
The following is a review of the Alternative Investments for Portfolio Management principles designed to address the learning outcome statements set forth by CFA Institute®. This topic is also covered in:

ALTERNATIVE INVESTMENTS PORTFOLIO MANAGEMENT¹

Study Session 13

EXAM FOCUS

This is an extremely comprehensive review of alternative investments, and unfortunately, there is little, if anything, that is not prime material for the exam. You will notice, however, that the material is largely qualitative. This means you will probably see questions related to how and when to utilize alternative investments in a client's portfolio as well as item sets relating to the characteristics (comparisons of) and the use of different alternative investments.

There are six basic categories of alternative investments. Most share several properties, such as low liquidity and difficulty in measuring returns. There are many issues concerning composing suitable indices as benchmarks. There are special due diligence issues ranging from assessing the type of market opportunity the investment offers to the people managing the investment. Hedge funds are a broad class of alternative investments and have many varied sub-categories. Based upon historical data, most alternative asset classes would have improved risk-adjusted returns, if added to a stock and bond portfolio. Many alternative investments have high Sharpe ratios as standalone investments; however, the Sharpe ratio may not be an appropriate risk measure due to skewed return distributions on many alternative investments.

ALTERNATIVE INVESTMENT FEATURES

LOS 36.a: Characterize the common features of alternative investments and their markets and discuss how they may be grouped by the role they typically play in a portfolio.

Many institutional investors and high-net-worth individuals invest in alternative investments because they combine the potential for diversification with the opportunity for active management. There are **six basic categories** of alternative investments: *real estate, private equity, commodities, hedge funds, managed futures, and distressed securities*. We will explore each of these in more detail shortly.

-
1. The terminology used throughout this topic review is industry convention as presented in Reading 36 of the 2011 CFA Level 3 exam curriculum. Empirical results are referenced in that reading as well.

Common Features of Alternative Investments

The following list summarizes the common features of alternative investments:

1. *Low liquidity.* Because of their general lack of liquidity, alternative investment returns include a liquidity premium.
2. *Diversification.* As most alternative investments are minimally correlated with stock and bond returns, they are a good diversification tool for a stock and bond portfolio.
3. *Due diligence costs.* Costs associated with researching and monitoring alternative investments can be high because of their individual characteristics, the complex strategies in which they are employed, and/or low-transparency in reporting.
4. *Difficult to value.* It is sometimes very difficult to value (appraise) alternative investments because of lack of transparency and/or difficulty identifying appropriate valuation benchmarks.
5. *Access to information.* Markets for alternative investments are *informationally less efficient* than most stock markets.

In addition to their general characteristics, we can categorize alternative investments into three categories by how they are utilized in a portfolio. Alternative investments can provide:

1. Exposure to asset classes that stocks and bonds cannot provide.
2. Exposure to special investment strategies (e.g., hedge and venture capital funds).
3. Special strategies and unique asset classes (e.g., funds that invest in private equity and distressed securities).

DUE DILIGENCE CHECKPOINTS

LOS 36.b: Explain and justify the major due diligence checkpoints involved in selecting active managers of alternative investments.

Checkpoints for selecting an alternative investment manager include assessing the market opportunity, the investment process, the organization, the people, the terms and structure, the ancillary service providers, and the documents.

1. *Assess the market opportunity offered.* Are there exploitable inefficiencies in the market for the type of investments in which the manager specializes?
2. *Assess the investment process.* Does the manager seem to have a competitive edge over others in that market?
3. *Assess the organization.* Is it stable and well-run? What has been the staff turnover?

4. *Assess the people* by meeting with them and assessing their characters.
5. *Assess the terms and structure* (amount and time period) of the investment.
6. *Assess the service providers* (e.g., lawyers, brokers, ancillary staff) by investigating the outside firms that support the manager's business.
7. *Review documents* such as the prospectus or private-placement memorandum and the audits.

ISSUES FOR PRIVATE WEALTH CLIENTS

LOS 36.c: Explain the special issues that alternative investments raise for investment advisers of private wealth clients.

In contrast to institutional investors, the special issues that advisers of private-wealth clients should address are tax issues, determining suitability, communicating with the client, decision risk, and determining whether the client has a large position in closely held equity.

1. *Taxes.* Tax issues can be unique to the individual because the characteristics of private-wealth clients and their investments can vary greatly. For individuals, there can be partnerships, trusts, and other situations that make tax issues complex.

For the Exam: The tax efficiency of some alternative investment classes is discussed in Study Session 5. Be aware that some alternative investments (e.g., private equity) and other assets are more tax-efficient while others (e.g., hedge funds) are less tax-efficient. On the exam, look for questions that ask directly about relative tax efficiency or a case for an individual or institutional investor that asks you to specify the optimal asset allocation, in which the tax status of the investor must be considered. Remember, insurance companies and banks are taxable investors, while pension funds, foundations, and endowments are generally tax-exempt.

2. *Suitability.* Determining suitability is important for the same reason. Unlike institutional investors, who usually have long time horizons, the horizons of individuals can vary a great deal. With individuals there is also the *emotional aspect*, like preferences for, or aversion to, certain types of assets.
3. *Communication.* Communicating with the client helps determine suitability of recommendations and the overall management process. This is more important because the client may not be knowledgeable enough to effectively communicate her needs.

4. *Decision risk.* Decision risk is the risk of irrationally changing a strategy. For example, since individuals tend to make emotional decisions, the adviser must be prepared to deal with a client who wants to get out of a position that has just declined in value. This is particularly relevant for alternative investments, which can have large swings in value.
5. *Concentrated positions.* Wealthy individuals' portfolios frequently contain large positions in closely held companies. Such ownership should be considered with the overall allocation to alternative investments like private equity, just like the client's home should be factored in with the real estate allocation.

ALTERNATIVE INVESTMENT GROUPS

LOS 36.d: Distinguish among the principal classes of alternative investments, including real estate, private equity, commodity investments, hedge funds, managed futures, buyout funds, infrastructure funds, and distressed securities.

There are subgroups within each of the classes of alternative investments, and in some cases there is more than one way to categorize the investment subgroups. One of the more common methods is whether the investments are *direct* or *indirect*. Generally, in a direct investment, you actually own the asset, and in an indirect investment, you own shares of a fund (e.g., a limited partnership) that owns the assets.

Real Estate

As with most assets, real estate can be broken down into *direct* and *indirect*. Examples of direct investment in real estate include ownership of residences, commercial real estate, or agricultural land, and the ownership involves direct management of the assets. Indirect investment in real estate generally means there is a well-defined middle group that manages the properties. *Indirect* real estate investments include:

- Companies that develop and manage real estate.
- Real estate investment trusts (REITs), which are publicly traded shares in a portfolio of real estate.
- Commingled real estate funds (CREFs), which are pooled investments in real estate that are professionally managed, and since they are privately held, they have more flexibility than REITs.
- Separately managed accounts by managers like those that manage the CREFs.
- Infrastructure funds, which provide private investment in public projects like schools and hospitals for a promised cash flow in the future.

Direct investments in real estate generally are large and have low liquidity, high transactions costs, low mobility, and asymmetric information in transactions (low transparency).

Real estate provides diversification to a stock/bond portfolio, but real estate as an asset class and each individual real estate asset can have a large idiosyncratic risk component.

Private Equity

Private equity subgroups include *start-up companies*, *middle-market private companies*, and *private investment in public entities*. The distinguishing feature of the subgroups is the stage of development of the company receiving the invested dollars.

- *Start-up* or *formative-stage* companies are those that have not yet or have just begun selling a product.
- *Middle-market private companies* are established, have significant revenues, and may even be preparing for an Initial Public Offering (IPO).
- *Private investment in public entities* (PIPEs) refers to private equity investors purchasing or privatizing a public company, purchasing an established private company, or purchasing a division of an established company.

Investments in start-up and middle-market private companies have more risk but the potential for very high returns when the investments are successful. On average, due to their high initial failure rate, their returns are lower than investments in established companies via *buyout funds*. They also suffer from the risks associated with asymmetric information. All the categories have low liquidity.



Professor's Note: Asymmetric information is common with investments in private equity, venture capital, hedge funds, and any other investment that is not publicly traded or required to publicly release relevant structural, operating, and performance information.

A *direct* investment in private equity is when the investor purchases a claim directly from the firm (e.g., preferred shares of stock), which has some minimum guaranteed payment before the common equity owners get paid.

Indirect investment is usually done through private equity funds, which include venture capital (VC) and buyout funds. In a venture capital limited partnership, the manager (general partner) invests the investors' (limited partners') money in many companies and attempts to realize value by developing portfolio companies and exiting (i.e., liquidating the investments) within a specific time period.

Commodities

Commodity investments can also be grouped into *direct* and *indirect* subgroups. *Direct* investment is either through the purchase of the physical commodity (e.g., as agricultural products, crude oil, metals) or the purchase of derivatives (e.g., futures) on those assets.

Indirect investment in commodities is usually done through investment in companies whose principal business is associated with a commodity (e.g., investing in a metal via ownership of shares in a mining company).

Investments in both commodity futures and publicly traded commodity companies are fairly liquid, especially when compared to many other alternative investments. Investments in commodities have common risk features such as *low correlation with*

stocks and bonds and business-cycle sensitivity, and most have a positive correlation with inflation. These risk characteristics are the reasons commodities provide good diversification to an investor's portfolio.

Hedge Funds

The distinguishing features of hedge funds are: (1) they are intentionally structured to avoid regulation enabling them to be less transparent in reporting their investment strategies, and (2) they tend to use strategies not normally seen in more conventional investments like the extensive use of derivatives, leverage, and shorting techniques.

Hedge funds are usually classified according to their investment style, which can include any one of the following: equity market neutral, convertible arbitrage, fixed-income arbitrage, distressed securities, merger arbitrage, hedged equity, global macro, emerging markets, and fund of funds (FOF).



Professor's Note: For a more complete discussion on the different investment strategies used by hedge funds, please see LOS 36.p.

Managed Futures

Managed futures funds share many characteristics with hedge funds. For example, the primary legal structure of most managed futures in the United States is the limited partnership. Managed futures funds also utilize much the same compensation scheme for managers (base fees plus performance fees) and are often described as skill-based investment strategies, because like hedge funds, their returns rely on the skills of the manager. Like hedge funds, they are usually classified as absolute return strategies, and also like hedge funds, there is more than one way to categorize subgroups within the class of managed futures.

The primary feature that distinguishes managed futures from hedge funds is the difference in the assets they hold. For example, managed futures funds tend to trade only in derivatives markets, while hedge funds tend to trade in spot markets and use futures for hedging. Also, managed futures funds generally take positions based on indices, while hedge funds tend to focus more on individual asset price anomalies. In other words, hedge funds tend to have more of a micro focus, while managed futures tend to have a macro focus.



Professor's Note: The general partner in a managed commodity futures limited partnership is known as a commodity pool operator (CPO), and investors (i.e., the limited partners) are institutions or high-net-worth individuals. The CPO typically hires commodity trading advisors (CTAs) to manage individual funds or groups of funds in the pool. Both CPOs and CTAs are registered with the Commodity Futures Trading Commission and the National Futures Association. As such, managed futures tend to be more regulated than hedge funds, which strive to avoid regulation.

One way to construct subgroups within the managed futures alternative investment class is according to the way individuals invest in the funds. These include *private commodity pools*, *managed futures programs as separately managed accounts*, and *publicly traded commodity futures funds*.

Other ways to classify managed futures funds include: the *investment style*, ranging from pure systematic to discretionary trading; the *market* where the underlying of the futures contracts trade, such as currency or equity markets; and the *trading strategy*, such as following trends or being contrarian.

The *risk characteristics* will also vary like those of hedge funds. A trend-following strategy will offer lower diversification than a contrarian strategy. The standard deviation of managed futures is generally less than that of equities but greater than that of bonds. The correlation between managed futures and equities is low and often negative. With bonds, the correlation is higher but still less than 0.50.

Liquidity will be lower for private funds than for publicly traded commodity futures funds.

Buyout Funds

Buyout funds are the largest segment of the private equity market and can be divided into *middle-market buyout funds* and *mega-cap buyout funds*. The primary difference between the two is the size of the target.

Middle-market buyout funds concentrate on divisions spun off from larger, publicly traded corporations and private companies that, due to their relatively small size, cannot efficiently obtain capital. **Mega-cap buyout funds** concentrate on taking publicly traded firms private. In either case, the target represents an investment opportunity through the identification of under-valued assets, the ability to restructure the debt of the firm, and/or improved (i.e., more efficient) management and operations. To improve operations and increase value, buyout funds typically maintain a list of qualified managers who can be called on to operate the firms.

Buyout funds usually capture value for their investors by selling the acquisitions through private placements or IPOs or through *dividend recapitalizations*. In a dividend recapitalization, the buyout fund issues debt through an acquired firm and pays a special dividend to itself and other equity investors. The debt effectively replaces some or most of the equity of the acquired firm, while allowing the investors to recoup some or all of their original investment. *Recapitalization* in this case refers to reducing the firm's equity and increasing its leverage, sometimes to critical levels. Notice, however, that the ownership structure does not change (i.e., the buyout fund retains control).

Infrastructure Funds

Infrastructure funds specialize in purchasing public infrastructure assets (e.g., airports, toll roads) from cities, states, and municipalities. Since infrastructure assets typically provide a public service, they tend to produce relatively stable, long-term real returns.

Their monopoly-like position means that infrastructure assets generate reliable cash flows, and because of their nature, they typically require relatively low operating costs. In addition, they tend to be regulated by local governments, which only adds to the predictability of cash flows. Their low correlation with equity markets means infrastructure assets provide diversification, and their long-term natures provide a good match for institutions with long-term liabilities (e.g., pension funds). Their relatively low risk, however, means that infrastructure returns are low.

Distressed Securities

Distressed securities are securities of companies that are in or near bankruptcy. They are another type of alternative investment where the risk and return depend upon skill-based strategies. As with managed futures, analysts often consider distressed securities to be part of the hedge fund class of alternative investments. It may also be part of the private equity class. One way to construct subgroups in distressed securities is by structure, which determines the level of liquidity. The hedge fund structure for distressed security investment is more liquid. The private equity fund structure describes funds that are less liquid because they have a fixed term and are closed-ended. The latter structure is more appropriate when the underlying securities are too illiquid to overcome the problem of determining a net asset value (NAV). Figure 1 presents a summary of alternative investment characteristics.

Figure 1: Alternative Investment Characteristics

	<i>Types of Investments</i>	<i>Risk/Return Features</i>	<i>Liquidity</i>
Real estate	Residences; commercial real estate; agricultural land.	Large idiosyncratic risk component; provides good diversification.	Low.
Private equity	Preferred shares of stock; venture capital; buyout funds.	Start-up and middle-market private companies have more risk and lower returns than investments in established companies via buyout funds.	Low.
Buyout funds	Well-established private firms and corporate spin-offs.	Less risk than venture capital funds; good diversification.	Low.
Infrastructure funds	Public infrastructure assets.	Low risk, low return; good diversification.	Low.
Commodities	Agricultural products; crude oil; metals.	Low correlation with stocks/bonds. Positive correlation with inflation.	Fairly liquid.
Managed futures	Tend to trade only in derivatives market. Private commodity pools; publicly traded commodity futures funds.	Risk is between that of equities and bonds. Negative and low correlations with equities and low-to-moderate correlations with bonds.	Lower for private funds than for publicly traded commodity futures funds.
Distressed securities	May be part of hedge fund class or private equity class. Investments can be in debt and/or equity.	Depends on skill-based strategies. Can earn higher returns due to legal complications and the fact that some investors cannot invest in them.	Hedge fund structure more liquid; private equity structure less liquid.

For the Exam: The various types of alternative investment classes appear in several places throughout the curriculum. Hedge funds are discussed in Study Session 5 as a type of institutional investor. GIPS treatment of private equity and real estate is discussed in Study Session 18. Commodities are examined in greater detail later in this study session. This should give you a feeling for the importance of alternative investments in the Level 3 curriculum. The published topic weight for alternative investments this year is 5%–15%. That means questions related to alternative investments will be worth no less than 18 points (5%) or as much as 54 points (15%) on the 2011 Level 3 exam.

ALTERNATIVE INVESTMENT BENCHMARKS

LOS 36.e: Discuss the construction and interpretation of benchmarks and the problem of benchmark bias in alternative investment groups.

For the Exam: On the exam, you should not be asked to discuss specific benchmarks. For example, they will not ask you to describe the Dow Jones-UBS Commodity Index. Instead, be ready to discuss the general properties, including the drawbacks, of alternative investment benchmarks.

Benchmarks for alternative investments exist, but they often have peculiar attributes that vary from class to class. The following is a list of the more common benchmarks used by the various alternative investment classes.

- **Real estate** has the National Council of Real Estate Investment Fiduciaries (NCREIF) Property Index as its principal benchmark for *direct investments*. The NCREIF Index is a *value-weighted* index of commercially owned properties that uses samples based both on geographic location and type (e.g., apartment and industrial). The values are obtained periodically, usually by annual appraisal, so the volatility of the index is *downward biased*. The index is published quarterly.

For *indirect* real estate investment, the primary benchmark is the National Association of Real Estate Investment Trusts (NAREIT) Index. The NAREIT Index is cap-weighted and includes all REITs traded on the NYSE or AMEX. Similar to other indices based upon current trades, the monthly NAREIT Index is “live” (i.e., its value represents current values).

- **Private equity** indices are provided by Cambridge Associates and Thomson Venture Economics. Indices are constructed for the buyout and venture capital (VC) segments of the private equity markets. Since private equity values are not readily available, the value of a private equity index depends upon events like IPOs, mergers, new financing, et cetera, to provide this information. Thus, the indices might present dated values as *repricing* occurs infrequently. Note that private equity investors also often construct custom benchmarks.
- **Commodity markets** have many indices for use as benchmarks. Most of them assume a futures-based strategy. For example, the Dow Jones-UBS Commodity Index (DJ-UBSCI) and the S&P Commodity Index (S&PCI) represent returns associated with passive long positions in futures.

The indices include exposures to most types of commodities and are considered *investable*. They can vary widely, however, with respect to their purpose, composition, and method of weighting the classes. Given the zero-sum nature of futures, the indices cannot use a market-cap method of weighting. Two methods of weighting are: (1) basing weights on world-production of the underlying commodities and (2) basing weights on the perceived relative worldwide importance of the commodity. The various indices use either arithmetic or geometric averaging to calculate component returns.



Professor's Note: Although there are other characteristics an index must meet to be considered investable, the easiest way to look at it is whether an investor can effectively hold the index by purchasing the assets in the index. For example, an investor can purchase and hold all the stocks of the S&P 500. If that cannot be done, the index is not investable.

- **Managed futures** have several investable benchmarks. Some common benchmarks, such as the Mount Lucas Management Index (MLMI), replicate the return to a *mechanical, trend-following strategy*. The strategies usually include using both long and short positions using trading rules based upon changes in technical indicators. Others benchmarks, such as the CTA Indices published by the Center for International Securities and Derivatives Markets (CISDM), are indices based upon *peer-group managed futures funds*. They can use *dollar-weighted* (CTA\$) or *equal-weighted* (CTAEQ) returns from databases of separately managed accounts. Among these indices there are benchmarks based upon the level of discretionary management and the underlying market, as well as trend-following or contrarian.
- **Distressed securities** funds are often considered a hedge fund subgroup. Most of the index providers for hedge funds have a sub-index for distressed securities. Benchmarks in this area have the same characteristics as long-only hedge fund benchmarks.

Figure 2 presents a summary of these alternative investment benchmarks, their construction, and their associated biases. Hedge fund benchmarks are then discussed separately.

Figure 2: Alternative Investment Benchmarks

	<i>Benchmarks</i>	<i>Construction</i>	<i>Biases</i>
Real estate	NCREIF; NAREIT.	NCREIF is value-weighted; NAREIT is cap-weighted.	Measured volatility is downward biased. The values are obtained periodically (annually).
Private equity	Provided by Cambridge Associates and Thomson Venture Economics.	Constructed for buyout and venture capital. Value depends upon events. Often construct custom benchmarks.	Repricing occurs infrequently which results in dated values.
Commodities	Dow Jones-UBS Commodity Index; S&P Commodity Index.	Assume a futures-based strategy. Most types considered investable.	Indices vary widely with respect to purpose, composition, and method of weighting.
Managed futures	MLMI; CTA Indices.	MLMI replicates the return to a trend-following strategy. CTA Indices use dollar-weighted or equal-weighted returns.	Requires special weighting scheme.
Distressed securities	Characteristics similar to long-only hedge fund benchmarks.	Weighting either equally weighted or based upon assets under management. Selection criteria can vary.	Self-reporting; backfill or inclusion bias; popularity bias; survivorship bias.

Hedge Fund Benchmarks

Hedge fund benchmarks vary a great deal in composition and even frequency of reporting. Also, there is no consensus as to what defines hedge fund strategies, and this leads to many differences in the indices as style classifications vary from company to company. The following points summarize the ways index providers compose their respective indices.

- *Selection criteria* can vary, and methods include assets under management, the length of the track record, and the restrictions imposed on new investment.
- *Weighting schemes* are usually either equally weighted or based upon assets under management.
- *Rebalancing rules* must be defined for equally weighted indices, and the frequency can vary from monthly to annually.
- *Investability* often depends upon frequency of reporting (e.g., daily reporting allows for investability while monthly reporting tends not to). Some indices are not explicitly investable, but independent firms modify the index to produce an investable proxy.

Some indices explicitly report the funds they include in the composition of the index, and some do not. Some indices report monthly and some report daily. Examples of providers of *daily indices* are Hedge Fund Research (HFR), Dow Jones (DJ), and Standard & Poor's (S&P). The DJ and S&P explicitly list the funds included in their indices and use an equal-weighting approach.

The following list is providers of *monthly indices* with a few of their general characteristics:

- *CISDM of the University of Massachusetts*: several indices that cover both hedge funds and managed futures (equally weighted).
- *Credit Suisse/Tremont*: provides various benchmarks for different strategies and uses a weighting scheme based upon assets under management.
- *EACM Advisors*: provides the EACM100[®] Index, an equally weighted index of 100 funds that span many categories.
- *Hedge Fund Intelligence, Ltd.*: provides an equally weighted index of over 50 funds.
- *HedgeFund.net*: provides an equally weighted index that covers more than 30 strategies.

Biases often exist in these indices because of the *self-reporting* of fund returns. This can apply to returns as they are earned or when filling in gaps in the historical data. *Backfill* or *inclusion bias* is the potential bias when a hedge fund joins an index and the manager adds historical data to complete the series.



Professor's Note: Being largely unregulated, hedge fund managers are currently not required to publicly report their operating performance or even the composition of their portfolios. As such, hedge fund indices contain only the results of managers who choose to report, and managers are not typically eager to report poor performance. Also, managers will agree to be included only when they have met what they feel is the proper level of performance. Then, since the performance prior to that is generally increasing, backfilling a fund's performance will produce an upward backfill bias.

Also, the methods for selecting and weighting funds included in the index can cause a wide range of return differences among indices in the same class. Correlations of supposedly similar indices can be as low as 20%.

- **Popularity bias** can result if one of the funds in a value-weighted index increases in value and then attracts a great deal of capital. The inflow of investment to that fund will have a misleading effect on the index. Research has shown that indices can easily suffer from a popularity bias of a particular style, which is caused by inflows and not the actual return on investment. Even without the popularity bias, a dramatic increase in one style can bias an index. The problem with equally weighted indices is that they are not rebalanced often and effectively. This lowers their investability.
- **Survivorship bias** is a big problem for hedge fund indices. Indices may drop funds with poor track records or that fail, causing an upward bias in reported values. Studies have shown that the bias can be as high as 1.5%–3% per year. The degree of survivorship bias varies among the hedge-fund strategies. It is lower for event-driven strategies and higher for hedged-equity strategies.



Professor's Note: Related to the self-reporting bias associated with hedge funds, survivorship bias also results from hedge fund managers who decide to stop reporting when operating results turn sour. Thus, indices tend to report only those positive results that active managers choose to report.

RETURN ENHANCEMENT AND DIVERSIFICATION

LOS 36.f: Evaluate and justify the return enhancement and/or risk diversification effects of adding an alternative investment to a reference portfolio (for example, a portfolio invested solely in common equity and bonds).

Real Estate

Real estate is an asset class as well as an alternative investment. High risk-adjusted performance is possible because of the low liquidity, large lot sizes, immobility, high transactions costs, and low information transparency that usually means the seller knows more than the buyer.

Real estate typically reacts to macroeconomic changes differently than stocks and bonds, and each investment has a large idiosyncratic (unsystematic) risk component. Because of both of these characteristics, real estate provides great diversification potential. Using data for the period 1990–2004, Figure 3 compares the returns of the indicated portfolios based on benchmarks for the indicated asset classes.

Figure 3: Portfolio Returns from 1990–2004

<i>Measure (annualized)</i>	<i>50/50 Stock/Bonds</i>	<i>40/40/20 Stocks/Bonds/REITs</i>	<i>40/40/20 Stocks/Bonds/Real Estate</i>
Return	9.60%	10.34%	9.33%
Standard deviation	7.87%	7.62%	6.59%
Sharpe ratio	0.67	0.79	0.77

You will notice in Figure 3 that adding direct real estate to a stock/bond portfolio (last column) decreases the portfolio return from 9.60% to 9.33% but increases the Sharpe ratio from 0.67 to 0.77. This is due to the lack of correlation between direct real estate and equity markets and the resulting diversification effect. Since REITs trade like stocks, however, you will notice that adding REITs (third column) instead of direct real estate increases the portfolio return but, due to the increased correlation with equity markets, only marginally reduces the portfolio standard deviation. The result is an only marginally increased Sharpe ratio compared to using real estate.

Figure 3 contains some valuable information about real estate to remember for the exam.

Portfolio Sharpe ratio:

- Adding either direct real estate or REITs to a stock/bond portfolio significantly increases the portfolio Sharpe ratio.
- The Sharpe ratio using REITs is only slightly better than the Sharpe ratio using direct real estate because direct real estate produces a better diversification effect.

Portfolio return:

- Adding REITs to a stock/bond portfolio increases the portfolio return.
- Adding direct real estate to a stock/bond portfolio decreases the portfolio return.

Portfolio risk/standard deviation:

- Adding REITs to a stock/bond portfolio only marginally reduces the portfolio standard deviation.
- Adding direct real estate to a stock/bond portfolio significantly reduces the portfolio standard deviation.

Private Equity

Private equity is less of a diversifier and is more a long-term return enhancer. Private equity investments (both venture capital and buyout funds) are usually illiquid, require a long-term commitment, and have a high level of risk with the potential for complete loss. In addition, there is often a minority discount associated with the investment. Because of these issues, investors require a high expected internal rate of return (IRR). Venture capital investments have lower transparency than buyout funds, which can actually add to the potential for large profits.

The difference in transparency between venture capital funds and buyout funds is caused by the different natures of the investments. Venture capital, for example, is provided to

new, non-public companies in need of capital for growth. By definition, the managers of firms receiving the funds have considerably more information on the true value of the firm than the investing public. This adds to the risk faced by venture capital funds, but, at the same time, increases the possible return to venture capitalists, who make it a point to learn as much about the firm as possible before investing. Buyout funds, on the other hand, usually provide capital to managements and others to purchase the equity of publicly traded firms.

Private equity returns typically move with stock market returns. Computed correlations are often positive and low, but some attribute the low correlation to the infrequently updated (i.e., “stale”) prices of the private equity. Each investment has a large idiosyncratic risk component, however, which can provide moderate diversification.

Since the primary benefit from private equity is return enhancement, Figure 4 gives the most important information for comparison. From the figure, we see that in the most recent years, venture capital funds and buyout funds had a lower return than both small-cap and large-cap stocks (NASDAQ and S&P). Over the long-term of 20 years, however, private equity had higher returns.

Figure 4: Returns to Private Equity and Equity Markets

<i>Period</i>	<i>NASDAQ</i>	<i>S&P 500</i>	<i>VC Funds</i>	<i>Buyout Funds</i>
2002–2005	22.4%	14.7%	4.9%	14.7%
2000–2005	–10.1%	–3.1%	–9.3%	3.1%
1995–2005	7.5%	7.7%	26.5%	8.7%
1985–2005	12.3%	11.2%	16.5%	13.3%

Commodities

Commodities chiefly offer *diversification* to a portfolio of stocks and bonds. Correlations of commodity indices with stocks and bonds have been low and even slightly negative. With the exception of the *agricultural subgroups*, commodity indices have a strong positive correlation with inflation. That is a benefit to the investor because they provide a hedge against inflation, while stocks and bonds are hurt by inflation.

The returns on commodities have generally been lower than stocks and bonds over the period of 1990–2004, both on an absolute and on a risk-adjusted basis. The *energy subgroup* of commodities has had the highest returns, and without it, the broad GSCI index return would have been much lower. Figure 5 gives the statistics for 1990–2004.

Figure 5: Index Returns from 1990–2004

<i>Measure (annualized)</i>	<i>S&P 500</i>	<i>Lehman Government/ Corporate Bond Index</i>	<i>GSCI¹ (broad commodity index)</i>
Return	10.94%	7.77%	7.08%
Standard deviation	14.65%	4.46%	19.26%
Sharpe ratio	0.45	0.78	0.15

1. Goldman Sachs Commodity Index

Commodities have had higher returns in more recent years. For the sub-period of 2000–2004, the GSCI average return of 13.77% was higher than both the –2.30% return for stocks and the 8.0% return on bonds. The high volatility of commodities, however, still gave it a lower Sharpe ratio than bonds (0.5 for commodities as compared to 1.11 for bonds).

We see how commodities play a useful role in the portfolio in Figure 6, which compares a 50/50 stock/bond portfolio to a portfolio with an allocation to commodities. The return is slightly lower, but the Sharpe ratio is higher.

Figure 6: Portfolio Returns from 1990–2004

<i>Measure (annualized)</i>	<i>50/50 Stock/Bonds</i>	<i>40/40/20 Stocks/Bonds/ GSCI</i>
Return	9.60%	9.51%
Standard deviation	7.87%	7.19%
Sharpe ratio	0.67	0.73

Since commodities had a higher return in more recent years and stocks had a negative average return, commodities enhanced portfolio returns even more for the most recent years, as shown in Figure 7.

Figure 7: Portfolio Returns from 2000–2004

<i>Measure (annualized)</i>	<i>50/50 Stock/Bonds</i>	<i>40/40/20 Stocks/Bonds/ GSCI</i>
Return	3.15%	5.66%
Standard deviation	7.93%	7.60%
Sharpe ratio	0.06	0.39

Hedge Funds

Hedge funds generated higher absolute and risk-adjusted returns than stocks and bonds over the period 1990–2004. The Hedge Fund Composite Index (HFCI) return, standard deviation, and Sharpe ratio were 13.46%, 5.71%, and 1.61, respectively. Hedge funds ranked between bonds and stocks in the more recent period of 2000–2004, where the corresponding numbers were 6.84%, 4.83%, and 0.86. For the more recent period, the mean return and Sharpe ratio is higher than the measures for stocks, but they are both lower than the measures for bonds.

As was the case for most of the previous alternative investments, a 40/40/20 stock/bond/HFCI portfolio had a higher return and lower standard deviation than the 50/50 stock/bond portfolio over both the 1990–2004 and 2000–2004 periods.

Hedge funds vary widely, however, so the benefits of investing in one of any given style will vary. Figure 8 provides a representative list of the best and worst performing funds with their correlations with the S&P 500 and the Lehman Government/Corporate Bond Index. The last two rows in Figure 8 comment on each index's return and how well it added diversification over the period 1990–2004.

Figure 8: Hedge Fund Strategy Index Performance from 1990–2004

<i>Measure (annualized)</i>	<i>Short Selling</i>	<i>MSCI World</i>	<i>Fixed Income Arbitrage</i>	<i>Equity Hedge</i>	<i>Global Macro</i>	<i>HFCI (composite)</i>
Return	–0.61%	7.08%	7.62%	15.90%	16.98%	13.46%
Standard deviation	19.39%	14.62%	3.61%	9.34%	8.38%	5.71%
Sharpe ratio	–0.25	0.19	0.92	1.24	1.51	1.61
Correlation w/ S&P 500	–0.76	0.86	0.06	0.64	0.26	0.59
Correlation w/ bonds	–0.01	0.09	–0.06	0.10	0.34	0.17
Performance	Poor	Moderate	Moderate	Good	Good	Good
Diversification	Good	Poor	Good	Moderate	Good	Moderate

Managed Futures

Managed futures are usually considered a category of hedge funds and are usually compared to stocks and bonds, but their record has been similar to that of hedge funds. Over the period 1990–2004, the dollar-weighted index of separately managed accounts (CTA\$) had a return, standard deviation, and Sharpe ratio equal to 10.85%, 9.96%, and 0.66, respectively, which is about the same as stocks but with a better Sharpe ratio. They also had a higher return than bonds with a lower Sharpe ratio.

The CTA\$ also ranked between bonds and stocks from 2000–2004. The corresponding numbers were 7.89%, 8.66%, and 0.60. The return was certainly higher than the

–2.30% return for stocks and slightly less than the 8.0% return for bonds; however, the Sharpe ratio for bonds was higher at 1.11.

A portfolio consisting of 36/36/18/10 of stocks/bonds/HFCI/CTA\$ accounts had a higher return and Sharpe ratio than a 40/40/20 stocks/bonds/HFCI portfolio for both the longer 1990–2004 and shorter 2000–2004 periods.

Note that actively managed separate accounts are those where the managers seek to take advantage of mispricing opportunities, and there is evidence that short-term momentum and other strategies can produce excess returns. Managed futures seem to provide unique returns and diversification benefits. This is made evident from the near-zero correlation (–0.01) between the index of separately managed accounts and a 50/50 stock/bond fund.

Distressed Securities

Distressed security returns have had a relatively high average return but a large negative skew, so the comparisons using averages and Sharpe ratios can be misleading. They can provide high returns because many investors cannot hold distressed-debt securities, and few analysts cover the market. Based on comparisons of the average return and Sharpe ratio, the HFR Distressed Securities Index outperformed both stocks and bonds, both on an absolute and on a risk-adjusted basis. The returns are often event-driven, so they are uncorrelated with the overall stock market.

For the Exam: The diversification benefits of alternative investments are also discussed in Study Session 8, Asset Allocation. Be prepared to determine whether alternative investments are appropriate for a client's portfolio considering the client's objectives and constraints. For the exam, this is particularly relevant for a morning case where you need to allocate among several asset classes. Remember from Study Session 8 that there are drawbacks to adding alternative investments to a portfolio (e.g., amount of capital required, lack of liquidity) but there are also benefits (e.g., diversification, return enhancement).

REAL ESTATE EQUITY INVESTING

LOS 36.g: Evaluate the advantages and disadvantages of direct equity investments in real estate.

Direct equity real estate investing has the following advantages and disadvantages.

Advantages:

- Many expenses are tax deductible.
- Ability to use more leverage than most other investments.
- More direct control than stock investing.
- Ability to diversify geographically.
- Lower volatility of returns than stocks.

Disadvantages:

- Lack of divisibility means a single investment may be a large part of the investor's portfolio.
- High information costs, high commissions, high operating and maintenance costs, and hands-on management requirements.
- Special geographical risks, such as neighborhood deterioration and political risks, such as changing tax codes.

VENTURE CAPITAL INVESTING

LOS 36.h: Discuss the major issuers and buyers of venture capital, the stages through which private companies pass (seed stage through exit), the characteristic sources of financing at each stage, and the purpose of such financing.

Issuers of venture capital include *formative-stage companies* that are either new or young and *expansion-stage companies* that need funds to expand their revenues or prepare for an IPO. **Buyers** of venture capital include: *angel investors*, who are usually accredited investors and the first outside investors after the family and friends of the company founders; *venture capitalists*, who identify companies with valuable potential but the need for financial and strategic support; and *large companies*, who engage in corporate venturing. The large companies are usually in the same industry as the issuer and are also called *strategic partners*.

The **stages** through which private companies pass are early stage, later stage, and exit stage.

The *early stage* consists of the following:

- Seed: the small amount of money provided by the entrepreneur to get the idea off the ground.
- Start-up: usually a pre-revenue stage that brings the entrepreneur's idea to commercialization.
- First stage: additional funds, if the idea is sound but start-up funds have run out.

The *later stage* occurs after revenue has started and funds are needed to expand sales. The *exit stage* is the time when the venture capitalist realizes the value of the investment. It can occur through a merger, sale, or IPO.

LOS 36.i: Compare and contrast venture capital funds with buyout funds.

In contrast to venture capital funds, **buyout funds** usually have:

- A higher level of leverage.
- Earlier and steadier cash flows.
- Less error in the measurement of returns.
- Less frequent losses.
- Less upside potential.

These differences are the natural consequence of buyout funds purchasing entities in later stages of development or established companies and corporate spin-offs, where the risks are lower.

CONVERTIBLE PREFERRED STOCK

LOS 36.j: Discuss the use of convertible preferred stock in direct venture capital investment.

Convertible preferred stock is a good vehicle for direct venture capital investment because preferred stockholders must be paid a specified amount (e.g., twice their initial investment) before common stockholders can receive cash in the form of dividends or other distributions. Any buyout of the company that is favorable to shareholders will lead to the conversion of the preferred stock. Typically, investors in subsequent rounds of financing receive preferred stock with a claim that is senior to any previously issued preferred stock. Seniority is included to entice subsequent investors and makes those preferred shares more valuable than those issued earlier.

PRIVATE EQUITY INVESTING

LOS 36.k: Explain the typical structure of a private equity fund, including the compensation to the fund's sponsor (general partner) and typical timelines.

Private equity funds usually take the form of **limited partnerships** or **limited liability companies** (LLCs). These legal structures limit the loss to investors to the initial investment and avoid corporate double taxation. For limited partnerships, the sponsor is called the *general partner*, and for LLCs the sponsor is called the *managing director*. The sponsor constructs and manages the fund and selects and advises the investments.

The **time line** starts with the sponsor getting commitments from investors at the beginning of the fund and then giving “capital calls” over the first five years (typically), which is referred to as the *commitment period*. The expected life of these funds is seven to ten years, and there is often an option to extend the life up to five more years.

The sponsor can receive *compensation* in several ways. First, the sponsor has capital invested that earns a return. This is usually required, as it helps keep the sponsor's interests in line with those of the limited partners. As a manager, the sponsor typically gets a *management fee* and *incentive fee*.

The **management fee** is usually 1.5% to 2.5% and is based upon the *committed funds*, not just funds already invested. The percent may decline over time based upon the assumption that the manager's work declines over time.

The **incentive fee** is also called the *carried interest*. It is the share of the profits, usually around 20%, that is paid to the manager after the fund has returned the outside investors' capital—often after a minimum required return or hurdle rate has been paid on the cash from the outside investors. In some cases, the manager can receive early

distributions based on expectations, but a *claw-back* provision may be in place that requires the manager to give back money if the expected profits are not realized.

PRIVATE EQUITY INVESTMENT STRATEGY

LOS 36.l: Discuss the issues that must be addressed in formulating a private equity investment strategy.

Any strategy for private equity investment must address the following issues:

- *Low liquidity*: the portfolio allocation to this class should typically be 5% or less with a plan to keep the money invested for seven to ten years.
- *Diversification through a number of positions*: since commitments are usually large, only investors with portfolios over \$100 million can invest in the necessary five to ten investments needed for diversification. Diversified, commingled funds exist for smaller investors, but these funds have additional fees.
- *Diversification strategy*: knowing the unique aspects of a proposed private equity investment as they relate to the overall portfolio.
- *Plans for meeting capital calls*: committed funds are called as needed, and the investor needs to be prepared to meet the calls.

COMMODITY INVESTING

LOS 36.m: Compare and contrast indirect and direct commodity investment.

Direct commodity investment entails either purchasing the actual commodities or gaining exposure via derivatives. **Indirect commodity investment** is the purchase of indirect claims like shares in a corporation that deals in the commodity.

Direct investment gives more exposure, but cash investment in commodities can incur carrying costs. Indirect investment may be more convenient, but it may provide very little exposure to the commodity, especially if the company is hedging the risk itself.

The increase in the number of investable indices in commodities and their associated futures is indicative of the advantages of investing via derivatives. These indices also make investing in commodities available to smaller investors.

THE TERM STRUCTURE OF FUTURES PRICES

LOS 36.n: Explain the three components of return for a commodity futures contract and the effect that an upward- or downward-sloping term structure of futures prices will have on roll yield.

The components of the return to a commodity futures contract are the *spot return*, the *collateral return*, and the *roll return*. These components are usually considered to be additive, so one component can be calculated given the value of the others:

$$\text{total return} = \text{spot return} + \text{collateral return} + \text{roll return}$$

As the name implies, the **spot return** (a.k.a. *price return*) is the return on the futures caused by the change in the underlying commodity's spot price. According to the cost-of-carry model, the futures price equals the spot price multiplied by a factor that accounts for the time-value of money and storage costs. Over short periods, changes in the futures price will be proportional to changes in the spot price.

The *collateral return* (a.k.a. *collateral yield*) is assumed to be the risk-free rate. The yield is the result of the no-arbitrage assumption that if an investor is long a contract and invests the value of the futures in T-bills, he will be able to pay for the required purchase at the futures maturity. Such a fully hedged (i.e., *fully collateralized*) position should earn the risk-free rate.

Roll return (a.k.a. *roll yield*) is the change in the futures price not explained by the change in the spot price and is usually the result of *backwardation*. Backwardation, when it exists, produces a downward-sloping term structure of futures prices (i.e., each successive futures price is lower). Such a condition predicts a positive roll return, as the futures price increases to the spot price. If the term structure is positive, which is a result of *contango*, the roll return would be negative.

Professor's Note: Backwardation implies that counterparties who are long the commodity (e.g., farmers) dominate the market and are willing to accept a reduced price in the future (i.e., a price below the expected spot price) to guarantee selling their crops at a known price. Contango, on the other hand, implies users of the commodity dominate and are willing to pay a higher future price to guarantee an adequate supply at a known price. See Topic Review 38, LOS 38.a, for a more in-depth discussion of factors affecting forward commodity prices.



Example: Calculating the roll return to a commodity futures contract

The change in price on a futures contract is \$6, the spot return is \$3, and the collateral return is \$1. Calculate the roll return.

Answer:

$$\text{roll return} = \text{change in futures price} - \text{spot return} = \$6 - \$3 = \$3$$

COMMODITIES AND INFLATION

LOS 36.o: Discuss the relationship between commodities and inflation and explain why some commodity classes may provide a better hedge against inflation than others.

There appear to be two factors that determine whether a commodity is a good inflation hedge: *storability* and demand relative to *economic activity*.

It appears that whether a commodity is *storable* is the primary determinant in whether its value provides a hedge against unexpected inflation. For example, the values of storable

commodities such as precious metals (e.g., gold, silver), industrial metals (e.g., zinc, aluminum, copper), and energy (e.g., crude oil, heating oil, natural gas) are positively related to unexpected changes in inflation. That is, they tend to increase (decrease) in value with unexpected increases (decreases) in inflation.

Non-storable commodities, on the other hand, tend to exhibit the opposite behavior. Agricultural (e.g., livestock, wheat, corn) tend to fall into this category. Their values are negatively (positively) affected by unexpected increases (decreases) in inflation.

Another factor to consider with respect to inflation hedging capability is whether the commodity's demand is linked to economic activity. Those that enjoy a more or less constant demand regardless of the level of economic activity, for example, seem to provide little hedge against unexpected changes in inflation. Again, agricultural commodities tend to fall into this group. Those commodities that are most affected by the level of economic activity (e.g., energy, precious metals) tend to be better hedges.

HEDGE FUND CLASSIFICATIONS

LOS 36.p: Identify and explain the style classification of a hedge fund, given a description of its investment strategy.



Professor's Note: The following material relates to LOS 36.d and 36.p.

Hedge funds are classified in various ways by different sources. Since hedge funds are a “style-based” asset class, strategies can determine the subgroups. Within the strategies, there can be even more precise subgroups such as long/short and long-only strategies. The following is a list of nine of the more familiar hedge fund strategies.

1. *Convertible arbitrage* commonly involves buying undervalued convertible bonds, preferred stock, or warrants, while shorting the underlying stock to create a hedge. The investor gains from increases in the value of the convertible, the short rebate (i.e., interest on short-sale proceeds) and/or further decline in the stock price. (Note the similarity to delta hedging, where an options dealer sells calls and buys the underlying stock. In fact, the number of shares to short in a convertible arbitrage is determined by the delta of the convertible.)
2. *Distressed securities* investments can be made in both debt and equity. Investments can earn a high return because many investors do not want to deal with the legal complications for these securities, and some cannot invest in them at all (e.g., pension plans). Note that since the securities are already distressed, shorting can be difficult or impossible.
3. *Emerging markets* generally only permit long positions, and often there are no derivatives to hedge the investments.

4. *Equity market neutral* is usually an attempt to exploit price discrepancies through combinations of long and short positions. For example, the equity market neutral style (pairs trading) combines long and short positions in undervalued and overvalued securities, respectively, to eliminate systematic risk while capitalizing on mispricing.
5. *Fixed-income arbitrage* involves taking long and short positions in fixed-income instruments based upon expected changes in the yield curve and/or credit spreads.
6. *Fund of funds* describes a hedge fund that invests in many hedge funds. They can be of varying styles or not. The idea is to get diversification, but there is a fee paid to the manager of the fund of funds, as well as to the managers of the funds in the fund of funds. An interesting characteristic of funds of funds is that they tend to be more correlated with equities than with individual hedge fund strategies.
7. *Global macro strategies* take positions in major financial and non-financial markets through various means (e.g., derivatives and currencies). The distinguishing feature is that they tend to focus on an entire group or area of investment instead of individual securities or classes of securities.
8. *Hedged equity strategies* (a.k.a. *equity long-short*) represent the largest hedge fund classification in terms of assets under management. These strategies take long and short positions in under- and over-valued securities, respectively, similar to equity market neutral strategies. The difference is that hedged equity strategies do not focus on balancing the positions to eliminate systematic risk and can range from net long to net short.
9. *Merger arbitrage* (a.k.a. *deal arbitrage*) focuses on returns from mergers, spin-offs, takeovers, et cetera. For example, if Company X announces it will acquire Company Y, the manager might buy shares in Y and short X.

Another classification scheme divides hedge funds strategies into five general segments: (1) *relative value*, (2) *event-driven*, (3) *hedged equity*, (4) *global asset allocators*, and (5) *short selling*.

1. *Relative value* strategies attempt to exploit price discrepancies. This category combines the equity market neutral, the convertible arbitrage, and fixed-income arbitrage strategies mentioned previously. As the name implies, this strategy compares the relative values of assets and attempts to capitalize, through various long and short strategies, on the relative mispricing.
2. *Event-driven* strategies invest with a short-term focus on an event like a merger (merger arbitrage) or the turnaround of a distressed company (distressed securities).
3. *Equity hedge* entails taking long and short equity positions with varying overall net long or short positions and can include leverage.
4. *Global asset allocators* take long and short positions in a variety of both financial and non-financial assets.
5. *Short selling* takes short-only positions in the expectation of a decline in value.

As a skill-based investment class, the risk and return of a hedge fund depends heavily upon the skill of the manager. We can make a distinction concerning risk, however, in that styles that are mainly long-only (e.g., distressed securities) tend to offer less potential for diversification than long/short styles, and liquidity can vary from fund to fund or even within subgroups. A hedge fund within any of the classes can have a lock-up period, for example, and the length of the lock-up period can vary. During this lock-up period, investors cannot withdraw funds.

HEDGE FUND STRUCTURE

LOS 36.q: Discuss the typical structure of a hedge fund, including the fee structure, and explain the rationale for high-water mark provisions.

The most common **compensation structure** of a hedge fund consists of an assets-under-management (AUM) fee of about 1% to 2% and an *incentive fee* of 20% of profits. The definition of *profit* should be spelled out in the terms of the investment. It could be the dollar return over the initial investment, for example, or the dollar return above the initial investment increased by some hurdle rate.

High water marks (HWM) are typically employed to avoid incentive fee double-dipping. For example, assume a fund is valued and opened for subscription on a quarterly basis. Each quarter, the increase in value over the previous quarter is determined and investors pay incentive and management fees accordingly. This is fine, as long as the fund's value is higher at each successive valuation. If the value of the fund is lower than the previous quarter, however, the manager receives only the management fee and the previous high value of the fund (i.e., the last fund value at which incentive fees were paid) is established as a HWM. Investors are then required to pay incentive fees only if and when the value of the fund rises above the HWM. Note that HWMs are investor- and subscription-date specific. For those who subscribe while the fund value is below the previously established HWM, that HWM is not relevant. They will pay management fees each quarter, as well as incentive fees, for increases in value above the value at their subscription date.

A **lock-up period** is a common provision in hedge funds. Lock-up periods limit withdrawals by requiring a minimum investment period (e.g., one to three years) and designating exit windows. The rationale is to prevent sudden withdrawals that could force the manager to have to unwind positions.

Hedge Fund Incentive Fees

Incentive fees are paid to encourage the manager to earn ever higher profits. There is some controversy concerning incentive fees because the manager should have goals other than simply earning a gross return. For example, the manager may be providing limited downside risk and diversification. An incentive fee based upon returns does not reward this service.

Managers with good track records often demand higher incentive fees. The concern for investors is whether the manager with a good historical record can continue to perform well enough to truly earn the higher fees.

FUND OF FUNDS

LOS 36.r: Explain the purpose and special characteristics of fund-of-funds hedge funds.

A **fund of funds** (FOF) is a hedge fund that consists of several, usually 10 to 30, hedge funds. The point is to achieve diversification, but the extra layer of management means an extra layer of fees. Often, a FOF offers more liquidity for the investor, but the cost is cash drag caused by the manager keeping extra cash to meet potential withdrawals by other investors. Despite the drawbacks, FOF are *good entry-level investments* because the manager of the FOF exercises due diligence.

A FOF may serve as a *better* indicator of aggregate performance of hedge funds (i.e., a better benchmark) because they suffer from less survivorship bias. If a FOF includes a fund that dissolves, it includes the effect of that failure in the return of the FOF, while an index may simply drop the failed fund.

A FOF can, however, suffer from **style drift**. This can produce problems in that the investor may not know what she is getting. Over time, individual hedge fund managers may tilt their respective portfolios in different directions. Also, it is not uncommon for two FOF that claim to be of the same style to have returns with a very low correlation.

FOF returns have been more highly correlated with equity markets than those of individual hedge funds. This characteristic has important implications for their use as a diversifier in an equity portfolio.

HEDGE FUND PERFORMANCE EVALUATION

LOS 36.s: Critique the conventions and special issues involved in hedge fund performance evaluation, including the use of hedge fund indices and the Sharpe ratio.

The hedge fund industry views hedge fund performance appraisal as a major concern with many special issues and conventions to address. One special issue is that some claim that hedge funds are **absolute-return vehicles**, which means that no direct benchmark exists. The question (and problem) is how to determine alpha. The problem is especially perplexing given that most performance evaluation techniques are based on long-only positions, and hedge funds use various combinations of short positions and leverage. To create comparable portfolios, analysts: (1) create single and multi-factor models and (2) use an optimization technique to create a tracking portfolio.



Professor's Note: Think of an absolute return strategy as earning as much as possible. Hedge fund managers justify risky positions (strategies) by the amount of return they earn and feel they should not be judged against a benchmark.

Conventions to consider in hedge fund performance evaluation are the impact of performance fees and lock-up periods, the age of funds, and the size of funds. Empirical studies have found that:

- Funds with longer lock-up periods tend to produce higher returns than those with shorter lock-up periods.
- Younger funds tend to outperform older funds.
- Large funds underperform small funds.

Returns. By convention, hedge funds report *monthly* returns by comparing the ending value of the fund to the beginning value [i.e., $(V_1 / V_0) - 1$]. These simply calculated monthly returns are then compounded to arrive at annual returns. Note that returns are often biased by entry into and exit from the fund, which are allowed on a quarterly or less frequent basis, and by the frequency of the manager's trading (i.e., cash flows).



Professor's Note: You will see in the GIPS material in Study Session 18 that the way cash flows are handled affects the resulting return calculations.

To smooth out variability in hedge fund returns, investors often compute a *rolling return*, such as a 12-month moving average. A 12-month moving average is the average monthly return over the most recent 12 months, including the current month. The next moving average return is calculated by adding the next month and dropping the most distant month. In this fashion, the average return is always calculated using returns for 12 months.

Leverage. The convention for dealing with leverage is to treat an asset as if it were fully paid for (i.e., effectively “look through” the leverage). When derivatives are included, the same principle of *deleveraging* is applied.

Risk. Using standard deviation to measure the risk of a hedge fund can produce misleading results. For example, hedge fund returns are usually skewed with significant leptokurtosis (fat tails), so standard deviation fails to measure the true risk of the distribution (i.e., standard deviation does not accurately measure the probability of returns in the tails).

Downside deviation. Downside deviation measures only the dispersion of returns below some specified threshold return. The most common formula for downside deviation is:

$$\text{downside deviation} = \sqrt{\frac{\sum_1^n [\min(\text{return}_t - \text{threshold}, 0)^2]}{n - 1}}$$

The threshold return in the formula is usually either zero or the risk-free rate of return. If the threshold is a recent average return, then we call the downside deviation the **semivariance**. The point of these measures is to focus on the negative returns and not penalize a fund for high positive returns, which increases measured standard deviation.



Professor's Note: It is fairly easy to visualize how earning a few very high returns in conjunction with average returns could produce a large standard deviation, even when the manager produced no negative returns. In this case, we should properly conclude that the manager performed well on a risk-adjusted basis, but using standard deviation to measure variability (i.e., risk) could lead us to conclude that the manager took unnecessary risk.

The Sharpe Ratio

Annual hedge fund Sharpe ratios are calculated using annualized measures, as discussed earlier:

$$\text{Sharpe}_{\text{HF}} = \frac{\text{annualized return} - \text{annualized risk-free rate}}{\text{annualized standard deviation}}$$

In addition to concerns associated with the way returns are calculated, the Sharpe ratio has the following *limitations* with respect to hedge fund evaluation:

- *Time dependency:* The Sharpe ratio is higher for longer holding periods (e.g., monthly versus weekly returns) by a scale of the square root of time because monthly or quarterly returns and standard deviations are annualized. For example, quarterly returns are multiplied by 4, but the quarterly standard deviation is multiplied by $\sqrt{4}$.
- *Assumes normality:* Measures that incorporate standard deviation are inappropriate for skewed return distributions.
- *Assumes liquidity:* Because of infrequent, missing, or assumed return observations, illiquid holdings have upward-biased Sharpe ratios (i.e., downward-biased standard deviations).
- *Assumes uncorrelated returns:* Returns correlated across time will artificially lower the standard deviation. For example, if returns are trending for a period of time, the measured standard deviation will be lower than what may occur in the future. Serially correlated returns also result when the asset is illiquid and current prices are not available (e.g., private equity investments).
- *Stand-alone measure:* Does not automatically consider diversification effects.

In addition to these statistical shortcomings, the Sharpe ratio has been shown to have little power for predicting winners (i.e., it uses historical data). Also, research has found evidence that managers can manipulate their reported returns to artificially inflate their Sharpe ratio.

DERIVATIVE MARKETS

LOS 36.t: Explain the market opportunities that may be exploited to earn excess returns in derivative markets that are otherwise zero-sum games.

Derivatives are a **zero-sum game**. This means the gross long-term return on passively managed and unlevered futures positions should be the risk-free rate. To earn more than the risk-free rate would imply that parties in the market are willing to sacrifice return. This may be the case when hedgers effectively pay a risk-premium to have derivative “insurance” on their cash positions (e.g., protective put).

Since not all market participants can use derivatives, as with short selling and investing in distressed debt, investors in derivatives may be able to capture returns not available to all investors. Actively managed funds try to earn excess returns by finding cases where pricing relationships are not in equilibrium or by following momentum strategies.

DISTRESSED SECURITIES INVESTING

LOS 36.u: Discuss the sources of distressed securities and explain the major strategies for investing in them.

The major types of **distressed securities investing strategies** are long-only value investing, distressed debt arbitrage, and private equity.

Long-only value investing basically tries to find opportunities where the prospects will improve and, of course, tries to find them before other investors do. *High-yield investing* is buying publicly traded, below investment grade debt. *Orphan equities investing* is the purchase of the equities of firms emerging from reorganization. The reason these present a market opportunity is that some investors cannot participate in this market and many do not wish to do the necessary due diligence.



Professor's Note: An issue of debt that has fallen from investment grade to below investment grade is referred to as a “fallen angel.”

Distressed debt arbitrage is the purchasing of a company’s distressed debt while short selling the company’s equity. The investment can earn a return in two ways: (1) if the firm’s condition declines, the debt and equity will both fall in value; the equity should decline more in value, though, because debt has seniority; and (2) if the company’s prospects improve, because of the priority of interest over dividends, the returns to bondholders should be greater than that of equity holders, including dividends paid on the short position. The possibility of returns from the two events provides a good market opportunity.

Private equity is an “active” approach where the investor acquires positions in the distressed company, and the investment gives some measure of control. The investor can then influence and assist the company as well as acquire more ownership in the process

of any reorganization. By providing services and obtaining a strategic position, the investors create their own opportunities. *Vulture funds*, which specialize in purchasing undervalued distressed securities, engage in this type of strategy.

CONCERNS OF DISTRESSED SECURITIES INVESTING

LOS 36.v: Explain the importance of event risk, market liquidity risk, market risk, and “J-factor risk” for distressed securities investors.

Distressed securities can have event risk, market liquidity risk, market risk, J factor risk, and other types of risk.

- **Event risk** refers to the fact that the return on a particular investment within this class typically depends on an event for the particular company. Because these events are usually unrelated to the economy, they can provide diversification benefits.
- **Market liquidity risk** refers to low liquidity and the fact that there can be cyclical supply and demand for these investments.
- **Market risk** from macroeconomic changes is usually less important than the first two types mentioned.
- In **J factor risk**, the *J factor* refers to the role that courts and judges can play in the return, and this involves an unpredictable human element. By anticipating the judge’s rulings, the distressed security investor knows whether to purchase the distressed company’s debt or equity.

KEY CONCEPTS

LOS 36.a

Common features of alternative investments include:

- Low liquidity.
- Good diversification potential.
- High due diligence costs.
- Difficult to value.
- Limited access to information.

Alternative investments can provide:

- Exposure to asset classes that stocks and bonds cannot provide.
- Exposure to special investment strategies (e.g., hedge and venture capital funds).
- Special strategies and unique asset classes (e.g., funds that invest in private equity and distressed securities).

LOS 36.b

- Assess the market opportunity offered: Are there exploitable inefficiencies in the market for the type of investments in which the manager specializes?
- Assess the investment process: Does the manager seem to have a competitive edge over others in that market?
- Assess the organization of the manager and their operations. Is it stable and well-run? What has been the staff turnover?
- Assess the people by meeting with them and assessing their character.
- Assess the terms and structure (amount and time period) of the investment.
- Assess the service providers (i.e., lawyers, brokers, ancillary staff, etc.) by investigating the outside firms that support the manager's business.
- Review documents such as the prospectus or private-placement memorandum and the audits.

LOS 36.c

- Tax issues can be unique to the individual because the characteristics of private-wealth clients and their investments can vary greatly. For individuals there can be partnerships, trusts, and other situations that make tax issues complex.
- Suitability: Time horizons and wealth of individuals can vary a great deal. With individuals, there is also the emotional aspect, like preferences for, or aversion to, certain types of assets.
- Communication with the client helps determine suitability of recommendations and the overall management process.
- Decision risk is the risk of irrationally changing a strategy. For example, the advisor must be prepared to deal with a client who wants to get out of a position that has just declined in value.
- Concentrated positions: Wealthy individuals' portfolios frequently contain large positions in closely-held companies. Such ownership should be considered with the overall allocation to alternative investments, like private equity.

LOS 36.d

Real estate can be broken down into direct and indirect. Examples of direct investment in real estate include ownership of residences, commercial real estate, or agricultural land, and it involves direct management of the assets. Indirect real estate investments include:

- Companies that develop and manage real estate.
- Real estate investment trusts (REITs).
- Commingled real estate funds (CREFs).
- Separately managed accounts.
- Infrastructure funds.

Private equity subgroups include start-up companies, middle-market private companies, and private investment in public entities. A direct investment in private equity is when the investor purchases a claim directly from the firm (e.g., preferred shares of stock). Indirect investment is usually done through private equity funds, which include venture capital (VC) and buyout funds.

Commodity investments can also be grouped into direct and indirect subgroups. Direct investment is either through the purchase of the physical commodity or the purchase of derivatives (e.g., futures) on those assets. Indirect investment in commodities is usually done through investment in companies whose principal business is associated with a commodity (e.g., investing in a metal via ownership of shares in a mining company). Many commodities have a low correlation with stocks and bonds and a positive correlation with inflation.

Managed futures funds share many characteristics with hedge funds. The primary feature that distinguishes managed futures from hedge funds is the difference in the assets they hold. Managed futures funds tend to trade only in derivatives markets, while hedge funds tend to trade in spot markets and use futures for hedging. Also, managed futures funds generally take positions based on indices, while hedge funds tend to focus more on individual asset price anomalies. In other words, hedge funds tend to have more of a micro focus, while managed futures tend to have a macro focus.

Buyout funds are the largest segment of the private equity market. Middle-market buyout funds concentrate on divisions spun off from larger, publicly traded corporations and private companies that, due to their relatively small size, cannot efficiently obtain capital. Mega-cap buyout funds concentrate on taking publicly traded firms private. In either case, the target represents an investment opportunity through the identification of under-valued assets, the ability to restructure the debt of the firm, and/or improved (i.e., more efficient) management and operations.

Infrastructure funds specialize in purchasing public infrastructure assets (e.g., airports, toll roads) from cities, states, and municipalities. Distressed securities are securities of companies that are in or near bankruptcy. As with managed futures, analysts often consider distressed securities to be part of the hedge fund class of alternative investments. It may also be part of the private equity class.

LOS 36.e

Real Estate: *Benchmarks:* NCREIF, NAREIT; *Construction:* NCREIF is value-weighted, NAREIT is cap-weighted; *Biases:* Measured volatility is downward biased. The values are obtained periodically (annually).

Private Equity: *Benchmarks:* Provided by Cambridge Associates and Thomson Venture Economics; *Construction:* Constructed for buyout and venture capital. Value depends upon events. Often construct custom benchmarks; *Biases:* Repricing occurs infrequently which results in dated values.

Commodities: *Benchmarks:* Dow Jones-UBS Commodity Index, S&P Commodity Index; *Construction:* Assume a futures-based strategy. Most types considered investable; *Biases:* Indices vary widely with respect to purpose, composition, and method of weighting.

Managed Futures: *Benchmarks:* MLMI, CTA Indices; *Construction:* MLMI replicates the return to a trend-following strategy. CTA Indices use dollar-weighted or equal-weighted returns; *Biases:* Requires special weighting scheme.

Distressed Securities: *Benchmarks:* Characteristics similar to long-only hedge fund benchmarks; *Construction:* Weighting either equally-weighted or based upon assets under management. Selection criteria can vary; *Biases:* Self-reporting, backfill or inclusion bias, popularity bias, and survivorship bias.

LOS 36.f

Over the long term, in most cases, a 20% investment in alternative investments would have improved both the absolute return and the risk-adjusted return of a stock/bond portfolio. Over the 1990–2004 time period, adding managed futures to a portfolio of stocks, bonds, and hedge funds increased the return and the Sharpe ratio. Private equity provided less diversification than the other classes but provided return enhancement. Distressed securities have been found to provide both diversification and return enhancement.

LOS 36.g

Advantages of direct equity real estate investing:

- Many expenses are tax deductible.
- Ability to use more leverage than most other investments.
- Provides more control than stock investing.
- Ability to diversify geographically.
- Lower volatility of returns than stocks.

Disadvantages of direct equity real estate investing:

- Lack of divisibility means a single investment may be a large part of the investor's portfolio.
- High information cost, high commissions, high operating and maintenance costs, and hands-on management requirements.
- Special geographical risks, such as neighborhood deterioration and the political risk of changing tax codes.

LOS 36.h

Venture capital issuers include formative-stage companies and expansion-stage companies.

Venture capital buyers include angel investors, venture capitalists, and large companies (also known as strategic partners).

A private company typically goes through the following stages.

- The early stage consists of:
 - ◆ Seed.
 - ◆ Startup.
 - ◆ First stage.
- The later stage occurs after revenue has started and funds are needed to expand sales.
- The exit stage is the time when the venture capitalist realizes the value of the investment. It can occur through a merger, an acquisition, or an IPO.

LOS 36.i

In contrast to venture capital funds, buyout funds usually have:

- A higher level of leverage.
- Earlier and steadier cash flows.
- Less error in the measurement of returns.
- Less frequent losses.
- Less upside potential.

These differences are the natural consequence of buyout funds purchasing entities in later stages of development, or even established companies where the risks are lower.

LOS 36.j

Convertible preferred stock is a good vehicle for direct venture capital investment. This is because preferred stockholders must be paid a specified amount (e.g., twice their initial investment) before common stockholders can receive cash in the form of dividends or other distributions. Any buyout of the company that is favorable to shareholders will lead to the conversion of the preferred stock. Typically, investors in subsequent rounds of financing receive preferred stock with a claim that is senior to any previously issued preferred stock. Seniority is included to entice subsequent investors and make those preferred shares more valuable than those issued earlier.

LOS 36.k

Private equity funds usually take the form of limited partnerships or limited liability companies (LLC). These legal structures limit the loss to investors to the initial investment and avoid corporate double taxation. For limited partnerships, the sponsor is called the general partner, and for LLCs, the sponsor is called the managing director.

The timeline starts with the sponsor getting commitments from investors at the beginning of the fund and then giving “capital calls” over the first five years (typically), which are referred to as the commitment period. The expected life of these funds is seven to ten years, and there is often an option to extend the life up to five more years.

The sponsor can receive compensation in several ways. First, the sponsor has capital invested that earns a return. This is usually required as it helps keep the sponsor’s interests in line with those of the limited partners. As a manager, the sponsor typically gets a management fee of around 2% and an incentive fee of about 20% of the profits.

LOS 36.l

Any strategy for private equity investment must address the following issues:

- Low liquidity: Portfolio allocation to this class should be 5% or less with a plan to keep the money invested for 710 years.
- Diversification through a number of positions: Only investors with portfolios over \$100 million can invest in the 510 investments needed for diversification. Diversified commingled funds exist, but these funds have additional fees.
- Diversification strategy: Know how the proposed private equity investment relates to the overall portfolio.
- Plans for meeting capital calls: Committed funds are only called as needed, and the investor needs to be prepared to meet the calls.

LOS 36.m

Direct commodity investment entails either purchasing the actual commodities or gaining exposure via derivatives. Indirect commodity investment is the purchase of indirect claims, like shares in a corporation, that deals in the commodity.

Direct investment gives more exposure, but cash investment in commodities can incur carrying costs. Indirect investment may be more convenient, but it may provide very little exposure to the commodity, especially if the company is hedging the risk itself.

The increase in the number of investable indices in commodities and their associated futures is indicative of the advantages of investing via derivatives. These indices also make investing in commodities available to smaller investors.

LOS 36.n

The components of the return to a commodity futures contract are the spot return, collateral return, and the roll return:

$$\text{total return} = \text{spot return} + \text{collateral return} + \text{roll return}$$

As the name implies, the spot return (a.k.a. price return) is the return on the futures caused by the change in the underlying commodity's spot price. The collateral return (a.k.a. collateral yield) is assumed to be the risk-free rate.

If an investor is long a contract and invests the value of the futures in T-bills, he will be able to pay for the required purchase at the futures maturity. Such a fully hedged (i.e., fully collateralized) position should earn the risk-free rate.

Backwardation produces a downward-sloping term structure of futures prices (i.e., each successive futures price is lower). Such a condition predicts a positive roll return, as the futures prices increase to the spot prices. If the term structure is positive, which is a result of contango, the roll return is negative.

LOS 36.o

It appears that whether a commodity is *storable* is the primary determinant in whether its value provides a hedge against unexpected inflation. For example, the values of storable commodities such as precious metals, industrial metals, and energy are positively related to unexpected changes in inflation. That is, they tend to increase (decrease) in value with unexpected increases (decreases) in inflation.

Nonstorable commodities, on the other hand, tend to exhibit the opposite behavior. Agricultural commodities (e.g., livestock, wheat, corn) tend to fall into this category. Their values are negatively (positively) affected by unexpected increases (decreases) in inflation.

Another factor to consider with respect to inflation hedging capability is whether the commodity's demand is linked to economic activity. Those that enjoy a more or less constant demand regardless of the level of economic activity, for example, seem to provide little hedge against unexpected changes in inflation.

LOS 36.p

Hedge funds are classified in various ways by different sources. Since hedge funds are a “style-based” asset class, strategies can determine the subgroups. The following is a list of nine of the more familiar hedge fund strategies.

1. Convertible arbitrage commonly involves buying undervalued convertible bonds, preferred stock, or warrants, while shorting the underlying stock to create a hedge.
2. Distressed securities investments can be made in both debt and equity; since the securities are already distressed, shorting can be difficult or impossible.
3. Emerging markets generally only permit long positions, and often there are no derivatives to hedge the investments.
4. Equity market neutral (pairs trading) combines long and short positions in undervalued and overvalued securities, respectively, to eliminate systematic risk while capitalizing on mispricing.
5. Fixed-income arbitrage involves taking long and short positions in fixed-income instruments based upon expected changes in the yield curve and/or credit spreads.
6. Fund of funds describes a hedge fund that invests in many hedge funds to get diversification, but there is a fee paid to the manager of the fund of funds, as well as to the managers of the funds in the fund of funds.
7. Global macro strategies take positions in major financial and non-financial markets through various means (e.g., derivatives and currencies), focusing on an entire group or area of investment instead of individual securities.
8. Hedged equity strategies (a.k.a. equity long-short) represent the largest hedge fund classification in terms of assets under management. These strategies take long and short positions in under- and over-valued securities, respectively. Hedged equity strategies do not focus on balancing the positions to eliminate systematic risk and can range from net long to net short.
9. Merger arbitrage (a.k.a. deal arbitrage) focuses on returns from mergers, spin-offs, takeovers, et cetera.

Another classification scheme divides hedge funds strategies into five general segments: (1) relative value, (2) event-driven, (3) hedged equity, (4) global asset allocators, and (5) short selling.

1. Relative value strategies attempt to exploit price discrepancies through various long and short strategies, on the relative mispricing.
2. Event-driven strategies invest with a short-term focus on an event like a merger (merger arbitrage) or the turnaround of a distressed company (distressed securities).
3. Equity hedge entails taking long and short equity positions with varying overall net long or short positions and can include leverage.
4. Global asset allocators take long and short positions in a variety of both financial and non-financial assets.
5. Short selling takes short-only positions in the expectation of a decline in value.

LOS 36.q

The most common compensation structure of a hedge fund consists of an assets-under-management (AUM) fee of about 1% to 2% and an incentive fee of 20% of “profits.”

High water marks (HWM) are typically employed to avoid incentive fee double-dipping. For example, each quarter the increase in value over the previous quarter is determined, and investors pay incentive and management fees accordingly. If the value of the fund is lower than the previous quarter, however, the manager receives only the management fee and the previous high value of the fund is established as a HWM.

A lock-up period limits withdrawals by requiring a minimum investment period (e.g., one to three years), preventing sudden withdrawals that could force the manager to have to unwind positions.

Incentive fees are paid to encourage the manager to earn ever higher profits. There is some controversy concerning incentive fees because the manager should have goals other than simply earning a gross return.

LOS 36.r

A fund of funds (FOF) consists of approximately 10 to 30 hedge funds. The point is to achieve diversification, but the extra layer of management means an extra layer of fees. Often a FOF offers more liquidity for the investor, but the cost is cash drag. Despite the drawbacks, FOF are *good entry-level investments* because the manager of the FOF exercises due diligence.

A FOF may serve as a better *benchmark* because they suffer from less survivorship bias.

A FOF can suffer from style drift. Often two FOF that are classified as having the same style have a low correlation of returns.

FOF returns have been more highly correlated with equity markets than those of individual hedge funds. This characteristic has important implications for their use as a diversifier in an equity portfolio (i.e., as correlation increases, diversification decreases).

LOS 36.s

One special issue is that some claim that hedge funds are absolute-return vehicles, which means that no direct benchmark exists. The question (and problem) is how to determine alpha. Conventions to consider in hedge fund performance evaluation are the impact of performance fees and lock-up periods, the age of funds, and the size of funds.

- Funds with longer lock-up periods tend to produce higher returns than those with shorter lock-up periods.
- Younger funds tend to outperform older funds.
- Large funds underperform small funds.

By convention, hedge funds report monthly returns by comparing the ending value of the fund to the beginning value. These simply calculated monthly returns are then compounded to arrive at annual returns. The convention for dealing with leverage is to treat an asset as if it were fully paid for. When derivatives are included, the same principle of deleveraging is applied.

Using standard deviation to measure the risk of a hedge fund can produce misleading results. Hedge fund returns are usually skewed with significant leptokurtosis (fat tails), so standard deviation fails to measure the true risk of the distribution.

Downside deviation is a popular hedge fund risk measure, as it measures only the dispersion of returns below some specified threshold return. The most common formula for downside deviation is:

$$\text{downside deviation} = \sqrt{\frac{\sum_{t=1}^n [\min(\text{return}_t - \text{threshold}, 0)^2]}{n-1}}$$

The threshold return in the formula is usually either zero or the risk-free rate of return. Annual hedge fund Sharpe ratios are calculated using annualized measures, as:

$$\text{Sharpe}_{\text{HF}} = \frac{\text{annualized return} - \text{annualized risk-free rate}}{\text{annualized standard deviation}}$$

The Sharpe ratio has the following limitations with respect to hedge fund evaluation:

- *Time dependency.* The Sharpe ratio is higher for longer holding periods.
- *Assumes normality.* Measures that incorporate standard deviation are inappropriate for skewed return distributions.
- *Assumes liquidity.* Illiquid holdings have upward-biased Sharpe ratios (i.e., downward-biased standard deviations).
- *Assumes uncorrelated returns.* Returns correlated across time will artificially lower the standard deviation.
- *Stand-alone measure.* Does not automatically consider diversification effects.

LOS 36.t

Derivatives are a zero-sum game. This means the gross long-term return on passively managed and unlevered futures positions should be the risk-free rate. To earn more than the risk-free rate would imply that parties in the market are willing to sacrifice return. This may be the case when hedgers effectively pay a risk-premium to have derivative “insurance” on their cash positions (e.g., protective put).

Since not all market participants can use derivatives, as with short selling and investing in distressed debt, investors in derivatives may be able to capture returns not available to all investors. Actively managed funds try to earn excess returns by finding cases where pricing relationships are not in equilibrium or by following momentum strategies.

LOS 36.u

- Long-only value investing attempts to find opportunities where the prospects will improve tries to find them before other investors do. *High-yield investing* is buying publicly-traded, below investment grade debt. *Orphan equities investing* is the purchase of the equities of firms emerging from reorganization.
- Distressed debt arbitrage is the purchasing of a company's distressed debt while short selling the company's equity. The investment can earn a return in two ways:
 - ◆ If the firm's condition declines, the debt and equity will both fall in value, but equity should decline more in value.
 - ◆ If the company's prospects improve, the returns to bondholders should be greater than that of equity holders.
- Private equity is an "active" approach where the investor acquires positions in the distressed company, and the investment gives some measure of control. The investor can then influence the company as well as acquire more ownership in the process of any reorganization.

LOS 36.v

Distressed securities can have several types of risk:

- Event risk refers to the fact that the return on a particular investment within this class typically depends on an event for the particular company. Because these events are usually unrelated to the economy, they can provide diversification benefits.
- Market liquidity risk refers to low liquidity and the fact that there can be cyclical supply and demand for these investments.
- Market risk from macroeconomic changes is usually less important than the first two types mentioned.
- In J factor risk, the "J factor" refers to the role that courts and judges can play in the return (i.e., an unpredictable human element). By anticipating the judge's rulings, the distressed security investor knows whether to purchase the distressed company's debt or equity.

CONCEPT CHECKERS

1. All of the following are special issues for the private wealth client when investing in alternative investments except:
 - A. tax issues.
 - B. decision risk.
 - C. return enhancement.

2. Which of the following represent private equity subgroups where the company invested in has not typically started generating revenues?
 - A. Start-up companies only.
 - B. Start-up companies and middle-market private companies only.
 - C. Start-up companies, middle-market private companies, and private investment in public entities only.

3. The hedge fund structure and private equity fund structure are subgroups of which alternative investment class?
 - A. Real estate.
 - B. Distressed debt.
 - C. Commodities.

4. The strategies of convertible arbitrage, emerging markets, equity market neutral, and fixed-income arbitrage are categories of which alternative investment class?
 - A. Real estate.
 - B. Commodities.
 - C. Hedge funds.

5. For use in evaluating hedge funds, the Sharpe ratio may not be appropriate because the Sharpe ratio assumes the returns:
 - A. are positive only.
 - B. reflect diversification.
 - C. are serially uncorrelated.

6. Based on historical data, when compared to a 50/50 stock/bond portfolio, a 40/40/20 portfolio of bonds, stocks, and which of the following had a higher Sharpe ratio?
 - A. Real estate only.
 - B. Commodities only.
 - C. Both real estate and commodities.

7. When comparing the returns of various types of hedge funds to the returns on stocks and bonds for the period 1990–2004:
 - A. none outperformed stocks and bonds by any measure.
 - B. some outperformed stocks and bonds and some did not.
 - C. all outperformed stocks and bonds on a risk-adjusted basis.

Study Session 13

Cross-Reference to CFA Institute Assigned Reading #36 – Alternative Investments Portfolio Management

Study Session 13

8. Compared to an indirect investment in real estate, a direct investment in real estate has which one of following advantages?
 - A. Lower information cost.
 - B. Lower commissions.
 - C. Potential for more leverage.

9. The buyers of venture capital who are the first investors after the entrepreneur's family and friends would *most likely* be:
 - A. angel investors.
 - B. corporate venture capitalists.
 - C. vultures.

10. Purchasing of a company's distressed debt while selling the company's equity short is called:
 - A. market neutral.
 - B. preferred arbitrage.
 - C. distressed debt arbitrage.

ANSWERS – CONCEPT CHECKERS

1. C Return enhancement is certainly not a special issue. All the other choices are issues of concern for the private wealth client but generally not issues for the institutional client.
2. A Start-up companies, middle-market private companies, and private investment in public entities represent three subgroups of private equity. Middle-market private companies typically have revenues, as do public entities. The start-up companies are usually in a pre-revenue phase.
3. B Investments in distressed debt can have either of these structures, that is why distressed debt is often considered as a subclass of other alternative investment asset classes.
4. C Hedge funds have many strategies that include the following: convertible arbitrage, distressed securities, emerging markets, equity market neutral, fixed-income arbitrage, fund of funds, global macro strategies, hedged equity strategies, and merger arbitrage.
5. C The Sharpe ratio is probably not applicable to hedge funds because it assumes the returns are normally distributed and not serially correlated. Another problem is that the Sharpe ratio is a stand-alone measure and does not consider the diversification that the hedge fund can add to a portfolio.
6. C As is the case with most of the classes of alternative investments, adding either real estate or commodities to a bond and stock portfolio would have increased the Sharpe ratio for the period 1990–2004.
7. B The performance of the various classes varied widely, from a Sharpe ratio of -0.25 for the short selling strategies to 1.51 on global macro strategies.
8. C Higher information costs, higher commissions, and political risk are disadvantages of direct investment in real estate. Direct investment allows more leverage, however.
9. A Angel investors are usually accredited investors and the first outside investors after the family and friends of the company founders.
10. C This is the definition of distressed debt arbitrage.

The following is a review of the Alternative Investments for Portfolio Management principles designed to address the learning outcome statements set forth by CFA Institute®. This topic is also covered in:

SWAPS

Study Session 13

EXAM FOCUS

As an indication of the importance of swaps in the Level 3 curriculum, note that they are covered in this topic review as well as Study Session 15. For the exam, be able to perform and discuss any of the calculations in this topic review, especially the calculations for determining the swap fixed price and the amount and direction of any settlement payment. The examples in this topic review assume a 2-year time horizon, but the calculations for three or more years would follow exactly the same format. Also, if on the exam the swap settlements are semiannual or quarterly rather than annual, be sure to divide all related interest rates as required.

SWAP HEDGING STRATEGIES

LOS 37: Evaluate commodity hedging strategies that rely on swaps and illustrate their inherent risk exposures.

Commodity and interest rate swaps share many characteristics. Both of the contracts are agreements between two parties to exchange cash flows over a specified time based upon whether a certain market variable is above or below a fixed benchmark value. This fixed value is the swap *rate* for interest rate swaps and the swap *price* for a commodity swap. In both cases, the value of the swaps at initiation is zero but can change with the passage of time and as market variables change. Commodity swaps have more risk considerations than interest rate swaps because they have more inputs to consider. Interest rate swaps have interest rates and forward rates as inputs, for example, while commodity swaps have those inputs as well as forward commodity prices. Many commodities have a seasonal supply and demand, and the commodity swap can incorporate features to address the seasonality of commodity markets.

The **swap rate** for an interest rate swap is the weighted average of forward rates, where the weights are based upon the corresponding discount factors using those forward rates.

$$\text{swap rate} = \frac{\sum_{t=1}^T (\text{FDF}_t) \times (\text{forward rate})_t}{\sum_{t=1}^T \text{FDF}_t}$$

The term FDF_t is the **forward discount factor** corresponding to time period t . It is the product of (time value of money) discount factors for each sub-period based on the imbedded forward rates. Multiplying each FDF_t by the face value of a zero-coupon bond with the corresponding maturity, for example, yields the current market price of the zero-coupon bond.

For a commodity swap using **financial settlement**, we can use the same basic formula to compute the *swap price*:

$$\text{swap price} = \frac{\sum_{t=1}^T (\text{FDF}_t) \times (\text{forward price of commodity})_t}{\sum_{t=1}^T \text{FDF}_t}$$

The following example demonstrates the calculation of a swap price using both interest rates and bond prices.

Example: Computing a swap price

The forward prices for oil are \$120 and \$125 for delivery in one year and two years, respectively. The 1-year interest rate and the 1-year forward rate for Year 2 (1-year rate starting one year from today) are 4% and 4.5%, respectively. **Calculate** the swap price using: (1) the spot and forward rates and (2) the prices of zero-coupon bonds with a face value of \$1,000.

Answer:

(1) Using the current and forward rates, the swap price is:

$$\text{swap price} = \frac{\left(\frac{1}{1.04}\right)(\$120) + \left(\frac{1}{(1.04)(1.045)}\right)(\$125)}{\frac{1}{1.04} + \frac{1}{(1.04)(1.045)}} = \$122.445$$

Professor's Note: We could have discounted the second forward price for two years at the current 2-year interest rate instead of the two 1-year rates.

To do that, we first solve for the 2-year rate: (If you were asked to find the effects of a change in forward or spot prices or interest rates on the exam, you would be given either the 1-year rates or the 1- and 2-year rates. The following calculation is an example of bootstrapping.)

$$(1 + 2\text{-year rate})^2 = (1 + \text{current 1-year rate})(1 + 1\text{-year rate in one year})$$

$$(1 + 2\text{-year rate})^2 = (1.04)(1.045)$$

$$(1 + 2\text{-year rate})^2 = 1.0868$$

$$2\text{-year rate} = \sqrt{1.0868} - 1 = 4.249\%$$

Next, solve for the swap price by discounting forward prices at their relevant interest rates:

$$\text{swap price} = \frac{\left(\frac{1}{1.04}\right)\$120 + \left(\frac{1}{(1.04249)^2}\right)\$125}{\frac{1}{1.04} + \left(\frac{1}{(1.04249)^2}\right)} = \$122.445$$

(2) We'll now use zero-coupon bond prices instead of interest rates. The price of a 1-year, zero-coupon bond is $\$1,000 / 1.04 = \961.54 . Using the current 1-year rate and the 1-year forward rate, we can compute the rate on the 2-year, zero-coupon bond. Note that the rate (i) on the 2-year bond is the geometric average of the current and expected 1-year rates:

$$i = (1.04 \times 1.045)^{1/2} - 1 = 0.04249 = 4.25\%$$

Using the discount rate (required return) on the 2-year, zero-coupon bond, we calculate a market price (P) of \$920.13:

$$P = \frac{\$1,000}{(1.0425)^2} = \$920.13$$

Note: Alternatively we could have discounted the \$1,000 face value of the bond for one year at 4.5% and then for another year at 4%:

$$\frac{\$1,000}{1.045} = 956.94; \quad \frac{\$956.94}{1.04} = \$920.13$$

We then use the prices of the \$1,000, zero-coupon bonds to calculate the swap price of \$122.445:

$$\text{swap price} = \frac{(\$961.54)(\$120) + (\$920.13)(\$125)}{\$961.54 + \$920.13} = \$122.445$$

We could alternatively have used the price of a \$1 zero-coupon bond, which is actually just the present value factor for one dollar and the number of periods corresponding to the maturity of the bond.

$$\text{swap price} = \frac{(\$0.96154)(\$120) + (\$0.92013)(\$125)}{\$0.96154 + \$0.92013} = \$122.445$$

Using the result of this example, we can now describe a possible commodity swap for oil and see how it works. This is best done with an example.

Example: Computing a commodity swap price

The manager of an oil refinery has entered into a 2-year, annual reset swap with a 1,000,000 barrel notional principal. (We assume the manager needs a total of 2,000,000 barrels over the two years.) The manager agrees to receive the market price per barrel in one year and in two years. He also agrees to pay the swap price of \$122.445/barrel at each settlement date. If the spot price of oil in one year is \$123.12, **calculate** the cash flow at the first settlement.

Answer:

The refinery manager has agreed to receive the (variable) market price and pay the (fixed) swap price. Since the cost of the oil in the market (\$123.12) is greater than the swap price (\$122.445), the manager will *receive* a (netted) payment of \$675,000:

$$(\$123.12/\text{barrel} - \$122.445/\text{barrel}) \times 1,000,000 \text{ barrels} = \$675,000$$

Note that each settlement of the swap is equivalent to settling a forward contract, and remember that a forward contract effectively locks in a purchase or selling price. The manager buys the oil in the market and pays the market price of \$123.12 per barrel for 1,000,000 barrels for a total of \$123,120,000. The manager receives a payment of \$675,000 from the swap counterparty, so the net effective price paid for the oil is \$123,120,000 – \$675,000 = \$122,445,000, or \$122.445 per barrel.

There are also **prepaid swaps**. In this case, the manager pays an amount at the inception of the contract to receive a specified amount of oil in the future. The amount paid at inception is the *present value* of the forward oil prices. In our example, the manager would pay:

1,000,000 barrels in one year:

$$\left(\frac{\$120}{1.04} \right) 1,000,000 = \$115,384,615.40$$

Plus 1,000,000 barrels in two years:

$$\left(\frac{\$125}{(1.04)(1.045)} \right) 1,000,000 = \$115,016,562.40$$

$$\$115,384,615.40 + \$115,016,562.40 = \$230,401,177.80$$



Professor's Note: The amount paid at inception can also be calculated as the average of the present values of the 1- and 2-year forward prices for the oil multiplied by the total number of barrels needed:

$$P_{\text{average}} = \frac{\left(\frac{\$120}{1.04} + \frac{\$125}{(1.04)(1.045)} \right)}{2} = \$115.200589 \text{ per barrel}$$

then:

$$(\$115.200589 \text{ per barrel})(2,000,000 \text{ barrels}) = \$230,401,178$$

As you can imagine, prepaid swaps have significant credit risk. Assume, for example, that our manager paid over \$230 million today in a prepaid swap based upon a notional 1,000,000 barrels per year for two years. In other words, the manager has prepaid an amount equal to the current forward prices. At each settlement date, the counterparty must deliver 1,000,000 barrels of oil to the manager. If the counterparty defaults, the manager has not only lost the money paid but now must buy the oil in the market.



Professor's Note: The focus of the discussion for the first LOS is on financial settlement.

COMMODITY SWAPS VS. INTEREST RATE SWAPS

The **settlements** of interest rate swaps and commodity swaps (financial settlement) are very similar. They have the same basic properties:

$$\text{settlement} = \text{difference between fixed and market values} \times \text{notional principal}$$

The direction of the cash flow depends on the perspective of the counterparty. For example, the fixed-rate payer receives the cash flow if the market value is greater than the fixed value (e.g., when the market interest rate is greater than the swap fixed rate in the case of an interest rate swap). For interest rate swaps, there may be an adjustment like multiplying by one quarter if settlement is quarterly. The previous example of a commodity swap illustrated how the settlement will equal the difference between the market price per barrel minus the swap price times the notional principal:

$$\text{settlement} = (\$123.12 - \$122.445) \times 1,000,000 \text{ barrels} = \$675,000$$

In that case, the payer of the fixed swap price benefited because the market price was higher than the swap price at settlement.

Valuing Swaps

With respect to swap **valuation**, memorize the following main points:

1. The **value** at any time of an interest rate or commodity swap is the present value of the settlement cash flows that can be locked in by taking offsetting positions in forward contracts.
2. The value at inception of both types of swaps is zero (ignoring fees).
3. Since the prices are based on forward interest rates, the values of both types of swaps change as interest rates change. In addition, the value of a commodity swap changes as commodity prices change.
4. The values of both types of swaps change over time, even if market rates and prices do not change.

Swap Risks

From the perspective of the buyer of a **prepaid swap**, there are three types of risks: (1) the *credit risk* that the other counterparty will not deliver the commodity; (2) the *market risk* from the prices and forward prices *changing* in such a way that the prepaid price was too high; and (3) from the *financial risk* of an interest rate increase leading to an increase in the opportunity cost of the prepaid price.

For **financially settled swaps**, there is still risk from the changes in forward prices and the changes in interest rates, but the credit risk is considerably less. At inception, the credit risk to both parties is zero. The credit risk can go back and forth between the counterparties during the life of the swap as the value of the swap changes.

The formulas presented thus far indicate that the value of a commodity swap can change in response to changes in market prices, forward prices, and interest rates. The important point is that to *remove all noncredit risk* from a commodity swap, the counterparties need to hedge the interest rate risk with an appropriate interest rate derivative (e.g., an interest rate swap).

Finally, hedging commodity transactions requires an assessment of the *seasonality* of commodity prices. As we have mentioned, this can be done by including both a varying quantity and a price component in the swap agreement.

KEY CONCEPTS

LOS 37

From the perspective of the buyer of a prepaid swap, there are three types of risks: (1) the *credit risk* that the other counterparty will not deliver the commodity, (2) the *market risk* from the prices and forward prices changing in such a way that the prepaid price was too high, and (3) the *financial risk* of an interest rate increase leading to an increase in the opportunity cost of the prepaid price.

For financially settled swaps, there is still risk from the changes in forward prices and the changes in interest rates, but the credit risk is considerably less. At inception, the credit risk to both parties is zero. The credit risk can go back and forth between the counterparties during the life of the swap as the value of the swap changes.

The value of a commodity swap can change in response to changes in market prices, forward prices, and interest rates. The important point is that to remove all noncredit risk from a commodity swap, the counterparties need to hedge the interest rate risk with an appropriate interest rate derivative.

Hedging commodity transactions requires an assessment of the seasonality of commodity prices. This can be done by including both a varying quantity and price component into the swap agreement.

CONCEPT CHECKERS

1. At inception, the value of a commodity swap is typically:
 - A. greater than zero.
 - B. zero.
 - C. less than zero.
2. With respect to swap rates for interest rate swaps and swap prices for commodity swaps, which are weighted averages based upon forward contracts?
 - A. Swap rates only.
 - B. Swap prices only.
 - C. Both swap rates and swap prices.
3. A change in interest rates and forward rates will affect the value of:
 - A. interest rate swaps only.
 - B. commodity swaps only.
 - C. both interest rate swaps and commodity swaps.
4. Being able to vary the notional principal of a commodity swap in a swap contract is:
 - A. both possible and legal.
 - B. not possible but would probably be legal.
 - C. not possible and would be illegal if possible.

Use the following information for Questions 5, 6, and 7.

Concerned with global supply issues, a supply manager wants to hedge future purchases of crude oil that his firm will use in manufacturing solvents estimated to be 1,200,000 barrels in each year. Current forward prices for delivery of crude in one and two years are \$125.88 and \$129.01, respectively. The current 1-year and 2-year Treasury rates are 2.38% and 2.63%, respectively. The manager approaches a swap dealer to enter (strike) a 2-year swap agreement.

5. The expected 1-year Treasury rate beginning in one year is *closest* to:
 - A. 0.024%.
 - B. 2.630%.
 - C. 2.880%.
6. Based on current forward prices and interest rates, the fixed price for a 2-year crude oil swap is *closest* to:
 - A. 125.44.
 - B. 127.42.
 - C. 128.22.
7. If at the first settlement date in one year the spot price of crude is \$127.96, what would the *most likely* settlement action be? The manager will:
 - A. make a payment of \$312,000.
 - B. receive a payment of \$550,000.
 - C. receive a payment of \$648,000.

ANSWERS – CONCEPT CHECKERS

- B** The swap price is designed to make the value of the swap zero at inception.
- C** Both swap rates and swap prices are weighted averages based upon forward discount factors, or equivalently, zero-coupon bond prices.
- C** Since the value of both types of swaps is the present value of a locked-in set of cash flows, the value of both types of swaps is sensitive to changes in interest rates.
- A** Swap counterparties can design the swap any way they choose. Commodity swaps can have the quantity and swap price change over the life of the swap.
- C** The 2-year Treasury rate is earned each year for two years. Two strategies should provide the same results: (1) earning the 2-year rate for two years, or (2) earning the 1-year rate for the current year and the 1-year rate in Year 2. We set the two strategies equal and solve for the missing interest rate (this is *bootstrapping*):

$$\begin{aligned}(1 + 1\text{-year rate})(1 + 1\text{-year rate in Year 2}) &= (1 + 2\text{-year rate})^2 \\ (1.0238)(1 + x) &= (1.0263)^2 \\ (1 + x) &= \frac{(1.0263)^2}{(1.0238)} = 1.0288 \\ x &= 2.88\%\end{aligned}$$

- B** The swap fixed price is the present value of the forward prices using the 1- and 2-year interest rates:

$$\text{swap price} = \frac{\frac{125.88}{1.0238} + \frac{129.01}{(1.0263)^2}}{\frac{1}{1.0238} + \frac{1}{(1.0263)^2}} = 127.42$$

- C** The manager will purchase the oil in the spot market, and since the spot price is above the swap fixed price, the manager will receive a payment from the dealer. If the spot price had instead been below the swap fixed price, the manager would have to make a payment to the dealer.



Professor's Note: The final amount paid for the commodity should be the swap fixed price, so I recommend checking that if you are asked for this on the exam.

$$\begin{aligned}\text{settlement payment} &= (\text{spot price} - \text{swap fixed price})\text{NP} \\ &= \left[\left(\frac{\$127.96}{\text{barrel}} \right) - \left(\frac{\$127.42}{\text{barrel}} \right) \right] \times 1,200,000 \text{ barrels} = \$648,000\end{aligned}$$

Check:

Purchase 1.2 million barrels in the spot market:
 $\$127.96 \times 1,200,000 = \$153,552,000$

Receive swap settlement of \$648,000

$$\text{net per barrel} = \frac{\$153,552,000 - \$648,000}{1,200,000} = \$127.42$$

The following is a review of the Alternative Investments for Portfolio Management principles designed to address the learning outcome statements set forth by CFA Institute®. This topic is also covered in:

COMMODITY FORWARDS AND FUTURES

Study Session 13

EXAM FOCUS

Although the concepts underlying the pricing of commodity forwards and futures can be quite quantitative in nature and prime material for calculations, the LOS in the topic review are all qualitative in nature. (You'll notice that the LOS ask you to discuss, identify and explain, and compare and contrast.) As you read through this topic review, try to follow the logic in the calculations and formulas. That is the only way you can truly understand the concepts. For the exam, be sure you can answer the three LOS if asked as a stand-alone question or as part of a larger, related question. For example, you may be asked to comment on the appropriateness of commodities and commodity forwards/futures for a given institutional investor and/or whether or not storage costs, convenience yield, et cetera, have been properly incorporated into the price.

PRICING COMMODITY FORWARDS AND FUTURES

LOS 38.a: Discuss the unique pricing factors for commodity forwards and futures, including storability, storage costs, production, and demand, and explain their influence on lease rates and the forward curve.

Commodity and financial forward contracts are similar in some regards. For example, the prices of both are logically based upon expected spot prices. Some financial forwards (e.g., S&P 500 Index) are based upon the expected future spot price minus dividends received during the holding period. The price of a commodity forward must also be based upon expectations, but there are several factors to consider. For example, based upon their physical qualities, some commodities are *storable* (e.g., metals) and the associated costs depend upon the physical characteristics of the commodity. Also, due to their physical nature, others are not storable (e.g., electricity, perishable foods).

Some commodities are also appropriate for *leasing*. That is, an investor without a current need purchases the commodity and then lends it out to others who do have a current need. Just as with the loan of any asset, the lender requires a return, so a *lease rate* (i.e., required return) is established. For example, assume an investor uses cash and purchases a commodity. If a viable lease market exists for the commodity, the investor might lend it to someone. Since the investor used cash to acquire the commodity, he must charge a lease rate. Failing to do so would amount to an interest-free loan of the money tied up in the commodity.

Lease Rates

A *lease rate* is the amount of interest a lender of a commodity requires. The lease rate is defined as the return the investor requires to buy and then lend a commodity. From the borrower's perspective, the lease rate represents the cost of borrowing the commodity. The lease rate and risk-free rate are important inputs to determining a commodity forward price. The lease rate in the pricing of a commodity forward is very similar to the dividend payment in a financial forward.

A no-arbitrage price can be established if there is an active lending market for a commodity. The amount a commodity borrower is willing to pay must equal the amount the lender requires in return for lending out the commodity for time T . This interest or lease amount is an important factor in establishing the forward price for the commodity.

To determine the lease rate (i.e., the return to the commodity owner/lender), we must first establish that the expected spot price for a commodity must be the current spot price, increased by the expected growth in the price of the commodity over the time period, T :

$$\hat{S}_T = S_0 e^{gT}$$

where:

\hat{S}_T = the expected spot price at time T

S_0 = the current spot price

g = the continuous growth rate in price of the commodity

For the Exam: This discussion on determining the commodity lease rate is presented only to help you understand the concept. On the exam, you may be asked questions about commodity lease rates, but you should not have to perform these calculations.

The net present value (NPV) of any investment is calculated as the present value of expected cash flows minus the original cost. Since the cost of the commodity is the current spot price and the only expected cash flow is the expected spot price, we can express the NPV for the lease transaction as:

$$NPV = \hat{S}_T e^{-\alpha T} - S_0$$

where:

α = the required return reflecting the risk of the expected cash flow

$\hat{S}_T e^{-\alpha T}$ = the present value of the expected spot price

S_0 = the current spot price (i.e., original cost)

Note that this assumes there are no cash flows to the owner/lender until the termination of the lease transaction. At the termination of the lease, the lessee can return the required (increased) amount of commodity or its equivalent cash value.

Using the relationship between the current and expected spot prices, we can now restate the expression for the NPV of a commodity lease transaction in terms of its current spot price (i.e., original cost) and expected cash flows (i.e., expected spot price):

$$\text{NPV} = \hat{S}_T e^{-\alpha T} - S_0$$

$$\text{then, since } \hat{S}_T = S_0 e^{gT}$$

$$\text{NPV} = S_0 (e^{gT}) (e^{-\alpha T}) - S_0 \Rightarrow$$

$$\text{NPV} = S_0 e^{(g-\alpha)T} - S_0$$

The expression shows that the lease transaction can have a zero or positive NPV to the lessor only when $g \geq \alpha$.

For the Exam: Important commodity pricing relationships start with the next formula. Be sure you can perform any of the commodity forward price calculations incorporating a combination of lease rates, storage costs, and convenience yields.

Returning to our basic expression relating spot and forward prices, the commodity forward price for time T with an *active lease market* is expressed as:

$$F_{0,T} = S_0 e^{(R_F - \delta_1)T}$$

where:

S_0 = commodity current spot price

$R_F - \delta_1$ = risk-free rate less the lease rate

The lease rate, δ_1 , is income earned only if the commodity is loaned out.

Example: Pricing a commodity forward with a lease payment

Calculate the 12-month forward price for a bushel of corn that has a spot price of \$5 and an annual lease rate of 7%. The appropriate continuously compounding annual risk-free rate for the commodity is equivalent to 9%.

Answer:

We can determine the 12-month forward price as follows:

$$F_{0,T} = (S_0) e^{(R_F - \delta_1)T} = \$5 \times e^{(0.09 - 0.07)(1)} = \$5.101$$

Contango and Backwardation

An upward-sloping forward curve indicates that forward prices for delivery more distant in time (i.e., forward contracts with longer maturities) are higher than shorter-term forward prices. The market is described as being in **contango** with an upward-sloping forward curve. A contango commodity market occurs when the *lease rate is less than the risk-free rate*. Based on the commodity forward formula, $F_{0,T} = S_0 e^{(R_F - \delta_1)T}$, if $(R_F - \delta_1) > 0$, then the forward price must be greater than the spot price.

The market is described as being in **backwardation** with a downward-sloping forward curve. A backwardation commodity market occurs when the *lease rate is greater than the risk-free rate*. Based on the commodity forward formula, $F_{0,T} = S_0 e^{(R_F - \delta_1)T}$, if $(R_F - \delta_1) < 0$, then the forward price must be less than the spot price.

Storage Costs

When holding a commodity requires storage costs, *the forward price must be greater than the spot price* to compensate for the physical storage costs (i.e., costs associated with constructing and maintaining a storage facility) and financial storage costs (i.e., interest). The owner of a commodity can either sell it today for a price of S_0 or for delivery at time T at the forward price. If the owner sells it at a forward price, this is known as *cash-and-carry* because the seller receives the cash but must store (i.e., carry) the commodity until the delivery date. The owner will only store the commodity if the forward price is greater than or equal to the expected spot price plus storage costs. This is represented mathematically as:

$$F_{0,T} \geq S_0 e^{R_F T} + \lambda(0, T)$$

where:

$\lambda(0, T)$ = future value of storage costs from time 0 to T

If storage costs are paid continuously and are proportional to the value of the commodity, then the no-arbitrage forward price becomes:

$$F_{0,T} \geq S_0 e^{(R_F + \lambda)T}$$

where:

λ = continuous annual storage cost proportional to the value of the commodity

Example: Commodity forward pricing with storage costs and effective interest

Calculate the 3-month forward price for a bushel of soybeans if the current spot price is \$3/bushel, the effective monthly interest rate is 1%, and the monthly storage costs are \$0.04/bushel.

Answer:

First, calculate the future value (at time T) of storage for three months, $\lambda(0, T)$, as follows:

$$\$0.04 + \$0.04(1.01) + \$0.04(1.01)^2 = \$0.1212$$

The amount \$0.1212 represents three months' storage costs plus interest. Next, add the cost of storage to the spot price plus interest on the spot price:

$$\begin{aligned} F_{0,T} &= S_0 e^{R_F T} + \lambda(0, T) \approx \$3.00(1.01^3) + \$0.1212 \\ &= \$3.0909 + \$0.1212 = \$3.2121 \end{aligned}$$

Example: Commodity forward pricing with storage costs and continuously compounded interest

Now assume that storage costs are paid continuously and are stated as a percent of the cost of the commodity. **Calculate** the 3-month forward price for a bushel of soybeans, if the current spot price is \$3/bushel, the continuously compounded annual interest rate is 12%, and the continuously compounding annual storage costs proportional to the value of the commodity is \$0.48/bushel or 16.0%.

Answer:

The 3-month forward price is:

$$F_{0,T} = S_0 e^{(R_F + \lambda)T} = \$3e^{(0.12 + 0.16)(3/12)} = \$3e^{0.07} = \$3.218$$

Convenience Yield

If the owners of the commodity need the commodity for their business, holding physical inventory of the commodity creates value. For example, assume a manufacturer requires a specific commodity as a raw material. In order to reduce the risk of running out of inventory and slowing down production, excess inventory is held by the manufacturer. This reduces the risk of idle machines and workers. In the event that the excess inventory is not needed, it can always be sold. Holding an excess amount of a commodity for a non-monetary benefit is referred to as *convenience yield*.

For the Exam: Here is a handy guide for relating forward and spot commodity prices on the exam.

Start with the basic expression relating forward and spot prices:

$$F_{0,T} = S_0 e^{R_F T}$$

This expression says that if there are no costs or benefits associated with buying and holding the commodity, the forward price is just the spot price compounded at the risk-free rate over the holding period.

If there are benefits (e.g., lease rates, convenience yield) to buying the commodity today, the holder is willing to accept a lower forward price. The forward price is reduced by the benefit, either the lease rate or convenience yield:

$$F_{0,T} = S_0 e^{(R_F - c)T} < S_0 e^{R_F T}$$

where c = the convenience yield, or

$$F_{0,T} = S_0 e^{(R_F - \delta)T} < S_0 e^{R_F T}$$

where δ = the lease rate

If there are costs, such as storage costs, associated with purchasing the commodity today, the forward price is increased by the cost:

$$F_{0,T} = S_0 e^{(R_F + \lambda)T} > S_0 e^{R_F T}$$

where λ = the storage costs

Of course, there can be combinations of costs and benefits, so in your discussion on the exam be sure to increase the exponent for costs and reduce it for benefits:

$$F_{0,T} = S_0 e^{(R_F + \lambda - c)T}$$

where λ = the storage costs

where c = the convenience yield (benefit)



Professor's Note: The lease rate (δ) compensates for the loss of the convenience yield less storage costs, so $\delta = c - \lambda$. Since the convenience yield (c) and storage costs (λ) are already incorporated into the lease rate (δ), any combination of the two symbols c and λ cannot appear in the exponent of the spot price at the same time with the lease rate (δ).

COMMODITY CHARACTERISTICS

Certain commodities exhibit unique properties that impact their forward prices. For example, gold, corn, natural gas, and oil are all examples of commodities with characteristics that differ with respect to storage costs, the ability to store, production costs, and seasonal demand. These differences are reflected in lease rates, storage costs, and convenience yields that influence the commodity forward prices and the shape of the forward curves.

Gold Forward Price Factors

Because gold can earn a return by lending it out, strategies for holding synthetic gold offer a higher return than holding just the physical gold without lending it out. When a positive lease rate is present, the synthetic gold is preferred to physically holding the gold because the lease rate represents the cost of holding the gold without having to lend it physically. In other words, by holding physical gold you sacrifice the lease rate and you incur storage costs.

The value of gold is also influenced by the costs of production. The present value of gold received in the future is simply the present value of the forward price computed at the risk-free rate of return. The total present value of gold production (i.e., the value of the gold mine) is calculated as:

$$\text{total PV of production} = \sum_{i=1}^n X_i (F_{0,i} - c_{p,i}) e^{-(R_{F,i})t_i}$$

where:

X_i = ounces of gold extracted (produced) in period i

$F_{0,i}$ = forward price today for delivery of one ounce at the end of period i

$c_{p,i}$ = production costs per ounce in period i

$R_{F,i}$ = risk-free rate over period i

Under this framework, the gold mine is assumed to operate the entire time, and production is known with certainty.



Professor's Note: You will not be required to perform this calculation. Gold is presented here only to show how production costs affect values. Note that the costs associated with mining gold are incorporated into the forward price, much like a storage cost.

Corn Forward Price Factors

Corn is an example of a commodity with seasonal production and a constant demand. Corn is produced in the fall of every year, but it is consumed throughout the year. In order to meet consumption needs, corn must be stored. Thus, interest and storage costs need to be considered. The price of the corn will fall as it is being harvested and then

rise to reflect the cost of storage until it is harvested again. Thus, the forward curve is increasing until harvest time, and then it drops sharply at harvest time and slopes upward again when the harvest is over.

Example: Corn commodity pricing with storage costs

Suppose the spot price today for a bushel of corn is \$2.25, the continuously compounded interest rate is 5.5%, and the storage cost is 2.0% per month. Calculate the 6-month forward price.

Answer:

$$F_{0,0.5} = \$2.25 \times e^{(0.00458 + 0.02)6} = 2.25 \times 1.15893 = \$2.61$$



Professor's Note: The 0.458% used for the monthly interest rate is the annual rate divided by 12.

Natural Gas Forward Price Factors

Natural gas is an example of a commodity with constant production but seasonal demand. Natural gas is expensive to store, and demand in the United States peaks during the winter months. In addition, the price of natural gas is different for various regions due to high international transportation costs. Storage is at its peak in the fall, just prior to the peak demand. Therefore, the forward curve rises steadily in the fall. The following example demonstrates how storage costs produce a positively sloped forward curve.

Example: Calculation of natural gas forward price with storage costs

Calculate the implied storage cost for natural gas for the month of October, if the October 2009 spot price is 4.071, the annual risk-free rate of interest is 6%, and the November forward price is 4.157.

Answer:

$$\$4.157 = \$4.071e^{0.005} + \lambda_{\text{Oct2009}}$$

$$\$4.157 = \$4.091 + \lambda_{\text{Oct2009}}$$

$$\$4.157 - \$4.091 = \lambda_{\text{Oct2009}}$$

$$\$0.066 = \lambda_{\text{Oct2009}}$$

Oil Forward Price Factors

The physical characteristics of oil make it easier than natural gas to transport; consequently, the price of oil is comparable worldwide. Lower transportation costs and more constant worldwide demand causes the long-run forward price to be fairly stable. In the short run, supply and demand shocks cause more volatile prices because supply is fixed. For example, the Organization of Petroleum Exporting Countries (OPEC) may decrease supply to increase prices by causing a shortage in the short run. Supply and demand adjust to price changes in the long run.

COMMODITY ARBITRAGE

LOS 38.b: Identify and explain the arbitrage situations that result from the convenience yield of a commodity and from commodity spreads across related commodities.

Convenience Yield

A convenience yield *cannot* be earned by the average investor who does not have a business reason for holding the commodity. The forward price, including a convenience yield and storage costs, is calculated:

$$F_{0,T} \geq S_0 e^{(R_F + \lambda - c)T}$$

where:

c = convenience yield

λ = storage costs

The commodity borrower (i.e., lessee) is willing to pay $\delta = c - \lambda$, which is the value of the convenience yield less the cost of storage. The value of the forward to the commodity borrower is calculated as follows:

$$F_{0,T} \geq S_0 e^{(R_F - \delta)T}$$

For the investor who does not earn the convenience yield, cash-and-carry arbitrage implies that:

$$F_{0,T} \leq S_0 e^{(R_F + \lambda)T}$$

Example: Impact of convenience yield on the no-arbitrage cash-and-carry commodity forward pricing range

Suppose the owner of a commodity decides to lend it, and the commodity has a continuously compounded convenience yield of c . What range of prices must represent the no-arbitrage cash-and-carry opportunity for an investor who recognizes a convenience yield?

Answer:

The owner of a commodity is able to create a range of no-arbitrage prices as follows:

$$S_0 e^{(R_F + \lambda - c)T} \leq F_{0,T} \leq S_0 e^{(R_F + \lambda)T}$$

The upper bound $(S_0 e^{(R_F + \lambda)T})$ depends on storage costs but not on the convenience yield. The lower bound $(S_0 e^{(R_F + \lambda - c)T})$ adjusts for the convenience yield and therefore explains why forward prices may appear lower at times, when a convenience yield is considered.

Commodity Spreads

A *commodity spread* results from a commodity that is an input in the production process of other commodities. For example, soybeans are used in the production of soybean meal and soybean oil. A trader creates a *crush spread* by holding a long (short) position in soybeans and a short (long) position in soybean meal and soybean oil.

Similarly, oil can be refined to produce different types of petroleum products such as heating oil, kerosene, or gasoline. This process is known as *cracking* and, thus, the difference in prices of crude oil, heating oil, and gasoline is known as a *crack spread*. For example, 7 gallons of crude oil may be used to produce 4 gallons of gasoline and 3 gallons of heating oil. Commodity traders refer to the crack spread as 7-4-3, reflecting the 7 gallons of crude oil, 4 gallons of gasoline, and 3 gallons of heating oil. Thus, an oil refiner could lock in the price of the crude oil input and the finished good outputs by an appropriate crack spread reflecting the refining process. However, this is not a perfect hedge because there are other outputs that can be produced (such as jet fuel and kerosene).

Example: Pricing a crack (i.e., crude oil) spread

Suppose we plan on buying crude oil in one month to produce gasoline and heating oil for sale in two months. The 1-month futures price for crude oil is currently \$118/barrel. The 2-month futures prices for gasoline and heating oil are \$125/barrel and \$133/barrel, respectively. Calculate the 5-3-2 crack (commodity) spread.

Answer:

The 5-3-2 spread tells us the amount of profit that can be locked in by buying 5 barrels of oil and producing 3 barrels of gasoline and 2 barrels of heating oil.

Profit for a 5-3-2 spread = $(3 \times \$125) + (2 \times \$133) - (5 \times \$118) = \$375 + \$266 - \$590 = \$51$ for 5 barrels or $\$51 / 5 \text{ barrels} = \$10.20/\text{barrel}$.



Professor's Note: There is no calculation for interest adjustment in this example.

BASIS RISK**LOS 38.c: Compare and contrast the basis risk of commodity futures with that of financial futures.**

As you may recall, *basis* is the difference between the spot price (or rate) and the price (or rate) of the futures contract used to hedge. If the values of both move together perfectly, an investor long or short the asset can lock in a return or value by selling or buying futures, respectively.



Professor's Note: When you expect to receive the commodity in the future, we say you are long the commodity, and you will hedge the value of the expected commodity by selling the corresponding futures contracts. If you will deliver the commodity in the future, you are short, and you will hedge by taking a long position in the corresponding futures contracts.

Any time the values of the spot and futures contracts do not move together perfectly, the hedger faces *basis risk*. An example with financial futures is using a basket currency futures contract to hedge the value of a transaction in an emerging market. Since the hedged asset (i.e., the emerging market currency) and the underlying in the futures contract are not identical, there is risk associated with changes in their *relative* values. Also, if the financial futures contract must be rolled over, or if it matures after the delivery date, this adds to the basis risk.

Since there are storage and transportation costs associated with commodities, hedgers face more concerns. As with financial futures, every commodity futures contract specifies a delivery amount and a delivery date. In addition, however, every commodity futures contract specifies a delivery *location* and the deliverable *grade* (i.e., quality). For example,

an investor planning to receive oil in New York City might use NYMEX futures, which specify delivery in Oklahoma. At the producer level, an Iowa corn farmer might use CBOT corn futures, which specify delivery in Chicago.

Strip hedges and **stack hedges** are prevalent in industries where producers sign agreements to deliver amounts of oil or other commodities in a sequential fashion. For example, an oil producer might have signed an agreement to deliver a fixed amount of oil each month for the next year. One method of hedging the price risk is to immediately go long in a series of forward contracts (i.e., a *strip hedge*) with delivery dates and amounts matching the agreement. In this fashion, the producer effectively locks in the monthly forward curve for the next year. Bid-ask spreads tend to widen as the contract maturity increases, however, because longer-term contracts can be very thinly traded (or even non-existent). This can make the strip hedge costly or even impossible to implement.

To help reduce transaction costs, the oil producer might instead utilize a *stack hedge*. To form a stack hedge, the oil producer would enter into a 1-month futures contract equaling the total value of the year's promised deliveries. As transactions costs are less for short-term (e.g., 1-month) contracts, the total cost of implementing this strategy is less than for a comparable strip hedge. At the end of the first month, the producer rolls into the next 1-month contract, and so forth, each month setting the total amount of the contract equal to the remaining promised deliveries. This strategy of continually rolling into the next near-term contract is referred to as *stack and roll*.

For the Exam: Basis risk is also examined in the context of currency risk management in Study Session 14, Topic Review 40. Know that when the basis changes, it can affect the value of the futures contract used as a hedging instrument. Be prepared for a question on basis risk as part of an item set in the afternoon session of the exam, especially comparing the differences in the basis risk of financial and commodity futures.

KEY CONCEPTS

LOS 38.a

The commodity forward price today is defined as a biased estimate of the expected spot commodity price at time T as follows:

$$F_{0,T} = \hat{S}_T e^{(R_F - \alpha)T}$$

The lease rate is defined as the amount of return the investor requires to buy and then lend a commodity. If an active lease market exists for a commodity, a commodity lender can earn the lease rate by buying a commodity and immediately selling it forward. The commodity market is in contango with an upward-sloping forward curve when the lease rate is less than the risk-free rate. The market is in backwardation with a downward-sloping forward curve when the lease rate is greater than the risk-free rate.

A commodity owner will only store the commodity if the forward price is greater than or equal to the spot price plus the future storage costs as follows: $F_{0,T} \geq S_0 e^{R_F T} + \lambda(0, T)$, where $\lambda(0, T)$ represents the future value of storage costs for one unit of the commodity from time 0 to T . If storage costs are paid continuously and are proportional to the value of the commodity, the no-arbitrage forward price becomes $F_{0,T} = S_0 e^{(R_F + \lambda)T}$.

Holding an excess physical inventory of the commodity creates non-monetary value for commodity owners who require the commodity as a production input. This is referred to as convenience yield, and the forward price including a convenience yield is calculated as $F_{0,T} \geq S_0 e^{(R_F + \lambda - c)T}$, where c is the continuously compounded convenience yield, proportional to the value of the commodity.

Gold, corn, natural gas, and oil are all examples of commodities with characteristics that differ with respect to storage costs, the ability to store, production costs, and seasonal demand. These unique differences influence the commodity forward prices and the shape of the forward curves.

LOS 38.b

A commodity used in production has a continuously compounded convenience yield of c , proportional to the value of the commodity. A range of prices that represent the no-arbitrage cash-and-carry opportunity for an investor who recognizes a convenience yield is:

$$S_0 e^{(R_F + \lambda - c)T} \leq F_{0,T} \leq S_0 e^{(R_F + \lambda)T}$$

The upper bound ($S_0 e^{(R_F + \lambda)T}$) depends on storage costs but not the convenience yield. The lower bound ($S_0 e^{(R_F + \lambda - c)T}$) adjusts for the convenience yield, and therefore explains why forward prices may appear lower at times when a convenience yield is considered.

LOS 38.c

Basis is the difference between the spot price (or rate) and the price (or rate) of the futures contract used to hedge. If the values of both move together perfectly, an investor long or short the asset can lock in a return or value by selling or buying futures, respectively. Any time the values of the spot and futures contracts do not move together perfectly, however, the hedger faces basis risk (i.e., an uncertain basis). As with financial futures, every commodity futures contract specifies a delivery amount and a delivery date. In addition, however, every commodity futures contract specifies a delivery location and the deliverable grade (i.e., quality).

CONCEPT CHECKERS

1. The spot price for a commodity is \$24. The annual lease rate is 6% for the commodity. The appropriate continuously compounding annual risk-free rate for the commodity is equivalent to 7%. The 6-month commodity forward rate is *closest* to:
 - A. \$23.91.
 - B. \$24.00.
 - C. \$24.12.

2. The current spot price for corn is \$3/bushel, the *effective* monthly interest rate is 1.5%, and the monthly storage costs are \$0.03/bushel. The 3-month forward price for a bushel of corn is *closest* to:
 - A. \$3.18.
 - B. \$3.23.
 - C. \$3.29.

3. Suppose that storage costs are paid continuously and are proportional to the cost of the commodity. **Calculate** the 3-month forward price for a bushel of corn if the current spot price is \$2.50/bushel, the continuously compounded annual interest rate is 10%, and the continuously compounding annual storage costs proportional to the value of the commodity are 14.4%. The 3-month forward price is *closest* to:
 - A. \$2.55.
 - B. \$2.66.
 - C. \$2.73.

4. Suppose the owner of a commodity decides to lend out the commodity. If the commodity has a continuously compounded convenience yield of c , proportional to the value of the commodity, which of the following *best* represents the lowest forward price?
 - A. $S_0 e^{(R_F + \lambda - c)T}$.
 - B. $S_0 e^{(R_F + \lambda)T}$.
 - C. $S_0 e^{(R_F - \delta_1 - c)T}$.

5. Suppose we plan on buying crude oil in one month to produce gasoline and heating oil for sale in two months. The 1-month futures price for crude oil is currently \$120/barrel. The 2-month futures prices for gasoline and heating oil are \$127/barrel and \$135/barrel, respectively. What is the 7-5-2 crack (commodity) spread?
 - A. \$9.29/barrel.
 - B. \$12.71/barrel.
 - C. \$14.50/barrel.

6. Which of the following is not an example of basis risk? Purchasing:
 - A. an oil contract with delivery in a different geographical region.
 - B. a Eurodollar contract, due to lack of commodity futures.
 - C. a commodity with a desired distant delivery with long-term contracts.

7. Which of the following commodities is an example of seasonal production and constant demand?
 - A. Gold.
 - B. Corn.
 - C. Natural gas.

ANSWERS – CONCEPT CHECKERS

1. **C** The 6-month forward rate is calculated as follows:

$$F_{0,T} = S_0 e^{(R_F - \delta)T} = \$24 \times e^{(0.07 - 0.06)0.5} = \$24.12$$

2. **B** First, calculate the future cost of storage for three months, $\lambda(0, T)$, as follows:

$$\$0.03 + \$0.03(1.015) + \$0.03(1.015)^2 = \$0.0914$$

The amount of \$0.0914 represents the 3-month storage costs plus interest. Next, add the cost of storage to the spot price plus interest.

$$F_{0,T} = S_0 e^{R_F T} + \lambda(0, T) \approx \$3.00(1.015^3) + \$0.0914 = \$3.1370 + \$0.0914 = \$3.23$$

3. **B** The 3-month forward price is:

$$F_{0,T} = S_0 e^{(R_F + \lambda)T} = \$2.50 e^{(0.10 + 0.144)3/12} = 2.50(1.0629) = \$2.657$$

4. **A** The owner of a commodity is able to create a range of no-arbitrage prices as follows: $S_0 e^{(R_F + \lambda - c)T} \leq F_{0,T} \leq S_0 e^{(R_F + \lambda)T}$. The lower bound adjusts for the convenience yield and, therefore, explains why forward prices may appear lower at times when the convenience yield is considered. The upper bound depends on storage costs but not on the convenience yield.

5. **A** The 7-5-2 spread tells us the amount of profit that can be locked in by buying 7 barrels of oil and producing 5 barrels of gasoline and 2 barrels of heating oil.

$$\begin{aligned} \text{Profit for a 7-5-2 spread} &= \\ (5 \times \$127) + (2 \times \$135) - (7 \times \$120) &= \$635 + \$270 - \$840 = \$65 \text{ for 7 barrels,} \\ \text{or } \$65 / 7 \text{ barrels} &= \$9.29/\text{barrel.} \end{aligned}$$

6. **C** Basis risk results from the inability of commodities to create a perfect hedge. Differences due to timing, grade, storage costs, or transportation costs create basis risk.
7. **B** Corn is an example of a commodity with seasonal production and a constant demand. Corn is produced in the fall of every year, but it is consumed throughout the year.