



CredGuild

STUDY NOTES

CFA® Program Level I

Alternative Investments

2027 curriculum · 7 readings · 23 practice questions

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ABOUT THIS EDITION

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USING THIS BOOK

These notes are a study aid. Use them alongside the CFA Institute curriculum. The latest version is free at credguild.com.

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Contents

How to use this book	1
Alternative Investments	2
80. Alternative Investment Features, Methods, and Structures	3
81. Hurdle Rate	11
82. Mezzanine Financing	19
83. Real Estate and Infrastructure	26
84. Natural Resources	34
85. High Water Mark	40
86. Introduction to Digital Assets	48
Keep going at credguild.com	60

How to use this book

These are the CredGuild notes for the 2027 CFA® Program Level I curriculum, Alternative Investments: 7 readings. They are the same notes as on credguild.com, set out for reading on paper or offline.

What each reading contains

- **What you'll learn:** the learning outcome statements the reading covers.
- **The notes, module by module:** worked examples, key concepts, common exam traps, exam shortcuts and a bottom line.
- **A quick check after each module:** one question with its answer and the full explanation.
- **Practice questions at the end, with the answers.** The full explanation for each one is free on the reading's page at credguild.com; the link is under the answers.

The coloured boxes

KEY CONCEPT

Definitions and formulas to know.

Example. A worked problem, step by step. Try it before you read the working.

COMMON EXAM TRAPS

Mistakes that cost marks.

EXAM SHORTCUTS

Faster ways through a question.

BOTTOM LINE

What to remember from the module.

Using it with the website

Paper is good for reading. Practice works better on the site: it scores each answer as you go, explains every option, keeps a list of the questions you got wrong and spreads the readings across the weeks before your exam. If you are not sure where to start, the free diagnostic test (credguild.com/cfa/level-1/diagnostic/) gives you a score in each topic.

If this book helps you, pass it on to someone else who is studying.

CFA® PROGRAM LEVEL I · TOPIC

Alternative Investments

Exam weight 6–9% · 7 readings

How alternative investments differ from stocks and bonds, how the funds are structured and paid, how their returns are measured, and the main types: private equity and debt, real estate and infrastructure, natural resources, hedge funds and digital assets.

Reading 80 Alternative Investment Features, Methods, and Structures

Reading 81 Hurdle Rate

Reading 82 Mezzanine Financing

Reading 83 Real Estate and Infrastructure

Reading 84 Natural Resources

Reading 85 High Water Mark

Reading 86 Introduction to Digital Assets

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ALTERNATIVE INVESTMENTS · READING 80

Alternative Investment Features, Methods, and Structures

What you'll learn

LOS 80.a Describe what alternative investments are, why investors hold them, their typical features and their three broad categories.

LOS 80.b Compare fund investing, co-investing and direct investing on control, fees, diversification, minimum size and expertise.

LOS 80.c Describe limited partnership structures and fee terms: management fees, performance fees, hurdles, catch-up, high-water marks, waterfalls and clawbacks.

MODULE 80.1

Alternative Investment Structures

This reading defines alternative investments, the reasons investors hold them and how they differ from traditional investments. It compares fund investing, co-investing and direct investing, and explains limited partnership structures, management and performance fees, hurdle rates, catch-up clauses, high-water marks, waterfalls and clawbacks, including how to calculate the fee under each hurdle.

LOS 80.a — What counts as an alternative investment

Traditional investments are long-only holdings of cash and publicly traded stocks and bonds. Anything outside that box is an **alternative investment**. Most alternatives are actively managed. They fall into three broad categories: private capital, real assets and hedge funds.

Why investors add them (perceived benefits)

- **Diversification:** returns have relatively low correlations with those of stocks and bonds, so adding them can reduce portfolio risk.
- Higher potential returns: investors may earn an illiquidity premium, and markets for some alternatives may be less efficient than public markets.

Typical features compared with traditional investments

KEY CONCEPT

Feature	Alternatives	Traditional
Manager knowledge	More specialized	Less specialized
Correlation with stocks/bonds	Relatively low	—
Liquidity of assets held	Less liquid	Liquid
Investor time horizon	Longer	Shorter/flexible

Feature	Alternatives	Traditional
Size of commitment	Larger	Smaller
Leverage	Used by some vehicles (LBO funds borrow heavily; hedge funds may use leverage and derivatives)	Long-only holdings of cash, stocks and bonds
Regulation and transparency	Less	More
Fees	Higher	Lower
Structures	Limited partnerships and other special legal forms, with management and performance fees	Mutual funds, directly held securities

Resulting characteristics

- Investment structures designed to let the manager invest directly in the underlying assets.
- **Information asymmetry** between managers and investors, which funds try to offset with incentive-based fees.
- Difficulty appraising performance: historical return and volatility data are scarce and less reliable.
- Correlations that are low *on average* can rise sharply during periods of economic stress.

Three broad categories

1. **Private capital: private equity** and **private debt**. Private equity funds hold shares of unlisted firms, or buy listed firms with the aim of delisting them; many targets sit in the mature or declining phase of their industry. Most private equity funds are **leveraged buyout** (LBO) funds, which finance the purchase of established firms largely with debt. **Venture capital** funds finance new firms with no track record, in their start-up and early phases. Private debt funds make direct loans, provide **venture debt** to young firms, or buy **distressed debt** of borrowers that are struggling with payments or are in bankruptcy.
2. **Real assets**: real estate, natural resources, infrastructure and other real assets.
 - Real estate covers residential and commercial property and real estate-backed debt. It can be held through outright or leveraged ownership of a building, a single property loan, private or listed securities whose collateral is a pool of properties or mortgages, or a limited partnership.
 - Natural resources are commodities, farmland and timberland. Commodity exposure can come from physical holdings, commodity derivatives (some funds track a commodity index with futures) or shares of commodity producers. Farmland earns lease income or income from crops and livestock; timberland earns cash flows from harvesting trees.
 - Infrastructure means long-lived assets that provide public services: economic infrastructure (roads, airports, utility grids) and social infrastructure (schools, hospitals). Governments often finance and build infrastructure, but more recently public-private partnerships have also taken large stakes in such projects, and an asset may later return to public ownership.
 - Other real assets include collectibles (art), intangibles (patents) and **digital assets** (cryptocurrencies).
3. **Hedge funds**: pooled vehicles open to qualified investors that may use leverage, short positions and derivatives. Despite the name, they do not necessarily hedge.

COMMON EXAM TRAPS

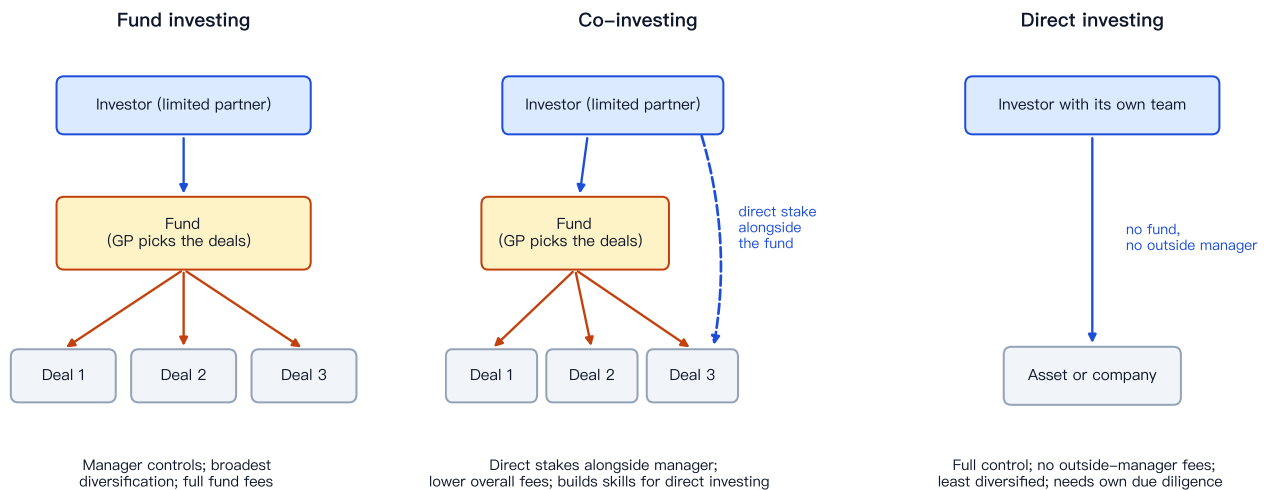
- Read the direction of a comparison. A question on how *traditional* investments differ wants the mirror image of the alternatives column: lower fees, greater liquidity, less specialized managers.
- Diversification rests on *low* correlation with stocks and bonds. An option that cites high correlation as a benefit is wrong, even though correlations can rise in a crisis.

LOS 80.b — Fund investing, co-investing and direct investing**KEY CONCEPT**

Method	What the investor does	Control	Fees	Diversification	Minimum size / expertise
Fund investing	Pools money with other investors; a fund manager selects and manages the assets	Manager controls	Management + incentive fees	Broadest	Lowest amounts; manager does the due diligence
Co-investing	Invests in the fund <i>and</i> has the right to invest directly alongside the manager in some deals	Investor takes selected direct stakes alongside the manager	Lower overall than pure fund investing	Moderate	Larger amounts; builds skills for direct investing
Direct investing	Buys assets itself (e.g., a sovereign wealth fund buying farmland or a private company)	Full control	No outside-manager fees	Least	Highest amounts; must do its own due diligence

A fund's **term sheet** sets out its investment policy, fee structure and the requirements investors must meet to participate.

The fee saving in co-investing comes from the part of the money that goes into a deal directly rather than through the fund, while the investor still relies on the manager to find and evaluate the deal. For the manager, allowing co-investment can bring in more capital and widen the scope and diversification of the fund.



Fund investing, co-investing and direct investing: where the investor's money goes

COMMON EXAM TRAPS

- A small investor who wants diversification, or one with no in-house deal team, belongs in fund investing, because the manager does the due diligence.
- Direct investing wins on control and fees but loses on diversification, minimum size and required expertise. The cheapest method is the wrong answer for an investor without scale or staff.

LOS 80.c — Ownership and compensation structures

Limited partnerships. The **general partner (GP)** is the fund manager: it makes all investment decisions and bears the partnership's liabilities, including its debt. The **limited partners (LPs)** are the investors: they own shares in proportion to their contributions, have no say in management and no liability beyond their investment. LP interests are usually limited to **accredited investors**, who have the wealth to bear significant risk and the sophistication to understand it, and a partnership typically caps the number of LPs it admits. LPs often commit an amount up front and contribute it over time as the GP calls capital.

- The **limited partnership agreement** holds the rules of the partnership.
- A **side letter** gives terms to one LP that others do not get (e.g., an **excusal right** to skip a capital call). A **most-favored-nation clause** requires that special terms granted to other LPs also be offered to this LP.
- A **master limited partnership (MLP)** is publicly traded; MLPs are common in natural resources and real estate.

Management fee. Typically 1%–2% a year, earned regardless of performance.

- Hedge funds: a percentage of **assets under management (AUM)**, usually the fund's NAV.
- Private equity funds: a percentage of **committed capital** rather than invested capital. Committed capital is **drawn down** over roughly three to five years, at the manager's discretion; undrawn commitments are **dry powder**. Charging on committed capital removes the incentive to invest quickly rather than selectively.

A fee quoted as "*m* and *p*" means an *m*% management fee and a *p*% performance fee, so "2 and 20" is a 2% management fee and a 20% incentive fee.

Calculating the performance fee

Performance fee. The **performance fee** (also **incentive fee** or **carried interest**) is a share of profits. It is usually paid only after a **hurdle rate (preferred return)** is reached: the minimum return the fund must earn before the GP receives any performance fee. Below the hurdle, the GP earns no performance fee at all.

- **Soft hurdle rate:** once the hurdle is met, the fee applies to the *whole* gain.
- **Hard hurdle rate:** the fee applies only to the gain *above* the hurdle.
- **Catch-up clause:** after LPs receive the hurdle return, the GP receives 100% of the next slice of gains until it has received its full share of all gains so far; after that, gains are split normally. The clause favors the GP.
- Performance fees are usually settled once a year. The base is typically the year's gain in the fund's investments net of the management fee and other charges, such as consulting and monitoring fees billed to portfolio companies. A fund's terms may instead compute the performance fee independently of the management fee, on the full gain.
- **High-water mark:** no performance fee on gains that only recover earlier losses. The fee is paid only on value above the highest previous net-of-fees value, so investors are never charged twice for the same gain. Each investor can have a different high-water mark.

With a performance fee rate p , a hurdle h and a fund return R at or above the hurdle (no fee if $R < h$):

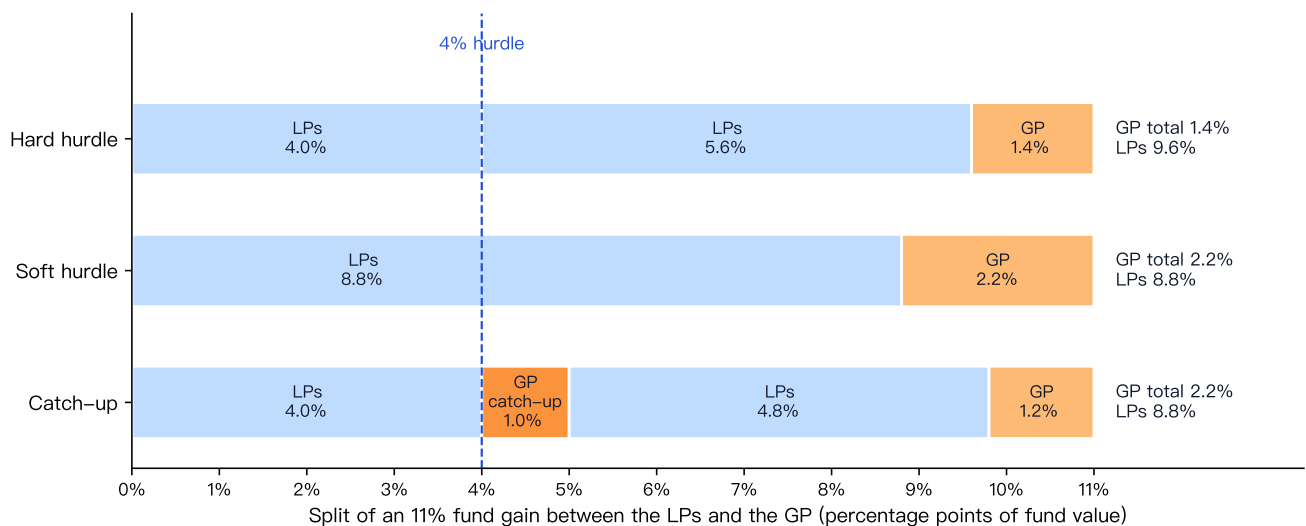
$$\text{Fee}_{\text{soft hurdle}} = p \times R \quad \text{Fee}_{\text{hard hurdle}} = p \times (R - h) \quad \text{full catch-up reached at } R = \frac{h}{1 - p}$$

With a full catch-up, the GP receives $R - h$ while R is between h and $h/(1 - p)$, and $p \times R$ once R is above that point.

Example. A fund earns 11% in a year with a 20% performance fee and a 4% hurdle.

$$\text{Soft hurdle: } 0.20 \times 11\% = 2.2\% \quad \text{Hard hurdle: } 0.20 \times (11\% - 4\%) = 1.4\%$$

With a catch-up instead, LPs get the first 4%, the GP gets 100% of the next slice until it holds 20% of the total. That total is $4\%/0.80 = 5\%$, so the GP's catch-up is 1%. The remaining $11\% - 5\% = 6\%$ is split 80/20, which gives the GP another 1.2%. The GP's total is $1\% + 1.2\% = 2.2\%$, exactly 20% of 11%.



Splitting an 11% gain with a 4% hurdle and a 20% performance fee

The catch-up gives the same result as a soft hurdle once the gain is large enough to complete the catch-up, here 5%. Between the 4% hurdle and 5%, the GP receives less than a soft hurdle would pay. Had the fund earned 4.6%, the GP would receive the whole 0.6% above the hurdle, less than its full 20% share of 0.92%.

Waterfalls and clawbacks

Waterfalls. A waterfall sets how realized profits are split between the GP and the LPs:

KEY CONCEPT

	Deal-by-deal waterfall (American waterfall)	Whole-of-fund waterfall (European waterfall)
When the GP is paid	As each investment is sold	Only after LPs get back 100% of their capital plus the hurdle
Who it favors	GP	LPs

The deal-by-deal waterfall favors the GP because carried interest is paid on each profitable exit before the LPs have received all of their contributed capital plus the hurdle return.

A **clawback provision** lets LPs recover incentive fees paid on earlier gains that are later reversed by losses on other deals. For example, if the GP took fees on early winners, the clawback makes sure the LPs still receive their agreed share (e.g., 80%) of the fund's total profit. A clawback is most valuable with a deal-by-deal waterfall.

COMMON EXAM TRAPS

- "Invested capital" is the usual wrong answer for a private equity fund's management fee base.
- Check whether the stated hurdle is soft or hard before computing the fee; the two give different answers from the same inputs. In the example, applying a hard hurdle as if it were soft gives a fee of 2.2% instead of 1.4%.
- Sort provisions by whom they favor. GP: catch-up clause, deal-by-deal (American) waterfall. LPs: high-water mark, clawback, whole-of-fund (European) waterfall.

- A high-water mark stops new fees until earlier losses are recovered; a clawback takes back fees already paid. Options often swap the two.

BOTTOM LINE

- Alternative investments are everything outside long-only holdings of cash and publicly traded stocks and bonds, and they fall into three broad categories: private capital, real assets and hedge funds.
- Investors add alternatives for diversification, because their returns have relatively low correlations with stocks and bonds, and for higher potential returns from an illiquidity premium and less efficient markets, although correlations that are low on average can rise sharply under economic stress.
- Compared with traditional investments, alternatives have more specialized managers, less liquid assets, longer horizons, larger commitments, less regulation and transparency, higher fees and scarce, less reliable return data.
- Fund investing gives the broadest diversification with the lowest amounts and leaves due diligence to the manager, co-investing lowers fees overall by putting part of the money directly into deals alongside the manager, and direct investing gives full control with no outside-manager fees but the least diversification and the highest size and expertise requirements.
- In a limited partnership the GP makes all investment decisions and bears the partnership's liabilities, while LPs own shares in proportion to their contributions, have no say in management and no liability beyond their investment.
- The management fee, typically 1%–2% a year regardless of performance, is charged on AUM for hedge funds and on committed capital for private equity funds.
- The performance fee is paid only once a hurdle rate is met, on the whole gain under a soft hurdle and only on the gain above the hurdle under a hard hurdle, and a high-water mark bars fees on gains that merely recover earlier losses.
- A deal-by-deal (American) waterfall and a catch-up clause favor the GP, a whole-of-fund (European) waterfall, a high-water mark and a clawback favor the LPs, and a clawback is most valuable with a deal-by-deal waterfall.

QUICK CHECK

Question 1

A trustee new to the investment committee of a family foundation asks what sets alternative investments apart as a group. Which statement is *most accurate*?

- A They trade in markets that tend to be more efficient than those for listed stocks and bonds.
- B They cover investments other than long-only holdings of cash and publicly traded stocks and bonds.
- C Their returns tend to be highly correlated with the returns on traditional investments.

Answer: B

Alternative investments are defined by exclusion: traditional investments are long-only positions in cash and publicly traded stocks and bonds, and everything else is an alternative. The group includes private capital, real assets such as real estate, infrastructure and natural resources, and hedge funds, which may use short positions, leverage and derivatives.

Why the other options are wrong

- **A.** The reverse holds. Markets for some alternatives are thought to be less efficient than public stock and bond markets, which is one reason investors hope to earn higher returns from them.
- **C.** Alternatives are valued for their relatively low correlation with stocks and bonds, which is the source of their diversification benefit. Correlations can rise in periods of stress, but they are not typically high.

Key takeaway Traditional means long-only cash, listed stocks and listed bonds. Anything outside that definition is an alternative investment. Alternatives tend to have relatively low correlation with traditional assets, and some trade in markets that may be less efficient.

Practice questions

Question 2

A large insurer is weighing whether to buy stakes in private companies itself instead of committing money to a private equity fund. Compared with fund investing, direct investing *most likely* offers:

- A** lower fees.
- B** broader diversification.
- C** smaller minimum investment amounts.

Question 3

A foundation holds stakes in both a hedge fund and a private equity fund. The management fee charged by the *hedge fund* is *most likely* calculated as a percentage of:

- A** assets under management.
- B** committed capital.
- C** invested capital.

Question 4

The partnership agreement of Halvorsen Growth Partners provides that, each time a portfolio company is sold, the profit on that sale is split between the general partner and the limited partners immediately, without waiting for the rest of the portfolio to be exited. This arrangement is *best* described as a:

- A** whole-of-fund waterfall.
- B** deal-by-deal waterfall.
- C** clawback provision.

Answers: 2. A · 3. A · 4. B

Why each answer is right and why each other option is wrong: credguild.com/cfa/level-1/notes/alternative-investments/alternative-investment-features-methods-and-structures/. The full bank has 26 questions on this reading.

ALTERNATIVE INVESTMENTS · READING 81

Hurdle Rate

What you'll learn

LOS 81.a Describe why alternative investment performance is hard to appraise: life-cycle timing (J-curve, IRR, money multiple), leverage, valuation (fair value hierarchy) and fees.

LOS 81.b Calculate and interpret alternative investment returns before and after management fees, performance fees, hurdle rates and high-water marks.

MODULE 81.1

Performance Appraisal and Return Calculations

This reading explains how to appraise alternative investments given the J-curve, leverage, hard-to-value assets and complex fee terms, and how IRR and MOIC differ. It then covers redemption terms and index biases and shows how to calculate returns before and after management and performance fees, with hurdles, high-water marks, fund-of-funds fees and waterfalls.

LOS 81.a — Appraising the performance of alternative investments

Alternative investments carry risks that an unleveraged, long-only stock or bond portfolio does not. Returns should, as far as possible, be judged with these in mind:

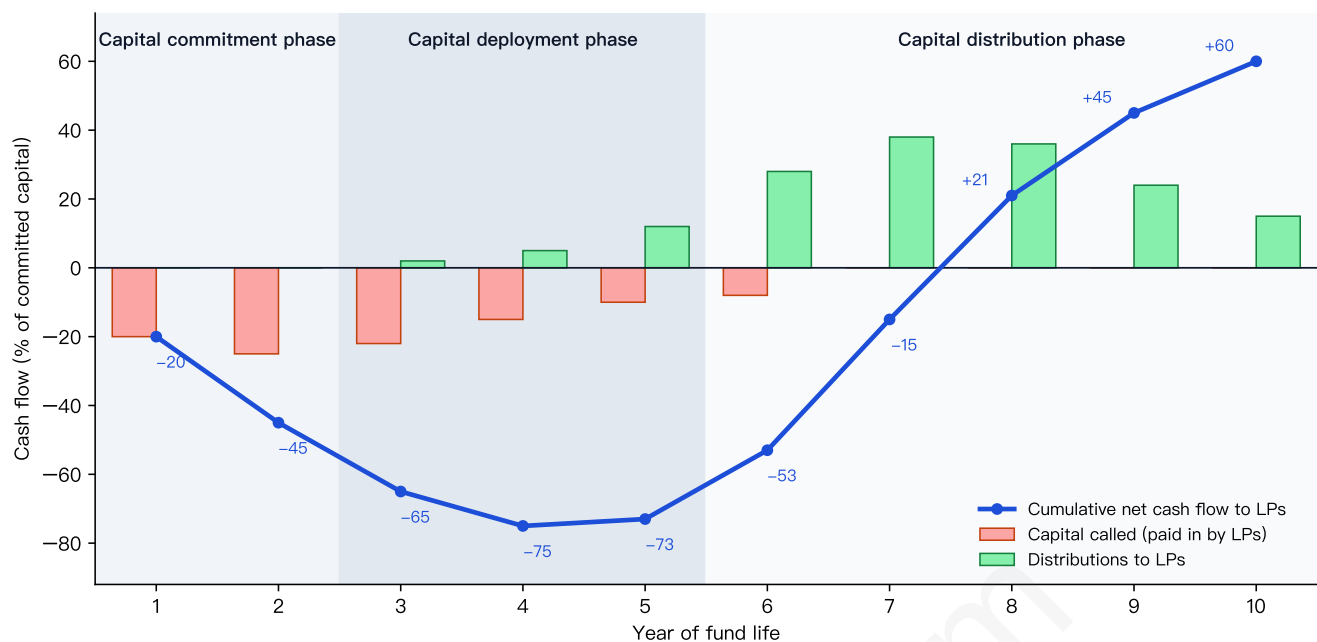
1. Timing of cash flows over the fund's life cycle
2. Use of leverage
3. Valuation of assets that may have no observable market price
4. Complexity of fees, taxes and accounting

Life cycle and the J-curve

KEY CONCEPT

Phase	What happens	Typical returns
Capital commitment phase	Manager finds deals and makes capital calls on LPs' commitments	Negative
Capital deployment phase	Capital is invested; manager works with the portfolio companies or projects	Still negative (especially for start-ups or troubled firms being turned around), but improving
Capital distribution phase	Investments produce income and are exited	Positive and rising, and may level off near the end of the fund's life

Plotting cumulative returns, or the LPs' cumulative net cash flow, against time gives the **J-curve effect**: an early dip followed by a steep rise. The dip comes from the timing of cash flows. Capital calls come first, and distributions start only after the investments begin producing income or are sold.



J-curve: capital calls come first and distributions later (commitment of 100)

Because the manager controls the timing and size of cash flows, the **IRR** (a money-weighted return) over the fund's life is the most appropriate performance measure. Its drawback is that it depends on assumed rates: a financing cost for the capital the investor contributes and a reinvestment rate for the distributions the investor receives. A simpler measure is the **multiple of invested capital** (MOIC), also called the **money multiple**:

$$\text{MOIC} = \frac{\text{total capital returned} + \text{value of remaining assets}}{\text{total capital paid in}}$$

It ignores timing, so it is considered somewhat naive.

Example. In the fund shown in the figure, LPs pay in 100 in total and receive 160 in distributions, with nothing left in the fund at the end, so $\text{MOIC} = 160/100 = 1.6\times$. The IRR on the same annual cash flows is about 11.3%. If every distribution arrived two years later, MOIC would still be $1.6\times$, but the IRR would fall to about 7.6%. The money multiple cannot see the delay; the IRR can.

Leverage

Hedge funds in particular may borrow through margin financing from **prime brokers** or gain leverage through derivatives. If a fund with equity V_0 borrows V_B at rate r_B and earns r on the whole portfolio:

$$\text{leveraged return} = \frac{r(V_0 + V_B) - r_B V_B}{V_0}$$

Example. $V_0 = \$40$ million, $V_B = \$20$ million, $r = 7\%$, $r_B = 3\%$.
 $(0.07 \times 60 - 0.03 \times 20)/40 = (4.2 - 0.6)/40 = 9.0\%$, versus 7% unleveraged.

Rearranging the formula shows where the extra return comes from:

KEY CONCEPT

$$\text{leveraged return} = r + \frac{V_B}{V_0} (r - r_B)$$

Leverage adds the spread between the portfolio return and the borrowing rate, scaled by the ratio of borrowing to equity. In the example, $7\% + 0.5 \times (7\% - 3\%) = 9\%$. The same ratio works against the fund when r is below r_B : if the portfolio returned -4% , the fund would return $-4\% + 0.5 \times (-4\% - 3\%) = -7.5\%$.

Some strategies use leverage because the pricing anomalies they exploit are too small to earn a meaningful return without it. Leverage also brings risks. **Margin calls** can force sales at bad prices, large forced sales can push prices down further, and lenders may cut off further borrowing.

Valuation: the fair value hierarchy

Level	Inputs	Examples
Level 1	Quoted prices in active markets	Exchange-traded securities
Level 2	Observable inputs, directly or indirectly (models)	Many derivatives
Level 3	Unobservable inputs; few or no transactions	Private equity, real estate

Level 3 values can stay near cost for long periods and may not reflect exit values. Because these values change little, reported returns are smoothed, so risk and correlation with traditional investments look lower than they really are. Exam convention: stale Level 3 values can also make reported returns appear higher (for example, when write-downs of assets that have lost value are delayed). Current practice: staleness by itself only smooths returns; a lag can hold back a gain as well as delay a write-down, so the direction of any effect on the average return is not fixed.

Fees are negotiable

Fee terms are negotiated and can differ by investor and by when the investor committed. As a result, different investors in the same fund can earn different returns.

COMMON EXAM TRAPS

- "Improving" in the deployment phase does not mean positive. Returns typically turn positive only in the distribution phase.
- Stale Level 3 values make a fund look *less* volatile and *less* correlated with public markets, not more.

LOS 81.b — Returns before and after fees**Redemption and fee terms**

Weak returns tend to trigger redemption requests, which, like margin calls, can force a fund to sell at bad prices and at bad times. Early returns are usually negative (the J-curve), so funds (hedge funds in particular) restrict early redemptions:

- **Lockup period:** time after the initial investment during which LPs cannot redeem, or can redeem only with significant fees.

- **Notice period:** time (typically 30–90 days) the fund has to meet a redemption request, so positions can be reduced in an orderly way.
- **Redemption fees** offset the manager's transaction costs. A **gate** lets the manager restrict redemptions temporarily.
- **Side letters** contain investor-specific terms that differ from the standard offering documents.
- **Founders class shares:** better fee or liquidity terms given to early investors.
- **Either-or fees:** each year the investor pays the *greater* of the management fee and the incentive fee. For example, under terms of 1% (management) or 30% (incentive), the investor pays 1% unless the incentive fee works out higher; the terms may also deduct a management fee paid from a later year's incentive fee.

"2 and 20" for single funds and "1 and 10" for funds of funds were once common, but fees are under competitive pressure. Larger commitments can negotiate lower fees, and investors can trade off lower fees against better liquidity (shorter lockup and notice periods). Hurdle rates, the choice of a hard or soft hurdle, and catch-up terms can also be negotiated.

Index biases

Index returns tell an investor little about alternatives as a group: no two funds are structured alike, and the funds in an index may be at very different stages of their life cycles. Comparing funds of the same **vintage year** deals with the second problem. **Survivorship bias** (failed funds drop out) is especially large for hedge funds, since by some estimates more than a quarter of them fail within their first three years; it overstates returns and understates risk. **Backfill bias** (managers add only their successful funds, with their history) may magnify the effect.

After-fee return mechanics

The simplest case has a management fee m on end-of-period assets, a performance fee p on the total gain and no hurdle:

$$\text{total fees} = mV_1 + \max[0, p(V_1 - V_0)] \quad r_{\text{after fees}} = \frac{V_1 - V_0 - \text{total fees}}{V_0}$$

Each of these provisions must be stated in the fund's terms (or the question); none should be assumed:

KEY CONCEPT

Provision	Effect on the performance fee
Net of management fee	Fee base = gain minus management fee
Independent of management fee	Fee base = full gain
Soft hurdle rate	Once the hurdle is met, fee on the whole gain
Hard hurdle rate	Fee only on the gain above the hurdle
High-water mark	Fee only on value above the highest previous net-of-fees value
Management fee on beginning vs ending assets	Changes the management fee amount

Steps for an after-fee return.

1. Compute the management fee on the stated asset base (beginning or end of the period).
2. Find the performance fee base: the gain above the high-water mark, or above the beginning value if there is none, after deducting the management fee if the performance fee is net of it.
3. Apply the hurdle, measured from the same reference value (the high-water mark or the beginning value).
Under a soft hurdle, the whole base earns the fee once the return clears the hurdle, and no fee is due if it does not. Under a hard hurdle, subtract the hurdle amount from the base.
4. Multiply the base by the performance fee rate. The fee is zero if the base is zero or negative.
5. Add the two fees, subtract them from the ending value and compute the return on the beginning value, as in the formula above.

Example. A \$60 million fund charges "2 and 20", with the management fee on year-end assets and the incentive fee net of the management fee. The gross return is 10%.

- $V_1 = 60 \times 1.10 = \$66$ million; management fee = $0.02 \times 66 = \$1.32$ million
- Incentive fee = $0.20 \times (66 - 60 - 1.32) = \0.936 million
- After-fee return = $(66 - 1.32 - 0.936)/60 - 1 = 6.24\%$

Example (high-water mark with a hurdle). A fund starts at \$40 million. It charges a 1% management fee on beginning-of-year assets and a 20% performance fee on gains net of the management fee, with a 5% hurdle and a high-water mark.

- Year 1: assets fall to \$36.4 million before fees. The management fee is $0.01 \times 40 = \$0.4$ million, so the year ends at \$36.0 million. No performance fee is due, and the high-water mark stays at \$40 million.
- Year 2: assets rise to \$44.36 million before fees. The management fee is $0.01 \times 36 = \$0.36$ million, which leaves \$44.0 million. The gain above the high-water mark is $44.0 - 40.0 = \$4.0$ million, a 10% return measured from \$40 million.
- Soft hurdle: 10% clears 5%, so the fee is $0.20 \times 4.0 = \$0.8$ million. The year ends at \$43.2 million, an after-fee return of $43.2/36.0 - 1 = 20.0\%$.
- Hard hurdle: the fee applies only above $40 \times 1.05 = \$42$ million, so it is $0.20 \times (44.0 - 42.0) = \0.4 million. The year ends at \$43.6 million, a return of $43.6/36.0 - 1 = 21.1\%$.

Without the high-water mark, the soft-hurdle fee would be charged on the whole $44.0 - 36.0 = \$8.0$ million rise, which is \$1.6 million. Half of that fee would be charged on the \$4.0 million that only recovers the Year 1 loss.

Fund of funds. An investor pays two layers of fees: the underlying funds' fees (already reflected in their net values) plus the fund of funds' own fees on top.

Example. An investor puts \$30 million into a fund of funds that charges "1 and 10", with both fees computed independently on year-end values. The fund of funds places \$18 million with one hedge fund and \$12 million with another. A year later the two stakes are worth \$20.4 million and \$13.2 million, net of the hedge funds' own fees.

- Gross year-end value = $20.4 + 13.2 = \$33.6$ million
- Management fee = $0.01 \times 33.6 = \$0.336$ million; incentive fee = $0.10 \times (33.6 - 30.0) = \0.36 million

- Net value = $33.6 - 0.336 - 0.36 = \$32.904$ million, a return of $32.904/30 - 1 = 9.68\%$

Holding the same two stakes directly would have returned $33.6/30 - 1 = 12\%$. The gap is the fund of funds' layer of fees.

Waterfalls and clawback. Under a deal-by-deal (American-style) waterfall, the GP earns a fee on each profitable exit even if other deals lose money. Under a whole-of-fund (European-style) waterfall, the fee is based on the net gain across all deals. A clawback lets LPs recover the excess so that total fees equal the agreed share of the fund's net gain.

Example. A fund with a 20% carried interest puts \$50 million into each of two companies. One is sold for \$70 million and the other for \$40 million in the same year. Deal-by-deal, the GP earns $0.20 \times 20 = \$4$ million on the winner and nothing on the loser. Whole-of-fund, the net gain is $110 - 100 = \$10$ million and the fee is \$2 million. A clawback returns $4 - 2 = \$2$ million to the LPs. The risk for LPs is greatest when the winners are sold before the losers: a deal-by-deal fee is paid on the early exit, and only a clawback recovers it once the later loss is realized. Exam convention: if the winning deal is sold in an earlier year than the losing deal, a performance fee computed year by year makes the whole-of-fund result the same as the deal-by-deal result. Current practice: a whole-of-fund waterfall pays the GP no carried interest until LPs have received all contributed capital (plus any hurdle), so an early winner on its own does not trigger a fee.

COMMON EXAM TRAPS

- Subtracting fee percentages from the return (e.g., "10% - 2% - 20%") gives a wrong answer; the fees are money amounts computed on assets and gains.
- Charging the incentive fee on the gross gain when the terms say net of the management fee (or the reverse) gives a distractor close to the key. In the "2 and 20" example, a fee on the full \$6 million gain is \$1.2 million and gives 5.80% instead of 6.24%.
- After a loss year, the prior year-end value is the wrong base for a fund with a high-water mark; the fee starts only above the previous peak. In the high-water mark example, measuring from \$36.0 million gives a soft-hurdle fee of \$1.6 million and a return of 17.8% instead of \$0.8 million and 20.0%.

EXAM SHORTCUTS

- Delaying distributions without changing their amounts leaves MOIC unchanged but lowers the IRR, so when only timing changes, MOIC can be ruled out as the measure that reflects it.

BOTTOM LINE

- Over a fund's life returns are negative in the capital commitment phase, still negative but improving in the deployment phase and positive in the distribution phase, the J-curve, which makes the IRR the most appropriate measure, while MOIC ignores timing.
- The leveraged return is $r + (V_B/V_0)(r - r_B)$, so borrowing adds return when the portfolio earns more than the borrowing rate and deepens losses when it earns less, and margin calls can force sales at bad prices.
- Level 3 values rest on unobservable inputs and change little, which smooths reported returns so risk and correlation with traditional investments look lower than they are; exam convention: stale values can also make returns look higher; current practice: staleness by itself only smooths, and the direction of

any effect on the average return is not fixed.

- Lockup periods, notice periods, redemption fees and gates restrict redemptions, and under either-or fees the investor pays the greater of the management fee and the incentive fee each year.
- Survivorship bias, especially large for hedge funds, overstates index returns and understates risk, backfill bias may magnify it, and comparing funds of the same vintage year deals with differences in life-cycle stage.
- An after-fee return requires the stated asset base for the management fee, whether the performance fee is net of or independent of the management fee, the type of hurdle and any high-water mark, none of which should be assumed.
- An investor in a fund of funds pays the underlying funds' fees, already reflected in their net values, plus the fund of funds' own fees on top.
- Under a deal-by-deal (American) waterfall the GP earns a fee on each profitable exit even if other deals lose money, a whole-of-fund (European) waterfall bases the fee on the net gain across all deals, and a clawback lets LPs recover the excess.

QUICK CHECK

Question 1

Two private equity funds each invested all of their investors' capital at inception and each made a single distribution. Fund Aldgate took in \$60 million; at the end of Year 4 it distributed \$84 million, and its remaining holdings were then valued at \$24 million. Fund Brixton took in \$50 million; at the end of Year 8 it distributed \$70 million, and its remaining holdings were then valued at \$20 million. Which statement is *most* accurate?

- A Each fund's MOIC is 1.40, because only distributed capital counts as returned.
- B Each fund's MOIC is 1.80, so the two funds earned the same annualized return.
- C Each fund's MOIC is 1.80, but Aldgate earned the higher annualized return.

Answer: C

The multiple of invested capital (MOIC) divides the total capital returned plus the value of the remaining assets by the total capital paid in. Both funds have a MOIC of 1.80. MOIC ignores the timing of cash flows, however. Aldgate reached 1.80 times its capital in four years and Brixton needed eight, so Aldgate's annualized return (its IRR) is much higher.

$$\text{MOIC} = \frac{\text{capital returned} + \text{value of remaining assets}}{\text{capital paid in}}$$

Aldgate: $(84 + 24)/60 = 1.80$. Brixton: $(70 + 20)/50 = 1.80$.

With one outflow at inception and all value measured at the end of year n , the annualized return (IRR) is $\text{MOIC}^{1/n} - 1$:

Aldgate: $1.80^{1/4} - 1 = 15.8\%$ a year. Brixton: $1.80^{1/8} - 1 = 7.6\%$ a year.

Why the other options are wrong

- **A.** 1.40 counts only the distributions (84/60 and 70/50). MOIC also includes the value of the holdings that have not yet been realized.
- **B.** The MOICs are equal, but MOIC says nothing about how long the capital was tied up. The same multiple earned over four years and over eight years implies annualized returns of 15.8% and 7.6%.

Key takeaway MOIC is simple to compute and interpret but ignores timing; the IRR accounts for when cash flows occur and is the preferred measure when the manager controls that timing.

Practice questions

Question 2

Brackwater Credit Partners, a hedge fund whose lockup period has expired for all investors, has a 10-day redemption notice period. It holds a few thinly traded corporate bonds, and each position is a large part of that bond's outstanding issue. In one month two issuers default, the fund's net asset value falls by 12%, its prime broker makes margin calls, and investors ask to redeem 40% of the partnership interests. The *most likely* result is that:

- A** the 10-day notice period gives the fund enough time to sell 40% of its holdings in an orderly way.
- B** forced sales are likely to push prices lower, deepen losses and prompt further redemption requests.
- C** prices received will be largely unaffected, since redemptions are paid only after the notice period.

Question 3

A private equity fund invests \$60 million in Ashby Robotics and \$40 million in Corran Freight. In the same year, Ashby is sold for \$81 million and Corran is liquidated for \$34 million. The general partner's carried interest is 20%, profits are distributed under a deal-by-deal (American-style) waterfall, and there is no clawback provision. The limited partners' return on the \$100 million, after carried interest, is *closest* to:

- A** 15.0%.
- B** 12.0%.
- C** 10.8%.

Answers: 2. B · 3. C

Why each answer is right and why each other option is wrong: credguild.com/cfa/level-1/notes/alternative-investments/hurdle-rate/. The full bank has 13 questions on this reading.

ALTERNATIVE INVESTMENTS · READING 82

Mezzanine Financing

What you'll learn

LOS 82.a Explain private equity categories (LBO, MBO/MBI, venture capital stages, minority/PIPE), exit routes, and risk/return features.

LOS 82.b Explain the types of private debt (direct lending, unitranche, mezzanine, venture, distressed) and their risk and return characteristics.

LOS 82.c Describe the diversification benefits of private capital and the importance of vintage year and the business cycle.

MODULE 82.1

Private Capital

This reading covers private capital: the main private equity strategies and exit routes, the types of private debt, the diversification private capital offers and the importance of vintage years.

LOS 82.a — Private equity: categories, exits, risk and return

Private capital is funding for companies that is not raised in public markets. It covers **private equity**, which is equity capital raised outside the public markets, and private debt (LOS 82.b). Private equity funds typically buy stakes in private companies, buy public companies in order to take them private (leveraged buyout funds), or back companies early in their lives (venture capital funds). The companies a private equity fund invests in are its **portfolio companies**.

Leveraged buyouts

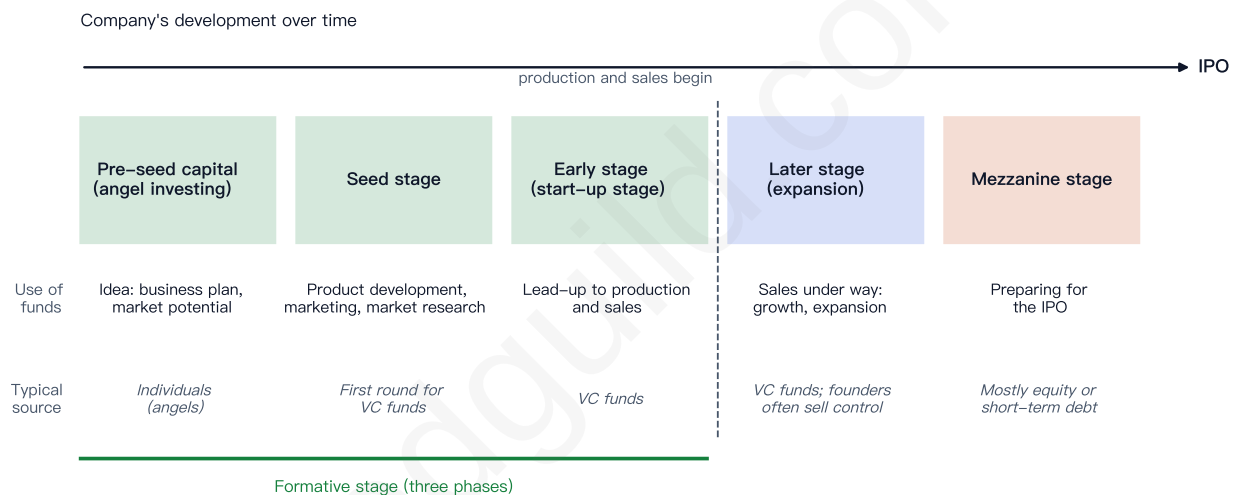
A **leveraged buyout (LBO)** fund buys a public company with debt financing a large percentage of the purchase price, taking it private. The fund then tries to improve operations so that the company's cash flows can service and repay the acquisition debt.

LBO type	Who runs the company afterwards
Management buyout (MBO)	The <i>existing</i> management team, which takes part in the purchase
Management buy-in (MBI)	A <i>new</i> management team brought in by the private equity manager to replace the current one

Venture capital

Venture capital (VC) funds back young companies, usually taking common equity, but sometimes **convertible debt** or **convertible preferred stock**. Convertibles align the interests of the VC investor and the founders while giving the VC investor a higher claim in liquidation. VC investors are hands-on: they often sit on boards or fill key roles. Risk is high, and returns can be very large.

Stage	Use of the money	Typical source or form
Formative stage: pre-seed capital / angel investing	Idea stage: business plans, assessing market potential	Individuals ("angels"), small amounts
Formative stage: seed stage (seed capital)	Product development, marketing and market research	Usually the first round in which VC funds take part
Formative stage: early stage (start-up stage)	Running the business in the lead-up to production and sales	VC funds
Later stage (expansion venture capital)	Growth after production and sales have begun (expansion, product improvement, marketing)	VC funds; founders often sell control
Mezzanine stage (mezzanine-stage financing)	Preparing the company for an initial public offering (IPO)	Mostly equity or short-term debt



Venture capital stages along a company's development path

"Mezzanine stage" describes timing (just before the IPO), not the type of security. **Mezzanine financing** is a separate term for hybrid debt–equity securities such as convertibles.

Minority equity investing

Minority equity investing (developmental capital) buys a less-than-controlling stake to fund growth or restructuring. When the company is public, this is a **private investment in public equity (PIPE)**, a private offering of the company's shares to institutional investors. A PIPE lets the company raise capital faster and more cheaply than a public offering, with fewer disclosures. The company stays listed.

Exit strategies (average holding period of about five years)

Exit	Buyer / mechanism	Notes
Trade sale	A strategic buyer , such as a competitor, via direct sale or auction	Buyer often pays a premium for synergies; faster and cheaper than an IPO; management may resist; few buyers
IPO	Shares sold to the public with underwriters	Most common listing route; usually the highest price and more visibility; high transaction and compliance costs, and the market may receive it poorly; best for large firms in growing industries with stable finances and a clear strategy
Direct listing	Shares listed without underwriters	Lower cost than an IPO because there are no underwriters. Exam convention: a direct listing floats existing shares and raises no new capital for the company. Current practice: some exchanges also permit a <i>primary</i> direct listing, in which the company sells new shares.
Special purpose acquisition company (SPAC)	"Blank check" company that raised cash to buy a private firm	Must complete an acquisition within a stated period or return the cash. More flexible than an IPO, less uncertainty about the portfolio company's valuation, and access to investors who deal regularly with the sponsors; drawbacks include dilution from SPAC shares and warrants, a gap between the SPAC's value and the target's value, deal risk, stockholder overhang and growing regulatory scrutiny
Recapitalization	Portfolio company issues debt to pay a dividend	Not a true exit: the fund keeps control but extracts cash
Secondary sale	Another private equity firm or group of investors	
Write-off/liquidation	None	Loss is recognized

Risk and return

Private equity has historically returned more than public equity, with a higher standard deviation (illiquidity and leverage risk). Indexes are self-reported and subject to **survivorship bias** and **backfill bias**, which overstate returns. Infrequent valuation of portfolio companies biases measured volatility and correlation with other assets downward.

COMMON EXAM TRAPS

- A question about the first round in which a VC *fund* invests wants the seed stage. Angel money comes earlier, but from individuals.
- A company with a finished product but no production or sales yet is at the early stage; later-stage (expansion) capital starts only once sales have begun.
- Selling to a competitor is a trade sale and selling to another private equity firm is a secondary sale. Options often swap the two.
- A PIPE leaves the company listed, while an LBO takes it private.

LOS 82.b — Private debt

Private debt is debt that investors provide directly to private entities. Its main types:

Type	Features	Relative risk
Direct lending	Loans made directly to private companies without an intermediary; usually senior and secured , with covenants. Exam convention: a leveraged loan is a loan made by a private debt fund that has borrowed money to fund its lending, so the fund's loan portfolio is leveraged. Current practice: in wider market usage (for example, CLO collateral), a leveraged loan is a loan to a highly indebted or low-rated borrower	Lowest of these five types
Unitranche debt	Secured and unsecured classes blended into one loan with a blended rate; ranks between senior and subordinated debt	Moderate
Mezzanine debt	Subordinated to senior secured debt, often unsecured; may carry warrants or conversion rights	High
Venture debt	Lending to start-ups that are not yet profitable; often convertible or paired with warrants; lets founders keep control	High
Distressed debt	Debt of mature companies in trouble (default, bankruptcy). Some investors look for sound companies with temporary cash flow problems and wait for recovery; others buy the debt to take an active role in restructuring or turning the company around	High

Private debt typically offers a higher return than traditional bonds to compensate for more risk (default, illiquidity). It adds diversification because its returns have relatively low correlation with traditional assets. Rates usually float over a reference rate such as SOFR. Senior private debt has steadier yields; mezzanine debt has more upside. Investing in private debt requires specialized knowledge of the debt's structure, the borrower's life cycle phase and, for secured loans, the underlying assets.

COMMON EXAM TRAPS

- In a comparison with traditional bonds, private debt offers the higher expected return. Options that give it greater liquidity or lower risk reverse the comparison.
- Warrants and conversion rights point to the riskier types (venture and mezzanine debt). Senior secured direct lending seldom carries them.

- The issuers of distressed debt are mature firms, not start-ups.

LOS 82.c — Diversification and vintage years

Private capital offers some diversification. Correlations of private capital index returns with public markets are reported at roughly 0.63–0.83.

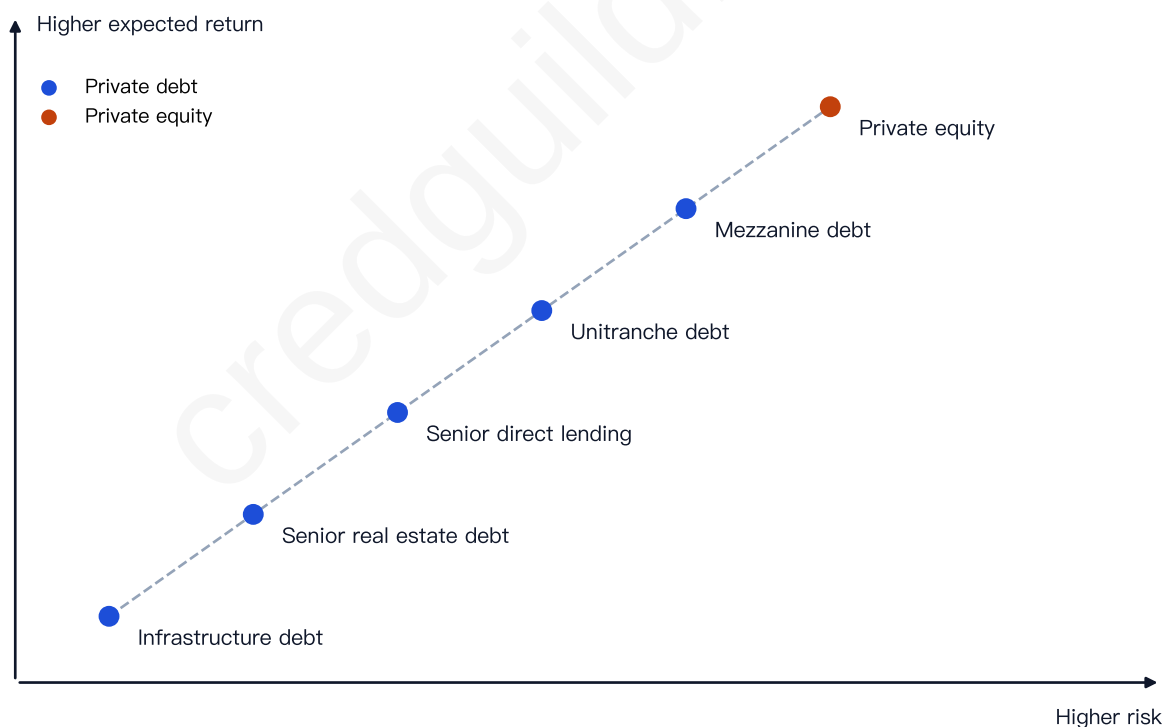
KEY CONCEPT

A fund's **vintage year** is the year it makes its **first investment**. This is not necessarily the year capital is first committed, because committed money may be deployed later. Vintage-year conditions matter a lot:

- Funds that start investing in a **business cycle expansion** tend to do better if they specialize in early-stage companies (venture capital).
- Funds that start investing in a **business cycle contraction** tend to do better if they specialize in distressed companies.

Investors should therefore **diversify across vintage years**.

Risk/return ranking (lowest to highest): infrastructure debt < senior real estate debt < senior direct lending < unitranche debt < mezzanine debt < private equity.



Risk and return across private capital categories

COMMON EXAM TRAPS

- Options that date a fund by its first commitment or its first exit are wrong; only the first investment sets the vintage year.

- A strong venture capital track record points to a vintage in an expansion.

EXAM SHORTCUTS

- Place a VC round by whether sales have begun: formative stages come before production and sales, later-stage capital comes after, and mezzanine-stage financing prepares for an IPO.

BOTTOM LINE

- An LBO fund buys a public company largely with debt and takes it private; an MBO keeps the existing management and an MBI brings in a new team.
- Venture capital runs from pre-seed (angel) and seed capital, the first round with VC funds, through early-stage and later-stage financing to mezzanine-stage financing before an IPO.
- Exit routes are a trade sale, an IPO, a direct listing, a SPAC, a secondary sale and a write-off; a recapitalization extracts cash but is not a true exit.
- A PIPE is a private sale of a listed company's shares, and the company stays listed.
- Among private debt types, direct lending carries the lowest risk, unitranche debt moderate risk, and mezzanine, venture and distressed debt high risk.
- Private equity indexes overstate returns through survivorship and backfill bias, and infrequent valuation understates volatility and correlation.
- A fund's vintage year is the year of its first investment, and investors should diversify across vintage years.

QUICK CHECK

Question 1

A private equity firm acquires Ashcombe Textiles in a leveraged buyout. As part of the deal, the firm removes Ashcombe's current executives and installs a leadership team it has recruited from outside the company. This transaction is *best* described as a:

- A management buyout.
- B management buy-in.
- C private investment in public equity.

Answer: B

In a management buy-in (MBI), the private equity manager replaces the company's existing management with a new team. In a management buyout, the existing team takes part in the purchase.

Why the other options are wrong

- **A.** In a management buyout, the *existing* management team participates in the purchase and stays on.
- **C.** A PIPE is a minority investment in a company that stays public. It is not a buyout of the whole company.

Key takeaway MBO = existing managers take part in the purchase; MBI = outside managers are brought in.

Practice questions

Question 2

A private equity fund exits its stake in Norquay Logistics by selling the company to Tidewell Freight, a larger rival in the same industry that expects cost synergies from the deal. This exit is *best* described as a(n):

- A secondary sale.
- B trade sale.
- C initial public offering.

Question 3

To make fair comparisons, a consultant groups private equity funds by vintage year, so that each group holds funds that began putting capital to work under similar market conditions. A fund's vintage year is the year in which it:

- A receives its first capital commitment.
- B makes its first investment.
- C exits its first investment.

Answers: 2. B · 3. B

Why each answer is right and why each other option is wrong: credguild.com/cfa/level-1/notes/alternative-investments/mezzanine-financing/. The full bank has 19 questions on this reading.

ALTERNATIVE INVESTMENTS · READING 83

Real Estate and Infrastructure

What you'll learn

LOS 83.a Explain real estate investment forms (public/private, debt/equity), direct vs. indirect investment, REIT types and real estate strategies.

LOS 83.b Explain the risk, return and diversification characteristics of real estate investments.

LOS 83.c Explain infrastructure categories, investment routes, cash-flow arrangements and greenfield/brownfield/secondary-stage assets.

LOS 83.d Explain the risk, return and diversification characteristics of infrastructure investments.

MODULE 83.1

Real Estate

This reading describes the forms of real estate investment, the benefits and drawbacks of direct and indirect ownership, REITs and the core to opportunistic strategies, and how real estate holdings range from bond-like to equity-like. It then describes infrastructure assets, their cash-flow arrangements and the greenfield, brownfield and secondary-stage categories, and compares their risk and return.

LOS 83.a — Features of real estate investments

Real estate earns **rental income** and may appreciate in price. Property divides into two main types, single-family residential and commercial. Within commercial property the four largest categories are office, rental residential (multifamily and single-family detached), retail (shopping) and industrial (warehouse and distribution).

The four basic forms (the real estate quadrant)

Investments are classified on two dimensions: public vs. private and debt vs. equity.

KEY CONCEPT

	Equity	Debt
Private	Direct ownership: sole ownership, joint ventures, limited partnerships (a GP manages the property and LPs such as pension plans invest). Indirect ownership: real estate funds, private REITs	Mortgage debt, construction loans, mezzanine debt
Public	Publicly traded shares: construction, operating and development companies, public REIT shares, UCITS, mutual funds and ETFs	Residential MBS , commercial CMBS , CMOs, covered bonds, mortgage REITs, mortgage ETFs

Each of the four forms has its own risk, expected return, regulation, legal issues and market structure.

- An **equity investor** owns the property (or shares of an owner) and controls decisions on borrowing, management and exit. Equity value = property value – outstanding debt.
- A **debt investor** is a lender. Its claim is secured by the property and ranks ahead of equity in default.

- Private investments are large, indivisible and illiquid. Public securities let investors split ownership without splitting the property, which gives liquidity and diversification across many properties. Direct private ownership needs property-management expertise; REITs and partnerships are professionally managed.

Direct investment

KEY CONCEPT

Benefits

Control over purchase, financing, improvements, tenants and timing of sale

Diversification (returns imperfectly correlated with stocks and bonds)

Tax benefits (noncash depreciation and interest deductions)

Drawbacks

Illiquidity and **price opacity** (properties trade rarely, so current prices are hard to observe)

Complexity of managing property

Need for specialized knowledge of current market conditions

High initial capital; **concentration risk** with few properties

Indirect investment and REITs

Indirect routes include limited partnerships and joint ventures, where the investor holds a stake in a partnership that owns the property, and publicly traded securities. The quadrant lists these partnerships under private direct ownership because the partnership itself owns the property. **REITs** are exempt from double taxation, which makes them a popular way to hold income-producing real estate. They have specialized managers and report GAAP metrics such as EPS; some also report net asset value. Exam convention: REITs trade on exchanges, so unlike mutual funds they face no redemption or liquidation risk; investors exit by selling shares to other investors. Current practice: a REIT keeps its tax exemption only if it distributes most of its taxable income, and **non-traded REITs** also exist; they have no exchange liquidity, and their redemption programs may be limited or suspended.

- Equity REITs** own property; **mortgage REITs** lend or buy MBS/CMBS; **hybrid REITs** do both.

Strategies (from least to most risky equity strategy)

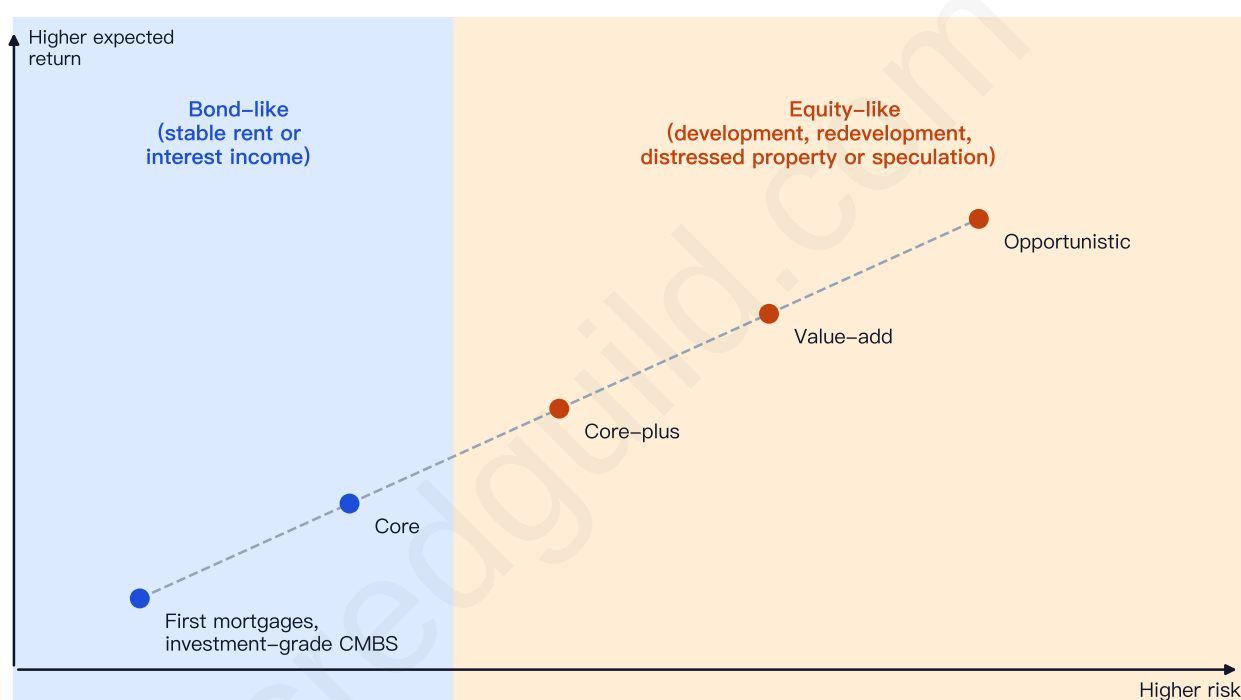
KEY CONCEPT

Strategy	What it does	Typical structure
Core	High-quality commercial and residential property; stable income	Open-end, indefinite life
Core-plus	A little more risk: modest development/redevelopment	Closed-end, finite life
Value-add	Larger-scale development/redevelopment	Closed-end, finite life

Strategy	What it does	Typical structure
Opportunistic	Large-scale redevelopment and repurposing, distressed property, market speculation	Closed-end, finite life

LOS 83.b — Investment characteristics of real estate

Real estate returns come from rental income, from price appreciation, or from both. The more a holding depends on steady income from leases, the more it behaves like a bond; the more it depends on gains from development or rising prices, the more it behaves like equity. First mortgages and investment-grade CMBS are the least risky real estate investments and behave much like bonds. Core strategies come next and are also bond-like, because their rent is stable and comes from many tenants. Core-plus, value-add and opportunistic strategies take on more risk in turn and are equity-like.



Real estate investments from bond-like to equity-like

- The diversification and liquidity that publicly traded REITs offer come with a cost: REIT returns are more correlated with equities than direct real estate returns are, and the correlation rises in steep market downturns.
- Even so, adding real estate improves the risk-return profile of a stock-and-bond portfolio.

Example. A closed-end fund buys an empty 1970s office block to convert into apartments. It has little current income and a large development budget, so it is an equity-like, value-add or opportunistic strategy rather than a bond-like core strategy.

COMMON EXAM TRAPS

- "Stable income from many tenants" and "open-end" describe core strategies. Both are wrong answers for a strategy built on development or redevelopment.

- Classify by the security held, not by the collateral: CMBS and mortgage REIT shares are public debt even though the underlying loans are private mortgages.
- The extra risk from owning a building directly, compared with listed stocks and bonds, is **liquidity risk**. Market risk is shared with traditional assets.

BOTTOM LINE

- Real estate investments are classified as public or private and as debt or equity; an equity investor owns the property and controls borrowing, management and exit decisions, while a debt investor's claim is secured by the property and ranks ahead of equity in default.
- Direct real estate gives control, diversification and tax benefits, but brings illiquidity, price opacity, management complexity, a need for specialized market knowledge, high initial capital and concentration risk.
- Exam convention: exchange-traded REITs face no redemption or liquidation risk, because investors exit by selling shares; current practice: a REIT keeps its tax exemption only if it distributes most of its taxable income, and non-traded REITs exist whose redemption programs may be limited or suspended.
- Equity real estate strategies run from least to most risky as core (high-quality property, stable income, open-end), core-plus, value-add and opportunistic (closed-end, finite life).
- The more a holding relies on steady lease income the more it behaves like a bond, and the more it relies on development or rising prices the more it behaves like equity, with first mortgages and investment-grade CMBS the least risky.
- Publicly traded REITs offer diversification and liquidity but are more correlated with equities than direct real estate, with the correlation rising in steep downturns, although adding real estate still improves a stock-and-bond portfolio's risk-return profile.

QUICK CHECK

Question 1

A pension fund buys a portfolio of commercial mortgage-backed securities. Within the basic four-quadrant classification of real estate investments, this holding is *best* classified as:

- A public equity.
- B private debt.
- C public debt.

Answer: C

Real estate investments are classified as public or private, and as debt or equity. CMBS are traded securities that give a claim on pools of commercial mortgages, so they are public debt.

Why the other options are wrong

- **A.** Public equity would be shares of an equity REIT or a real estate company, which are ownership claims rather than claims on mortgages.
- **B.** Private debt would be a mortgage or loan held directly. CMBS are traded securities.

Key takeaway Debt vs. equity = lender vs. owner; public vs. private = traded securities vs. privately held interests.

MODULE 83.2

Infrastructure

LOS 83.c — Features of infrastructure

Infrastructure assets are long-lived, capital-intensive assets that provide public services.

KEY CONCEPT

Category	Examples
Economic infrastructure: transportation	Roads, airports, ports, railways
Economic infrastructure: utilities and energy	Gas distribution, electricity generation and distribution, waste disposal and treatment
Economic infrastructure: information and communication technology	Telecom towers , cable systems
Social infrastructure	Prisons, schools, health care facilities (hospitals)

Economic infrastructure supports economic activity: it moves people and goods, supplies energy and water, and carries data. Social infrastructure serves people directly, for example through education, health care and justice.

Ways to invest. Build the asset and sell or lease it to the government or operate it; buy an existing asset from the government to lease back or operate; or join a **public-private partnership**.

Cash-flow arrangements

- **Availability payments:** paid for making the asset available, regardless of use.
- **Usage-based payments:** e.g., highway tolls.
- **Take-or-pay arrangements:** the buyer must pay a minimum price for an agreed volume, whether or not it takes delivery.

Stage of the asset

KEY CONCEPT

Type	Meaning	Cash-flow pattern
Greenfield investment	Assets still to be constructed ; typically follows build-operate-transfer (BOT)	Outflows while building, rising inflows once operating, then transfer to a government or third party
Brownfield investment	Expanding or privatizing an existing asset, e.g., a sale-leaseback with the government	Existing cash flows, though a newly privatized asset or sale-leaseback may have a short operating record

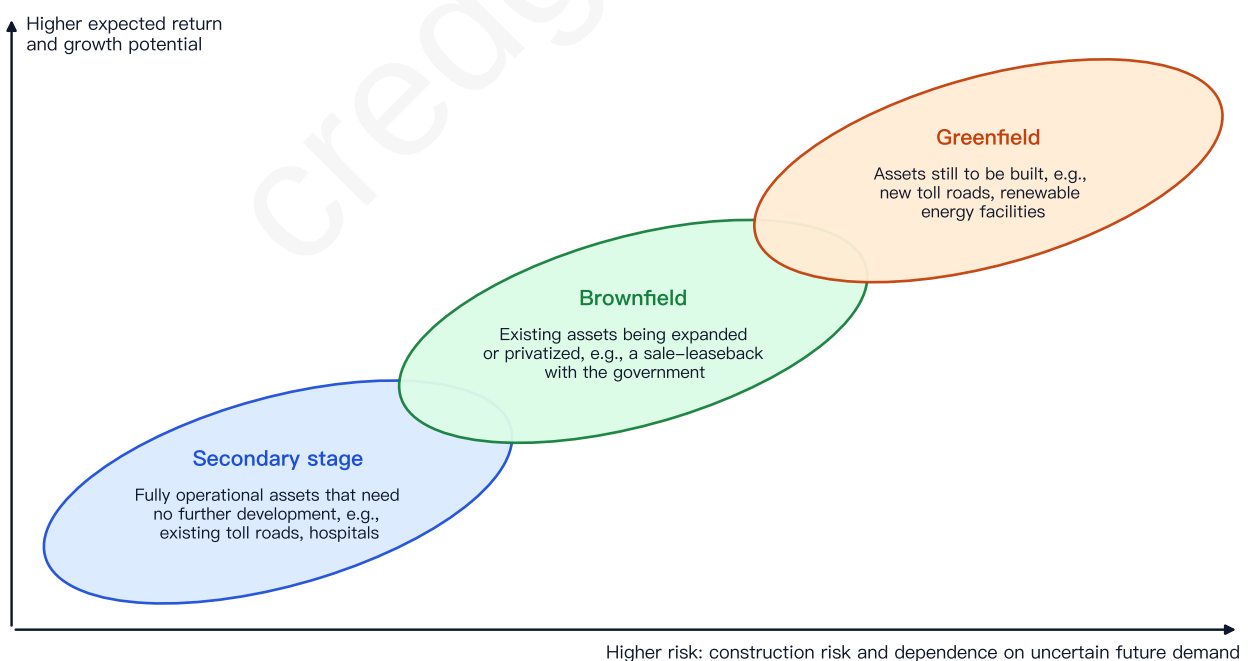
Type	Meaning	Cash-flow pattern
Secondary-stage investment (a type of brownfield investment)	Fully operational facility that needs no further development	Most predictable

Direct infrastructure investment, such as owning the asset or holding a first mortgage on it, is illiquid because the assets are huge and long-lived. Investors who want more liquidity can use **MLPs**, ETFs, mutual funds or private equity funds. The listed universe is small and concentrated in a few asset types. Infrastructure debt can be privately placed or publicly traded.

LOS 83.d — Investment characteristics of infrastructure

KEY CONCEPT

	Secondary-stage / brownfield	Greenfield
Cash flows	Stable, relatively high current yield	Uncertain; lower near-term yield
Growth potential	Little	Greater
Risk and expected return	Lower; secondary-stage assets (e.g., existing toll roads and hospitals) are the least risky and offer the lowest return	Higher (e.g., new toll roads, renewable energy facilities)



Infrastructure investments by stage of the asset

- Long-term contracts and barriers to entry make equity cash flows stable and give low correlation with public equities. Infrastructure debt tends to be safe and less cyclical.
- Greenfield projects in developing economies are risky but have produced attractive long-run returns as incomes rise.
- Risks: **regulatory risk**, financial leverage, cash flows below expectations, **construction risk** (building projects) and **operational risk** (privately operated assets).
- Suitable for long-term institutions: pension plans, life insurers, sovereign wealth funds.

How cash-flow arrangements shift risk. The contract behind the revenue matters as much as the asset.

Availability payments are made for making the infrastructure available, take-or-pay arrangements require the buyer to pay a minimum price for an agreed volume, and usage-based payments such as tolls depend on how much the asset is used. Projects that rely on revenue from uncertain future demand tend to be the riskiest. A toll road built to serve a city that has not yet grown is therefore riskier than a hospital leased to a health authority on an availability basis.

Example. A consortium plans a new solar farm that has not yet been built. It is a greenfield project with construction risk, early cash outflows, and the most risk and upside. Buying an existing, fully operating water-treatment plant would be a secondary-stage, lower-risk investment.

COMMON EXAM TRAPS

- A sale-leaseback of an existing asset is brownfield. Only an asset still to be built is greenfield.
- When an asset is fully operational and needs no further development, "secondary stage" is the more precise answer than "brownfield", even though it is a type of brownfield investment.
- Public use does not make an asset social infrastructure. Waste treatment, power grids and telecom towers are economic infrastructure; prisons, schools and health care facilities are social.
- An infrastructure ETF, mutual fund or MLP is an indirect investment; holding the first mortgage on a toll road counts as direct.

BOTTOM LINE

- Economic infrastructure covers transportation, utilities and energy (including waste disposal and treatment) and information and communication technology (including telecom towers), while social infrastructure covers prisons, schools and health care facilities.
- Infrastructure revenue comes from availability payments made regardless of use, usage-based payments such as tolls, or take-or-pay arrangements with a minimum price for an agreed volume, and the projects carrying the most risk are usually those whose revenue depends on demand that is still uncertain.
- A greenfield investment is an asset still to be constructed, typically under build-operate-transfer; a brownfield investment expands or privatizes an existing asset, for example through a sale-leaseback; and a secondary-stage investment is a fully operational brownfield asset needing no further development.
- Secondary-stage and brownfield assets have stable cash flows, a relatively high current yield, little growth potential and lower risk and return, with secondary-stage assets the least risky, while greenfield assets have uncertain cash flows, more growth potential and higher risk and expected return.

- Direct infrastructure investment is illiquid because the assets are huge and long-lived, and MLPs, ETFs, mutual funds and private equity funds offer indirect exposure with more liquidity.
- Infrastructure risks include regulatory risk, financial leverage, cash flows below expectations, construction risk and operational risk, and the assets suit long-term institutions such as pension plans, life insurers and sovereign wealth funds.

QUICK CHECK

Question 2

Which of the following is *least likely* to be classified as social infrastructure?

- A Schools.
- B Waste treatment facilities.
- C Health care facilities.

Answer: B

Waste treatment facilities are utility assets, which are part of economic infrastructure. Schools and health care facilities are social infrastructure.

Why the other options are wrong

- A. Schools are social infrastructure.
- C. Health care facilities are social infrastructure.

Key takeaway Utilities (power, gas, water and waste treatment) are economic infrastructure.

Practice questions

Question 3

Which type of infrastructure investment typically offers the highest risk and the highest potential return?

- A Greenfield.
- B Secondary stage.
- C Brownfield.

Answers: 3. A

Why each answer is right and why each other option is wrong: credguild.com/cfa/level-1/notes/alternative-investments/real-estate-and-infrastructure/. The full bank has 12 questions on this reading.

ALTERNATIVE INVESTMENTS · READING 84

Natural Resources

What you'll learn

LOS 84.a Explain the features, cash flows and investment characteristics of raw land, timberland and farmland.

LOS 84.b Describe commodity sectors, ways to gain commodity exposure, and futures pricing (cost of carry, convenience yield, contango and backwardation).

LOS 84.c Analyze the sources of risk, return and diversification for natural resource investments, including inflation hedging.

MODULE 84.1

Farmland, Timberland, and Commodities

This reading compares raw land, farmland and timberland, describes the commodity sectors and the ways to gain commodity exposure, and shows how a futures price follows from the spot price and the cost of carry, including contango and backwardation. It then covers the sources of commodity risk and return and the diversification and inflation-hedging role of natural resources.

LOS 84.a — Raw land, timberland and farmland

Natural resources include **raw land**, land used to grow crops or timber, and **commodities**. Exposure can be direct or through commingled vehicles (ETFs, REITs, limited partnerships, LLCs), as well as through derivatives such as commodity futures and swaps.

Common features of the three kinds of land:

- All are illiquid, and value is driven mainly by location. For farmland and timberland, value also depends on access to transport and markets, water and soil quality.
- Each type can produce lease income as well as gains from rising prices; farmland and timberland add income from what they produce (crops, livestock, timber).

KEY CONCEPT

	Raw land	Farmland	Timberland
Current cash flow	Little or none: no output, only possible lease income (value mainly from appreciation or development)	Most steady: annual crop sales or lease income	Yes, but the owner chooses <i>when</i> to harvest
Typical owners	Institutions	Mostly individuals (farmland REITs open access to retail investors)	Institutions; lot sizes much larger than farmland

	Raw land	Farmland	Timberland
Special features	None	Crops must be harvested within a short window; farmers often short commodity futures to hedge the harvest	Harvest timing is flexible: trees keep growing if prices are low; expertise available through timberland investment management organizations (TIMOs)

Financing choices for farmland and timberland are narrower than for residential or commercial real estate and consist mainly of bank loans or direct private debt. Because crops and trees absorb carbon, they appeal to investors with an ESG climate focus.

Risks. Low liquidity, weather-dependent cash flows, and losses from natural disasters.

LOS 84.b — Commodities and how to gain exposure

Sectors. Commodity sectors are **metals** (base/industrial, such as copper and aluminum, and precious, such as gold and silver), **agricultural products** (grains, livestock, coffee) and **energy** (crude oil, natural gas, coal). Contracts also specify **grade** (quality) and **delivery location**. Governments influence supply and demand. They may subsidize food crops for consumers or support prices for farmers, control access to extractable resources, or take part in production themselves. Climate-related regulation can reduce demand for fossil fuels and increase demand for lithium, cobalt, nickel and similar minerals.

Ways to gain exposure. Derivatives are the most common route:

Vehicle	Key points
Physical commodity	Possible (e.g., gold, grain) but has storage and transport costs
Futures, forwards, options on futures	Exchange-traded futures have no counterparty risk, because the clearinghouse guarantees performance
Exchange-traded products (ETPs): ETFs and ETNs	Trade on exchanges like shares and can track prices or indexes. Exam convention: ETPs, both ETFs and ETNs, suit investors who are limited to buying equity shares. Current practice: an ETN is an unsecured debt note of its issuer and carries issuer credit risk, so an equity-only investor would normally need its mandate to allow debt before holding one; an ETF 's fund shares raise no such problem
Managed futures funds (e.g., run by commodity trading advisers, CTAs)	Actively managed; may be sector-focused or diversified; structured as LPs (hedge-fund-like fees and investor restrictions) or as publicly traded mutual-fund-style shares (lower minimums, more liquidity)
Separately managed accounts (SMAs)	For large investors that want customized portfolios
Specialized funds	Focus on one commodity sector, such as oil and gas, grains, precious metals or industrial metals; can use any of the structures above

Commodity valuation: cost of carry

Holding a commodity today costs financing and storage (warehousing, insurance, spoilage), but it also gives the **convenience yield**. This is the nonmonetary benefit of having the physical good available to use over the life of the contract. A futures buyer does not have the good until delivery and so gives up this benefit, which is why the convenience yield lowers the futures price while financing and storage costs raise it.

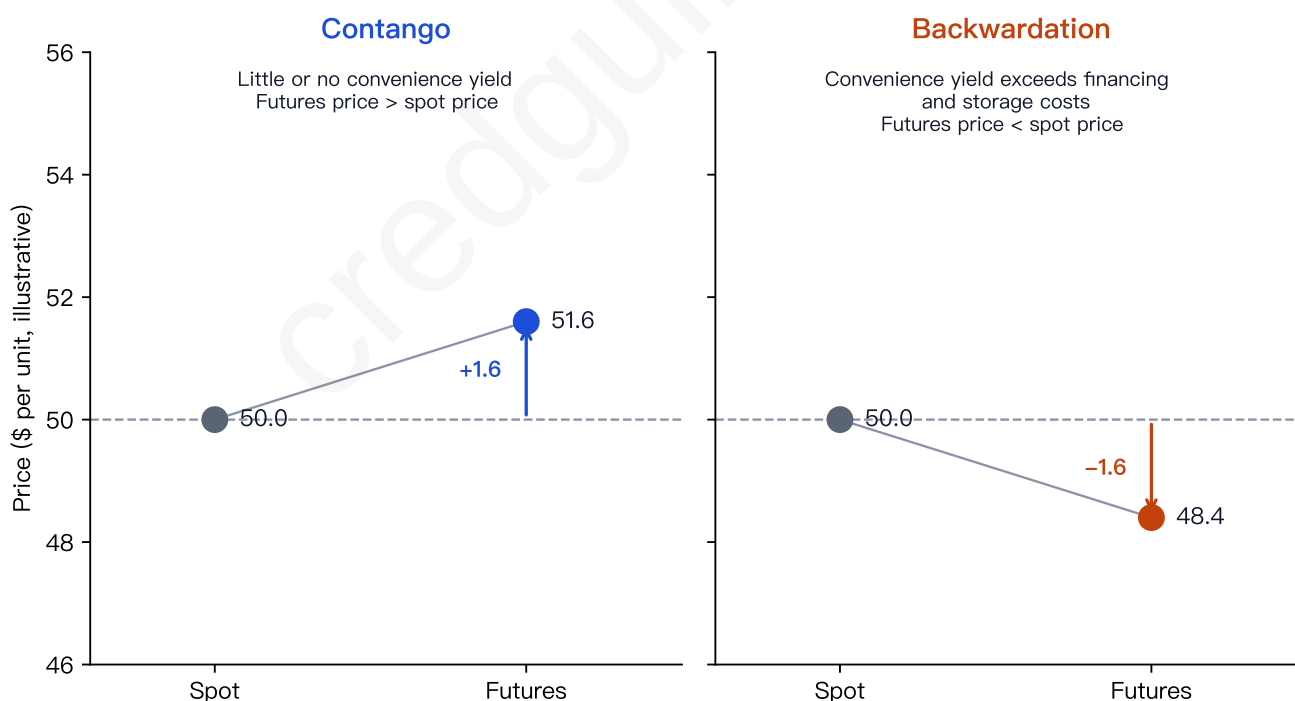
KEY CONCEPT

$$\text{futures price} \approx \text{spot price} \times (1 + r_f) + \text{storage costs} - \text{convenience yield}$$

Equivalently, futures price = spot price + **net cost of carry**.

KEY CONCEPT

Situation	Net cost of carry	Futures vs. spot	Market classification	Effect on long-only investors
Little or no convenience yield	Positive	Futures > spot	Contango	Lowers returns
Convenience yield > storage (and financing) costs	Negative	Futures < spot	Backwardation	Raises returns



Futures prices compared with spot: contango and backwardation (illustrative prices)

To classify a market from a list of prices, compare each futures price with the spot price: futures above spot indicate contango, and futures below spot indicate backwardation. This spot comparison is separate from the slope of the futures term structure, which describes how futures prices change across maturities; futures can all

be above spot without rising at every maturity. When storage costs and the convenience yield are equal, they cancel, so the futures price exceeds the spot price by the financing cost alone whenever the risk-free rate is positive.

Example. Copper spot \$9.00/lb, 3% financing for the period, storage \$0.12, convenience yield \$0.05.
 $F \approx 9.00 \times 1.03 + 0.12 - 0.05 = \9.34 , which is above spot, so the market is in contango.

LOS 84.c — Sources of risk, return and diversification

Prices come from supply and demand. Demand depends on the value to end users and on global economic conditions. Supply depends on production, storage costs and inventories.

- Supply is **inelastic in the short run** (drilling wells or planting crops takes time), so prices can swing sharply over the economic cycle or after supply shocks such as natural disasters.
- Weather and plant disease drive agricultural output. Poor harvests mean high prices; bumper crops mean low prices.
- Extraction costs rise as producers turn to more expensive methods or more remote sites.
- Forecasters watch inventories, production forecasts, government policy and economic growth.

Return and risk history

In recent decades:

Asset	Returns	Volatility
Commodities	Higher than global stocks or bonds	Higher than global stocks or bonds
Timberland and farmland	Higher average returns	Lower than global stocks, similar to global bonds

Speculators who correctly anticipate short-term commodity price moves can earn high returns over short periods.

Farmland and timberland returns come from selling what the land produces and from changes in land values. Timberland values also move with the lumber price outlook and with the volume of timber already cut. Farmland returns depend on crop prices and on crop quality and quantity.

Portfolio benefits

- Diversification: historically low correlation with global equities and bonds.
- **Inflation hedge:** commodity prices tend to move with inflation, so commodities have tended to outperform stocks and bonds when inflation is high and to underperform when it is low.
- Simply holding a commodity produces no current income; the holder gains only if the price rises.
- Commodity prices are especially sensitive to geopolitical and weather risks.

COMMON EXAM TRAPS

- Options that call convenience yield a cash payment, or say it raises the futures price, confuse it with income or with storage costs. In the copper example, adding the \$0.05 convenience yield instead of subtracting it gives \$9.44 instead of \$9.34.

- A *negative* net cost of carry means backwardation and higher long-only returns. Pairing negative carry with contango is the usual wrong statement.
- The inflation hedge rests on a *positive* correlation between commodity prices and inflation. An option that cites a negative correlation is wrong.
- "Current income" is the wrong answer when asked for a benefit of holding commodities.
- Timberland's flexibility to delay the harvest is not shared by farmland, whose crops must be harvested within a short window.

EXAM SHORTCUTS

- When storage costs equal the convenience yield they cancel, so with a positive risk-free rate the futures price exceeds the spot price by the financing cost alone and the market is in contango.

BOTTOM LINE

- Raw land, farmland and timberland are illiquid and valued mainly by location; raw land produces little or no current cash flow, farmland has the steadiest income, and timberland lets the owner choose when to harvest, whereas farm crops must be harvested within a short window.
- Derivatives are the most common route to commodity exposure, and exchange-traded futures carry no counterparty risk because the clearinghouse guarantees performance.
- Exam convention: commodity ETPs, both ETFs and ETNs, suit investors limited to buying equity shares; current practice: an ETN is an unsecured debt note carrying issuer credit risk, so an equity-only mandate would normally have to allow debt before holding one.
- The futures price is approximately $\text{spot} \times (1 + r_f) + \text{storage costs} - \text{convenience yield}$, the convenience yield being the nonmonetary benefit of holding the physical good, which lowers the futures price.
- A positive net cost of carry puts futures above spot (contango) and lowers long-only returns, while a negative net cost of carry puts futures below spot (backwardation) and raises them.
- Commodity supply is inelastic in the short run, so prices can swing sharply over the economic cycle or after supply shocks such as natural disasters.
- In recent decades commodities have had higher returns and higher volatility than global stocks or bonds, while timberland and farmland have had higher average returns with volatility below global stocks and similar to global bonds.
- Commodities have historically offered diversification through low correlation with global equities and bonds and an inflation hedge because their prices tend to move with inflation, but holding them produces no current income.

QUICK CHECK

Question 1

An investor in land-based natural resources wants the most regular annual cash flow. Which of the following is *most likely* to provide it?

- A Timberland.
- B Farmland.

C Raw land.

Answer: B

Farmland produces income every year from leasing the land or from selling crops, which must be harvested within a short window. It therefore has the steadiest cash flows of the three.

Why the other options are wrong

- **A.** Timberland produces cash flow, but the owner decides when to harvest: it can let the trees keep growing when prices are low. Its cash flows are therefore less regular.
- **C.** Raw land produces no output to sell. It may earn some lease income, but its return comes mainly from price appreciation, so it offers the least regular cash flow.

Key takeaway Cash-flow steadiness: farmland > timberland > raw land.

Practice questions

Question 2

For a particular commodity, the convenience yield outweighs the storage and financing costs of holding the physical good. In this situation:

- A** the spot price is below the futures price.
- B** long-only futures investors see lower returns.
- C** the forward curve exhibits backwardation.

Question 3

Which of the following is *least likely* to be a benefit of adding commodities to a portfolio of stocks and bonds?

- A** Current income.
- B** Diversification.
- C** Inflation hedge.

Answers: 2. C · 3. A

Why each answer is right and why each other option is wrong: credguild.com/cfa/level-1/notes/alternative-investments/natural-resources/. The full bank has 11 questions on this reading.

ALTERNATIVE INVESTMENTS · READING 85

High Water Mark

What you'll learn

LOS 85.a Explain what distinguishes hedge funds from other asset classes and vehicles, including their main strategy families and liquidity terms.

LOS 85.b Describe the legal forms and vehicles for hedge fund investing: partnerships, commingled funds, SMAs, master-feeder structures and funds of funds.

LOS 85.c Analyze hedge fund return sources, risk-adjusted comparison, index biases and diversification benefits.

MODULE 85.1

Hedge Funds

This reading describes what distinguishes hedge funds from other vehicles, their four strategy families and their liquidity and fee terms, including the high-water mark. It then covers their legal forms, separately managed accounts, master-feeder structures and funds of funds, and explains where hedge fund returns come from, how index biases distort reported performance and how to compare funds on a risk-adjusted basis.

LOS 85.a — What makes a hedge fund different, and the main strategy families

A **hedge fund** is a privately offered pool of capital. Access is normally limited to investors who clear a wealth or sophistication threshold (accredited, qualified or institutional investors). Because it is not sold to the general public, it faces far lighter regulation than a mutual fund or ETF, and the manager enjoys a broad mandate: long and short positions, leverage, derivatives, and securities across many markets. Hedge funds began as long/short vehicles meant to earn positive returns in any market, but they now pursue a wide variety of strategies.

Key features:

- **Return drivers:** hedge funds try to profit from market inefficiencies (mispricings) and from volatility rather than from simply owning the market.
- **Holdings:** mostly liquid assets, chiefly the traditional asset classes of debt and equity, along with derivatives. Leverage and derivatives mean the fund's risk/return profile can look very different from the assets it holds.
- **Performance evaluation:** usually on an absolute (total) return or risk-adjusted basis instead of against a conventional benchmark, because the strategies do not map neatly onto any market index.
- **Alignment:** managers often co-invest their own money. Incentive fees are commonly subject to a **high-water mark**, so a fee is earned only on value above the fund's previous peak.
- **Versus other vehicles:** hedge funds are privately held. Exam convention: mutual funds, REITs and ETFs are all publicly traded. Current practice: private (non-traded) REITs also exist, so the contrast holds for publicly offered REITs. Compared with private equity, hedge funds hold more liquid assets, have a shorter horizon and allow periodic redemptions, while private equity capital is committed for many years. Both are usually structured as limited partnerships, but a hedge fund charges its management fee on assets under management, while a private equity fund charges it on committed capital.

Strategy families

KEY CONCEPT

Family	Core idea	Sub-strategies	Typical net exposure
Equity hedge	Long and short positions in listed equities (or equity derivatives/indexes)	Fundamental long/short; fundamental growth; fundamental value; market neutral; short bias	Varies: long/short and growth usually net long; market neutral near zero; short bias net short
Event-driven	Profit from corporate events such as takeovers, distress, activism, spin-offs	Merger arbitrage; distressed/restructuring; activist shareholder; special situations	Usually net long
Relative value	Buy one security, short a related one, and profit when the price gap between them closes	Convertible arbitrage fixed income; specific fixed income (ABS, MBS, high yield); general fixed income; multistrategy	Paired long and short positions can reduce broad market exposure
Opportunistic	Top-down bets on macro trends and commodity/financial futures	Macro; managed futures (CTAs)	Can be long or short any asset class

Equity hedge and event-driven managers mostly build positions company by company (bottom-up analysis). Macro managers start from views on the economy as a whole (top-down analysis).

Equity hedge sub-strategies

- *Fundamental long/short*: long undervalued names picked by fundamental research, short a basket or index to trim market risk; most run a long bias. A manager with no negative view on particular stocks can take the hedging short in a market index.
- *Fundamental growth*: long companies expected to keep growing revenue and earnings quickly (seeking capital appreciation); short low- or no-growth firms; net long.
- *Fundamental value*: long shares judged cheap versus intrinsic value, short shares judged expensive; results track value versus growth.
- *Market neutral*: longs and shorts of roughly equal size so that broad market moves cancel; profits come from relative moves; leverage may be used.
- *Short bias*: mostly short positions in shares the manager believes are overvalued (e.g., weak business models, aggressive accounting), perhaps a few longs, with negative net market exposure; a contrarian style.

Event-driven sub-strategies

- *Merger arbitrage*: long the target, short the acquirer (typical for a stock deal). Not riskless: the deal can be re-priced or collapse.

- *Distressed/restructuring*: buy deeply discounted securities (often debt) of firms in or near bankruptcy, expecting value to be unlocked by the restructuring; may short overvalued claims too.
- *Activist shareholder*: take a stake large enough to push management toward value-raising changes.
- *Special situations*: trade around issuance, buybacks, spin-offs, asset sales, or capital distributions.

Relative value sub-strategies

- *Convertible arbitrage fixed income*: exploits mispricing between a company's convertible bonds, its common shares and options on those shares, for example by buying the convertible bond and selling the shares short.
- *Specific fixed income (ABS, MBS, high yield)*: exploits pricing and quality discrepancies in asset-backed, mortgage-backed or high-yield securities.
- *General fixed income*: trades mispricing between fixed-income securities of different issuers and types.
- *Multistrategy*: looks for mispricing between related securities, both inside one asset class and across asset classes and markets.

Opportunistic sub-strategies

Opportunistic funds often trade ETFs and derivatives as well as individual securities. *Macro* funds base long or short positions in currencies, commodities, equities or fixed income on their view of global economic trends; they benefit from volatility around big economic events, and central-bank smoothing of shocks hurts them. *Managed futures* funds trade commodity or financial futures (commodity specialists are CTAs). Commodity prices tend to self-correct in a way financial asset prices do not: high prices cut demand, which pulls prices down, and low prices cut supply, which pushes prices up.

Liquidity, fees and transparency

Compared with mutual funds and ETFs, hedge funds cost more, because an incentive fee comes on top of a generally high management fee, and they are less liquid. The main terms:

KEY CONCEPT

Term	Meaning
Lockup period	Minimum period after the initial investment during which the investor cannot redeem (hard lockup) or can redeem only with a significant penalty (soft lockup).
Notice period	After the lockup has expired and a redemption request is made, the time the fund has to pay out (commonly 30–90 days).
Liquidity gate	A partial limit on redemptions, e.g., a cap on the fraction of the fund that may be withdrawn per period; less drastic than a full suspension.
Redemption fee	Charge paid by the redeeming investor to offset the trading costs of meeting the withdrawal.
Management fee	Annual fee on assets under management (historically ~2%).
Incentive (performance) fee	Share of profits (historically ~20%; some newer funds use ~1% management plus ~30% performance fee based on return relative to a benchmark rather than total return).

Notice periods and gates let the manager unwind positions in an orderly way. Redemptions tend to spike after poor performance, and the cost of meeting them can further damage the remaining investors. Transparency is limited because managers protect proprietary strategies, which makes independent valuation of holdings difficult.

Example (high-water mark). Maple Ridge Fund's NAV per unit peaked at 110 two years ago, fell to 100, and ends this year at 121 before incentive fees. With a 20% incentive fee and a high-water mark, the fee applies only to the gain above 110: $0.20 \times (121 - 110) = 2.2$ per unit rather than $0.20 \times (121 - 100) = 4.2$.

COMMON EXAM TRAPS

- Swapping *lockup* (cannot redeem yet) and *notice period* (time the fund has to honor a request).
- Classifying market neutral as relative value (it is equity hedge) or merger arbitrage as relative value (it is event driven).
- Reversing the merger arbitrage trade: it is long the target and short the acquirer.
- Assuming hedge funds are low risk because they own liquid assets; leverage and derivatives change the risk profile.

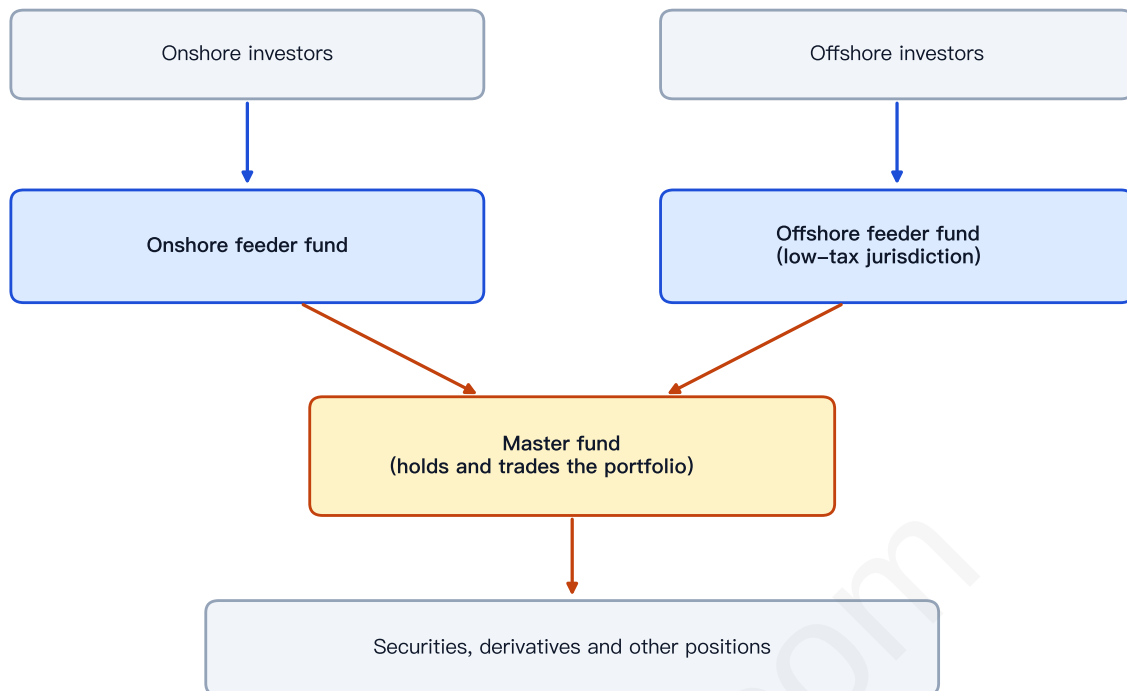
LOS 85.b — Legal forms, vehicles and indirect access

Legal form. Most hedge funds are **limited partnerships** (or limited liability companies). The **general partner** (or managing member) is the manager and is paid partly on performance; investors are **limited partners**. The rights and obligations of both sides are set out in the fund documents: the **partnership agreement**, the **private placement memorandum (PPM)**, or the articles of incorporation. A **side letter** is different: it is a bilateral agreement granting one investor special terms (e.g., lower fees, extra reporting, better liquidity) and can override the general documents for that investor only. Funds usually have an indefinite life.

Commingled fund vs. separately managed account (SMA)

Feature	Commingled fund	SMA
Investors	Many, capital pooled	One (usually a large institution)
Customization	Standard terms for all	Portfolio and mandate tailored to the investor
Fees	Standard	Often negotiated lower
Drawbacks	Terms not tailored to any one investor	More operational oversight, so suited to larger or institutional investors; the manager has no own capital at stake, so interests are less closely aligned; the account may receive allocations of only the manager's most liquid trades

A **master-feeder** structure is common for commingled funds: an onshore feeder and an offshore feeder (in a low-tax jurisdiction) both invest in a single master fund that holds the portfolio. Benefits: tax efficiency, economies of scale, and access to global capital. The structure also sidesteps regional regulatory requirements.



Master-feeder structure

A **fund of funds (FoF)** is a vehicle that invests in several hedge funds. Advantages: diversification across strategies and managers, the FoF manager's expertise in selecting and monitoring funds, access for smaller investors to funds they could not enter directly, and often shorter lockups/better exit liquidity. Disadvantage: a second layer of fees (historically about 1% management plus 10% incentive) on top of the underlying funds' fees, which can substantially cut net returns. A FoF does not promise higher returns.

COMMON EXAM TRAPS

- Treating a side letter as a fund-wide governing document.
- Listing "stronger manager motivation" as an SMA benefit; weaker incentive alignment is an SMA drawback.
- Saying a FoF lowers fees; it adds fees.

LOS 85.c — Where returns come from, index biases and diversification

Hedge fund returns come from three sources:

$$R_{\text{fund}} = \underbrace{\text{market beta}}_{\text{broad market}} + \underbrace{\text{strategy beta}}_{\text{sector/strategy exposure}} + \underbrace{\alpha}_{\text{manager skill}}$$

- **Market beta:** the part of return that comes from the broad market index.
- **Strategy beta:** the return attributable to the specific sectors or strategy the fund is exposed to.
- **Alpha:** the additional return delivered by the manager's security selection.

Market beta can be bought cheaply through index funds, so hedge funds often short it away. Managers use leverage to magnify strategy beta and alpha. High fees are a drag on net results.

Risk-adjusted comparison. Because hedge funds differ widely in risk, compare them per unit of risk. One simple measure is the **coefficient of variation**:

$$CV = \frac{\sigma}{R}$$

A lower CV means less risk per unit of return, i.e., better risk-adjusted performance. A low standard deviation alone ignores return; a high return or alpha alone ignores risk.

Example. Fund P averages 10% with $\sigma = 12\%$ ($CV = 1.2$); Fund Q averages 6% with $\sigma = 5\%$ ($CV = 0.83$). Q is better risk-adjusted even though P earns more.

Index biases. Hedge fund indexes are built from data that managers report voluntarily. Poor performers tend not to report, so index returns are biased upward, and measured correlations with traditional assets may be distorted.

KEY CONCEPT

Bias	What happens	Effect on reported index performance
Survivorship	Funds that fail or stop reporting drop out (or never reach minimum size/age to enter), so their poor results vanish	Overstates returns
Backfill	When a fund joins, its earlier (typically strong) history is added to the index	Overstates returns
Selection	Index providers assign funds to strategy categories inconsistently or use differing inclusion rules	Distorts peer-group (category) comparisons; can also tilt reported performance upward when inclusion favors stronger funds

Diversification. Results depend heavily on the measurement period, but hedge funds as a group have added diversification to portfolios of traditional assets. Their returns are more correlated with equities than with bonds.

COMMON EXAM TRAPS

- Options that call the voluntary-reporting bias downward or negligible are wrong, because the funds that stop reporting are the weak ones.
- Survivorship and backfill bias do not offset each other; both push index returns up.
- Asked what leverage is meant to magnify, "market beta" is the trap answer.

BOTTOM LINE

- A hedge fund is a privately offered pool open to investors above a wealth or sophistication threshold, lightly regulated and free to use long and short positions, leverage and derivatives, and it is usually evaluated on an absolute or risk-adjusted basis instead of against a conventional benchmark.

- Compared with private equity, hedge funds hold more liquid assets, have a shorter horizon and allow periodic redemptions, and they charge the management fee on assets under management where private equity charges it on committed capital.
- The four strategy families are equity hedge (including market neutral), event-driven (including merger arbitrage, long the target and short the acquirer), relative value (including convertible arbitrage) and opportunistic (macro and managed futures).
- During a lockup period the investor cannot redeem (hard lockup) or can redeem only with a significant penalty (soft lockup), a notice period is the time the fund has to pay out a redemption, a gate partially limits redemptions, and a high-water mark restricts the incentive fee to value above the fund's previous peak.
- A separately managed account is tailored to one investor and often has lower fees but needs more oversight and aligns interests less closely, while a fund of funds offers diversification and access for smaller investors at the cost of a second layer of fees.
- Hedge fund returns come from market beta, strategy beta and alpha; funds often short away market beta because it is cheap to buy through index funds, and they use leverage to magnify strategy beta and alpha.
- The coefficient of variation, $\sigma/\bar{R}$, measures risk per unit of return, and a lower CV means better risk-adjusted performance, whereas a low standard deviation or a high return alone ignores the other side.
- Because index data are reported voluntarily, survivorship and backfill bias both overstate hedge fund index returns, and selection bias distorts category comparisons.

QUICK CHECK

Question 1

An adviser makes three claims to a client about hedge funds as a vehicle. Which claim is *least* accurate?

- A** They are generally offered only to investors who meet accredited, qualified or institutional-investor thresholds.
- B** Their use of leverage and derivatives can give them a risk and return profile quite unlike that of the assets they hold.
- C** They are regulated about as heavily as mutual funds, which confines them to a narrow set of permitted strategies.

Answer: C

Hedge funds are private pooled vehicles that face light regulation and give managers wide latitude over strategy, leverage and instruments, so the claim that they are tightly regulated and strategy-constrained is false. The other statements are accurate: access is limited to investors meeting high suitability standards, and although most holdings are liquid stocks and bonds, leverage and derivatives change the fund's risk profile, which is why managing the fund's risk exposure matters.

Why the other options are wrong

- **A.** Accurate. Hedge funds are sold privately to investors who satisfy wealth or sophistication requirements.

- **B.** Accurate. Leverage and derivatives can make the fund's risk and return behave very differently from the underlying debt and equity positions. For the same reason, owning mostly liquid assets does not make a hedge fund lower risk than, say, a private equity fund.

Key takeaway Hedge funds = private, lightly regulated, flexible. Liquid holdings do not equal low risk once leverage and derivatives are involved.

Practice questions

Question 2

A hedge fund that follows a macro strategy is *most likely* to make which of the following trades?

- A** Buying the shares of a company that has agreed to be acquired and selling short the acquirer's shares.
- B** Buying a company's convertible bonds and selling short the same company's common shares.
- C** Selling a country's currency and its government bond futures ahead of an expected rise in its inflation.

Question 3

The Northgate Teachers' Pension Plan is choosing between investing in a hedge fund's commingled vehicle and hiring the same manager through a separately managed account (SMA). Which of the following is a drawback of the SMA route?

- A** Fees that are often negotiated lower than the pooled vehicle charges.
- B** An investor-specific investment mandate tailored to the plan.
- C** Weaker alignment of interests, because the manager has no stake in the account.

Question 4

An analyst reviewing a hedge fund index database notes three practices. Each one illustrates a different hedge fund index bias: survivorship bias, backfill bias or selection bias. Which practice is the example of selection bias?

- A** Two funds running almost identical convertible arbitrage books are placed in different strategy categories by the index provider.
- B** A fund that suffered heavy losses and closed is removed from the index, and its record no longer appears in the index history.
- C** A fund joins the index after three strong years, and its returns for those earlier years are added to the index history.

Answers: 2. C · 3. C · 4. A

Why each answer is right and why each other option is wrong: credguild.com/cfa/level-1/notes/alternative-investments/high-water-mark/. The full bank has 21 questions on this reading.

ALTERNATIVE INVESTMENTS · READING 86

Introduction to Digital Assets

What you'll learn

LOS 86.a Describe how distributed ledger technology works (ledger, consensus protocols, network types) and its financial applications, including the main types of digital assets.

LOS 86.b Explain how digital assets differ from traditional asset classes in value, validation, use as a medium of exchange and regulation.

LOS 86.c Describe exchanges, direct and indirect investment vehicles, and asset-backed tokens and DeFi as forms of digital asset investment.

LOS 86.d Analyze the drivers of digital asset returns, their volatility and their potential diversification benefits.

MODULE 86.1

Distributed Ledger Technology

This reading explains distributed ledger technology, blockchains and their consensus protocols, permissionless and permissioned networks, and the main types of digital asset. It then compares digital assets with traditional assets, describes the ways to invest in them directly and indirectly, and covers their return drivers, risk and diversification potential.

LOS 86.a — Distributed ledger technology and the digital assets built on it

What a digital asset is

Digital assets are assets that are created, stored and transferred electronically. The class is young and includes **cryptocurrencies**, **tokens** and digital collectibles. Every digital asset is secured and validated with **distributed ledger technology (DLT)**, often called blockchain technology. A cryptocurrency runs on its own blockchain; a **crypto token** is built on top of a blockchain that already exists.

The distributed ledger

A **distributed ledger** is a database that is shared among market participants. Each participant keeps an identical copy, and the ledger holds a record of every transaction.

DLT benefits

Accuracy, transparency and security of records

Rapid transfer of ownership

Peer-to-peer (P2P) creation, trading and monitoring of assets, with no intermediary

DLT drawbacks

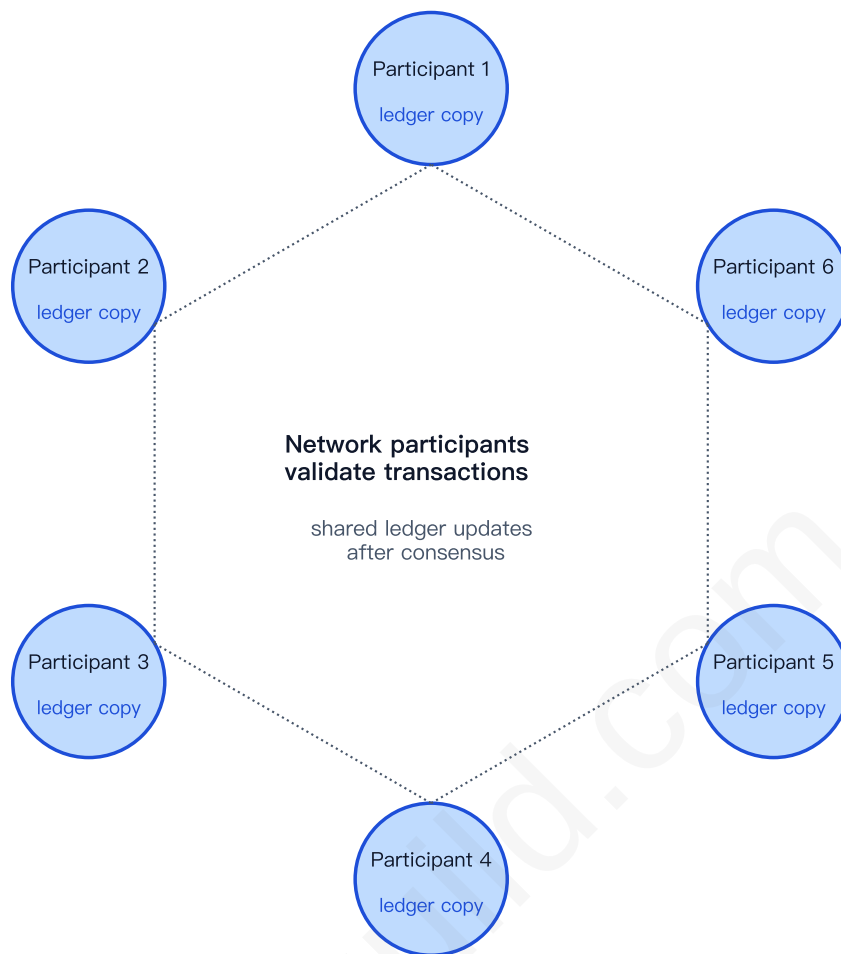
Data protection concerns

Possible violations of privacy

Very large computing power (and energy) needed to verify transactions

A DLT network has three parts:

1. a **digital ledger** (the shared record itself);
2. a **consensus mechanism**, which is how the network agrees on the state of the ledger by validating transactions and then updating the ledger; and
3. a **network of participants** (who may perform the network's functions).



Every copy is identical; a validated transaction updates the shared ledger.

A DLT network: consensus validates transactions before the shared ledger is updated

Validation plus updating makes records **immutable**, meaning they cannot be changed afterwards, while keeping them visible to all participants. **Cryptography** encrypts the data so that unauthorized parties cannot read it.

Smart contracts are computer programs on a DLT network that execute by themselves when pre-agreed terms and conditions are met. Examples: automatically settling contingent claims, or moving collateral to a lender when a borrower defaults.

Blockchains and consensus protocols

A **blockchain** is a digital ledger that stores information in **blocks** recorded in sequence. Each block holds a group of transactions plus a cryptographic link (a **hash**) to the block before it, so the blocks form a chain. A new transaction joins the chain only after authorized participants validate it.

Consensus protocols decide how blocks are chained together and are designed to resist manipulation.

KEY CONCEPT

	Proof of work (PoW)	Proof of stake (PoS)
Who validates	Miners	Validators
How	Computers race to solve a cryptographic problem that verifies the transaction	Participants pledge collateral (staking) to vouch that a block is valid; other validators then confirm it
Reward	Newly earned cryptocurrency	A return on the staked collateral
Protection against attack	Rewriting history would require controlling most (51%) of the network's computing power, which is very costly	Exam convention: validators protect the network from malicious attacks by controlling most of its computational power. Current practice: PoS security rests on staked collateral, so an attacker would need to control most of the stake rather than most of the computing power
Status	Most widely used	Emerging

Because a PoW attack needs a majority of the network, a blockchain with many participants is harder to attack and more likely to succeed.

Permissionless versus permissioned networks**KEY CONCEPT**

	Permissionless network (open)	Permissioned network
Who can transact	Any user; all network functions open to every participant	Some users restricted from some activities
Visibility	All transactions visible to all users	Access levels set by permissions, e.g., members add transactions, a regulator may only view history
Trust	Parties need not trust each other: consensus, not a central authority, confirms transactions, and the record is immutable	Controlled by whoever sets the permissions
Cost	Less cost effective	More cost effective (stronger restrictions)
Example	Bitcoin and many other cryptocurrencies	Private networks run by a group of institutions

Types of digital assets

Digital assets fall into two families, cryptocurrencies and tokens.

Main types of digital assets

Family	Type	Example or note
Cryptocurrencies	Bitcoin	The most widely traded cryptocurrency
Cryptocurrencies	Altcoins: other cryptocurrencies	Ether, on the Ethereum network
Cryptocurrencies	Altcoins: stablecoins	Tether, pegged to the US dollar
Cryptocurrencies	Altcoins: meme coins	Dogecoin
Cryptocurrencies	Central bank digital currencies (CBDCs)	A central bank's equivalent of a cryptocurrency
Tokens	Nonfungible tokens (NFTs)	Each token is unique, e.g., a piece of digital artwork
Tokens	Security tokens	Initial coin offerings (ICOs)
Tokens	Utility tokens	Paying for network services and network fees
Tokens	Governance tokens	Voting on how a permissionless network operates

- **Cryptocurrency:** a digital currency issued privately, with no central bank backing. It allows near-real-time transactions without an intermediary. Many cryptocurrencies limit the number of units that can be issued to support their role as a store of value, yet prices are still very volatile. **Bitcoin** is the most widely traded. **Altcoins** are alternatives built on Bitcoin's technology. The best known is **Ether** on the **Ethereum** network, a programmable blockchain on which users build smart contracts, so its value is not limited to being a store of value. As of mid-2022, Bitcoin and Ether together made up more than 80% of the cryptocurrency market.
- **Stablecoin:** designed to hold a stable value by being **linked to the value of another asset** (such as the US dollar); Tether, pegged to the US dollar, is a widely used example. Reserve-backed stablecoins are secured by a **reserve basket of assets**. **Algorithmic (smart) stablecoins** instead use algorithms to mint additional units when demand increases; they may hold no actual reserves, and a peg that depends only on the algorithm can fail, as TerraUSD's did in 2022. Exam convention: a stablecoin cannot be converted into fiat currency and has no legal or regulatory backing. Current practice: some issuers do redeem their stablecoins for fiat currency, and some jurisdictions have begun to regulate stablecoin issuers. An **asset-backed token** is a special case: its value is pegged to a target asset such as gold.
- **Meme coin:** launched for entertainment. Prices can soar on social media attention and then collapse. The best known is Dogecoin.
- **Central bank digital currency (CBDC):** a central bank's equivalent of a cryptocurrency, in effect a digital version of its banknotes and coins. Unlike cryptocurrencies, it is government issued.

- **Tokenization:** using DLT to record and track the ownership history of physical assets (e.g., real estate), which reduces the work needed to verify ownership when assets change hands. The token is the unit that represents the ownership right.
- **Nonfungible token (NFT):** a form of tokenization that ties a digital asset to a certificate of authenticity. Each NFT represents a distinct item (e.g., a piece of digital art), unlike fungible tokens, which are interchangeable.
- **Security token:** tracks ownership rights in publicly traded securities digitally. A blockchain can handle custody, settlement, recordkeeping and post-trade processing on one ledger.
- **Initial coin offering (ICO):** a way for a company to raise money by selling **crypto tokens** in exchange for money or other cryptocurrency. An ICO is classified as an example of a security token. The tokens are often usable later for the issuer's products or services.
- **Utility token:** used to pay for services on the network, such as service payments and network fees. It compensates holders only for network activity, while a security token may pay dividends.
- **Governance token:** issued on permissionless networks. It gives holders **voting rights** over how the network operates, e.g., voting on how to fix a technical problem.

ICO versus regulated IPO

KEY CONCEPT

	ICO	Regulated IPO
Regulation	Unregulated (many jurisdictions considering rules because of fraud)	Regulated
Issuance cost	Potentially lower	Higher
Time to raise capital	Potentially shorter	Longer
Voting rights	Usually none	Common shares normally carry votes
What investors get	Crypto tokens	Shares (registered securities)

Example

A cooperative owns a \$12 million grain terminal. It records ownership on a distributed ledger and issues 120,000 tokens, each representing $1/120,000$ of the terminal. Each token then represents a \$100 claim ($12,000,000/120,000 = 100$). A buyer with \$5,000 can hold 50 tokens, and each transfer of tokens is logged on the immutable ledger. This is tokenization: ownership of a physical asset is tracked on DLT. Because each token is a digital ownership claim on a physical asset, the tokens are also asset-backed tokens (LOS 86.c).

COMMON EXAM TRAPS

- Proof of work and proof of stake are consensus protocols. They are not types of ledger or types of network of participants.
- Options often swap the roles: miners and computing power go with PoW; validators and staked collateral go with PoS.

- A statement that parties on a permissionless network must trust each other is false, because consensus replaces trust. The cost advantage belongs to permissioned networks.
- Token, tokenization, smart contract and blockchain are often offered together. Match the noun the stem asks for: the ownership unit (token), the process of recording physical-asset ownership on DLT (tokenization), self-executing code (smart contract) or the ledger structure (blockchain).
- Stablecoins stay stable by being linked to other assets, through reserves or, for algorithmic stablecoins, through supply adjustments. Fiat convertibility and government backing are not the mechanism.
- ICO buyers usually receive crypto tokens with no voting rights. Governance tokens are the ones built around voting.
- A digital currency with government backing is a CBDC, not a stablecoin.

BOTTOM LINE

- Digital assets are created, stored and transferred electronically and secured with distributed ledger technology; a cryptocurrency runs on its own blockchain, while a crypto token is built on an existing one.
- The three parts of a DLT network are the digital ledger, the consensus mechanism and the network of participants, and validating and then updating the ledger makes its records immutable while keeping them visible to all participants.
- Under proof of work, miners solve a cryptographic problem and an attack would need most of the network's computing power; under proof of stake, validators pledge collateral, and the exam convention says validators guard the network by controlling most of its computational power, while in current practice an attacker would need most of the stake.
- A permissionless network is open to every user with all transactions visible and no need for parties to trust one another, while a permissioned network restricts some users' activities and is more cost effective.
- Stablecoins hold their value by being linked to another asset through reserves or, for algorithmic stablecoins, supply adjustments; exam convention: they cannot be converted into fiat currency and have no legal or regulatory backing; current practice: some issuers redeem them for fiat and some jurisdictions regulate issuers.
- Tokenization records ownership of physical assets on DLT, an NFT represents a distinct item, ICO buyers usually receive crypto tokens with no voting rights in an unregulated offering, utility tokens pay for network services, and governance tokens give voting rights over the network.

QUICK CHECK

Question 1

Two blockchains differ in how new blocks are accepted. On the first, miners compete to solve a cryptographic problem before a block is locked in. On the second, validators pledge some of their own holdings as collateral to vouch for a block, and further validators then confirm it. The two blockchains differ in their:

- A** network of participants.
- B** digital ledger.

C consensus protocol.

Answer: C

A DLT network has three components: the digital ledger, the consensus mechanism and the network of participants. Consensus protocols determine how blocks are validated and chained together. The first chain uses proof of work (miners solve cryptographic problems and earn cryptocurrency), and the second uses proof of stake (validators stake collateral and earn a return on it).

Why the other options are wrong

- **A.** The network of participants determines who may perform network functions. Those functions are open to all users in a permissionless network and restricted in a permissioned one. The network of participants does not set the rule used to validate and add blocks.
- **B.** The digital ledger is the shared, identical record of transactions itself. Proof of work and proof of stake are ways of agreeing on how to update that ledger. They are not ledgers in their own right.

Key takeaway Proof of work and proof of stake are the two main consensus protocols. Miners belong to PoW; validators and staking belong to PoS.

MODULE 86.2

Digital Asset Characteristics

LOS 86.b — Investment features of digital assets versus other asset classes

The number of cryptocurrencies has grown from dozens to thousands, and institutional investors are paying attention because of high expected returns and possible diversification benefits. Exchanges and custodians have built infrastructure to serve them. Digital assets nonetheless differ from traditional financial assets in four main ways:

KEY CONCEPT

Feature	Traditional financial assets	Digital assets
Inherent value	Backed by underlying assets and the cash flows they generate (interest, dividends)	Most have no backing and generate no cash flows, so they have no fundamental value . Prices reflect expected price appreciation , driven by scarcity (limited supply) and the ability to transfer value in the future
Transaction validation	Recorded on private ledgers kept by central intermediaries	Recorded on decentralized digital ledgers , often on permissionless blockchain networks

Feature	Traditional financial assets	Digital assets
Medium of exchange	Traded and priced in globally accepted fiat currencies	Used as an alternative to fiat currency, mostly for online transactions. Mainstream finance is reluctant to accept them because of high transaction costs , the fact that they are not legal tender in many jurisdictions, and heavy restrictions in some countries. CBDCs are being evaluated as tokenized fiat currency
Regulation	Clear, established rules in most jurisdictions	Lack well-developed standards. Rules are still being written; US regulators treat some digital currencies as commodities , while others see them as nonfinancial assets. Crypto exchanges are often unregulated, so behavior such as market manipulation is not specifically prohibited

LOS 86.c — Investment forms and vehicles

Where cryptocurrencies trade

Direct owners hold a **cryptocurrency wallet**, which stores the digital encryption keys needed to access and trade the assets.

KEY CONCEPT

	Centralized exchange	Decentralized exchange
Structure	Privately held; trades run on the exchange's private servers	No central authority; runs on a distributed framework of many computers
Popularity	Most popular type (even though centralization conflicts with Bitcoin's design)	Less used
Security	More vulnerable: a compromised server can halt trading and leak data such as wallet keys	Harder to attack: if one computer is hit, the others keep the exchange running
Regulation	Some are regulated as financial exchanges, depending on jurisdiction	Difficult to regulate, because no person or group controls it
Price and volume information	Platforms provide price transparency and volume data	No central platform

On both types, weak oversight raises investor protection concerns. Fraud and manipulation are more likely, e.g., **pump-and-dump schemes** that hype a coin on social media to push its price up.

Direct investment

A **direct investment** is a transaction recorded on the blockchain itself: buying tokens on a crypto exchange, trading an NFT, or taking part in an ICO. Most crypto exchanges trade continuously. Key risks:

- **Fraud:** theft, scam ICOs and attempts to obtain wallet credentials, on top of the manipulation risk that comes with weak exchange oversight.
- **Loss of access:** coins sit in wallets that require unique passkeys. If the passkey is lost, the coins cannot be retrieved and are effectively worthless. An estimated 20% of all Bitcoin sits in lost or abandoned wallets.
- **Whales:** a few large holders who own enough of a small cryptocurrency to manipulate its price. This is mainly a risk in thinly held coins; in the largest, widely held coins no single holder is likely to have that power.

Indirect investment

KEY CONCEPT

Vehicle	How it gives exposure	Points to remember
Cryptocurrency coin trusts	Shares in a trust whose assets are large holdings of the cryptocurrency itself	Trade over the counter, similar to a closed-end fund; more transparency; the investor needs no digital wallet or encryption keys; some charge high fees
Cryptocurrency futures contracts	Agreement to buy or sell a set quantity of a cryptocurrency at a future date, based on spot prices from crypto exchanges	Typically cash settled and leveraged; more volatile and less liquid than traditional futures
Cryptocurrency exchange-traded products (e.g., ETFs)	Mimic crypto returns using cash or cryptocurrency derivatives	Exchange traded rather than over the counter. Exam convention: they typically do not hold the coins directly. Current practice: some spot ETPs launched since 2024 do hold them
Cryptocurrency stocks	Shares of firms connected to digital assets: exchanges, payment providers, firms that accept, hold or mine crypto, blockchain service providers	Exposure through the business, not the coin
Cryptocurrency hedge funds	Discretionary long, long/short, quantitative and multistrategy approaches	Some also mine Bitcoin to add return

Digital investment in nondigital assets

Asset-backed tokens are digital claims on physical or financial (nondigital) assets such as oil, gold, real estate or equities, and they are collateralized by the underlying asset. They:

- can potentially make high-priced assets, such as real estate, more liquid through **fractional ownership**;

- create an **immutable ownership record**, which improves transparency and lowers transaction costs;
- are generally classified by regulators as securities.

They are often issued on Ethereum, where smart contracts allow P2P interaction. **Decentralized applications (dApps)** record transactions on the blockchain without a central system. **Decentralized finance (DeFi)** is the resulting marketplace of open-source dApps that can serve as a medium of exchange and a store of value, tokenize assets and keep immutable ownership records. Today most dApps focus on speculating in digital assets.

LOS 86.d — Risk, return and diversification

Return drivers. Returns on cryptocurrencies come mainly from **asset appreciation**. A major driver of prices is **limited supply**: Bitcoin is capped at 21 million units, and some call it "digital gold" for that reason. Prices are also affected by:

- market adoption and network impacts (network effects);
- technological innovation;
- regulation, including how new rules develop;
- speculation and investors' risk appetite.

Risk. Bitcoin and other cryptocurrencies have delivered high returns with high volatility compared with traditional asset classes, with very large rises followed by steep falls. Fraud, crime, uncertain regulation and outright bans in some countries (China banned cryptocurrencies in 2021) add to the uncertainty. Over January 2011 to January 2022, Bitcoin's average monthly log return was about 8.8%, against roughly 0.2% to 1.1% for US equities, global equities and global bonds, and its monthly standard deviation (about 0.32) was about eight times that of equities. Its coefficient of variation (standard deviation per unit of average return, about 3.7) was close to that of US equities and below those of global equities and global bonds.

Diversification. Historically, crypto returns have shown low correlations with traditional asset class returns (Bitcoin's monthly correlations with US equities, global equities and global bonds were only about 0.14 to 0.22 over the same period), so they may provide diversification benefits. The evidence is not settled, and correlations can rise during periods of extreme market stress, just when diversification is most needed.

Example

A coin's price goes from \$8,000 to \$20,000 over one year and then falls to \$11,000 over the next. The first-year return is $20,000/8,000 - 1 = 150\%$, and the second-year return is $11,000/20,000 - 1 = -45\%$. The two-year holding period return is $11,000/8,000 - 1 = 37.5\%$. No dividend or interest was received, so the whole return comes from price change. Such large swings are typical of the asset class's high volatility.

COMMON EXAM TRAPS

- The value of an unbacked cryptocurrency does not come from cash flows. "Projected cash flows" or "dividends" is the wrong answer to a question about the value or price drivers of such a cryptocurrency. This does not extend to every digital asset: security tokens may pay dividends, and asset-backed tokens draw value from the underlying asset.
- Options often attach "more popular" or "more vulnerable to attack" to decentralized exchanges. Both describe centralized exchanges.
- A vehicle that holds the coins and trades over the counter is a coin trust. Under the exam convention an ETF does not hold the coins.

- Asset-backed tokens lower transaction costs and increase transparency; options that reverse either effect are wrong.

BOTTOM LINE

- Unlike traditional financial assets, most digital assets have no backing and generate no cash flows, so they have no fundamental value; they are recorded on decentralized ledgers, are not legal tender in many jurisdictions and lack well-developed regulatory standards.
- Centralized crypto exchanges are the most popular type but more vulnerable to attack, while decentralized exchanges keep running if one computer is hit and are difficult to regulate.
- Direct investment carries the risks of fraud, permanent loss of coins whose passkey is lost, and, in thinly held coins, price manipulation by whales.
- Indirect exposure comes from coin trusts, which hold the coins and trade over the counter, cash-settled and leveraged futures, exchange-traded products (exam convention: typically not holding the coins; current practice: some spot ETPs launched since 2024 do), crypto stocks and crypto hedge funds.
- Asset-backed tokens are digital claims collateralized by nondigital assets, which allow fractional ownership, create an immutable ownership record that improves transparency and lowers transaction costs, and are generally classified by regulators as securities.
- Cryptocurrency returns come mainly from price appreciation, with limited supply a major driver, and have been high but highly volatile; their historically low correlations with traditional assets may offer diversification, although correlations can rise in periods of extreme stress.

QUICK CHECK

Question 2

An investment committee is debating whether to add digital assets to a multi-asset portfolio. Regarding their role as an investment class, which statement is *most accurate*?

- A** Their returns have historically moved closely with stocks and bonds.
- B** Their low historical correlations with traditional assets may aid diversification.
- C** They have behaved as a relatively stable, low-volatility asset class.

Answer: B

Cryptocurrency returns have historically shown low correlations with traditional asset class returns, so they may provide diversification benefits. The evidence is not conclusive, and correlations can rise in periods of extreme market stress, so the benefit is potential rather than assured.

Why the other options are wrong

- **A.** Returns have not closely tracked traditional asset classes; the low correlations are what make diversification possible. Digital assets have also produced much higher (and more volatile) returns than traditional assets.
- **C.** Digital assets are a new, highly speculative asset class with no clear legal protections, marked by high returns and very high volatility, so they are not a stable asset class.

Key takeaway Crypto offers potential diversification (low historical correlation) but with high volatility, and correlations may rise under stress.

Practice questions

Question 3

Kestrel Robotics is weighing two ways of raising new capital: a regulated initial public offering (IPO) or an initial coin offering (ICO). Compared with the IPO, the ICO would *most likely* involve:

- A a longer capital-raising period.
- B more voting rights for investors.
- C lower issuance costs.

Answers: 3. C

Why each answer is right and why each other option is wrong: credguild.com/cfa/level-1/notes/alternative-investments/introduction-to-digital-assets/. The full bank has 16 questions on this reading.

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