Question 1 of 9

A manager of an equity index-based fund is *least likely* to reduce tracking error against the index by:

A. using full replication.

B. minimizing cash drag.

C. **increasing management fees.**

Explanation

Tracking error indicates how closely an indexed equity fund's **performance compares** to its benchmark index and thus can be used to measure how well its manager can replicate the index's performance. Tracking error, which is the standard deviation of the indexed fund's excess return compared to the index, can be increased by management fees, intraday trading, stratified sampling, and cash drag.

Management fees cause deviation from the index's return and decrease the indexed fund's excess return, thus increasing tracking error. An increase to management fees would increase, not reduce, tracking error.

(Choice A) Full replication includes all of the index's constituents, at their invested weights, in the indexed fund and so is not likely to create or increase tracking error. Using full replication is more likely to *reduce* tracking error than using the alternatives, stratified sampling or optimization.

(Choice B) Cash drag is created by any cash held in the indexed fund, and is a source of tracking error. Although equity index funds have no cash allocation, they often have a cash balance due to dividends received, sales proceeds, or investor contributions, which causes deviation from the index's performance. Minimizing cash drag would *reduce* tracking error.

Things to remember:
Tracking error indicates how closely an indexed equity fund's performance compares to its index and thus can be used to measure how well its manager can replicate the index's performance. Managers can reduce tracking error, which is the standard deviation of the indexed fund's excess return compared to the index, by reducing management fees, using full replication of the index, and minimizing cash drag.

Compare the full replication, stratified sampling, and optimization approaches for the construction of index-based equity portfolios.
LOS

QUESTION 2 - 5

Hedwig Kozak was recently hired as a PM by a financial institution. Kozak was brought in to create index-based investment products that will complement the firm's open-end mutual funds business. She is meeting with Denzel Exham, the firm's CIO. Kozak and Exham discuss developing an ETF business with their firm acting as an ETF sponsor. During the discussion, Exham makes the following statements regarding his understanding of indexed-based ETFs:

Statement 1: All factor-based index-tracking ETFs are characterized as return-oriented since inclusion in an index is always based on factors such as sustained earnings growth or price momentum, which investment research has identified as primary drivers of higher returns.

Statement 2: ETFs can be created to track any factor-based index, although the optimal approach regarding portfolio construction depends on a variety of factors related to the number of index constituents, the liquidity of those securities, and the size of the ETF.

Kozak mentions to Exham that equity derivatives can be used to improve ETF operating efficiency with respect to reducing expenses and tracking error. Exham states that he is not knowledgeable about derivatives and that the firm has not previously used them. Kozak describes equity-index futures and equity swaps, addressing their potential uses in managing risk-return characteristics as well as the relative advantages and disadvantages of each and their use for ETFs that track both traditional indexes and factor-based indexes.

The conversation moves on to discussing various approaches to constructing portfolios for traditional cap-weighted and style-based index-tracking ETFs. During this discussion, Kozak makes the following comments about issues related to portfolio construction:

Comment 1: Since index returns are adjusted to reflect trading costs incurred by index funds, structuring the portfolio to keep expenses low will help our index-tracking ETF outperform its benchmark.

Comment 2: To minimize cost and tracking error for an ETF designed to track the total US equity market, the most appropriate portfolio construction is to use stratified sampling for large-cap funds and use full replication for mid- and small-cap funds.

Question 2 of 9

Which of Exham's statements is (are) *most likely* correct?

A. Only Statement 1

B. **Only Statement 2**

C. Both Statement 1 and Statement 2

Explanation

Factor-based equity strategies

Categories	Goal	Factor exposures
Return-oriented	Better risk-adjusted returns	• Growth • Value • Dividend yield • Quality (eg, sales or profit growth) • Momentum
Risk-oriented	Reduce volatility or overall portfolio risk	• Inverse volatility weighting • Mean-variance optimization
Diversification-oriented	Improve diversification	• Equal weighting of indexes • Maximize diversification (eg, max limit exposure to individual countries, sectors, issuers)

Factor-based equity strategies are designed to **provide** attractive **alternatives** to both **active portfolio management** and **traditional indexing strategies**. Factor-based indexes that serve as the benchmark for mutual funds, ETFs, and separately managed portfolios are created by grouping stocks based on either some combination of investment-related factors or on a single factor other than CAPM beta. Factor-based strategies attempt to outperform traditional indexes on a:

- total return basis by selecting securities using market risk premiums connected to various factors (eg, market cap, low PE),
- total-return or risk-adjusted basis by employing tilts to overweight and underweight specific factors to reflect a PM's expectations for relative performance, or
- risk-adjusted basis by minimizing risk or through broader diversification.

Return-oriented is only one of t**hree categories** used to classify factor-based strategies **(Choice A)**. **Return-oriented** strategies seek exposures based on return-related factors (eg, dividend yield) and/or employ fundamental-weighting. The other categories of factor-based strategies are:

- **Risk-oriented** strategies attempt to minimize absolute or downside volatility with strategies such as inverse-volatility weighting or mean-variance optimization.
- **Diversification-oriented** strategies reduce risk exposure to large-cap funds in traditional indexes by using equal weighting for portfolios.

ETFs can be created to track any factor-based index. The optimal approach to constructing the ETF portfolio is heavily influenced by the number of index constituents, their liquidity, and the money amount managed by the ETF. Full replication, stratified sampling, or synthetic positioning with equity swaps may be used individually or in combination when constructing and managing the portfolio **(Choice C)**.

Things to remember:
Factor-based strategies are designed to outperform traditional indexes. Return-oriented strategies attempt to outperform on either a total-return or a risk-adjusted basis. Risk-oriented and diversification-oriented strategies aim for risk-adjusted outperformance.

Compare different approaches to index-based equity investing.
LOS

Question 3 of 9

Compared to trading only cash market stocks in managing an index fund, which of the following is *least likely* an advantage of equity-index futures?

A. **Lack of counterparty risk**

B. Access to greater leverage

C. Trading cost of replicating index

Explanation

Equity-index portfolio vs. equity-index futures

	Portfolio	Futures
Liquidity	Depends on equities	Highly liquid
Counterparty risk	None, no counterparty	Effectively none
Cost	Market value	Zero
Leverage	Yes, marginable	More, lower initial margin

Index fund portfolios can be **constructed** with **cash equities**, derivatives, or both in combination. Using **equity-index futures** has several advantages compared to using only cash equities. In general, futures trading costs for equity-index funds are less than the cost to trade cash equities. Furthermore, **buying index futures replicates** the entire index fund **portfolio** in a single transaction, which is much simpler than buying each index stock in proportion to match the index's composition **(Choice C)**.

There is **no counterparty risk** when holding either equity securities or futures. Being a shareholder entitles ownership of a corporation, so no counterparty exists for risk exposure. Futures have almost no counterparty risk due to the futures clearinghouses' performance guarantees. Since no counterparty risk exists in either case, the lack of futures' counterparty risk is not an advantage compared to cash equities.

Investors can leverage cash equities by buying on margin, with the purchased securities serving as collateral. However, **futures** enable much **higher leverage** since margin requirements are much lower (eg, 5%). Unlike cash equities for which the buyer pays the seller in full, futures buyers pay the seller nothing. Since futures buyers can deposit interest-earning assets into their account to satisfy the margin requirement, futures positions can be more highly leveraged **(Choice B)**.

Things to remember:
Index fund portfolios can be constructed with cash equities, derivatives, or both in combination. Futures have lower trading costs and allow easier access to leverage compared to cash equities. Holders of cash equities have no counterparty risk relative to the issuer.

Compare different approaches to index-based equity strategies.

LOS

Question 4 of 9

When equitizing cash for ETFs designed to track factor-based indexes, which of the following is *most likely* an advantage of equity swaps over equity index futures? Equity swaps:

A. **can be structured so the underlying is the factor-based index.**

B. are more liquid, allowing more flexibility in managing cash drag.

C. have more counterparty risk since swap collateral is less than futures margins.

Explanation

Equity swaps vs. equity-index futures

	Swaps	Futures
Contract terms	Customizable	Standardized
Liquidity	Some liquidity	Highly liquid
Counterparty risk	Yes	Effectively none
Cost	Zero	Zero

Cash held by index-tracking ETFs **contributes to tracking error**. Any tracking error indicates suboptimal performance, but the impact is most damaging when markets are rising. The lower return to cash results in **cash drag**, and **equitizing cash** reduces this effect. **Equity-index futures** and **equity swaps** are used in this role. Although economically similar, each derivative has advantages relative to the other:

- Equity-index futures are very liquid and have almost no counterparty risk.
- Equity swaps can be customized as to underlying equities, size, and expiration.

For ETFs designed to track **traditional cap-weighted indexes** with a futures contract on the benchmark, this **index futures** contract is ideal for equitizing cash. Taking a position in futures with contract values equal to the amount of cash to be equitized synthetically creates that additional amount of the existing portfolio.

Usually, no futures contracts have an underlying that is the same **factor-based index** the ETF is designed to track. Using equity-index futures for such ETFs introduces another source of tracking error since the underlying equities are not the same as those in the ETF's portfolio. To minimize tracking error, the ETF should initiate an **equity swap** with the factor-based index the ETF is trying to track as the underlying.

(Choice B) Although swaps have some liquidity, futures are much more liquid and therefore enable more flexibility in managing cash drag.

(Choice C) Swaps do have more counterparty risk compared to futures, so this is a true statement. However, having more counterparty risk is not an advantage.

Things to remember:

Cash held by index-tracking ETFs contributes to tracking error, and equitizing cash reduces this effect. Index futures are more appropriate for ETFs tracking traditional indexes, and equity swaps are more appropriate for ETFs tracking factor-based indexes.

Compare different approaches to index-based equity investing.

LOS

Question 5 of 9

Which of Kozak's comments is *most likely* correct?

A. Comment 1 only

B. Comment 2 only

C. **Neither Comment 1 nor Comment 2 are correct**

Explanation

Tracking error

Sources of tracking error	Examples
Fees/expenses	Fund management fees
Representative sampling/optimization	Index not fully replicated
Portfolio holdings differ	American/global depositary receipts, other ETFs vs. underlying index
Index changes	Portfolio changes may not align exactly
Fund accounting differences	Pricing for foreign-exchange-traded and non-exchange-traded securities
Regulatory and tax issues	Foreign dividend withholding
Fund sponsor operations	Security lending, foreign dividend recapture

Equity indexing strategies can use traditional cap-weighted indexes or factor-based indexes. Pursuing an index-tracking strategy for either type of index using a pooled investment vehicle (eg, mutual fund, ETF) provides investors with a diversified portfolio and low costs. Since **tracking error** and **trading** and/or **operating expenses** are **significant issues** regarding the performance of **index-tracking mutual funds and ETFs**, expense control and portfolio construction decisions can have a major impact on successfully tracking the index's performance.

An index is a hypothetical portfolio, not a real-money portfolio consisting of equities, cash, and possibly derivatives. Since it is a hypothetical portfolio, an index incurs **no trading or operating costs**; there are no actual shares to trade or hold. Therefore, **index returns** are the weighted returns on the constituent securities, and no charge is levied against those returns to reflect the estimated expense of running a real-money portfolio **(Choice A)**.

The three approaches for constructing index-tracking portfolios are full replication, stratified sampling, and synthetic replication. PMs may use a single approach or multiple approaches in combination. **Full replication** is most appropriate for **large-cap stocks**, which tend to be **more liquid**. For securities with **poor liquidity** and a negative price-impact effect on trading costs, **stratified sampling** may be more appropriate. However, this circumstance is more likely to arise with small-cap stocks.

(Choice B) Comment 2 confuses the types of stocks for which full replication and stratified sampling are most appropriate.

Choice C is the most appropriate answer choice since neither of Kozak's comments are correct.

Things to remember:

Full replication is most appropriate for securities that are more liquid. Stratified sampling may be more appropriate for securities with poor liquidity. Index returns are not adjusted for estimated trading costs.

Discuss potential causes of tracking error and methods to control tracking error for index-based equity portfolios.

LOS

Question 6 of 9

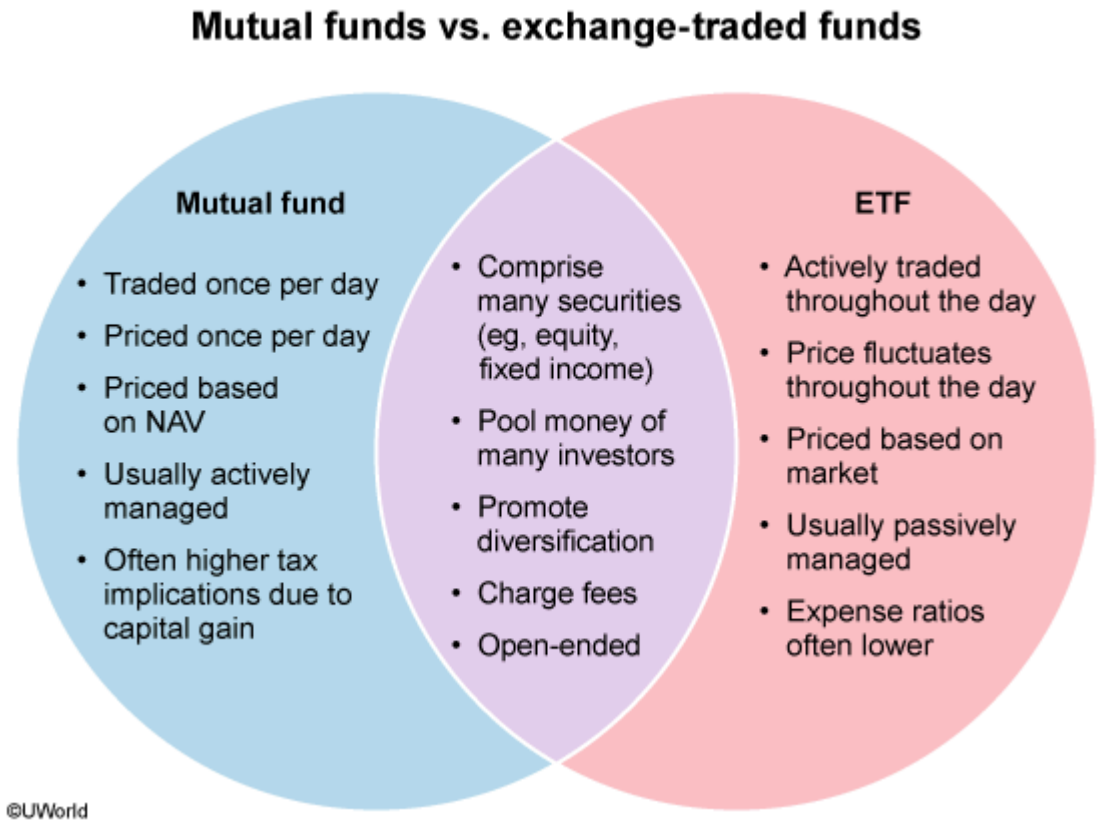
Which of the following is *least likely* a potential advantage of ETFs compared to mutual funds?

A. **ETFs are more liquid.**

B. ETFs can be sold short.

C. ETFs are more tax-efficient.

Explanation



Mutual funds and ETFs are pooled investments that many investors find attractive due to:

- low cost, and
- immediate diversification across the entire portfolio.

Index funds and ETFs have been created to track many standard country and industry indexes as well as indexes based on factors related to investment fundamentals (eg, dividend yield), investing styles (eg, growth or value), and other considerations (eg, momentum, risk).

In general, **both are liquid** but with distinct differences. **ETFs** are tradeable **any time markets are open**, whereas **mutual fund shares** trade only **once per day**, usually just after market close. This detail might seem to indicate that ETFs have better liquidity, but investors selling **ETFs** trade them at a **market-determined price**, which can be at a discount to NAV. Alternatively, mutual fund shares must be redeemed by the fund at a price reflecting NAV. In **periods of market stress, liquidity** for the ETF (and the underlying

shares) **can decrease significantly**, resulting in wider bid-ask spreads. Therefore, ETFs are not more liquid than mutual funds.

(Choice B) ETFs can be sold short, whereas mutual fund shares cannot.

(Choice C) ETFs are usually more tax efficient since holders are primarily taxed on gains at the sale of the shares. Mutual fund shareholders incur the tax consequences of portfolio sales each year throughout the holding period of the mutual fund. In this scenario, tax efficiency would not matter since retirement funds are tax-exempt.

Things to remember:
Mutual funds and ETFs are pooled investments attractive to investors due to their low cost and ready access to diversification. Both ETFs and mutual funds are liquid. However, mutual funds must redeem shares at NAV and ETFs trade in the open market, where financial market stress may adversely impact liquidity.

Compare different approaches to index-based equity investing.
LOS

Question 7 of 9

To minimize tracking error, which of the following management tactics is *least appropriate*?

A. **Stratified sampling**

B. Market-on-close orders

C. Synthetic equitization of cash

Explanation

Tracking error

Sources of tracking error	Examples
Fees/expenses	Fund management fees
Representative sampling/optimization	Index not fully replicated
Portfolio holdings differ	American/global depositary receipts, other ETFs vs. underlying index
Index changes	Portfolio changes may not align exactly
Fund accounting differences	Pricing for foreign-exchange-traded and non-exchange-traded securities
Regulatory and tax issues	Foreign dividend withholding
Fund sponsor operations	Security lending, foreign dividend recapture

Tracking error measures how effective PMs are at generating returns that closely mirror a benchmark over time. Tracking error is based on a comparison of period-by-period returns between a portfolio and benchmark, not just their cumulative returns over long time horizons. Tracking error is the **standard deviation** of the **difference** between period returns on the **portfolio** and its **benchmark**.

Market-on-close (MOC) orders and **synthetic cash equitization** are both tactics to **reduce** these **differences (Choices B and C)**. MOC orders contribute to reduced tracking error since trade execution is at stock prices that match the prices used to value the benchmark. Cash drag (ie, returns on cash less than return on stocks) results in portfolio returns trailing benchmark returns when equity market values are rising; this effect can be reduced by using equity futures or swaps to create synthetic long equity positions equal to the portfolio's cash holdings.

Stratified sampling is primarily an approach to portfolio construction intended to **reduce trading costs**. The goal is to mirror the benchmark's return without holding all the benchmark's stocks. Stratified sampling attempts to identify a representative sample by categorizing stocks into groupings (ie, strata) based on shared factors (ie, market cap, industry). The portfolio is constructed by selecting a subset of securities from each stratum. This practice can significantly reduce trading costs, especially when the benchmark contains

a very large number of securities or illiquid securities, but it can exacerbate tracking error as only a subset of index constituents is included in the index fund.

Things to remember:
Tracking error measures how effective PMs are at generating returns that closely mirror a benchmark over time. Market-on-close orders and synthetic cash equitization are both tactics to reduce differences in returns. Stratified sampling is primarily an approach to portfolio construction intended to reduce expenses.

Compare different approaches to index-based equity strategies.
LOS

Question 8 of 9

Relative to broad market-cap-weighted indexes, index-based factor strategies *most likely*:

A. **concentrate risk.**

B. allow ease of replication.

C. encourage single-factor indexes.

Explanation

Index-based **factor strategies** such as **smart beta** and **factor-rotation** involve identifying and weighting return and/or risk factors. Factor-rotation identifies and overweights the risk factor(s) most likely to experience excess return for the period.

While this weighting can produce overperformance if the overweighted factor overperforms, it also leads to the portfolio's risk being more concentrated. This concentration of risk and the possibility of single factor underperformance has encouraged investors to use multifactor rotation strategies **(Choice C)**.

(Choice B) Both broad market-cap weighted indexes and index-based factor-based strategies allow for ease of replication, since both are relatively transparent.

Things to remember:
Broad market-cap-weighted indexes, index-based factor strategies identify and over- or underweight risk and/or return factors. While this approach is designed to lead to outperformance, it also concentrates risk, relative to the market-cap-weighted index. As a result of such risk concentration, investors are encouraged to use multi-factor rotation strategies.

Compare factor-based strategies to market-capitalization-weighted indexing.
LOS

Question 9 of 9

In an indexed equity fund, which of the following is *most likely* to increase tracking error?

A. Full replication

B. **Intraday trading**

C. Cash equitization using derivatives

Explanation

Tracking error indicates how closely an indexed equity **fund's performance compares** to its index and thus can be used to measure how well its manager can replicate the index's performance. Tracking error can be increased by intraday trading, management fees, stratified sampling, and cash drag.

Since indexes report close-of-day prices, any intraday trading by the indexed fund will cause its reported prices to deviate, positively or negatively, from the index, and thus cause tracking error.

(Choice A) Full replication includes all of the index's constituents, at their invested weights, in the indexed fund and so is not likely to create or increase tracking error. Alternatively, stratified sampling, which includes only a sample of index constituents, is likely to create tracking error by omitting some fund constituents.

(Choice C) Cash equitization using derivatives is commonly used to minimize cash drag, created by any cash held in the indexed fund, and thus would *decrease* tracking error. Although equity index funds have no cash allocation, indexed funds often have a cash balance due to dividends received, sales proceeds, or investor contributions, which thus causes deviation from the index's performance.

Things to remember:
Tracking error indicates how closely an indexed equity fund's performance compares to its index and thus can be used to measure how well its manager can replicate the index's performance. Tracking error can be increased by intraday trading, management fees, stratified sampling, and cash drag.

Discuss potential causes of tracking error and methods to control tracking error for index-based equity portfolios.
LOS