to operate the business as well as generate high returns. Typical risks, potentially leading to failure and closure of the fund, include a lack of cash and working capital, a lack of a succession plan, and excessive redemptions in a short period of time.

A fund's business model risk can be assessed by performing the following tasks:

- Examining the nature of the revenues and expenses. For example, are revenue items stable, recurring, or one-time? Can costs be reduced or are they increasing uncontrollably?
- Calculating the percentage of revenues derived from variable incentive or performance fees (that may not materialize in market downturns).
- Assessing the significance of the gap between management fees (revenue) and operating expenses.

- Considering the sufficiency of the amount of working capital (especially cash) in place to cover revenue shortfalls and/or expense overages for a reasonable period of time.
- Determining how frequently budgets are created and for what period of time.
- Determining the fund's breakeven points in terms of assets under management and required performance level. Comparing those amounts to current (actual) and future (projected) amounts.
- Ascertaining if there is sufficient personnel or capacity to increase the fund's investment asset base.
- Ascertaining the existence of key person insurance on relevant individuals and the existence of a succession plan.

Fraud Risk

Fraud risk can always exist even though extensive due diligence has been performed on the manager and fund prior to investing. A fund's fraud risk can be assessed by determining the existence of the following factors:

- Frequent related-party transactions, including trading through a broker or using a valuator who is a related party.
- Frequent instances of illiquidity, including significant concentrations of illiquid investments (especially those that are valued by the manager only).
- Frequent litigation as a defendant, especially regarding claims of fraud.
- Unreasonably high (stated) investment returns.
- Frequent personal trading by the manager of the same or similar securities as those held by the fund.
- Frequent shorting transactions.

Fraud risk may be mitigated by performing the following actions:

- Check the SEC website for any prior regulatory infractions.
- Check court records for any prior litigation and bankruptcy records for examples of financial irresponsibility.
- Inquire with service providers for assurance over their competence and independence from the manager.
- Perform extensive background checks on the manager.

DUE DILIGENCE QUESTIONNAIRE

LO 72.7: Describe elements that can be included as part of a due diligence questionnaire.

Properly designed due diligence questionnaires that are thoroughly and honestly answered by respondents can yield valuable information to a potential investor and may provide a list of concerns that need further assessment. The questionnaire should make the following inquiries:

1. Inquiry into general information on the manager provides a starting point in the due diligence process. Examples of such information include:
 - Confirmation of proper registration with regulatory authorities.
 - Determination of ownership form (e.g., corporation) and structure.
 - Identification of key shareholders.

Topic 72**Cross Reference to GARP Assigned Reading – Mirabile, Chapter 11**

- Reference checks.
 - Information on past performance.
 - Business contact information.
2. Inquiry into general information on the fund also is critical. Examples of general information that should be collected include:
 - Fees.
 - Lockup periods.
 - Redemption policies.
 - Primary broker.
 - Fund director.
 - Administrator.
 - Compliance: auditor and legal advisor.
 - Financial: assets under administration, investment capacity, and historical performance (also see financial statements).
 - Historical drawdown levels.
 3. Inquiry into execution and trading as well as service providers may provide some insight on the speed and accuracy of transaction processing and the existence of related-party service providers, the latter of which may raise red flags with potential investors as discussed earlier.
 4. Inquiry regarding the firm's third-party research policy may be useful to determine a fund's sources of research information, thereby allowing the assessment of the extent and quality of the due diligence performed by the fund in its investment process.
 5. Inquiry regarding compliance processes, the existence and degree of involvement of in-house legal counsel, and the existence of anti-money laundering policy and procedures may help provide comfort that the fund and its managers have a desire to operate in an ethical manner and/or within the boundaries of the law.
 6. Inquiry into the existence of information regarding disaster recovery and business continuity plans as well as insurance coverage and key person provisions may provide some assurance regarding the stability of the firm and, therefore, the safety of any invested funds.
 7. Inquiry into the investment process and portfolio construction provides the potential investor with information required to make an informed decision whether the overall risk and return profile of the fund is consistent with the investor's investment objectives.
 8. Inquiry into risk controls such as leverage, liquidity, asset concentrations, portfolio diversification, and market risk factors give the investor a more complete picture of the investment risks and how the managers attempt to manage and mitigate them.

The existence of financial statements, especially if audited with an unqualified opinion, provide objective and historical financial information on the fund that can be used to assess performance. Information on the composition of the invested assets may also be helpful to the potential investor. Finally, interim statements (not necessarily audited) may provide more timely information to make a more current assessment of the fund by the potential investor.

KEY CONCEPTS

LO 72.1

Past fund failures can be attributed to poor investment decisions, fraud, extreme events, excess leverage, lack of liquidity, poor controls, insufficient questioning, and insufficient attention to returns.

LO 72.2

The due diligence process for assessing investment managers should include information on the investment background and reputation of the managers and past performance. In addition, there should be an assessment of the fund's investment process, risk controls, operations, and business model.

LO 72.3

In evaluating a manager, investors should consider four broad themes including strategy (e.g., evolution, risk management, quantification, types of investments), ownership, track record (e.g., comparison with peers, independent verification of results), and investment management (e.g., manager interviews, reference checks, background checks).

LO 72.4

Criteria that could be used in assessing a fund's risk management process includes risk (e.g., types, culture, quantification/models), security valuation, portfolio leverage and liquidity, tail risk exposure, risk reports, and consistency of the fund terms with the investment strategy.

LO 72.5

Performing due diligence on a fund's operating environment focuses on:

- Internal control assessment (i.e., qualifications and attitude of personnel, written policies and procedures, compliance system, counterparty risk, effectiveness of governance).
- Documents and disclosure (i.e., confirmations with the fund's legal counsel regarding fund documents, corroborating terms of the offering memorandum, conflicts of interest, disclosure of risks, manager's authority, manager's reporting duties to investors, financial statements, and fees paid to the manager, net contributions/withdrawals by the general partner).
- Service provider evaluation.

LO 72.6

Business model risk can be assessed by considering revenues and expenses (detailed examination), sufficiency of working capital, existence of budgets, computation of breakeven points, ability to increase investment asset base, existence of key person insurance, and existence of a succession plan.

Fraud risk can be assessed by considering the existence of related-party transactions, illiquidity, litigation, unreasonably high (stated) investment returns, personal trading by the manager of the same or similar securities as those held by the fund, and shorting transactions.

LO 72.7

Items to include as part of the due diligence questionnaire include general information on the manager and the fund, execution and trading, service providers, third-party research policy, compliance processes, existence and degree of involvement of in-house legal counsel, existence of anti-money laundering policy and procedures, existence of information regarding disaster recovery and business continuity plans, insurance coverage, key person provisions, details of the investment process and portfolio construction, risk controls, and information contained in the fund's financial statements.

CONCEPT CHECKERS

1. Based on historical evidence, which of the following factors is least likely to result in the eventual failure of a hedge fund?
 - A. Excessive controls in place.
 - B. Taking on more systematic risk.
 - C. Making decisions in a committee setting.
 - D. Materially misstated financial statements.
2. In performing due diligence on a potential investment manager, which of the following factors is the least important for the investor to consider?
 - A. Risk controls.
 - B. Business model.
 - C. Past performance.
 - D. Investment process.
3. Which of the following items is least likely to be included as requested information on a due diligence questionnaire?
 - A. Insurance coverage.
 - B. Returns attribution analysis.
 - C. Disaster recovery procedures.
 - D. Anti-money laundering policy.
4. Which of the following statements regarding the assessment of a fund's risk management process is correct?
 - A. The periodic valuation of a fund's securities is best performed by the fund manager.
 - B. The existence of written policies and procedures for internal controls is useful in measuring and monitoring risk.
 - C. The risk reports received by investors are preferably prepared by a third-party risk provider instead of by the fund itself.
 - D. The key requirement for information technology resources used to quantify the risks is that they measure items consistently.
5. Lisa Tahara, FRM, is considering an institutional investment in a hedge fund that has experienced volatile and generally positive returns in the past. Which of the following considerations about the fund's track record is least relevant for consideration in her investment decision?
 - A. Size of investment assets.
 - B. Absolute level of past returns.
 - C. Verification of returns by a third party.
 - D. Employment continuity of the investment team.

CONCEPT CHECKER ANSWERS

1. B If a fund takes on more systematic risk (i.e., regular market risk), it is less likely to result in a failure unless there is a significant market downturn. Taking on more unsystematic risk, however, is more likely to result in a failure. Excessive controls to reduce operational risk may be a good idea but may also result in excessive expenses and insufficient returns, thereby leading to a possible failure of the fund.

In a committee-style decision-making process, there may be a dominant member who sways the decision and/or members who are afraid to voice any valid concerns. Materially misstated financial statements are a form of accounting fraud, which significantly increases the risk of the eventual failure of a fund.
2. C Investors should assess potential managers and their investment strategies with an objective and unbiased mind. They should not be unduly concerned with a manager's past successes given that past performance is not always indicative of future performance. Risk controls, the business model, and the investment process are all fundamental parts of the due diligence process.
3. B A returns attribution analysis could be performed to determine how a fund's returns were generated. Return attributions are not generally part of a due diligence questionnaire but such an analysis could subsequently be performed based on some of the information received from the questionnaire. The other items (insurance coverage, disaster recovery procedures, and anti-money laundering policy) are all standard items that would be found in most, if not all, due diligence questionnaires.
4. D It is very important for the information technology resources used to quantify risks to measure items consistently. Securities valuation is an important and potentially subjective task, therefore, independence and objectivity is critical. Policies and procedures tend to be general and only demonstrate the intention to have a strong control environment. Their existence alone provides little assurance that they are properly measuring and monitoring risk. In general, the reporting of risk measures is a more objective task and as a result, there is little or no preference for the reporting to be done internally or externally.
5. B The absolute level of past returns is least relevant here given the volatile returns in the past. Also, past returns are not an assurance of similar returns in the future. The relative level of returns is more important than the absolute level. Verification of returns by a third party provides assurance that the return calculations were computed fairly and accurately by the fund. It is relevant to ascertain whether most or all of the staff on the investment team that generated the past results are still currently employed by the fund. It provides some (but not absolute) assurance that similar returns may be generated in the future.

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

BITCOIN: ECONOMICS, TECHNOLOGY, AND GOVERNANCE

Topic 73

EXAM FOCUS

Bitcoin is a virtual currency that utilizes blockchain technology. The genesis of this idea occurred in 2009 by an anonymous group of developers. There are currently over 16 million Bitcoins in circulation.¹ As of December 2016, daily volume in Bitcoins exceeds 200,000 with an exchange rate of one Bitcoin equaling over 900 U.S. dollars.² This virtual currency is important for academics, consumers, and regulators to understand since it is potentially disruptive to existing monetary systems. For the exam, be able to identify the limits of Bitcoin and the key risks that Bitcoin presents. Also, understand the measures taken to regulate this virtual currency.

INCENTIVES TO USE VIRTUAL CURRENCY

LO 73.1: Describe the incentives to use virtual currency.

Blockchain technology is an interesting innovation that arose out of the ashes of the 2007–2009 financial crisis. The collapse of Lehman Brothers turned a strictly financial crisis into a trust crisis. Blockchain technology uses a transparent distributed ledger that displays all transactions in the system to anyone with viewing access. You can actually monitor the distributed ledger live at <https://blockchain.info>. This distributed ledger is a list of all transactions currently being processed. Each transaction is encrypted and fully anonymous.

When a transaction, perhaps between Party A and Party B, is entered into the system, it must be validated. Those who conduct the validation are called **miners** because they are paid in virtual currency for their efforts to validate transactions. The validation process involves verifying that the party whose encrypted ID number initiated a payment actually has enough funds in their account to make the payment. Once this is verified, the transaction becomes a “block” and also becomes linked to all other previously verified blocks to create a publicly viewable audit trail called a *blockchain*. All entries in the blockchain are anonymous because they are encrypted, but the history of transactions for a specified encrypted account is publicly available. This process effectively replaces the traditional middle man, a commercial bank, with a nontraditional middle man, the miners, who validate the authenticity of transactions.

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1. “Bitcoins in Circulation,” Blockchain.info, December 15, 2016, <https://blockchain.info/charts/total-bitcoins>.
2. “Bitcoin Stats,” Blockchain.info, December 15, 2016, <https://blockchain.info/stats>.



Professor's Note: The NASDAQ stock exchange has launched the first ever stock exchange built on a blockchain platform. It is called "Linq" and began accepting trades in late 2015. This is something that needs to be very closely monitored because it enables anonymous equity transactions verified in encrypted blockchain format.

At its core, a Bitcoin is a peer-to-peer virtual currency that is essentially an online communication protocol to transfer value using blockchain technology. It is important to understand that Bitcoins are not blockchain technology. Instead, they use blockchain technology to transfer virtual value. An account can be opened to transact in Bitcoins without a vetting process, including identity verification. A Bitcoin user will download free software that creates an encrypted digital wallet where their Bitcoins are stored and, at the same time, creates an individual node on Bitcoin's peer-to-peer blockchain network. This network can be accessed from any internet connection in the world, and transactions generated from the user's wallet will be entered into the blockchain data structure after they have been verified and validated. The encryption used is similar to "HTTPS" websites, which use a private key-public key combination to conduct secure transactions. As of December 2016, there are over 10 million wallets active.³

Consider a fictitious transaction where Party A wants to transfer five Bitcoins to Party B to pay for a good or service provided by Party B. Party A will enter a payment into his digital wallet using Party B's encrypted account number as the intended recipient. Several miners will receive notification of Party A's desired transaction and begin the process of verification. They will search through the existing blockchain to find Party A's history of transactions to verify that he actually owns at least five Bitcoins. Once this has been verified, the miners then need to search for a digital key to verify the transaction (block) and link it to all other Bitcoin transactions in the blockchain. The first miner to do this will receive a fee. Multiple miners competing to verify the same transaction theoretically adds validity to the process. In this way, Bitcoins can be traced back through the blockchain all the way to its origin. Adept users can trace every wallet that a Bitcoin has been in since it was created. Albeit, every wallet is anonymous and the information has little use, other than for audit trail purposes.

The primary incentive to keep Bitcoin transactions as honest as possible is the fee received by the miners. The miners are the only police in the blockchain process. The miner's reward for successfully locating keys and verifying transactions is currently 12.5 Bitcoins. This is a generous sum in U.S. Dollar–terms to verify and validate a transaction. It also puts Bitcoin in circulation and enables Bitcoin to be used in other transactions. Once 21 million Bitcoins have been minted, no more will be created. This means that this fee will eventually go away. The fees were once 50 Bitcoins, but as more were created and the 21 million threshold grew closer, the fee was cut in half and then cut in half again. This signals that it will continue to be reduced over time until it is eventually completely eliminated. There is also a voluntary transaction fee that parties desiring to transact in Bitcoins can elect to offer to attract faster action from miners. The fee is currently only 0.0001 Bitcoin, but it will likely rise as the transaction-based stipend is withdrawn.

To be a successful miner, one must have very fast computer hardware and access to low-cost electricity because the processors spin at a very fast rate during this process. This real cost means that only serious miners will invest the effort. What about people setting up fake miner accounts to validate their own fraudulent transactions? The system is setup such that

3. "Blockchain Wallet Users," Blockchain.info, December 15, 2016, <https://blockchain.info/charts/my-wallet-n-users>.

you cannot choose your own validators. The first miner to solve the puzzle and validate your transaction gets the fee. If real miners find that a transaction is fake before a fake miner could validate their own fake transaction, then the fraudulent process would be terminated and the perpetrators of fraud would have simply spent time and money only to be shut down by a fast miner. At least, in theory, this is how it should work.

LIMITATIONS OF BITCOIN

LO 73.2: Identify the limits of Bitcoin and the concerns that may arise from these limits.

One significant limitation with Bitcoin transactions is that the transfer is irreversible. There is no mechanism for a payee to reverse an accidental or unwanted transfer. Basically, there is a no refund policy in effect at all times.

Perhaps the most substantial limitation of the Bitcoin structure is that there is no centralized governance system. This creates a problem in that no one is required to verify the identity of account owners or check them for individuals on watch lists or embargoed countries. Another issue with a lack of regulatory oversight is that all transactions are acceptable, whereas other payment vendors, like credit cards, disallow transactions for certain types of goods and services.

The decentralized structure of the Bitcoin market was entirely intentional. It was established this way to eliminate the possibility of one centralized person or entity controlling the virtual currency's movements. Distributing the system across a network of internet-connected computers also prevents a single centralized location that can be targeted for failure. There has evolved a de facto centralization over time as five key intermediaries have arisen: currency exchanges, digital wallet services, mixers, mining pools, and payment processors.

Currency exchanges permit the exchange of Bitcoins into and out of recognized national currencies. They operate with bids and asks just like traditional financial markets. They also levy fees in the form of commissions ranging from 0.2%–2.0% depending on the exchange being used. One limitation of currency exchanges becoming a formal centralized structure for Bitcoins is the cost of registering as a currency exchange, which can easily get into six figures. The most notable currency exchange for Bitcoins is Mt. Gox from Japan. In 2012, Mt. Gox served 80% of all Bitcoin currency transfers, but they collapsed in 2014 with a report of \$450 million worth of Bitcoins going missing within their system.⁴ As of December 2016, the three largest Bitcoin exchanges control 98.38% of all Bitcoin exchange volume.⁵

A Bitcoin wallet is really just a data file that stores Bitcoin accounts, transaction records (the blockchain), and a private key, which is needed to validate Bitcoin transfers. The digital wallet requires specific technical specifications and security measures to prevent crashing and hacking attacks. As of December 2016, just storing the blockchain requires

4. Rachel Abrams, Matthew Goldstein, and Hiroko Tabuchi, "Erosion of Faith Was Death Knell for Mt. Gox," *New York Times*, February 28, 2014.
5. "Bitcoin Trading Volume," data.bitcoinity.org, December 15, 2016, <http://data.bitcoinity.org/markets/volume/30d?c=e&t=a>.

almost 95 gigabytes of hard drive space.⁶ Since data storage and security are big concerns, digital wallet services were created to use a cloud-based shared server to store Bitcoin wallet information. Some services, like StrongCoin and CoinPunk, permit the user to retain their private key, which means that the digital wallet service could not spend the user's Bitcoins. On one hand this sounds good, but on the other, the user must keep their private key safe or risk losing everything in their account. Other services, like Coinbase and Xapo, hold the keys securely for their clients. This presents a different challenge since the digital wallet service could be hacked and then the users would still lose all of their Bitcoins.

The original vision for Bitcoin transfers involves all transactions being recorded in the blockchain, which leaves an audit trail of all transactions. If someone were able to discern the bank account that initiated a purchase of Bitcoins that subsequently resulted in a series of transactions or the address to which goods or services were deployed, then anonymity would be compromised. To solve this limitation, mixers were created. A mixer is essentially a middleman.

Consider Party A and Party B who both want to initiate payments. Party A wants to pay Party C and Party B wants to pay Party D. If Party A and Party B pay their intended payees directly, then the transactions could potentially be traced. However, if they both pay a mixer first and then the mixer pays the intended payees, the system would record Party A and Party B paying the mixer and then the mixer paying Party C and Party D without tracing the origin of the payments. Some digital wallet services have rolled mixers into their structure. However, mixers do carry a significant risk. All Bitcoin transfers are irreversible, which means that the mixers could just keep the transfer and never pay Party C and Party D and, as a result, Party A and Party B would have no recourse.

To verify a Bitcoin transaction, miners must compete to find a public key and validate a transaction. This process means there will always be miners who exert effort to solve the puzzle but do not get paid, since only the first to solve the puzzle will get paid. To address this limitation, mining pools were started. A mining pool is a group of miners that form an alliance and agree to all work toward a solution, but they share the reward with the entire syndicate of miners. This is akin to a group of people buying lottery tickets together. As of March 2015, the two largest mining pools accounted for nearly one-third of all mining activity. This method of de facto centralization is dangerous. Consider a 12-hour period in June 2014 where a mining pool named GHash.io briefly held more than 50% of all mining power. This meant that for half of a day, they could manipulate the system if they wanted to. They could insert false transactions into the blockchain or reject actual transactions.⁷

Bitcoins have been suggested as a more cost-effective way to conduct transactions for consumers. From the perspective of retailers who pay large processing costs to credit card vendors, like Visa and Mastercard, Bitcoin could reduce transaction processing costs. Bitcoin payment processing firm Coinbase currently charges 0% fees for the first \$1 million processed by a retailer in a given year and then only 1% thereafter. This is much better than the fees charged by credit card vendors. Customers may be less likely to use Bitcoin payment systems because they would lose the various incentives, like cash-back programs and reward points, currently offered by credit card vendors. In January 2014, Overstock.com became the first online traditional retailer to accept Bitcoins as a valid form

6. "Blockchain Size," Blockchain.info, December 15, 2016, <https://blockchain.info/charts/block-size>.

7. Alex Hern, "Bitcoin Currency Could Have Been Destroyed by '51%' Attack," *The Guardian*, June 16, 2014.

of payment. Since then, several other vendors, like Expedia.com and Gyft (a service for purchasing gift cards), have initiated acceptance of Bitcoin payment as well.

There are a few significant limitations preventing Bitcoin from going more mainstream. First, if Bitcoins were to be used by millions of consumers for ordinary daily purchases, then the blockchain data file would grow insurmountably large and be problematic to store in a given location. Second, the miner approval process slows down the pace of consumer transactions because it can take roughly 10 minutes for a Bitcoin transaction to be validated by the current mining structure, which is central to the Bitcoin model. Historical evidence also suggests that many Bitcoins are held for appreciation potential and not used for active transactions. Roughly 60% of all Bitcoins mined from 2009 to 2010 remained unspent or took over one year to be spent.⁸ Payments to a retailer might also need to be converted to or from Bitcoins and, therefore, incur fees for currency exchange that increase the total transaction costs beyond a reasonable level.

RISKS INHERENT WITH BITCOIN

LO 73.3: Explain and compare the distinctive risks that Bitcoin presents.

The underlying structure behind Bitcoin has several specific risks. They include market risk, the shallow market problem, counterparty risk, transaction risk, operational risk, privacy risk, legal risk, and regulatory risk.

Anyone who owns Bitcoins will face **market risk**, due to fluctuation in market exchange rates with regard to traditional national currencies. The all-time high was reached in November 2013 when the exchange rate between Bitcoin and the U.S. dollar briefly eclipsed \$1,000 per one Bitcoin. A little over a year later (January 2015), it crashed to below \$200. Since then, the trend in the exchange rate has been upward sloping. As mentioned earlier, as of December 2016, the exchange rate has risen to over \$900.

Bitcoins also exhibit what is known as the **shallow market problem**. This essentially means that they have relatively low trading volume relative to other currencies or financial instruments. Spikes in trading volume will influence the exchange rate.

The lack of centralization in the Bitcoin structure has also led to **counterparty risk**. Exchanges usually act as a de facto guarantor that transactions will clear as expected for both parties. Some Bitcoin counterparties have imploded over time. Moore and Christin (2013) found a complete cessation in operations for 45% of the Bitcoin currency exchanges in their study universe.⁹ High-volume exchanges usually closed because of a data breach while low-volume exchanges closed without disclosing a reason. Of the exchanges in the study that closed, only 46% of them reimbursed customers after shutting down. Digital wallet services may not close down, but they pose counterparty risk due to cybercriminals. In November 2013, Bitcoin wallet inputs.io had \$1.2 million worth of Bitcoins stolen due to cyber theft

8. Sarah Meiklejohn, Marjori Pamorale, Grant Jordan, Kirill Levchenko, Damon McCoy, Geoffrey Voelker, and Stefan Savage, "A Fistful of Bitcoins: Characterizing Payments Among Men With No Names," *Proceedings of the 2013 ACM Internet Measurement Conference (IMC)*, 2013, 127–40, ACM.
9. Tyler Moore and Nicolas Christin, "Beware the Middleman: Empirical Analysis of Bitcoin-Exchange Risk," in *Financial Cryptography and Data Security*, ed. Ahmad-Reza Sadeghi, vol. 7859 of Lecture Notes in Computer Science (Heidelberg: Springer, 2013), 25–33.

(McMillan, 2013),¹⁰ and Bitcoin payment processor BIPS had \$1 million taken the very next month (Southurst, 2013).¹¹

Transaction risk arises from the fact that Bitcoin transactions are irreversible. If there is either a mistaken or fraudulent transfer initiated from a given Bitcoin owner, then it is simply bad luck once the transaction has been verified and validated. Buyers and sellers can always agree to terms of a refund, but there is no mechanism for the Bitcoin system to address issues not mutually agreed to by both parties in a transaction. The irreversibility of Bitcoin transactions is a significant limitation and risk that users must be aware of. The other transaction-related risk stems from the time it takes to validate a transaction. It takes roughly 10 minutes for a transaction to be initiated and verified by miners. The audit trail of the blockchain system could be at risk of replacement if consumers push hard for the ability to use Bitcoin for everyday purchases that require faster transaction approval. The 10-minute window also creates the opportunity for high-speed Bitcoin users to spend the same Bitcoins on multiple baskets of goods and services while they are tied up in the verification process. This presents an opportunity for abuse.

There are also a series of **operational risks** that could compromise the integrity and safety of a Bitcoin user's stash of virtual currency. One example is the security of the user's private key that is needed for the transaction verification process. If the private key is ever compromised, then all currency held by that user is vulnerable to theft. Another operational risk is seen in the use of mining pools and the famous "51 percent attack" where 51% of all mining activity (transaction verification) was conducted by a single entity for a period of time. This structural issue could result in fraudulent transactions in the Bitcoin universe. The balance of power could also be shifted if a targeted denial-of-service attack were to effectively block a certain series of miners and temporarily permit a rival mining pool to control transaction approval, even if only for a brief time period.

The notion of Bitcoin also raises certain **privacy risks**. Bitcoin transactions are not so much anonymous as they are pseudonymous. Each transaction is void of a name, but it does reveal identifiable user information, such as an encrypted account number, that can be traced through the blockchain system. If a delivery address can be uncovered or a real name can be cross-referenced from currency exchange records, then the Bitcoin user's true identity can be tagged to an encrypted account number and followed through the blockchain. However, if a Bitcoin user is able to maintain anonymity through intentional structuring of their transactions, then they can potentially engage in the purchase of goods and services of questionable legality.

Bitcoin systems also face both **legal and regulatory risks** across numerous jurisdictions. Many central banks and national governments are wrestling with how best to address the advent of Bitcoins. The outcome is yet to be determined. Some Bitcoin users are buying the virtual currency in hopes of currency appreciation. Others are using Bitcoin as a vehicle to buy legitimate assets that are easiest to acquire using a virtual currency. Still others are using Bitcoins as a smokescreen for illegal activities. It is entirely possible that law-abiding Bitcoin users lose funds in an exchange that is seized because of some exchange user's illegal activities. The legal and regulatory landscape encompassing the Bitcoin universe is constantly changing and it will continue to do so.

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- 10. Robert McMillan, "\$1.2 Million Hack Shows Why You Should Never Store Bitcoins on the Internet," *Wired*, November 7, 2013.
 - 11. Jon Southurst, "Bitcoin Payment Processor BIPS Attacked, Over \$1 Million Stolen," *CoinDesk*, November 25, 2013.

REGULATION OF VIRTUAL CURRENCIES

LO 73.4: Describe the measures taken to regulate virtual currencies.

The Bitcoin structure holds natural tension with traditional regulatory and government controls. However, there are a few aspects of Bitcoins that do lend themselves to regulatory oversight, and such intervention could be very useful.

Regulatory scrutiny of criminal activity is necessary within the Bitcoin universe in three core areas: Bitcoin-specific crimes, money laundering, and Bitcoin-facilitated crimes. **Bitcoin-specific crimes** are attacks on either the infrastructure of Bitcoin transfers or the currency itself. This could include Bitcoin theft, attacks on mining pools, or denial-of-service attacks on exchanges. Law enforcement has struggled with these crimes due to the inherent technical complexities and limited cyber resources. **Money laundering** is a big potential issue with Bitcoins. This involves using the Bitcoin protocol to conceal proceeds of illegal activities. Law enforcement's only weapon in this war is to attempt to map transactions through the blockchain record. The use of mixers can further cloud this area that requires more regulatory oversight. **Bitcoin-facilitated crimes** occur when account owners use Bitcoins to conduct illegal transactions for goods or services or for payment of bribes and extortion. These three factors are all reasons why the Bitcoin infrastructure needs to have some measure of regulation.

There are some key challenges to imposing regulation on the Bitcoin universe. One such challenge is that Bitcoins are an international virtual currency. If all national jurisdictions do not impose the same constraints, then account owners will domicile their holdings in a game of regulatory arbitrage, seeking the country with the lowest regulatory hurdles. Regulators are traditionally drawn to financial intermediaries as targets to deploy regulation. One challenge is that many intermediaries in the Bitcoin structure have very little leverage with which to enact national regulations. This is why the Silk Road was able to conduct illegal transactions in controlled substances, hacking services, and money laundering using Bitcoins as a cover. Ross Ulbricht, the founder of the Silk Road, was only caught because early in his career, he advertised the Silk Road online using a Gmail account, which could be linked to his encrypted transactions in the blockchain. One potential point of regulation is in the currency exchanges. In December 2013, China enacted a “know-your-customer” standard for all accounts under their scope of influence. This imposed certain registration and record-keeping responsibilities on Bitcoin currency exchanges.

Another legal issue is taxation of Bitcoin profits. How will profits be taxed when the users are supposed to be anonymous? The IRS has been wrestling with this issue and whether to classify Bitcoin currency gains as ordinary income or capital gains income. If taxation is imposed, then users would need to keep track of all Bitcoin currency transactions, and transactions would be formally linked to Bitcoin accounts. If taxation is not imposed in all jurisdictions, then it would leave room for abuse.

One good feature about the Bitcoin structure is that theft can be tracked. Since all transactions are recorded in the blockchain, the account number that stole Bitcoins can be easily isolated. The tricky part is identifying who the account belongs to. That might take an extended period of time to wait for the account owner to make a mistake and either

Topic 73

Cross Reference to GARP Assigned Reading – Böhme et al.

convert assets at a currency exchange or use their account to ship product to a physical address. In theory, they could use the anonymous account to buy online services that require no physical delivery and remain anonymous indefinitely.

KEY CONCEPTS

LO 73.1

Bitcoins are a virtual currency transacted using blockchain technology. Transactions involve a distributed network of servers that host the blockchain record of all historical transactions and a series of miners who are compensated to verify the accuracy of all Bitcoin transfers. The compensation paid to the miners is the only financial incentive for honesty in the blockchain process. It is a strong incentive if the system is functioning as it theoretically should.

LO 73.2

One significant limitation with Bitcoins is that all transactions are irreversible. There is no mechanism to reverse an unwanted or accidental transaction. Another limitation is the decentralized structure that makes coordination and user identity verification difficult. Several solutions to this decentralized structure have arisen, but they each have their own limitations. Another limitation to broad consumer use of Bitcoins is the speed of transaction validation and the effect that millions of consumer purchases would have on the size of the blockchain data file.

LO 73.3

The underlying structure behind Bitcoins has several specific risks. They include market risk, the shallow market problem, counterparty risk, transaction risk, operational risk, privacy risk, legal risk, and regulatory risk.

LO 73.4

The Bitcoin structure holds natural tension with traditional regulatory and government controls. Regulatory scrutiny of criminal activity is necessary within the Bitcoin universe in three core areas: Bitcoin-specific crimes, money laundering, and Bitcoin-facilitated crimes. The structure of Bitcoin provides several challenges to the implementation of regulation. These challenges include the global nature of this virtual currency, the naturally decentralized structure, and the anonymity factor.

CONCEPT CHECKERS

1. Which of the following statements is incorrect regarding the incentives to use a virtual currency?
 - A. Bitcoin is a virtual currency that transacts using blockchain technology.
 - B. The Bitcoin verification process utilizes a key system similar to HTTPS protocols.
 - C. The incentive for honesty in Bitcoin transactions is a structured regulatory system.
 - D. Fees paid to Bitcoin miners are the primary incentive for honesty in the blockchain infrastructure.

2. Which of the following items is not a limitation of the current Bitcoin structure?
 - A. Bitcoin transactions are irreversible.
 - B. The potential for Bitcoins to be stolen from currency exchanges or from digital wallet services.
 - C. The time it takes to validate a Bitcoin transaction.
 - D. User identity verification is transparent.

3. Which of the following statements about Bitcoin centralization structures is not correct?
 - A. Mining pools were created to solve the problem of miners conducting work with a low probability of payoff.
 - B. Digital wallet services are a safe way to transact in Bitcoins.
 - C. Mixers are designed to protect anonymity in Bitcoin transfers.
 - D. Mixers blur transaction audit trails.

4. Which of the following items is not a risk borne by the Bitcoin structure?
 - A. The irreversibility of transactions subtracts a layer of protection afforded to traditional payment methods.
 - B. Low trading volume in the Bitcoin currency adds another layer of market risk to those who want to own the currency.
 - C. Blockchain transactions may not be anonymous if the user makes certain types of transactions.
 - D. Bitcoins do not face counterparty risk because all transactions are anonymous.

5. Which of the following items are correct with respect to the regulation of Bitcoin?
 - I. Theft of Bitcoin can be easily tracked to the specifically identifiable party that stole the Bitcoin.
 - II. Bitcoins need to be regulated because of money laundering and several categories of illegal transactions.
 - A. I only.
 - B. II only.
 - C. Both I and II.
 - D. Neither I nor II.

CONCEPT CHECKER ANSWERS

1. C Bitcoin is a virtual currency that transacts utilizing blockchain technology. It deploys a system of private and public keys just like the HTTPS protocol. The fees paid to Bitcoin miners are the only formal incentive to encourage honesty in the verification process because there is not a centralized regulatory structure supervising Bitcoin transactions.
2. D The decentralized structure makes coordination and user identity verification difficult. The transactions are irreversible, and there is the potential for Bitcoin to be stolen either from currency exchanges or from digital wallet services. The fact that it takes roughly 10 minutes to validate a Bitcoin transaction is a limitation to broad use of Bitcoin by consumers for everyday purchases.
3. B Mining pools were designed to allow syndicates of miners to jointly profit if one of the miners in the group successfully validates a transaction. This helps alleviate the problem of miners using tremendous effort to find the public key to validate a transaction and then miss the payment because another miner conducted the hunt faster. Digital wallets are a step forward in organization, but they may present risk to the Bitcoin owner. If the digital wallet is hacked, then Bitcoins can be stolen unless the owner retains the private key, in which case it is still subject to data security risks. Mixers do blur the audit trail, and for this reason, they help to protect anonymity in the blockchain transaction storage system.
4. D Bitcoins do face counterparty risk because some wallet services are hacked and some currency exchanges shut down. The irreversibility of Bitcoin transactions is a key risk for patrons. It makes accidental transactions an issue. The shallow market for Bitcoins does compound currency volatility. Blockchain transactions may sacrifice their anonymous features if the user ships products to a physical address or transacts on a monitored currency exchange.
5. B Bitcoins have been shown to be used for money laundering and various other illegal activities. However, regulation of Bitcoins is challenging due to the semi-anonymous nature of the accounts and the global reach of this virtual currency. All global jurisdictions will need to come to a common regulatory understanding, or users will be able to exploit regulatory arbitrage. Theft of Bitcoins is easily tracked to the account that stole them. This is accomplished using the blockchain structure, but this structure also makes it very difficult to find out who owns a given account unless they make a mistake that reveals their identity.

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

MARKET AND FUNDING LIQUIDITY— AN OVERVIEW

Topic 74

EXAM FOCUS

This brief topic defines the concepts of market liquidity and funding liquidity and describes how they are inherently connected. For the exam, be able to compare and contrast market and funding liquidity. Also, focus on the regulatory and non-regulatory factors that have affected liquidity as well as how funding liquidity risk can be reduced. In general, it is important to analyze how market and funding liquidity conditions continually evolve and to understand the factors that contribute to them.

LO 74.1: Compare and contrast market and funding liquidity and describe factors that have impacted both types of liquidity.

MARKET LIQUIDITY

Market liquidity is described as the actual cost plus the time required to buy or sell a security. Four factors generally impact market liquidity: (1) brokerage fees, (2) execution price compared to the midpoint of the bid-ask spread, (3) the impact of the transaction on the market price of the security, and (4) the speed of transaction execution.

There is some uncertainty as to whether market liquidity has or has not decreased in recent years. Evidence that suggests it has not decreased include: (1) stable quoted bid-ask spreads (U.S. Treasuries), (2) order book depth that is not unusually low (U.S. Treasuries), and (3) falling realized bid-ask spreads (corporate bonds). However, evidence that suggests market liquidity has decreased include: (1) larger trades now tend to result in large securities price changes, (2) average trade sizes have fallen, and (3) increased bifurcation in the corporate bond markets (i.e., liquidity is biased in favor of larger and more recent bond issuances by larger issuers).

FUNDING LIQUIDITY

In contrast, funding liquidity can simply be described as a firm's ability to borrow funds. Normally, funding liquidity and market liquidity are separate issues, but during a market crisis, they are related because funding liquidity may be reduced, which may cause other firms to not be able to supply market liquidity. A downward cycle may begin when market liquidity is reduced, thereby causing funding liquidity to be further reduced. During the 2007–2009 financial crisis, some large financial institutions became bankrupt due to their inability to finance long-term illiquid assets. As funding liquidity fell dramatically, many firms were forced to sell their securities that had become illiquid at deep discounts.

REGULATORY AND NON-REGULATORY FACTORS

LO 74.2: Describe the regulatory and non-regulatory factors that have affected liquidity.

Regulatory Factors

Capital and liquidity requirements for large dealers have increased substantially post-financial crisis. This likely lowered potential profits from market-making activities, negatively impacting the supply of market liquidity.

For U.S. Treasuries, the key change is the **supplementary leverage ratio** (SLR) that caps the amount of leverage permitted by dealers. In computing the SLR, the same amount of regulatory capital is required on all assets, regardless of their risk levels. Accordingly, there is now much less financing of low-risk assets, such as repurchase agreements (repos).

For corporate bonds, there have been three key changes: (1) the increase in the Basel risk-weighted capital ratio, (2) the Comprehensive Capital and Analysis Review (CCAR) stress tests, and (3) the Volcker Rule (i.e., proprietary trading disallowed for corporate bonds but not for U.S. Treasuries). As a result, dealers now hold far fewer corporate bonds.

Overall, there is not sufficient evidence to suggest that the more demanding regulatory measures are the biggest contributing factor to falling market liquidity. There is evidence, however, to suggest that the regulatory changes have had some impact. At the same time, there is a tradeoff between the lower market liquidity and the stronger, more stable financial system that has been created because of the regulatory changes. In other words, the higher cost of market liquidity during normal times may be worth the avoidance of significant price volatility during stressed times.

Non-Regulatory Factors

Changes in market structure, methods of trade execution, and competition from non-regulated entities have impacted liquidity.

The increase in large asset managers, mutual funds, exchange-traded funds (ETFs), and principal trading firms (PTFs) that are otherwise known as high-frequency trading firms have also impacted liquidity. For example, high-frequency trading firms have dominated the inter-dealer market for U.S. Treasuries, and mutual funds have significant holdings of corporate bonds. Since mutual funds do not usually provide liquidity, their corporate bond holdings could explain the decrease in the secondary bond market.

In addition, liquidity is impacted by cyclical changes in risk premiums and term premiums, as well as by monetary policy.

LINKING MARKET AND FUNDING LIQUIDITY

LO 74.3: Describe the link between market and funding liquidity.

The link between market and funding liquidity can be thought of as follows: the lack of funding liquidity results in lower trading volumes and thinner markets, thereby decreasing market liquidity. For example, during the 2007–2009 financial crisis, there was a fall in the amount of dealer-funded repos backed by U.S. Treasuries (lower funding liquidity), and the dispersion of Treasury yields compared to a fitted Treasury yield curve was wider (lower funding liquidity). These two events coincided with a rise in Treasury bid-ask spreads (lower market liquidity). Such a high correlation between funding liquidity and market liquidity is noticeably absent when markets are normal.

The lack of market liquidity will result in lower price efficiency with a greater number of arbitrage opportunities. At the same time, the lack of funding liquidity does not allow arbitrageurs (e.g., hedge funds) to exploit such opportunities in a timely manner, thereby perpetuating the pricing discrepancies in the market for similar assets. For example, with less dealer-funded repos, it is more difficult to arbitrage similar assets such as on-the-run and off-the-run Treasuries, corporate bonds and credit default swaps, and Treasuries and interest rate swaps.

Yield spreads have also changed between more capital intensive and less capital intensive assets. For example, the fixed-rate on a 10-year interest rate swap should be higher than the yield on a 10-year Treasury note due to the greater risk of the swap. Recently, however, the swap rate has persistently remained lower (i.e., an arbitrage opportunity) for an extended period. It is possible that higher capital requirements for derivatives transactions versus cash transactions and/or the lack of funding by dealers have allowed this arbitrage opportunity to remain untapped for so long.

LINKING FUNDING LIQUIDITY AND CAPITAL REQUIREMENTS

LO 74.4: Examine the links between funding liquidity and capital requirements.

In general, the greater the capital requirements, the greater the security of funding liquidity.

Funding liquidity risk can be reduced by:

- Imposing higher capital requirements to minimize the risk of insolvency during tougher economic times.
- Improving reporting and transparency (e.g., stress tests) to allow for a more accurate assessment of a firm's solvency.
- Imposing higher liquidity requirements (e.g., liquidity coverage ratio), which means that it is less likely that a firm will need to sell its assets at a deep discount, thereby reducing its capital. Having more “reserve liquidity” provides more flexibility to a firm in times of crisis so there is not an automatic need to liquidate assets.

- Having a lender-of-last-resort provide a source of liquidity to strengthen funding liquidity. For example, a firm may be uncertain of how other lenders would assess a counterparty's solvency. In the absence of a lender-of-last-resort, some lenders may refuse to lend to the counterparty, because the lender is primarily concerned about the opinions of the other lenders, and not because the lender thinks the counterparty is insolvent. In practice, a central bank (e.g., Federal Reserve) may be able to function as the lender-of-last-resort to improve the confidence that counterparties have with each other and thereby increase market and funding liquidity. The caveat is that a central bank will only assist if the firm is actually solvent and has enough collateral to pledge as security to the lender-of-last-resort.

KEY CONCEPTS

LO 74.1

Market liquidity is described as the actual cost plus the time required to buy or sell a security. Four factors generally impact market liquidity: (1) brokerage fees, (2) execution price compared to the midpoint of the bid-ask spread, (3) the impact of the transaction on the market price of the security, and (4) the speed of transaction execution.

Funding liquidity can be described as a firm's ability to borrow funds.

LO 74.2

Capital and liquidity requirements for large dealers have increased substantially post-financial crisis. For U.S. Treasuries, there is the supplementary leverage ratio (SLR) that caps the amount of leverage permitted by dealers. For corporate bonds, there have been three key changes: (1) the increase in the Basel risk-weighted capital ratio, (2) the Comprehensive Capital and Analysis Review (CCAR) stress tests, and (3) the Volcker Rule (i.e., proprietary trading disallowed for corporate bonds but not for U.S. Treasuries).

Changes in market structure, methods of trade execution, and competition from non-regulated entities have impacted liquidity. The increase in large asset managers, mutual funds, exchange-traded funds (ETFs), and principal trading firms (PTFs) that are otherwise known as high-frequency trading firms have also impacted liquidity. In addition, liquidity is impacted by cyclical changes in risk premiums and term premiums, as well as by monetary policy.

LO 74.3

The link between market and funding liquidity can be thought of as follows: the lack of funding liquidity results in lower trading volumes and thinner markets, thereby decreasing market liquidity. During times of market stress, there is a high correlation between funding liquidity and market liquidity that is noticeably absent when markets are normal.

The lack of market liquidity will result in lower price efficiency with a greater number of arbitrage opportunities. At the same time, the lack of funding liquidity does not allow arbitrageurs to exploit such opportunities in a timely manner, thereby perpetuating the pricing discrepancies in the market for similar assets.

LO 74.4

Funding liquidity risk can be reduced by:

- Imposing higher capital requirements.
- Improving reporting and transparency (e.g., stress tests).
- Imposing higher liquidity requirements (e.g., liquidity coverage ratio).
- Having a lender-of-last-resort, which provides a source of liquidity to strengthen funding liquidity.

CONCEPT CHECKERS

1. Which of the following reasons would least likely suggest that market liquidity has decreased in recent years?
 - A. Falling average trade sizes.
 - B. Increasing bifurcation in corporate bond markets.
 - C. Larger trades occurring with larger price changes.
 - D. Falling realized bid-ask spreads for corporate bonds.
2. Which of the following factors has had the greatest impact on the liquidity of U.S. Treasuries?
 - A. The Volcker Rule.
 - B. Basel risk-weighted capital ratio.
 - C. Supplementary leverage ratio (SLR).
 - D. Comprehensive Capital and Analysis Review (CCAR) stress tests.
3. Which of the following factors is not considered a regulatory factor impacting liquidity?
 - A. Basel risk-weighted capital ratio.
 - B. Comprehensive Capital and Analysis Review (CCAR) stress tests.
 - C. Monetary policy.
 - D. The Volcker Rule.
4. Which of the following statements regarding the link between market and funding liquidity is correct?
 - A. A lack of market liquidity results in fewer arbitrage opportunities available.
 - B. The correlation between the levels of funding liquidity and market liquidity tends to fall during times of market crisis.
 - C. The fixed-rate on an interest rate swap should always be higher than the yield on a Treasury note of the same term.
 - D. A narrower dispersion of Treasury yields compared to a fitted Treasury yield curve is indicative of lower funding liquidity.
5. Which of the following methods is the most appropriate way to reduce funding liquidity risk?
 - A. Performing more scenario analyses.
 - B. Imposing lower liquidity requirements.
 - C. Maintaining stable capital requirements.
 - D. Using a central bank as the lender-of-last-resort.

CONCEPT CHECKER ANSWERS

1. D Evidence to suggest that market liquidity has *not decreased* includes: (1) stable quoted bid-ask spreads (U.S. Treasuries), (2) order book depth that is not unusually low (U.S. Treasuries), and (3) falling realized bid-ask spreads for corporate bonds.

Evidence to suggest that market liquidity has *decreased* includes: (1) larger trades now tend to result in large securities price changes, (2) average trade sizes have fallen, and (3) increased bifurcation in corporate bond markets (i.e., liquidity is biased in favor of larger and more recent bond issuances by larger issuers).

2. C For *U.S. Treasuries*, the key change is the supplementary leverage ratio (SLR) that caps the amount of leverage permitted by dealers. In computing the SLR, the same amount of regulatory capital is required on all assets, regardless of their risk levels. Accordingly, there is now much less financing of low-risk assets, such as repos.

For *corporate bonds*, there have been three key changes: (1) the increase in the Basel risk-weighted capital ratio, (2) the Comprehensive Capital and Analysis Review (CCAR) stress tests, and (3) the Volcker Rule.

3. C Changes in monetary policy would be an example of a *non-regulatory* factor impacting liquidity.

There are three *regulatory* factors that have impacted liquidity: (1) the increase in the Basel risk-weighted capital ratio, (2) the Comprehensive Capital and Analysis Review (CCAR) stress tests, and (3) the Volcker Rule.

4. C The fixed rate on an interest rate swap of a given term should be *higher* than the yield on a Treasury note of the same term due to the greater risk of the swap.

A lack of market liquidity will result in lower price efficiency with a greater number of arbitrage opportunities. A higher level of correlation between funding liquidity (e.g., the fall in the amount of dealer-funded repos backed by U.S. Treasuries and wider dispersion of Treasury yields compared to a fitted Treasury yield curve) and market liquidity (e.g., rise in Treasury bid-ask spreads) exists during times of market crisis. A narrower (wider) dispersion of Treasury yields compared to a fitted Treasury yield curve is indicative of higher (lower) funding liquidity.

5. D Funding liquidity risk can be reduced by having a lender-of-last resort to provide a source of liquidity to strengthen funding liquidity. In practice, a central bank (e.g. Federal Reserve) may be able to function as the lender-of-last-resort to improve the confidence that counterparties have with each other and, thereby, increase market and funding liquidity.

Stress tests (not scenario analysis) should be performed to allow for a more accurate assessment of a firm's solvency. *Higher* liquidity requirements, such as the liquidity coverage ratio, should be imposed to reduce funding liquidity risk. It is not sufficient to just maintain stable capital requirements; *stronger* capital requirements are needed to minimize the risk of insolvency during tougher economic times.

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

MARKET LIQUIDITY—RESILIENT OR FLEETING?

Topic 75

EXAM FOCUS

The focus of this topic is on market liquidity, both in terms of levels and resiliency. For the exam, recognize the factors and drivers that influence liquidity levels and resiliency in both positive and negative directions in U.S. and foreign asset markets. Also, understand the impacts of monetary policy in terms of the channels through which policy impacts liquidity and the individual policy effects themselves. In addition, be able to describe liquidity spillovers and how liquidity declines for one asset can have negative impacts on the liquidity of other assets. Maintaining liquidity in times of financial stress is absolutely critical; therefore, be familiar with the recommendations and strategies that would help maintain liquidity.

MARKET LIQUIDITY LEVELS AND RESILIENCE

LO 75.1: Describe the factors that influence the level of market liquidity and the degree of liquidity resilience in markets.

Market liquidity exists when participants can quickly buy and sell a large volume of securities at a relatively low cost with a limited impact to price. It is very important that market liquidity be *resilient*, as this implies less vulnerability to sharp declines when market shocks occur. Evidence has shown that current market liquidity has in large part been sustained by relatively benign cyclical market conditions, with increases in spillovers of market liquidity across asset classes. Liquidity has been negatively impacted by reduced market making, with derivatives trading restrictions implemented by the European Union (EU) in 2012 weakening the liquidity of the underlying assets. On the other side, improvements in transparency have increased market liquidity.

Higher concentrations of holdings among insurance companies, pension funds, and mutual funds tend to negatively impact liquidity resiliency, as does larger corporate bond holdings by mutual funds. Small bond issuances have also lowered bond market liquidity. Relative to investment-grade bonds, liquidity indicators for emerging and high-yield bonds have weakened. Also, regulatory changes tend to have mixed effects as tougher balance sheet constraints tied to market making have led to reductions in market liquidity. To prevent sudden liquidity issues, preemptive strategies by policymakers and careful monitoring of market liquidity conditions should be implemented to cope with market liquidity shifts. Market infrastructure reforms, the re-evaluation of trading restrictions on derivatives, and normalizing monetary policy should all help maintain or even enhance liquidity.

Lower market liquidity limits the efficiency with which funds are transferred from savers to borrowers, which can potentially hinder economic growth. Lower liquidity also tends to be fragile, implying that market shocks are likely to cause liquidity to rapidly decline; in line with this are increased volatility and prices that stray from underlying fundamentals. Liquidity is higher in transparent and efficient market infrastructures that provide participants lower costs, easy access to funding, higher levels of risk appetites, lower risk in general, and a more diversified overall investor base. The more activity there is in a market, the more liquid it is; this becomes self-fulfilling, as more liquid markets attract more traders and more activity.

Asset price drops, margin calls, induced fire sales, and liquidity feedback loops all have a negative impact on market liquidity. In recent years, changes in bank funding models and inventory declines have led to market makers providing services to fewer clients. Banks have also seen increased regulations that have put restrictions on proprietary trading and led to increased capital buffers, which tend to limit market-making and trading activities. Electronic trading platforms and automated calculations for computerized trades have reduced the predictability of market liquidity.

Investment funds such as mutual funds and other large, homogeneous buy-side institutions tend to be more sensitive to redemption pressures, more likely to be vulnerable to following “the herd,” and less likely to make markets and absorb order flow imbalances; this leads to less resilient liquidity and increased liquidity risk.

The bond market tends to be the central mechanism through which monetary policy impacts other asset classes’ market liquidity. Bond prices have a major impact on investment and consumption through wealth and interest rate effects. Bond prices also play a key role in the repurchase agreement (repo) market and are highly connected to funding liquidity.

Examples of measures of liquidity include:

- **Bid-ask spread**, which measures transaction costs, subtracts the quoted bid price from the quoted ask price.
- **Effective spread**, which measures the distance between actual trading prices and median prices.
- **Roll’s price reversal**, which measures bid-ask spreads using covariances between price changes.
- **Corwin and Schultz’s high-low spread**, which measures transaction costs using two-day high and low prices.
- **Price impact**, which measures the change in price for a given trading volume.
- **Turnover**, which is more a measure of trading activity using trading volume and market values than a measure of market liquidity.
- **Amihud’s measure**, which measures market depth by dividing absolute daily return by daily volume.
- **Markit’s liquidity score**, which measures market breadth (number of participants) and implied liquidity.
- **Dealer count**, which measures market depth by documenting the number of dealer quotes on a given security.
- **Quote depth**, which quantifies the number of securities dealers willing to supply liquidity services.
- **Imputed round-trip cost**, which compares the high price point to the low price point for a security with the same trade size within one day.

DRIVERS OF MARKET LIQUIDITY LEVELS AND RESILIENCE

LO 75.2: Identify drivers and their effects on market liquidity level and resilience.

Whereas market liquidity involves being able to execute large transactions at low costs with limited price impacts, **funding liquidity** relates to market participants obtaining funding under reasonable conditions. Funding liquidity is typically needed for market liquidity, and in turn market liquidity enhances funding liquidity as margin requirements tend to depend on how easily securities can be sold. **Monetary liquidity** relates to monetary policy, and expansionary policies ease conditions for banks and therefore facilitate market-making activities.

Market liquidity must be evaluated in terms of both its level and its resilience. The big concern with market liquidity is that it can disappear in times of market stress, leading to potential overreactions (in a negative way) in asset prices. The higher liquidity is, the less volatility a market exhibits and the faster information is aggregated. When market liquidity is stable and abundant, all market participants benefit; when it is volatile and lacking, it can have a very negative impact on financial stability.

Market liquidity levels and resilience tend to be driven by three broad categories: (1) investor behavior and characteristics that reflect different constraints, mandates, and access to information; (2) market risks, risk appetite, and funding constraints faced by financial intermediaries; and (3) search costs impacting the speed that buyers and sellers can connect. Specifically, these drivers include:

- Positive and negative impacts to search costs as a result of new regulations.
- Tighter constraints on trading, resulting in a reduction in dealers' capacities to take risks and willingness to make markets.
- Electronic trading platform growth; although theoretically this would have reduced search costs, the impact may be adverse if algorithms are poorly designed or immediate liquidity is demanded.
- Large-scale purchases of securities by central banks could have both positive and negative effects on market liquidity. Positive effects include raising risk appetites, reducing default and term premiums, and relaxing funding constraints. Negative effects include cutting the supply of specific bonds, which ultimately raises costs for market participants. Search costs may also increase due to increases in the number of smaller issues based on demand of investors for higher yields in lower rate environments.
- Increased herding and market participant concentration, as well as daily redemptions offered by mutual funds invested in bond markets, has made liquidity vulnerable to sentiment changes.
- The search for yield mentioned previously, as well as accommodative monetary policy, the growth of index investing, and benchmark usage, has increased liquidity risk.
- On the other side, hedge funds have become more like mutual funds in terms of investment behaviors and easing of leverage, which has helped to moderate liquidity risk.

One of the primary benefits of electronic trading is the facilitation of matching buyers and sellers. Studies have shown the impact to market liquidity of corporate bonds has been beneficial. In fact, electronic auction markets have been shown to improve liquidity for thinly traded corporate bonds. For higher grade (investment-grade) corporate bonds, market liquidity levels and resilience seem to be stronger than those for lower grade bonds.

In fact, short-term resilience measured by how quickly liquidity recovers from unexpected or bad news indicates faster recoveries for investment-grade versus high-yield issues. In foreign markets, it has also been shown that the algorithmic trading behind electronic trading has enhanced average liquidity and price efficiency.

However, a potential negative impact to liquidity resilience is the facilitation through electronic trading platforms of **high-frequency trading** (HFT) firms. During the last decade, U.S. Treasury markets have experienced a rise in HFT firms and a decline in the role of banks. For banks, there has likely been a decline in balance sheet capacity related to market-making strategies, while HFT firms tend to operate with lower levels of capital. Markets tend to be more vulnerable to shocks because new market makers and even traditional market makers cannot or will not provide liquidity.

As studied through the lens of the 2013 taper tantrum (when panic spread throughout bond markets after the Federal Reserve suggested a reduction in bond purchases), drivers of the resilience of market liquidity include:

- *Market making.* For bonds where there are fewer market makers, there is a greater deterioration of liquidity when a financial shock occurs. In addition, higher-credit quality bonds with lower market-making costs tend to experience smaller liquidity declines in shock situations.
- *Issue size.* Liquidity resilience is likely reduced by growth in smaller issues and riskier bonds. There should be a positive relationship between bond liquidity and bond size due to a greater likelihood of larger issues belonging to an index and having a credit default swap, or due to economies of scale associated with information gathering on credit risk.
- *Liquidity resilience and trade transparency.* There is a positive relationship between liquidity resilience and pretrade transparency (based on the number of quotes). Bonds with greater pretrade/quote transparency outperformed bonds with fewer published quotes. Essentially, in times of financial distress, bonds with greater dissemination of trading interest experienced smaller liquidity declines.
- *The landscape of investors.* Larger holdings by investment companies such as mutual funds (especially open-end funds) are linked to greater liquidity declines during periods of financial stress. Also, when bond ownership is more concentrated due to institutional investor ownership (pension funds, insurance companies, and mutual funds), liquidity tends to decline.

Evidence has shown that in advanced economies, dealer banks have been less active as market makers in fixed-income securities. Similarly, corporate debt holdings by banks have declined in spite of overall increases in outstanding debt. For sovereign banks, U.S. banks have shown smaller holdings while German banks have experienced larger holdings. Surveys have shown a general decline in market making due primarily to regulatory reforms, balance sheet constraints for banks, and internal changes to trading and market making.

In regard to market liquidity level trends in bond markets since 2004, imputed round-trip costs have declined for U.S. corporate bonds while U.S. Treasury markets have shown recent liquidity deterioration. For European sovereign bonds, liquidity based on effective spreads has returned to pre-financial crisis levels while emerging market sovereign bond liquidity based on high-low bid-ask spreads has been stable. Liquidity increases based on bid-ask spreads have occurred for European corporate bonds and Japanese government bonds.

Bond markets have shown short-term liquidity resilience movements in opposite directions for high-yield versus investment-grade U.S. corporate bonds while price impacts for trades

have increased in countries such as France, Spain, Italy, and Belgium. Compared to before the crisis, larger trades are less frequent now. More recent evidence from 2014 forward has shown increases in quoted bid-ask spreads for emerging market bonds.

As noted earlier, market liquidity for corporate bonds will deteriorate if dealers are constrained in terms of how much they can allocate on their balance sheet to corporate bonds. These constraints are greater now than they were precrisis such that regulation and balance sheet constraints remain a significant concern for U.S. market makers. In fact, bond inventories for U.S. banks have declined in the United States while bond inventories remain relatively high for German banks. However, surveys in both the U.S. and the euro area indicate that balance sheet constraints and regulations are primary concerns for market makers.

In terms of the investor base, heterogeneity declines may have contributed to liquidity deterioration. In early 2013, a rule was adopted in the United States that required banks to decide (rather than use credit agency ratings) whether or not a security would be investment grade. Since commercial banks in the United States cannot invest in bonds below investment grade, the investor base declined for bonds near the bottom of the investment grade classification for rating agencies. As a result of this decline, market making in these bonds declined and dealers' inventory costs for these bonds increased.

Although liquidity levels are certainly a concern for markets, the primary concern regarding liquidity is the risk of liquidity freezes and disruptive drops across markets. Liquidity can be very vulnerable to external shocks for many of the reasons described earlier, including the reduced presence of market makers, concentrated holdings by institutional investors, larger holdings by mutual funds, and a broader range of higher-risk and smaller bonds.

In the corporate bond market, liquidity resilience can often be predicted by cyclical factors such as financial volatility, business conditions, the price of credit risk, monetary policy measures, and risk appetite. Evidence has shown that higher-yield bonds tend to be particularly sensitive to credit market developments and business conditions, while investment-grade bond liquidity seems to only be impacted by unconventional monetary policy.

Models of cyclical factors and their impacts on liquidity from 2002–2015 have shown that both investment-grade and high-yield corporate bonds in the United States are able to respond quickly to financial stress events. From 2005–2015, market liquidity has declined in the U.S. Treasury bond market while European sovereign debt has been able to maintain more consistent liquidity. In terms of currency performance from 1994–2015, low liquidity has been a greater concern for currencies of major advanced economies versus those of emerging market economies.

In the U.S. bond market, when market making is impaired or when dealer inventories are low, aggregate liquidity is more likely to suffer. The relationship between liquidity regimes and market-making abilities/dealer inventories are such that a higher percentage of total corporate securities to total assets for commercial banks has a negative relationship to low-liquidity regimes in the corporate bond market. The odds of the corporate bond market being in a low-liquidity regime are higher when the TED spread (which measures the difference between the three-month T-bill secondary market rate and the three-month London Interbank Offered Rate based on the U.S. dollar) is high—indicating funding liquidity is low.

For European sovereign bonds and foreign exchange markets, advanced economy business conditions are the main driver of liquidity regimes. For smaller advanced economies and emerging markets, business conditions are not as significant a factor.

Ironically, it would seem that investors only require higher returns for illiquid assets during periods of financial stress; this would indicate that the potential for vanishing liquidity during nonstress times is somewhat irrelevant. In fact, evidence has shown that in the U.S. corporate bond market, returns only react to liquidity shocks when returns are low and volatility is high (i.e., during high stress periods). It is also evident that shocks associated with liquidity in the equity market tend to impact high-yield markets and cause declines in bond returns.

MONETARY POLICY EFFECTS

LO 75.3: Assess the effects that monetary policy has on market liquidity.

Expansionary monetary policy typically has the effect on market liquidity of reducing costs associated with trading and market making. Many central banks implemented quantitative easing (QE) measures as elements of monetary policy designed to maintain liquidity. Monetary policy affects market liquidity through the following three channels:

1. *Bank Funding Channel.* Purchases of long-term securities by central banks increase bank reserves and, as a result, funding liquidity. Funding liquidity has been shown to be a significant driver of liquidity, in particular for high-yield bonds in the U.S. corporate bond market. Higher funding liquidity results in relaxed funding constraints and easier financing of bank inventories. However, recent years have shown banks becoming less active in repo markets and margin lending potentially due to higher costs; this may be due to greater uncertainty and the need to self-insure to protect against funding shocks.
2. *Market Functioning Channel.* Central bank purchases provide a direct effect on the liquidity of the securities themselves, which helps to reduce any search frictions that would prevent investors from finding trade counterparties. When a solvent and committed buyer exists, illiquidity risk is reduced and market making and market functioning are enhanced, leading to lower liquidity premiums. However, when some assets such as high-quality government fixed-income securities become scarce due to central bank purchases, search costs increase and liquidity is reduced.
3. *Risk Appetite Channel.* Accommodative monetary policy tends to increase risk appetite, which results in higher inventories and more trades for market makers and other market participants. In fact, risk appetite has been shown to be the main driver of market liquidity for investment-grade U.S. corporate bonds since 2010.

Searching for Yield

Ironically, expansionary monetary policy and associated low interest rates tend to lead investors to “search for yield” by seeking higher returns from higher-risk, less-liquid bonds. Exchange-traded funds and open-end mutual funds that offer daily liquidity while investing in longer-term assets also become more attractive in this environment.

Large-Scale Asset Purchases

Monetary policies that have involved large-scale asset purchases tend to have two effects. The first is that market liquidity is increased due to the central bank's role as a dependable, large buyer. The second is these asset purchases have cut the supply of specific securities in the marketplace.

Eligible Repo Assets

By facilitating market making, central banks have the ability to improve liquidity. Through expanding the range of eligible assets for inclusion in the list of eligible collateral for repo operations, central banks can improve market liquidity by relaxing market makers' funding constraints. As a result, the implicit costs of holding these instruments as liquidity buffers decline and in fact issuances in the primary market may increase as a result.

Trade Transparency

A rise in trade transparency has been shown in some cases to have a small but positive impact on bond market liquidity, but for many other assets such as equities the impact is negligible. The rationale for this effect is twofold: (1) increased transparency has a positive impact on liquidity due to improved risk sharing among dealers, increased competition, facilitated rules enforcement against unfair trading, and improved asset valuation, and (2) negative impacts on liquidity may result from market makers wishing to reduce large inventories as a result of potential problems with unwinding their positions caused by increased transparency. U.S. corporate bonds exhibited positive liquidity impacts due to enhanced transparency, in particular for larger transactions of lower-rated bonds.

CDS Positions

In late 2012, the European Union banned uncovered sovereign credit default swap (SCDS) positions in EU sovereign debt. In addition, the EU required disclosures of any short positions in European sovereign bonds. These actions led to liquidity reductions in these assets and in the European sovereign bond market overall due to challenges in finding trade counterparties and hedging for market makers. The impact of the liquidity decline was greater for countries with low credit risk, but it also had a negative impact in the derivatives and cash markets.

MBS Positions

In the U.S., QE initially helped but then hurt liquidity for mortgage-backed securities (MBS). One explanation for this is that any positive effects are reversed by scarcity tied to large central bank purchases.

LIQUIDITY SPILLOVERS

LO 75.4: Explain how liquidity spillovers can be amplified and describe what effects this has on the market.

Liquidity spillovers describe the effects of liquidity shocks that occur as one asset class impacts other asset classes. This may occur even with asset classes that are unrelated fundamentally, which may result from mark-to-market and rebalancing needs of market participants that can hurt participants' ability to hold and trade other assets. This can also occur when participants are highly leveraged. For asset fundamentals that are correlated, spillovers can have a significant effect as investors may perceive signals and information coming from one asset class tying to another. As expected, spillovers are larger during periods of financial stress when returns are lower, and they exhibit higher volatility. Spillovers have also been more volatile since the recent financial crisis.

The investment-grade bond market is the critical market to evaluate in terms of liquidity spillovers. Liquidity shocks that start in the investment-grade bond market tend to spill over into other markets, although the effect does not hold true in reverse as liquidity for other assets does not have as much of an impact on investment-grade bond liquidity.

IMPROVING MARKET LIQUIDITY LEVELS AND RESILIENCE

LO 75.5: Describe the recommendations to bolster the level of market liquidity and its resilience.

Due to the potential for market liquidity to suddenly evaporate (in particular during high stress periods), policymakers should consistently monitor liquidity (using transaction-based measures is one approach) and have plans in place to manage illiquidity episodes. Sudden market liquidity reductions have become higher risks due to impending monetary policy normalizations in advanced economies, larger roles for mutual funds, and other structural changes. Although balance sheet constraints may have a negative impact on market liquidity, these increased constraints cannot be linked to specific regulatory changes. Certain outcomes of Basel III, including the increase in capital requirements, restrictions on banks' proprietary trading, the leverage ratio requirement, and the net stable funding ratio, have not been in place long enough to truly assess their impact. Outside of regulations, business models for traditional market makers have changed such that they have moved from acting as dealers (i.e., risk warehousing) to acting as brokers (i.e., risk distribution).

Helping to reduce the impact of market making at banks are equal-access electronic trading, trade transparency, and standardization. In the United States, moving most index-CDS trading to swap execution facilities should serve to increase liquidity by enhancing transparency and providing incentives for market-making activities.

Based on the evidence and findings, the following recommendations should be considered to reduce market liquidity risks, strengthen market design, improve financial market regulations, and enhance the role of central banks:

- Central banks need to be aware of the potential negative side effects associated with their outright security purchases and collateral policies.

- Central banks, as well as financial supervisors, should also monitor liquidity in real time across asset classes and primarily in the investment-grade bond market.
- To improve market liquidity, reforming the design of markets through instrument standardization and trade transparency should be promoted.
- Asset managers and other traders should have access to electronic trading platforms on equal terms, as these platforms should become standard in the marketplace.
- Collateral policies by central banks in times of financial market stress should be relaxed such that a wider range of assets can be used as collateral for repo transactions.
- Consider reducing mutual funds' first-mover advantage (which leads to shareholder runs) and liquidity mismatches. Liquidity mismatches occur when funds that invest in infrequently traded and relatively illiquid assets allow investors to quickly and easily redeem shares. Tools should be considered that will price in liquidity costs, including mutual fund share-pricing rules, improvements in illiquid asset valuations, and minimum redemption fees.
- Restrictions on things like derivatives trading should be re-evaluated due to the negative impact they have on liquidity.
- Liquidity stress testing for investment funds and banks should be implemented.
- Preemptive strategies and monitoring of market liquidity should be adopted to allow quick reaction to sudden liquidity shifts.
- Smooth implementations of monetary policy are critical for avoiding liquidity disruptions.

Ideally, policies will be set up in advance that will allow the market to continue to function in times of financial stress. A regime that has low liquidity is more likely to produce contagion, spillovers, market freezes, and price dislocations. Based on all of the recommendations noted previously, the five main policy recommendations are:

- With the goal of creating more open and transparent capital markets, market infrastructure reforms such as standardization and equal-access electronic trading platforms should continue.
- As monetary policy normalizes in the United States, attention to liquidity developments and good communication are critical to avoiding liquidity disruptions in emerging and advanced economies.
- Measures are needed to reduce first-mover advantages and liquidity mismatches at mutual funds.
- Existing trading restrictions on derivatives should be re-evaluated.
- Preventive policies should be in place during normal (nonfinancial stress) times to maintain liquidity resilience. Strategies should be in place to handle episodes of market illiquidity.

KEY CONCEPTS

LO 75.1

Liquidity relates to how quickly market participants can sell large volumes of securities at relatively low costs with limited price impacts. Resiliency relates to how well a market maintains its liquidity, in particular during times of financial stress. Examples of factors that influence liquidity and resiliency include trading activity, reduced market making, derivatives trading restrictions, transparency improvements, higher asset concentrations by large investors, regulatory changes leading to tougher balance sheet constraints, and electronic trading platforms.

LO 75.2

Drivers of market liquidity levels and resilience include several elements that have both positive and negative effects including regulations, electronic trading platforms, central bank purchases of large-scale assets, increased herding and market participant concentration, accommodative monetary policy, and the search for yield. Drivers such as tighter constraints on trading and restrictions on derivatives and other speculative positions tend to have a decidedly negative effect on liquidity.

LO 75.3

Both expansionary monetary policy and quantitative easing (QE) measures have served to maintain market liquidity through three primary channels: bank funding, market functioning, and risk appetite. The effects of monetary policy include searching for yield through higher-risk investments, large-scale asset purchases (which are both helpful and harmful to liquidity), potential expansion of the list of eligible repo assets, increased trade transparency, and impacts to credit default swaps and mortgage-backed securities.

LO 75.4

A liquidity spillover occurs when a liquidity shock that impacts one asset class impacts the liquidity of other asset classes. The impacts of spillovers are greater during periods of financial stress and can occur between both correlated and uncorrelated assets. The investment-grade bond market is often the origin of the most impactful liquidity spillovers.

LO 75.5

Due to the risks associated with sudden reductions in market liquidity, it is critical that liquidity be monitored continuously and that policies are put in place to manage sudden liquidity downturns. The five primary policy recommendations include continued infrastructure reforms such as standardization and electronic trading platforms, attention to liquidity developments and good communication, reduction of first-mover advantages and liquidity mismatches, re-evaluation of derivatives trading restrictions, and preventive policies during nonfinancial stress times.

CONCEPT CHECKERS

1. Which of the following measures accurately describes how liquidity can be measured in a given market?
 - A. Turnover is used to compare price changes for a given trading volume.
 - B. Imputed round-trip cost looks at spread between the high and low price for a security.
 - C. Dealer count looks at market breadth based on market participants and implied liquidity.
 - D. Roll's price reversal is used to measure the difference between median and actual prices.
2. Which of the following statements is most accurate in regard to liquidity drivers during the 2013 taper tantrum?
 - A. Smaller and riskier bonds were more liquid than larger-scale, lower-risk bonds.
 - B. Bonds with greater pretrade transparency exhibited greater liquidity resilience.
 - C. Greater concentrations of investment company holdings help to maintain liquidity.
 - D. There is an inverse relationship between the number of market makers and overall liquidity.
3. Which of the following effects resulting from monetary policy decisions has been most beneficial to liquidity?
 - A. Increases in risk appetite by market makers.
 - B. Large-scale asset purchases by central banks.
 - C. Narrowing the range of assets eligible for repo transactions.
 - D. European Union (EU) restrictions on sovereign credit default swaps.
4. All of the following statements regarding liquidity spillovers are correct except:
 - A. spillovers have a greater impact when the economy is experiencing a high level of financial stress.
 - B. in the years following the most recent financial crisis, spillovers have exhibited greater levels of volatility.
 - C. a liquidity spillover will likely have a greater impact on assets that are correlated versus those that are uncorrelated.
 - D. liquidity shocks originating in the high-yield bond market will typically have a significant impact on the investment-grade bond market.
5. Which of the following policy recommendations should mitigate some of the concerns associated with low-liquidity markets?
 - A. Implement greater restrictions on derivatives trading.
 - B. Narrow the range of assets allowed by banks as collateral for repo transactions.
 - C. Reduce the mismatch associated with illiquid mutual fund holdings and investor redemptions.
 - D. Make electronic trading platforms available only to traders and market makers trading above a certain threshold.

CONCEPT CHECKER ANSWERS

1. B Imputed round-trip cost looks at an individual security with the same trade size within one day and compares the high price to the low price. Turnover measures trading activity by looking at trading volume and market values. Dealer count looks at market depth by showing how many dealer quotes exist on a given security. Roll's price reversal measures bid-ask spreads using covariances between price changes.
2. B Based on the number of quotes, bonds that had greater pretrade transparency outperformed bonds with less transparency from a liquidity standpoint. Smaller and riskier bonds were less liquid than larger-scale, lower-risk bonds. Greater concentrations of investment company holdings reduced liquidity. There is a direct (positive) relationship between the number of market makers and overall liquidity.
3. A When market makers have increased risk appetites, this leads to increased inventories and overall trading, which has a positive impact on market liquidity. Large-scale asset purchases have been both positive (due to the central bank's role as a dependable buyer) and negative (purchases of these assets may make them scarce). Expanding (rather than narrowing) the range of assets eligible for repo transactions would increase liquidity. EU restrictions on sovereign credit default swaps have harmed overall liquidity in the European sovereign bond market.
4. D A liquidity shock that originates in the investment-grade bond market will likely have a greater impact on the high-yield bond market, rather than the other way around. All of the other statements are accurate.
5. C Reducing the mismatch associated with illiquid mutual fund holdings and the ability of fund investors to easily redeem their holdings will help reduce the risk of low-liquidity markets. The other three recommendations would all serve to lower liquidity even further.

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

ALGORITHMIC TRADING BRIEFING NOTE

Topic 76

EXAM FOCUS

This short and qualitative topic covers algorithmic trading, which continues to be a key issue in global markets. For the exam, understand the key risks and mitigation methods associated with algorithmic trading. Also, focus on the risk management tools used to monitor a firm's algorithmic trading risks.

ALGORITHMIC TRADING RISKS

LO 76.1: Identify key risks with algorithmic trading.

High-frequency trading (HFT) is a form of algorithmic trading that has resulted in greater risks in global markets as seen by increased volatility and market disruption. There are four key risks associated with algorithmic trading: (1) amplified systemic risk, (2) substantial intraday risk, (3) lagging internal controls, and (4) rapid occurrence of significant losses.

Amplified systemic risk. A small trading error at a firm may have a significant ripple effect on the entire market in the form of further errors or changes in algorithms resulting from the error. There could also be negative impacts on clearinghouses and central counterparties (CCPs) due to incorrectly executed trades.

Substantial intraday risk. Most financial institutions have reporting requirements and internal controls to manage risk on an end-of-day basis. However, such requirements may not be as timely and controls may not be as strong on an intraday basis, thereby potentially taking on an inadvertent amount of risk at any point in the day. Additionally, intraday IT problems, sudden market changes, or algorithm weaknesses may result in excessive overnight risk exposure.

Lagging internal controls. With rapid increases in trade execution speed and complexity of financial instruments, internal control failures could have a magnified impact. The risk arises because prime brokerage divisions of financial institutions have not sufficiently developed their internal controls to keep up with the riskier activities of their HFT and algorithmic clients.

Rapid occurrence of significant losses. The high execution speed, especially in the absence of sufficient internal controls, can very quickly lead to significant losses for many market participants. Mitigating this problem would occur in the form of increased testing of algorithms or strategies as well as additional proposed requirements by market regulators to improve controls.

MONITORING AND CONTROLLING RISKS

LO 76.2: Describe how risks associated with algorithmic trading are monitored and controlled.

Algorithmic trading risks can be monitored and controlled with the following principles: (1) updating and improving controls, (2) sufficient governance and management oversight, (3) increased testing of new or revised algorithms or strategies, and (4) involvement of key stakeholders with internal controls planning.

Updating and improving controls. Given the rapid trading speeds and more complicated technology involved, a defense-in-depth process (i.e., several controls at different points in the process) is warranted when a wide variety of controls and a system of control redundancy exist throughout the firm. Control redundancy involves having the same control in place at different points of the trading process. Defense-in-depth aims to lower the chances of an erroneous and significant order actually being executed. Overall, the trading department must have controls over order generation, order handling, and order execution.

Sufficient governance and management oversight. There needs to be a centralized risk management process to ensure that best practices are applied throughout the firm and that trading controls are congruent with the firm's risk appetite. The application of controls consistently throughout the firm is also necessary to ensure there are few or no variances between trading desks so as to expose the firm to only an appropriate amount of risk.

Increased testing of new or revised algorithms or strategies. A new or revised algorithm or strategy requires testing during the development, rollout, and ongoing maintenance stages. During the development stage, there must be testing in a nonlive trading setup. Such testing is needed to ensure that the controls are sufficiently robust. During the rollout stage, the algorithms are introduced in a systematic and conservative manner. For example, there should be testing of adherence to the limits on price, position, and number of financial instruments pertaining to the use of the algorithm. During the ongoing maintenance stage, stress testing could be performed to consider the impact of increased or extreme market activity (e.g., increased volume) and external events.

Involvement of key stakeholders with internal controls planning. Relevant control-function groups within the firm, such as compliance, technology, operations, and legal as well as business-unit managers, should be involved in setting controls for the firm as a whole. Those groups must first understand the nature of algorithmic trading risks. Furthermore, the concept of defense-in-depth is more likely to succeed with participation from more groups within the firm.

MONITORING ALGORITHMIC TRADING ACTIVITY

LO 76.3: Explain how algorithmic trading activity is captured in banks' risk management frameworks.

LO 76.4: Assess the effectiveness of risk management tools to monitor risks associated with algorithmic trading.

Within the risk management framework, the monitoring of algorithmic trading activity is performed at three levels: (1) business-unit and desk management, (2) control-function and senior management, and (3) board and executive.

Business-Unit and Desk Management

The management team must consider the issue of segregation of duties when it comes to traders developing their own algorithms, testing them, and implementing them. Strong controls within a firm would ideally separate all three activities to decrease the chances of errors and fraud.

Should trading desks be allowed to formulate their own processes, excessive risk may be undertaken by the firm. As a result, an independent risk management group should regularly review the desks' processes and report any problems to senior management and the board.

In the absence of having the ideal controls in place at a firm (due to cost or lack of resources), compensating controls are necessary to counter both systematic and unsystematic risk. An independent group within the firm should test, approve, and regularly determine the sufficiency of such controls.

The trading desk should provide relevant reports to one or more of the risk management group, senior management, or the board to allow them to assess the firm's total risk. Within the realm of algorithmic trading, an intraday income statement would be relevant.

Control-Function and Senior Management

The risk management group should be able to formulate their own risk reports and to flag specific transactions deemed excessively risky to the attention of senior management for analysis and authorization. Senior management needs to appreciate how quickly intraday risks can build. Both the risk management group and senior management should be able to work with business units to prevent excessive intraday risk exposure.

Control-function groups should be actively involved in establishing and maintaining front-office controls to help implement best practices. The existence of control-related groups also serves as an important supplement to the front-office controls.

Near-miss incidents that do not result in financial losses should be reported through a firmwide incident reporting system. Such incidents allow for preemption of potential large losses by correcting known control weaknesses immediately. Any major losses or incidents

Topic 76**Cross Reference to GARP Assigned Reading – Federal Reserve Bank of New York**

need to be reported throughout the firm to improve controls sufficiently and allow senior management to assess the risk level of the firm's trading activities.

Exceptional situations include busting (canceling) trades and halting trading. Senior management must be aware of how various trading venues deal with exceptional situations and assess the effect on the firm's risk position.

All entities should periodically review their incident response processes to ensure they are updated, tested, and consider industry best practices. They should be clearly communicated to senior management. The incident responses should be consistent with established rules in the market.

Control-function groups need to work together to ensure coordinated responses to trading incidents. Emergency controls (or “break glass” procedures) that have an automatic notification function are needed for trading incidents, and they must be tested regularly.

Board and Executive

Senior management should communicate material information regarding the firmwide intraday risk to executive risk committees and to the board. Such information would be provided by trading desk management and independent risk management.

The board must have at least an overall understanding of the controls implemented within the firm to perform its oversight duties. The audit committee or the control committee may be able to assist with such duties.

Senior management should provide the board with information regarding any events that demonstrate major control weaknesses within the firm. That way, the board may determine whether or not controls, trading strategies, and risk appetite need to be re-evaluated.

KEY CONCEPTS

LO 76.1

Four key risks associated with algorithmic trading include (1) amplified systemic risk, (2) substantial intraday risk, (3) lagging internal controls, and (4) rapid occurrence of significant losses.

LO 76.2

Algorithmic trading risks can be monitored and controlled in the following ways:
(1) updating and improving controls, (2) sufficient governance and management oversight, (3) increased testing of new or revised algorithms or strategies, and (4) involvement of key stakeholders with internal controls planning.

LO 76.3

Within the risk management framework, the monitoring of algorithmic trading activity is performed at three levels: (1) business-unit and desk management, (2) control-function and senior management, and (3) board and executive.

LO 76.4

Segregation of duties, compensating controls, regular reporting to senior management or the board, involvement of control-function groups, incident reporting, and incident response processes are some of the key risk management tools used for monitoring risks associated with algorithmic trading.

CONCEPT CHECKERS

1. Increased testing of algorithms or trading strategies would be the most appropriate response to which of the following risks?
 - A. Amplified systemic risk.
 - B. Substantial intraday risk.
 - C. Lagging internal controls.
 - D. Rapid occurrence of significant losses.
2. During which stage of a trading product's lifecycle would stress testing most likely be performed?
 - A. Development stage.
 - B. Initial testing stage.
 - C. Ongoing maintenance stage.
 - D. Rollout stage.
3. The concept of defense-in-depth is the primary focus for which of the following activities?
 - A. Reporting by the trading desk.
 - B. Updating and improving controls.
 - C. Testing algorithms and strategies.
 - D. Governance and management oversight.
4. Firms are least likely to require controls in which of the following trading areas?
 - A. Order execution.
 - B. Order generation.
 - C. Order handling.
 - D. Order termination.
5. Which of the following parties is most likely to execute trading incident response processes?
 - A. Trading desk.
 - B. Senior management.
 - C. Control-function group.
 - D. Business-unit management.

CONCEPT CHECKER ANSWERS

1. D Mitigating the problem of the rapid occurrence of significant losses could be in the form of increased testing of algorithms or strategies as well as additional proposed requirements by market regulators to improve controls.

More frequent reporting throughout the day would help mitigate intraday risk. Making a concerted effort to fully develop internal controls to keep up with HFT and algorithmic clients would help mitigate the risks associated with lagging internal controls and amplified systemic risk.

2. C A new or revised algorithm or strategy requires testing during the development (initial testing), rollout, and ongoing maintenance stages. During the ongoing maintenance stage, stress testing could be performed to consider the impact of increased or extreme market activity and external events.

During the development stage (initial testing), there must be testing in a nonlive trading setup. Such testing is needed to ensure that the controls are sufficiently robust. During the rollout stage, the algorithms are introduced in a systematic and conservative manner. For example, there should be testing of adherence to limits on price, position, and number of financial instruments pertaining to the use of the algorithm.

3. B A defense-in-depth process includes a wide variety of controls as well as a system of control redundancy throughout the firm in an effort to update and improve controls. Defense-in-depth aims to lower the chances of an erroneous and significant order actually being executed.

The trading desk focuses on providing relevant reports to one or more of the risk management group, senior management, or the board to allow them to assess the firm's total risk. Testing of new or revised algorithms or strategies focuses on testing during the development, rollout, and ongoing maintenance stages. Governance and management oversight focuses on having a centralized risk management process and the application of controls consistently throughout the firm.

4. D The trading department must have controls over order generation, order handling, and order execution. There is no specific mention of order termination.
5. C Control-function groups need to work together to ensure coordinated responses to trading incidents. Incident response processes need to be communicated to senior management, but senior management does not ultimately execute them. An individual trading desk or business unit may be the cause of an incident that requires one or more control-function groups to respond to the incident.