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# How to Use the CFA Program Curriculum

The CFA® Program exams measure your mastery of the core knowledge, skills, and abilities required to succeed as an investment professional. These core competencies are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

A broad outline that lists the major CFA Program topic areas ([www.cfainstitute.org/programs/cfa/curriculum/cbok/cbok](http://www.cfainstitute.org/programs/cfa/curriculum/cbok/cbok))

Topic area weights that indicate the relative exam weightings of the top-level topic areas ([www.cfainstitute.org/en/programs/cfa/curriculum](http://www.cfainstitute.org/en/programs/cfa/curriculum))

Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from curriculum content covering a topic area: LOS are provided at the beginning of each block of related content and the specific lesson that covers them. We encourage you to review the information about the LOS on our website ([www.cfainstitute.org/programs/cfa/curriculum/study-sessions](http://www.cfainstitute.org/programs/cfa/curriculum/study-sessions)), including the descriptions of LOS “command words” on the candidate resources page at [www.cfainstitute.org/-/media/documents/support/programs/cfa-and-cipm-los-command-words.ashx](http://www.cfainstitute.org/-/media/documents/support/programs/cfa-and-cipm-los-command-words.ashx).

The CFA Program curriculum that candidates receive access to upon exam registration

Therefore, the key to your success on the CFA exams is studying and understanding the CBOK. You can learn more about the CBOK on our website: [www.cfainstitute.org/programs/cfa/curriculum/cbok](http://www.cfainstitute.org/programs/cfa/curriculum/cbok).

The curriculum, including the practice questions, is the basis for all exam questions. The curriculum is selected or developed specifically to provide candidates with the knowledge, skills, and abilities reflected in the CBOK.

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## CFA INSTITUTE LEARNING ECOSYSTEM (LES)

Your exam registration fee includes access to the CFA Institute Learning Ecosystem (LES). This digital learning platform provides access, even offline, to all the curriculum content and practice questions. The LES is organized as a series of learning modules consisting of short online lessons and associated practice questions. This tool is your source for all study materials, including practice questions and mock exams. The LES is the primary method by which CFA Institute delivers your curriculum experience. Here, candidates will find additional practice questions to test their knowledge. Some questions in the LES provide a unique interactive experience.

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## DESIGNING YOUR PERSONAL STUDY PROGRAM

An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Review the LOS both before and after you study curriculum content to ensure you can demonstrate the

knowledge, skills, and abilities described by the LOS and the assigned reading. Use the LOS as a self-check to track your progress and highlight areas of weakness for later review.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience, and you will likely spend more time on some topics than on others.

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## ERRATA

The curriculum development process is rigorous and involves multiple rounds of reviews by content experts. Despite our efforts to produce a curriculum that is free of errors, in some instances, we must make corrections. Curriculum errata are periodically updated and posted by exam level and test date on the Curriculum Errata webpage ([www.cfainstitute.org/en/programs/submit-errata](http://www.cfainstitute.org/en/programs/submit-errata)). If you believe you have found an error in the curriculum, you can submit your concerns through our curriculum errata reporting process found at the bottom of the Curriculum Errata webpage.

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## OTHER FEEDBACK

Please send any comments or suggestions to [info@cfainstitute.org](mailto:info@cfainstitute.org), and we will review your feedback thoughtfully.

# **Portfolio Management Pathway**



## LEARNING MODULE

# 1

## Index-Based Equity Strategies

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### LEARNING OUTCOMES

<i>Mastery</i>	<i>The candidate should be able to:</i>
<input type="checkbox"/>	compare factor-based strategies to market-capitalization-weighted indexing
<input type="checkbox"/>	compare different approaches to index-based equity strategies
<input type="checkbox"/>	compare different approaches to index-based equity investing
<input type="checkbox"/>	compare the full replication, stratified sampling, and optimization approaches for the construction of index-based equity portfolios
<input type="checkbox"/>	discuss potential causes of tracking error and methods to control tracking error for index-based equity portfolios
<input type="checkbox"/>	explain sources of return and risk to an index-based equity portfolio

### INTRODUCTION

# 1

This learning module provides a broad overview of index-based equity investing, including index selection, portfolio management techniques, and the analysis of investment results.

Index-based strategies are rule-based, transparent strategies that do not involve identifying mispriced individual securities but instead seek to replicate the performance of an index. Indexes include broad market indexes, such as the S&P 500 Index, Nikkei 225, and FTSE 100, as well as those tailored more to a factor exposure, such as the Russell 1000 Growth and Russell 1000 Value Indexes. The main advantages of index-based investing are low costs, diversification, and tax efficiency.

In the next section, we will compare factor-based strategies to broad indexing strategies. Then, we will look at how to gain exposure to an index, whether through a pooled investment, a derivative-based approach, or a separately managed account. We will also cover portfolio construction techniques for index-based strategies and discuss how a portfolio manager can control tracking error against the benchmark, including the sources of tracking error. In addition, we will introduce methods a

portfolio manager can use to attribute the sources of return in the portfolio, including country returns, currency returns, sector returns, and security returns. We will also describe the sources of portfolio risk. A summary of key points concludes the module.

## 2

### FACTOR-BASED STRATEGIES

- compare factor-based strategies to market-capitalization-weighted indexing

Investors in index-based strategies may seek market return, otherwise known as beta exposure, and do not seek outperformance, known as alpha. A focus on beta is based on a single-factor model: the capital asset pricing model (CAPM). Index-based strategies based on more than a single factor (and a single factor other than beta) are becoming more popular as investors gain an understanding of what drives investment returns. These strategies maintain the low-cost advantage of index funds but provide an expected return based on exposure to various factors, such as the five discussed in Fama and French (2015) that explain US equity market returns: the market risk premium from the CAPM, size, book-to-market ratio (value or growth style classification), operating profitability, and investment intensity (total asset growth).

Although the concepts underlying factor investing, sometimes marketed as “smart beta,” have been known for a long time, investors’ use of the technique increased dramatically over time. There are many indexes and index-based investment vehicles that allow access to such factors as Value, Size, Momentum, Volatility, and Quality, which are described in Exhibit 1. Many investors apply factor tilts—intentionally overweighting and underweighting certain risk factors—to their portfolios based on their judgment of market conditions. Index-based factor strategies can be used in place of or to complement a more traditional market-cap-weighted indexed portfolio.

#### Exhibit 1: Common Equity Risk Factors

Factor	Description
Growth	Growth stocks are generally associated with companies with an above-average net income growth rate and high P/Es.
Value	Value stocks are generally associated with mature companies that have stable net incomes or are experiencing a cyclical downturn. Value stocks frequently have low price-to-book and price-to-earnings ratios as well as high dividend yields.
Size	A tilt toward smaller size involves buying stocks with low float-adjusted market capitalization.
Yield	Yield is identified as dividend yield relative to other stocks. High dividend-yielding stocks may provide excess returns in low interest rate environments.
Momentum	Momentum attempts to capture further returns from stocks that have experienced an above-average increase in price during the prior period.

Factor	Description
Quality	Quality stocks might include those with consistent earnings and dividend growth, high cash flow to earnings, and low debt-to-equity ratios.
Volatility	Low volatility is generally desired by investors seeking to lower their downside risk. Volatility is often measured as the standard deviation of stock returns.

While index-based factor strategies may be labeled “passive,” they frequently involve active decision making: Decisions on the timing and degree of factor exposure are being made. As Jacobs and Levy (2014) note, the difference between index-based factor investing and conventional active management is that with the former, active management takes place up front rather than continuously. Relative to broad-market-cap weighting, factor-based strategies tend to concentrate risk exposures, leaving investors exposed during periods when a chosen risk factor is out of favor. The observation that even strong risk factors experience periods of underperformance has led many investors toward multi-factor approaches. Index-based factor strategies tend to be transparent in terms of factor selection, weighting, and rebalancing. Possible risks include ease of replication by other investors, which can produce overcrowding and reduce the realized advantages of a strategy.

#### FUNDAMENTAL FACTOR INDEXING

Capitalization weighting of indexes and index-tracking portfolios involve treating each constituent stock as if investors were buying all the available shares. Arnott, Hsu, and Moore (2005) developed an alternative weighting method based on the notion that if stock market prices deviate from their intrinsic value, larger-cap stocks will exhibit this tendency more than smaller-cap stocks. Thus, traditional cap weighting is likely to overweight overpriced stocks and underweight underpriced stocks. The combination is intended to make cap-weighting inferior to a method that does not use market prices as a basis for weighting.

The idea advanced by Arnott, Hsu, and Moore is to use a cluster of company fundamentals—book value, cash flow, revenue, sales, dividends, and employee count—as a basis for weighting each company. A separate weighting is developed for each fundamental measure. In the case of a large company, its sales might be 1.3% of the total sales for all companies in the index, so its weight for this criterion would be 0.013. For each company, the weightings are averaged across all of the fundamental measures, and those average values represent the weight of each stock in a “composite fundamentals” index.

The authors show that over a 43-year period, a fundamental index would have outperformed a related cap-weighted index by an average of almost 200 basis points per year. They hasten to add that the result should not necessarily be considered alpha, because the fundamental portfolio provides heightened exposure to the Value and Size factors.

Since the time of the seminal article’s publication, fundamental-weighted indexing strategies for country markets as well as market segments have gained in popularity and attracted a large amount of investor funds.

No matter the style of a factor-based strategy, its ultimate goal is to improve upon the risk or return performance of the market-cap-weighted strategy. Factor-based approaches gain exposure to many of the same risk factors that active managers seek to exploit. The strategies can be return oriented, risk oriented, or diversification oriented.

Return-oriented factor-based strategies include dividend yield strategies, momentum strategies, and fundamentally weighted strategies. Dividend yield strategies can include dividend growth as well as absolute dividend yield. The low interest rate environment, which followed the 2008–2009 global financial crisis, led to an increase in dividend yield strategies as investors sought reliable income streams. An example index is the S&P 1500 High Yield Dividend Aristocrats Index. This index selects securities within the S&P 1500 that increased dividends in each of the past 20 years and then weights those securities by their dividend yield, with the highest dividend-yielding stocks receiving the highest weight.

Another return-oriented strategy is momentum, which is generally defined by the amount of a stock's excess price return relative to the market over a specified time period. Momentum can be determined in various ways. One example is MSCI's Momentum Index family, in which a stock's most recent 12-month and 6-month price performance are determined and then used to weight the securities in the index.

Risk-oriented strategies take several forms, seeking to reduce downside volatility and overall portfolio risk. For example, risk-oriented factor strategies include volatility weighting, where all of an index's constituents are held and then weighted by the inverse of their relative price volatility. Price volatility is defined differently by each index provider, but two common methods include using standard deviation of price returns for the past 252 trading days (approximately one calendar year) or the weekly standard deviation of price returns for the past 156 weeks (approximately three calendar years).

Volatility weighting can take other forms as well. Minimum variance investing is another risk reducing strategy, and it requires access to a mean–variance optimizer. Minimum variance weights are those that minimize the volatility of the portfolio's returns based on historical price returns, subject to certain constraints on the index's construction. Constraints can include limitations on sector over/under weights, country selection limits, and limits on single stock concentration levels. Mean–variance optimizer programs can be accessed from such vendors as Axioma, BARRA, and Northfield.

Risk weighting has the advantages of being simple to understand and providing a way to reduce absolute volatility and downside returns. However, the development of these strategies is based on past return data, which may not reflect future returns. Thus, investors will not always achieve their objectives despite the strategy's stated goal.

Diversification-oriented strategies include equally weighted indexes and maximum-diversification strategies. Equal weighting is intuitive and has a low amount of single-stock risk. The low single-stock risk comes by way of the weighting structure of  $1/n$ , where  $n$  is equal to the number of securities held. Choueifaty and Coignard (2008) define maximum diversification by calculating a “diversification ratio” as the ratio of the weighted average volatilities divided by the portfolio volatility. Diversification strategies then can attempt to maximize future diversification by determining portfolio weights using past price return volatilities.

Portfolio managers who pursue factor-based strategies often use multiple benchmark indexes, including a factor-based index and a broad market-cap-weighted index. This can result in tracking error from the perspective of the end investor who has modeled a portfolio against a broad market-cap-weighted index. Tracking error indicates how closely the portfolio behaves like its benchmark and is measured as the standard deviation of the differences between a portfolio's returns and its benchmark returns. The concept of tracking error is discussed in detail later.

Finally, factor-based strategies can involve higher management fees and trading commissions than broad-market indexing. Factor-based index providers and managers demand a premium price for the creation and management of these strategies, and

## Pooled Investments

those fees decrease performance. Also, commission costs can be higher in factor-based strategies than they are in market-cap-weighted strategies. All else equal, higher costs will lead to lower net performance.

Factor-based approaches may offer an advantage for those investors who believe it is prudent to seek out groups of stocks that are poised to have desirable return patterns. Active managers also believe in seeking those stocks, but active management brings the burden of higher fees that can eat into any outperformance. Active managers may also own stocks that are outside the benchmark and are, thus, incompatible with the investment strategy. In contrast, factor-based strategies can provide nearly pure exposure to specific market segments, and there are numerous benchmarks against which to measure performance. Fees are generally modest because factor-based strategies are rules-based and thus do not require constant monitoring. An investor's process of changing exposures to specific risk factors as market conditions change is known as factor rotation. With factor rotation, investors can use index-based vehicles to make active bets on future market conditions.

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## POOLED INVESTMENTS

# 3

- compare different approaches to index-based equity strategies

Index-based equity investment strategies may be implemented using several approaches, from the do-it-yourself method of buying stocks to hiring a subadviser to create and maintain the investment strategy. Index-based investment strategies can be replicated by any internal or external portfolio manager who has the index data, trading tools, and necessary skills. In contrast, every actively managed fund, in theory, has a unique investment strategy developed by the active portfolio manager.

This section discusses different approaches to gain access to an investment strategy's desired performance stream: pooled investments (e.g., mutual funds and exchange-traded funds), derivatives-based portfolios (using options, futures, and swaps contracts), and direct investment in the stocks underlying the strategy.

Some index-based investments are managed to establish a target beta, and managers are judged on how closely they meet that target. Portfolio managers commonly use futures and open-end mutual funds to transform a position (in cash, for example) and obtain the desired equity exposure. This process is known as "equitizing." The choice of which method to use is largely determined by the financing costs of rolling the futures contracts over time.<sup>1</sup> With multinational indexes, it can be expedient to buy a set of complementary exchange-traded funds to replicate market returns for the various countries.

### Pooled Investments

Pooled investments are the most convenient approach for the average investor because they are easy to purchase, hold, and sell. This section covers conventional open-end mutual funds and exchange-traded funds (ETFs).

The Qualidex Fund, started in 1970, was the first open-end index mutual fund available to retail investors. It was designed to track the Dow Jones Industrial Average. The Vanguard S&P 500 Index Fund, started in 1975, was the first retail fund to attract investors on a large scale. The primary advantage provided by a mutual fund purchase is its ease of investing and record keeping.

Investors who want to invest in an index-based mutual fund must take the same steps as those investing in actively managed ones. First, a needs analysis must be undertaken to decide on the investor's return and risk objectives as well as investment constraints, and then to find a corresponding strategy. For example, risk-averse equity investors may seek a low volatility strategy, while investors looking to match the broad market may prefer an all-cap market-cap-weighted strategy. Once the need has been identified, it is likely that a mutual fund can be found or built to match that need.

Traditional mutual fund shares can be purchased directly from the adviser who manages the fund, through a fund marketplace, or through an individual financial adviser. The process is the same for any mutual fund whether it is index based or actively managed. Investment companies generally have websites and call centers to help their prospective investors transact shares.

A fund marketplace is a brokerage company that offers funds from different providers. The advantage of buying a mutual fund from a fund marketplace is the ease of purchasing a mutual fund from different providers while maintaining a single account for streamlined record keeping.

A financial adviser can also help in purchasing a fund by offering the guidance needed to identify the strategy, providing the single account to house the fund shares, and gaining access to lower-cost share classes that may not be available to all investors.

No matter how mutual fund shares are purchased, the primary benefits of index-based mutual funds are low costs and the convenience of the fund structure. The investment manager handles all the needed rebalancing, reconstitution, and other changes that are required to keep the investment portfolio in line with the index. Index-based strategies require constant maintenance and care to reinvest cash from dividends and to execute the buys and sells required to match the additions and deletions of securities to the index. The portfolio manager of an index-based mutual fund also has most of the same responsibilities as a direct investor. These include trading securities, managing cash, deciding how to proceed with corporate actions, voting proxies, and reporting performance. Moreover, index-based mutual funds bear costs in such areas as registration, custodial, and audit, which are similar to those for actively managed mutual funds.

Record keeping functions for a mutual fund include maintaining a record of who owns the shares and when and at what price those shares were purchased. Record keepers work closely with both the custodian of the fund shares to ensure that the security is safely held in the name of the investor and the mutual fund sponsor who communicates those trades.

In the United States, mutual funds are governed by provisions of the Investment Company Act of 1940. In Europe, Undertakings for Collective Investment in Transferable Securities (UCITS) is an agreement among countries in the European Union that governs the management and sale of collective investment funds (mutual funds) across European borders.

ETFs are another form of pooled investment vehicle. The first ETF was launched in the Canadian market in 1990 to track the return of 35 large stocks listed on the Toronto Stock Exchange. ETFs were introduced in the US market in 1993. They are registered funds that can be bought and sold throughout the trading day and change hands like stocks. Advantages of the ETF structure include ease of trading, low management fees, and tax efficiency. Unlike with traditional open-end mutual funds, ETF shares can be bought by investors using margin borrowing; moreover, investors can take short positions in an ETF. ETFs offer flexibility in that they track a wide array of indexes.

ETFs have a unique structure that requires a fund manager as well as an authorized participant who can deliver the assets to the manager. The role of the authorized participant is to be the market maker for the ETF and the intermediary between investors and the ETF fund manager when shares are created or redeemed. To create shares of the ETF, the authorized participant delivers a basket of the underlying stocks to

## Pooled Investments

the fund manager and, in exchange, receives shares of the ETF that can be sold to the public. When an authorized participant needs to redeem shares, the process is reversed so that the authorized participant delivers shares of the ETF in exchange for a basket of the underlying stocks that can then be sold in the market.

The creation/redemption process is used when the authorized participant is either called upon to deliver new shares of the ETF to meet investor needs or when large redemptions are requested. The redemption process occurs when an authorized participant needs to reduce its exposure to the ETF holding and accepts shares of the underlying securities in exchange for shares of the ETF.

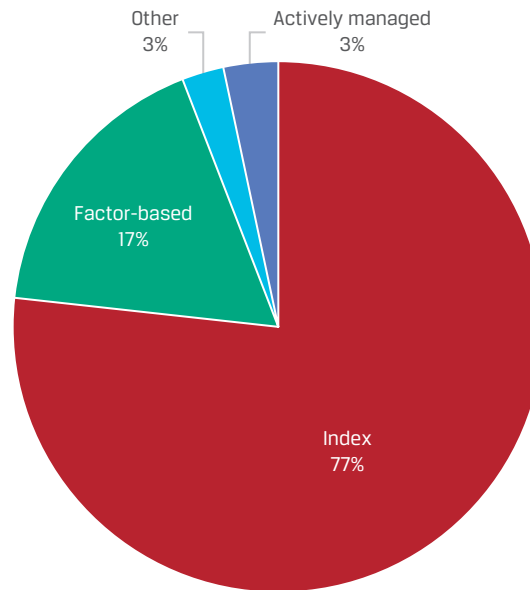
All else equal, for jurisdictions that require capital gains and losses to be passed through to investors like the US, an ETF has greater tax efficiency than a similarly managed mutual fund. Managers of mutual funds must sell their portfolio holdings to fulfill shareholder redemptions, creating a taxable event where gains and losses are realized. ETFs have the advantage of accommodating those redemptions through an in-kind delivery of stock, which is the redemption process. Capital gains are not recorded when a redemption is fulfilled through an in-kind delivery of securities, so the taxable gain/loss passed to the investor becomes smaller.

Disadvantages of the ETF structure include the need to buy at the offer and sell at the bid price, commission costs, and the risk of an illiquid market when the investor needs to buy or sell the actual ETF shares.

ETFs that track indexes are used to an increasing degree by financial advisers to provide targeted exposure to different sectors of the investable market. Large investors find it more cost effective to build their own portfolios through replication, stratified sampling, and optimization, concepts to be introduced later. Other investors find ETFs to be a relatively low-cost method of tracking major indexes. Importantly, like traditional open-end mutual funds, ETFs are an integrated approach in that portfolio management and accounting are conducted by the fund adviser itself. A limitation is that there are far more benchmark indexes than ETFs, so not all indexes have an exchange-traded security that tracks them, although new ETFs are constantly being created.

Exhibit 2 shows that factor-based ETFs have become a large segment of the market, accounting for 17% of the approximately \$7 trillion in global equity ETF assets under management as of the fourth quarter 2022. Factor-based ETFs provide exposure to such single factors as Size, Value, Momentum, Quality, Volatility, and Yield. There are also multifactor ETFs, such as the iShares U.S. Equity Factor ETF, which emphasizes exposure to the Size, Value, Momentum, Quality, and Volatility factors. Meanwhile, the ETF attempts to maintain characteristics that are similar to the underlying STOXX U.S. Equity Factor Index, including sector exposures. As of 2023, the fund's expense ratio was 0.08%.

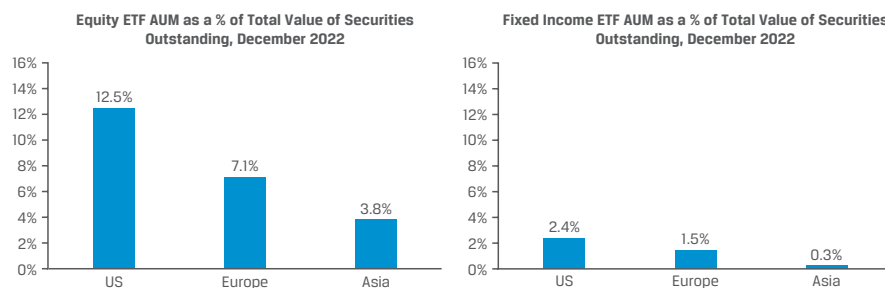
### Exhibit 2: Globally Listed Equity ETFs by Investment Approach, Based on Assets under Management



Sources: ETFGI (December 2022); authors' analysis. <https://etfgi.com/news/press-releases/2022/12/etfgi-reports-smart-beta-etfs-listed-globally-gathered-us755-billion>.

Exhibit 3 shows that while they are large, assets under management in ETFs still represent only a small part of financial markets. ETFs represented just 9% of equity assets across the United States, Europe, and Asia Pacific at the end of 2022. Market share for fixed-income ETFs is much lower. These numbers reflect index ETFs as well as factor-based and other approaches.

### Exhibit 3: ETF Market Share by Geography, December 2022



Sources: Blackrock; authors' analysis.

The decision of whether to use a conventional open-end mutual fund versus an ETF often comes down to cost and flexibility. Investors who seek to mimic an index must identify a suitable tracking security. Long-term investors benefit from the slightly lower expense ratios of ETFs than otherwise equivalent conventional open-end mutual funds. However, the brokerage fees associated with frequent investor trades into ETF shares can negate the expense ratio advantage and thus make ETFs less economical.

## DERIVATIVES-BASED APPROACHES AND INDEX-BASED PORTFOLIOS

# 4

- | compare different approaches to index-based equity investing

Beyond purchasing a third-party-sponsored pooled investment and building it themselves, investors can access index performance through derivatives, such as options, swaps, or futures contracts. Derivative strategies are advantageous in that they can be low cost, easy to implement, and provide leverage. However, they also present a new set of risks, including counterparty default risk for derivatives that are not traded on exchanges or cleared through a clearing house. Derivatives can also be relatively difficult to access for individual investors.

Options, swaps, and futures contracts can be found on many of the major indexes, such as the MSCI EAFE Index and the S&P 500 Index. Options and futures are traded on exchanges and so are processed through a clearing house. This is important because a clearing house eliminates virtually all of the default risk present in having a contract with a single counterparty. Equity swaps, on the other hand, are generally executed with a single counterparty and so add the risk of default by that counterparty.

Derivatives allow for leverage through their notional value amounts. Notional value of the contracts can be many times greater than the initial cash outlay. However, derivatives expire, whereas stocks can be held indefinitely. The risk of an expiring options contract is a complete loss of the relatively small premium paid to acquire the exposure. Futures and swaps can be extended by “rolling” the contract forward, which means selling the expiring contract and buying a longer dated one.

Futures positions must be initiated with a futures commission merchant (FCM), a clearing house member assigned to trade on behalf of the investor. The FCM posts the initial margin required to open the position and then settles on a daily basis to comply with the maintenance margin required by the clearing house. The FCM also helps close the position upon expiration. However, futures accounts are not free of effort on the client’s part. Having a futures account requires the management of daily cash flows, sometimes committing additional money and sometimes drawing it down.

It is uncommon for index-based portfolio managers to use derivatives in the long term to synthetically mimic the return from the underlying securities. Derivatives are typically used to adjust a pre-existing portfolio to move closer to meeting its objectives. These derivative positions are often referred to as an **overlay**. A **completion overlay** addresses an indexed portfolio that has diverged from its proper exposure. A common example is a portfolio that has built up a surplus of cash from investor flows or dividends, causing the portfolio’s beta to be significantly less than that of the benchmark. Using derivatives can efficiently restore the overall portfolio beta to its target. A **rebalancing overlay** addresses a portfolio’s need to sell certain constituent securities and buy others. Particularly in the context of a mixed stock and bond portfolio, using equity index derivatives to rebalance toward investment policy target weights can be efficient and cost-effective. A **currency overlay** assists a portfolio manager in hedging the returns of securities that are held in a foreign currency back to the home country’s currency.

Equity index derivatives offer several advantages over cash-based portfolio construction approaches. A portfolio manager can increase or decrease exposure to the entire index portfolio in a single transaction. Managers who want to make tactical adjustments to portfolio exposure often find derivatives to be a more efficient tool

than cash-market transactions for achieving their goals. Many derivatives contracts are highly liquid, sometimes more so than the underlying cash assets. Especially in this case, portfolio exposures can be tactically adjusted quickly and at low cost.

For the longer term, strategic changes to portfolios are usually best made using cash instruments, which have indefinite expirations and do not necessitate rolling over expiring positions. Futures markets, for example, can impose position limits on such instruments that constrain the scale of use. Derivatives usage is also sometimes restricted by regulatory bodies or investment policy statement stipulations, so in this case cash could be a preferred approach. Finally, depending on the index that is being tracked, a suitable exchange-traded futures contract may not be available.

In addition to options, which have nonlinear payoffs, the two primary types of equity index derivatives contracts are futures and swaps. Equity index futures provide exposure to a specific index. Unlike many commodity futures contracts, index futures are cash-settled, which means the counterparties exchange cash rather than the underlying shares.

The buyer of an equity index futures contract obtains the right to buy the underlying (in this case, an index) on the expiration date of the contract at the futures price prevailing at the time the derivative was purchased. For exchange-traded futures, the buyer is required to post margin (collateral) in the account to decrease the credit risk to the exchange, which is the effective counterparty. For S&P 500 Index futures contracts as traded on the Chicago Mercantile Exchange, every USD change in the futures price produces a USD250 change in the contract value (thus a “multiplier” of 250). For example, if the September S&P 500 futures contract settled at a price of 2,159.30 after settling at 2,157 the day before, then the change in contract value would be  $250 \times (\text{USD}2,159.30 - \text{USD}2,157) = \text{USD}575$ .

Equity index futures contracts for various global markets are shown in Exhibit 4.

#### Exhibit 4: Representative Equity Index Futures Contracts

Index Futures Contract	Market	Contract Currency and Multiplier
<b>Americas</b>		
Dow Jones mini	United States	USD 5
S&P 500	United States	USD 250
S&P 500 mini	United States	USD 50
NASDAQ 100 mini	United States	USD 20
Mexican IPC	Mexico	MXN 10
S&P/TSX Composite mini	Canada	CAD 5
S&P/TSX 60	Canada	CAD 200
Ibovespa	Brazil	BRL 1
<b>Europe, Middle East, and Africa</b>		
Euro STOXX 50	Europe	EUR 10
FTSE 100	United Kingdom	GBP 10
DAX 30	Germany	EUR 25
CAC 40	France	EUR 10
Swiss Market	Switzerland	CHF 10
IBEX 35	Spain	EUR 10

**Europe, Middle East, and Africa**

WIG20	Poland	PLN 20
FTSE/JSE 40	South Africa	ZAR 10

**Asia Pacific**

S&P/ASX 200	Australia	AUD 25
CSI 300	Chinese mainland	CNY 300
Hang Seng	Hong Kong SAR	HKD 50
H-Shares	Hong Kong SAR	HKD 50
Nifty 50	India	INR 50
Nikkei 225	Japan	JPY 1,000
Topix	Japan	JPY 10,000
KOSPI 200	Korea	KRW 500,000

Source: Please see [www.investing.com/indices/indices-futures](http://www.investing.com/indices/indices-futures), October 2021.

Given that futures can be traded using only a small amount of margin, it is clear that futures provide a significant degree of potential leverage to a portfolio. Leverage can be considered either a positive or negative characteristic, depending on the manner with which the derivative instrument is used. Unlike some institutional investors' short-sale constraints on stock positions, many investors do not face constraints on opening a futures position with a sale of the contracts. Among other benefits of futures is the high degree of liquidity in the market, as evidenced by low bid–ask spreads. Both commission and execution costs also tend to be low relative to the exposure achieved. The low cost of transacting makes it easy for portfolio managers to use futures contracts to modify the equity risk exposure of their portfolios.

Equity index futures do come with some disadvantages. Futures are used by index fund managers because the instruments are expected to move in line with the underlying index. To the extent that the futures and spot prices do not move in concert, the portfolio may not track the benchmark perfectly. The extent to which futures prices do not move with spot prices is known as basis risk. Basis risk results from using a hedging instrument that is imperfectly matched to the investment being hedged. Basis risk can arise when the underlying securities pay dividends, while the futures contract tracks only the price of the underlying index. The difference can be partially mitigated when futures holders combine that position with interest-bearing securities.

As noted, futures account holders also must post margin. The margin amount varies by trading exchange. In the case of an ASX-200 futures contract, the initial margin required by the Sydney Futures Exchange for an overnight position is AUD 6,700. The minimum maintenance margin for one contract is AUD 5,300.

By way of example, assume an investor buys an ASX-200 futures contract priced at AUD 5,700, and the futures contract has a multiplier of 25. The investor controls AUD 142,500 [= 25 × AUD 5,700] in value. This currency amount is known as the contract unit value. With the initial margin of AUD 6,700 and a maintenance margin of AUD 5,300, a margin call will be triggered if the contract unit value decreases by more than AUD 1,400. A decrease of AUD 1,400 in the margin is associated with a contract unit value of AUD 142,500 – AUD 1,400 = AUD 141,100. This corresponds to an ASX-200 futures price of AUD 5,644 [= AUD 141,100/25]. Thus, a futures price decrease of 0.98% [= (AUD 5,644 – AUD 5,700)/AUD 5,700] is associated with a decrease in the margin account balance of 20%. This example demonstrates how even a small change in the index value can result in a margin call once the mark-to-market process occurs.

Another derivatives-based approach is the use of equity index swaps. Equity index swaps are negotiated arrangements in which two counterparties agree to exchange cash flows in the future. For example, consider an investor who has a EUR20 million

notional amount and wants to be paid the return on her benchmark index, the Euro STOXX 50, during the coming year. In exchange, the investor agrees to pay a floating rate of return of Market Reference Rate (MRR) + 0.20% per year, with settlement occurring semi-annually. Assuming a six-month stock index return of 2.3% and annualized MRR of 0.18% per year, the first payment on the swap agreement would be calculated as follows. The investor would receive  $\text{EUR}20 \text{ million} \times 0.023 = \text{EUR}460,000$ . The investor would be liable to the counterparty for  $\text{EUR}20 \text{ million} \times (0.0018 + 0.0020) \times (180/360) = \text{EUR}38,000$ ; so, when the first settlement occurs the investor would receive  $\text{EUR}460,000 - \text{EUR}38,000 = \text{EUR}422,000$ . In this case, the payment received by the portfolio manager is from the first leg of the swap, and the payment made by that manager is from the second leg. MRR is used generically in this example, but the second leg can also involve the return on a different index, stock, or other asset, or even a fixed currency amount per period.

Disadvantages of swaps include counterparty, liquidity, interest rate, and tax policy risks. Relatively frequent settlement decreases counterparty risk and reduces the potential loss from a counterparty's failure to perform. Equity swaps tend to be non-marketable instruments, so once the agreement is made there is not a highly liquid market that allows them to be sold to another party (though it is usually possible to go back to the dealer and enter into an offsetting position). Although the equity index payment recipient is an equity investor, this investor must deliver an amount linked to MRR; the investor bears interest rate risk. One prime motivation for initiating equity swaps is to avoid paying high taxes on the full return amount from an equity investment. This advantage is dependent on tax laws remaining favorable, which means that equity swaps carry tax policy risk.

There are a number of advantages to using an equity swap to gain synthetic exposure to index returns. Exchange-traded futures contracts are available only on a limited number of equity indexes. Yet as long as there is a willing counterparty, a swap can be initiated on virtually any index. So swaps can be customized with respect to the underlying as well as to settlement frequency and maturity. Although most swap agreements are one year or shorter in maturity, they can be negotiated for as long a tenor as the counterparties are willing. If a swap is used, it is not necessary for an investor to pay transaction costs associated with buying all of the index constituents. Like futures, a swap can help a portfolio manager add leverage or hedge a portfolio, which is usually done on a tactical or short-term basis.

## Separately Managed Equity Index-Based Portfolios

Building an index-based equity portfolio as a separately managed portfolio requires a certain set of capabilities and tools. An equity investor who builds an indexed portfolio will need to subscribe to certain data on the index and its constituents. The investor also requires a robust trading and accounting system to manage the portfolio, broker relationships to trade efficiently and cheaply, and compliance systems to meet applicable laws and regulations.

The data subscription can generally be acquired directly from the index provider and may be offered on a daily or less-frequent basis. Generally, the data are provided for analysis only and a separate license must be purchased for index replication strategies. The index subscription data should include company and security identifiers, weights, cash dividend, return, and corporate action information. Corporate actions can include stock dividends and splits, mergers and acquisitions, liquidations, and other reasons for index constituent inclusion and exclusion. These data are generally provided in electronic format and can be delivered via file downloads or fed through a portfolio manager's analytical systems, such as Bloomberg or FactSet. The data are then used as the basis for the indexed portfolio.