LM01 Index-Based Equity Strategies

Version 1.0

1. Introduction

This learning module gives a broad overview of index-based equity investing. Index-based strategies are rule-based, transparent strategies that do not involve identifying mispriced securities but instead seek to replicate the performance of an index. The index selected for replication could be a broad-based index such as the S&P 500, or a factor-based index such as the Russell 1000 Growth. The main advantages of index-based investing are low costs, diversification and tax efficiency.

In this learning module we will:

- Compare factor-based strategies to broad indexing strategies.
- Look at how to gain exposure to an index, via a pooled investment, a derivative-based approach, or a separately managed account.
- Cover portfolio construction techniques
- Discuss tracking error management
- Describe sources of return and risk in an index-based equity portfolio

Instructor's Note: The terms 'index-based investing' and 'passive investing' have been used interchangeably in this learning module.

2. Factor-Based Strategies

Traditional indexing is based on replicating the performance of a market-cap-weighted index. Here we create portfolios with the same weights of constituent securities as the benchmark index.

However, most benchmark returns are driven by factors that can be identified and isolated. In factor-based strategies, we try to replicate the performance of a benchmark by creating a portfolio that has the same exposure to risk-factors as the benchmark.

Exhibit 1 of the curriculum shows the common risk factors that drive equity returns.

Factor	Description
Growth	Growth stocks are generally associated with high-performing 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.

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.

With factor-based strategies, investors can seek exposure to particular factors and/or overweight or underweight certain factors. For example, if an investor believes that value stocks will outperform growth stocks and large-cap stocks will outperform small-cap stocks, then the investor can create a portfolio that overweights large-cap value stocks.

To implement this strategy, decisions need to be made on the timing and degree of factor exposure. The investor needs to have a view of which factors will perform well over a given period. The risk associated with such strategies is that the chosen factor may go out of favor. For example, an investor may overweight value stocks based on the belief that the value factor will perform well, but value stocks may go out of favor and other investors may start preferring growth stocks instead. In such a scenario, value stocks will underperform growth stocks.

In general, factor-based strategies have higher management fees as compared to traditional market-cap based strategies.

There are three broad categories of factor-based strategies:

1. **Return oriented**
   - Dividend yield strategy: involves selecting stocks that have a relatively high dividend yield and which is expected to increase.
   - Momentum: involves selecting stocks that are outperforming other stocks in a given period.
   - Fundamentally weighted: involves using a company's fundamentals—book value, cash flow, revenue, sales, dividends, and employee count—as a basis for weighting each company. For example, selecting stocks based on their earnings. Stocks with higher earnings are likely to be over-weighted. The underlying assumption of this strategy is that the price of the stock should ultimately be based on the fundamentals of a company.
2. **Risk oriented**
   - These strategies seek to reduce risk. Several measures such as volatility, and downside volatility can be used to measure risk.
   - An easy way to implement this strategy is to build a portfolio with weights inversely related to the constituent's volatility. High volatility stocks will have a low weight in the portfolio.
3. **Diversification oriented**
   - A simple method is to create an equal weighted portfolio, where each stock has the

same weight.
- A sophisticated method is to determine weights (by looking at past volatility and correlations) to maximize future diversification.

3. Pooled Investments

This section discusses different approaches to passive equity investing such as pooled investments (e.g. mutual funds and ETFs), derivatives-based approaches (using options, futures, and swaps), and separately managed equity index-based portfolios (a do-it-yourself method).

Pooled Investments

The two major types of pooled investments are open-end mutual funds and exchange-traded funds. As with any investment decision, the first step, while selecting pooled investments is to carry out a needs-based analysis and understand the investor's return and risk objectives as well as investment constraints. Once the need has been identified, an investment can be made in an appropriate fund or a set of funds. For example, an investor who has a high return requirement and can also take on relatively high risk can invest in small-cap growth mutual funds.

Mutual funds

Mutual funds shares can be purchased through:
- Fund manager: Investors can purchase shares directly from the entity that manages the fund.
- Individual financial advisor: Investors can approach a financial advisor to get guidance on strategies that meet their needs and purchase mutual fund shares through him.
- Fund marketplace: A fund marketplace is a brokerage company that offers funds from different providers. This is often an online portal, where an investor can log in and select funds that meet his requirement.

A major benefit of investing in mutual funds is that they are convenient and cost effective. This convenience and cost effectiveness are achieved by outsourcing a lot of work to the fund manager. For example, the investment portfolio has to be rebalanced and reconstituted to match the benchmark index, cash dividends have to be reinvested, proper accounting and tax payments have to be made, performance reporting has to be done and record keeping is required.

Some constraints associated with open-ended mutual funds are:
- Shares can only be bought or sold based on closing prices. They are not traded throughout the day.
- Shares cannot be shorted.
- Margin purchases are not allowed.

Exchange-Traded Funds (ETFs)

Similar to open-ended funds, ETFs are also a convenient and cost-effective option for investors. However, ETFs have several advantages over open-end funds that have made them popular over the last couple of decades. Some of the advantages are:

- ETFs trade a lot like regular shares, they can be bought or sold during the trading day.
- Margin borrowing and short positions are allowed.
- They have a slightly lower expense ratio as compared to mutual funds.
- ETFs have a unique structure that leads to tax efficiency. An authorized participant acts as an intermediary between investors and the ETF manager. He is also the market maker for the ETF. To create new ETF shares, the authorized participant delivers a basket of underlying shares to the ETF manager and in return gets new ETF shares. These ETF shares are then sold to the investor. If an investor wants to redeem shares, then this process is reversed. ETFs can therefore accommodate redemptions through an in-kind delivery of stocks i.e. underlying stocks don't always have to be sold. This unique structure makes ETFs more tax efficient as compared to open-end mutual funds.
- Compared to mutual funds, ETFs track many more equity indexes.

Some disadvantages associated with ETFs are:

- Though ETFs track many more indexes as compared to mutual funds, there are still several indexes that are not tracked by an ETF.
- ETFs are subject to the bid-ask spread, i.e. they need to be bought at a relatively high price and sold at a relatively low price.
- They expose an investor to liquidity risk.
- Commission costs/ brokerage fees have to be paid while buying or selling ETFs.

Over time factor-based ETFs have also become popular. They track one or more factors such as size, value, momentum, quality, volatility, etc.

4. Derivatives-Based Approaches & Index-Based Portfolios

Apart from using pooled investments, investors can also replicate benchmark performance using derivatives such as futures or swaps. For example, if an investor's benchmark index is the S&P 500, the investor can replicate its performance by purchasing futures contracts on the S&P 500 or by entering into a swap where he pays a fixed/floating rate and receives the returns on the S&P 500.

Derivatives are typically used to adjust pre-existing portfolios and move them closer to their benchmarks. These derivative positions are called 'overlays'. There are three types of overlays:

1. Completion overlay: Consider a stock portfolio that is tracking the S&P 500. This portfolio has built up surplus cash because of dividends from the underlying stocks.

The surplus cash causes the portfolio beta to be less than that of the S&P 500. Using derivatives, we can restore the overall portfolio beta to that of the S&P 500.

2. Rebalancing overlay: Consider a mixed portfolio that was constructed using 60% stocks and 40% bonds. Stocks performed well over time and the portfolio weights are now 70% stocks and 30% bonds. Using derivatives, we can rebalance the portfolio towards the original target weights.
3. Currency overlay: Consider a US based investor who has bought shares in Europe. He has exposure to the EUR/USD exchange rate. Using derivatives, the investor can hedge this exposure.

Derivatives-based approaches offer several advantages

- Derivatives can be cost effective if the portfolio requires short-term changes. For long-term changes, generally, cash instruments are a better option.
- Derivatives-based strategies are easy to implement. In the completion overlay example, the portfolio manager can restore the portfolio beta by purchasing just one type of futures contract on the S&P 500 as opposed to potentially having to purchase all 500 stocks in a cash instruments-based strategy.
- Derivatives provide significant leverage. They provide substantial exposure to an index with a relatively small amount of investment.

Derivatives also have several disadvantages:

- Derivatives are not available in all markets. Further OTC derivative products like swaps are generally not accessible to small individual investors.
- There may be restrictions on using derivatives. For example, certain mutual funds may not allow the use of derivatives.
- OTC derivatives such as swaps, expose an investor to counterparty risk.
- Most derivatives such as futures and options tend to have short maturities. A long-term derivatives-based strategy requires constant rolling over of positions.

Equity Index Futures

Equity index futures allow us to increase/decrease the exposure to an index portfolio through a single transaction. They typically have a multiplier and initial and maintenance margin requirements. Let's understand these concepts with the help of an example from the curriculum.

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 an 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 the leverage that derivatives provide and how even a small change in index values can trigger a margin call.

Some futures contracts may be more liquid than the underlying securities. Also, it is easy to take short positions in the index futures rather than taking short positions in the underlying securities.

Several large popular indexes have future contracts. However, many smaller indexes do not have futures contracts.

If a futures contract does not fully track the underlying benchmark, then we have 'basis risk'. Basis risk may arise if the underlying securities pay dividends, whereas the futures contract tracks only the price of the underlying index.

Equity Index Swaps:

These are OTC negotiated agreements in which two parties agree to exchange cash flows. Just like equity index futures, equity index swaps can be used to increase or decrease exposure to a benchmark. Let's look at an example from the curriculum to understand how equity index swaps work.

Example: Consider an investor who has a EUR 20 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 Libor + 0.20% per year, with settlement occurring semi-annually. Assuming a six-month stock index return of 2.3% and annualized Libor of 0.18% per year, the first payment on the swap agreement would be calculated as follows. The investor would receive EUR 20 million × 0.023 = EUR 460,000. The investor would be liable to the counterparty for EUR 20 million × (0.0018 + 0.0020) × (180/360) = EUR 38,000; so, when the first settlement occurs the investor would receive EUR 460,000 – EUR 38,000 = EUR 422,000.

By using equity index swaps, investors can avoid paying taxes on the full equity return amount. In the above example, the full return amount on equity was 460,000. However, the net cash flow to the investor was 422,000. Most jurisdictions allow the investor to pay taxes on the net cash flows.

As compared to equity index futures that are available only for a limited number of equity indexes, a swap can be initiated on virtually any index, as long as there is a willing counterparty.

Equity index swaps expose an investor to the following risks:

- Counterparty risk: Swaps are OTC instruments and not exchange traded. The counterparty may default on its commitments.
- Liquidity risk: To sell to another party an investor needs to enter into an offsetting

swap with another party which may be difficult.
- Interest rate risk: If an investor is paying a floating interest rate in a swap, then he is exposed to interest rate risk.
- Tax policy risk: An investor may structure a swap based on the current tax policy, but the tax policy may change and impact the strategy.

Options: Along with futures and swaps, options can also be used in a derivatives-based strategy. Options require an upfront premium payment and provide a one-sided payoff.

Separately Managed Equity Index-Based Portfolios

For large investors, it can be cost effective to build their own portfolios. However, several capabilities and tools are required to build a separately managed portfolio. These include:
- Data subscription: To effectively track an index, the investor needs access to data about the constituents of the index, the weighting rules, security prices, etc.
- Trading systems are required to place orders easily. Also, the trading system should make it easier to compare the value and performance of the portfolio with the benchmark index.
- Accounting systems are required to report daily performance and historical transactions and to produce statements.
- Good broker relationships are required to minimize brokerage fees.
- Compliance tools are needed to ensure that trades are executed according to applicable rules and regulations.

Typically, managers buy securities using a 'program trade'. A program trade allows investors to buy and sell several securities simultaneously. The first step in a program trade is to create a trading file that shows the various transactions that need to be executed. The trading file is usually created on an order management system such as Charles River. This trading file is then sent to an execution broker to execute the program trade.

Once a portfolio is created to mimic a benchmark index, the manager must continue to review the holdings frequently. If there are any changes in the benchmark index, the manager must make trades to reflect the changes in the portfolio. If the underlying stocks pay cash dividends, the manager must reinvest these dividends.

Since the index is priced at the close of business each day, to replicate the index, most trade execution takes place at the close of business day. 'Market-on-Close' (MOC) orders are used to achieve this objective.

5. Portfolio Construction

This section describes how to construct passively managed portfolios. The three main approaches are full replication, stratified sampling, and optimization.

Full Replication

In this approach, all securities represented by the index are purchased in weightings that closely match the actual index weightings. For example, if the benchmark index is the S&P 500, under the full replication approach, all 500 securities that are part of the index will be purchased in amounts corresponding to their weights in the index.

Some indexes are more conducive to full replication than others. For example, all 500 securities in the S&P 500 are liquid. But many of the 8,000 securities in the MSCI ACWI Investable Markets Index are illiquid. Therefore, full replication is not a suitable choice for the MSCI ACWI Investable Markets Index.

Portfolio managers use data from index providers to construct portfolios. This includes information about the constituent securities, the weighting schemes, the rules associated with reconstitution and rebalancing, etc.

To execute a set of buy and sell orders, data is imported into a data compiler or an Order Management System (OMS) such as Charles River. A trading file is created and sent to the execution broker for executing the trades. The OMS should have a pre-trade compliance check feature. This ensures that before a trade is executed, all necessary checks are done to ensure that no rules and regulations are violated.

Once the portfolio is created, the manager must keep the portfolio in sync with the Index. Dividends received should be reinvested. Any changes to the index should be reflected in the portfolio.

As the number of securities in a portfolio increases, the tracking error decreases but the associated trading cost increases. It may not always be practical to do full replication, then a more suitable approach known as the stratified sampling approach (discussed in the next section) may be used.

Stratified Sampling

Stratified sampling is used when the index has many constituent securities or when assets under management are low.

In this approach, we split the population into strata (or sub-groups) and then select samples from each stratum. For example, consider a benchmark index with 1,000 constituents. 50% of the constituents belong to Sector A, 30% belong to Sector B and 20% belong to Sector C. Also assume that these percentages represent the market cap of each sector. A sample of 10 stocks can then be created by selecting 5 stocks from Sector A, 3 stocks from Sector B, and 2 stocks from Sector C.

Apart from industry sectors, strata can also be created on style characteristics- value, growth, blend, or market cap- large cap, mid cap, small cap.

The advantage of stratified sampling is that a limited sample can closely track the index.

This keeps trading costs low, while also minimizing the tracking error.

Example: Stratified Sampling
(*This example is taken from the curriculum.*)

A portfolio manager responsible for accounts of high-net-worth individuals is asked to build an index portfolio that tracks the S&P 500 Value Index, which has more than 300 constituents. The manager and the client agree that the minimum account size will be USD 750,000, but the manager explains to the client that full replication is not feasible at a reasonable cost because of the mandate size.

How can the manager use stratified sampling to achieve her goal of tracking the S&P 500 Value Index?

Solution:

The manager recommends that the client set a maximum number of constituents (for example, 200) to limit the average lot size and to reduce commission costs. Next, the manager seeks to identify the constituents to hold based on their market capitalization. That is, the manager selects the 200 securities with the largest market capitalizations. Then the manager seeks to more closely match the performance of the index by matching the sector weightings of the sampled portfolio to the sector weightings of the index. After comparing sector weights, the manager reweights the sampled portfolio. Using this method of stratified sampling meets the manager's stated goal of closely tracking the performance of the index at a reasonable cost.

Optimization

In this approach, we try to maximize desirable characteristics or minimize undesirable characteristics subject to one or more constraints. For example, we can try to minimize tracking error subject to constraints such as the number of shares in the portfolio ≤ 50, or market cap of selected shares must be above a certain level.

Simply minimizing the tracking error can lead to a portfolio that is not mean-variance efficient as compared to the benchmark. This issue can be addressed by introducing a constraint that the standard deviation of the portfolio should be equal to the standard deviation of the benchmark index.

Optimization can be conducted in conjunction with stratified sampling. The population can be divided into strata and optimization programs can be run for these strata. This ensures that the portfolio has adequate coverage across all strata of the population.

The advantages of the optimization approach are:

- It has a lower tracking error relative to stratified sampling.
- It explicitly considers correlations among the securities of a portfolio.

The disadvantages of the optimization approach are:

- Optimization is based on variances, correlations, and expected returns of

constituent securities. These factors change occur over time; therefore, optimization programs need to be run frequently resulting in adjustments that can increase trading costs.
- Optimization requires a high level of technical sophistication. Analysts are required to have knowledge about the software to be used and have expertise in interpreting outputs.

Blended Approach

If an index has a large number of constituents, where some are very liquid while others are less liquid, then a blended approach can be used. Therefore, an indexed portfolio can be constructed using a blended approach which involves full replication for the liquid securities and stratified sampling or optimization for less liquid securities.

6. Tracking Error Management

Tracking Error and Excess Return

Tracking error measures the extent to which a portfolio tracks a benchmark. It is calculated as the standard deviation of the difference between the portfolio return and its benchmark return. A portfolio that closely matches the benchmark will have a low tracking error.

Excess return is the difference between the portfolio return and the benchmark return. Tracking error and excess return are separate measures and they should not be used interchangeably. It is possible to have a high tracking error but a zero excess return. This can happen if the portfolio was initially lagging the index and then subsequently leading the index by the same amount.

Index fund managers try to maintain a low tracking error and an excess return that is not negative.

Tracking error varies depending on:
- The manager's approach to track the index. For example, a full replication approach will have a low tracking error as compared to a stratified sampling approach.
- How frequently the data is measured. If we measure data very frequently, then the tracking error will be high. For example, a daily frequency will have a high tracking error as compared to a monthly frequency.

Tracking error is not a constant value, it varies over time. The tracking error can be high for some time periods and relatively low for other time periods.

Example: Tracking Error and Excess Return
(*This example has been taken from the curriculum.*)

Exhibit 12 illustrates key portfolio metrics for three of the older and larger conventional open-end funds in the Australian and South Korean markets. Based on the levels of tracking error and excess return figures provided in the exhibit, explain whether the funds are likely

replicating or sampling.

Exhibit 12 Major Conventional Index Mutual Funds in Australia and South Korea

Fund Name (Holdings)	Holdings	Annual Management Fee (bps)	3-Year Annualized Tracking Error	3-Year Annualized Excess Return
Australian market benchmark for the following funds is the S&P/ASX 300 Index. Number of securities in the index: 300.				
BlackRock Indexed Australian Equity Fund	296	20	0.0347%	−0.1684%
Macquarie True Index Australian Shares	259	0	0.0167%	0.0111%
Vanguard Australian Shares Index	293	18	0.1084%	−0.1814%
South Korean market benchmark for the funds below is the KRX KOSPI 200 Korea Index. Number of securities in the index: 200.				
KB Star Korea Index Equity CE	190	36	1.2671%	0.3356%
KIM Cruise Index F2.8 Equity-Deriv A	178	9	1.5019%	1.7381%
Samsung Index Premium Equity-Deriv A	204	40	1.3325%	1.1097%

Solution:

Based on the number of stocks in the fund compared to the index constituent number, it appears most funds are attempting to replicate. Two of the funds (Macquarie True Index and KIM Cruise Index) have 80% to 90% of the stocks in the index, which indicates they are more likely to be using sampling. One fund (Samsung Index Premium) actually holds more than the index, which can happen if buffering is used. No fund contains the same number of stocks as constituents in the index. Thus, it is not surprising that the funds failed to track their respective indexes perfectly. On an annualized basis, tracking error for the Australian funds is less than one-tenth the level of the Korean funds. However, the Korean funds' excess return—which is fund return less the benchmark index return—is positive in all three cases. The negative excess returns for two of the Australian funds are relatively close and possibly attributable to their management fees of 18–20 basis points.

Potential Causes of Tracking Error and Excess Return

Several reasons result in tracking errors and excess returns:

- Fees charged: High management fees drive down excess returns and increase the tracking error.
- Number of securities: If the number of securities in the benchmark index is high, full replication may not be feasible and stratified sampling may be required, which increases tracking error.
- Intra-day trading: Benchmarks use the end-of-day prices. If portfolio securities are brought or sold during the day, then their prices will differ from benchmark prices leading to tracking errors.
- Trading commissions: Similar to management fees, trading commissions also lower excess returns and increase tracking error.

- Cash holdings: Indexes do not have a cash component, whereas portfolios do have temporary uninvested cash balances from sources such as dividends received, sale proceeds, investor contributions, etc. The tracking error caused by the uninvested cash balance is called the 'cash drag'. Cash drag has a negative effect on excess return when the market is rising and a positive effect when the market is falling.

Controlling Tracking Error

The following approaches can be used to control tracking error:

- Minimize cash held by the portfolio. For example, reinvest dividends as soon as they are received.
- Invest at valuations used by index providers. Use market-on-close orders or trade as near to the closing time as feasible.
- Maintain a beta of 1 relative to the index.
- Keep risk factor exposures similar to those of the index.

7. Sources of Return and Risk in Index-Based Equity Strategies

Attribution Analysis

Attribution analysis refers to the analysis of sources of return of the portfolio and the underlying index and identifying the reasons for the differences.

The sources of return include company-specific returns, sector returns, country returns, and currency returns. Unlike active managers, a passive manager does not make company-specific allocation choices. Hence, this factor is not a major consideration for passive managers. The most significant source of return for a passive manager is sector allocation. The sector exposures for the portfolio should be compared to the sector exposures of the benchmark and differences should be identified. Exhibit 13 of the curriculum provides an example of sector attribution analysis, an excerpt from this exhibit is provided below.

		Portfolio X		Benchmark for Portfolio X		Attribution Analysis
Sector	Sector Return (A)	Sector Weight (B)	Contribution to Return (C) = (A) × (B)	Sector Weight (D)	Contribution to Return (E) = (A) × (D)	Difference (F) = (C) – (E)
Total	5.62	100.00	5.62	100.00	5.65	–0.03
Telecom. Services	16.94	2.25	0.38	2.34	0.40	–0.02
Utilities	15.45	12.99	2.01	13.03	2.01	–0.01
Consumer Discretionary	12.09	3.89	0.47	3.90	0.47	0.00

This example shows that the portfolio underperformed the benchmark index by 0.03. This difference was because the sector exposures for the telecom services and utilities sector were lower than the benchmark (2.25 and 12.99 versus 2.34 and 13.03 respectively). Because the telecom services and utility sectors performed well and the portfolio was underexposed to these sectors, the overall portfolio underperformed the benchmark. Thus,

sector attribution analysis helps us understand the reason for over/underperformance.

Securities Lending

Fund managers can lend shares to short-sellers and other market participants for a fee. Shares are usually lent to borrowers through a lending agent. A portion of the fee received from the borrower is paid to the lending agent as compensation for his services. The borrower needs to post collateral that is typically 102% to 105% of the value of the shares borrowed. A borrower can also provide collateral in the form of cash. The lending agent will invest this cash in short-term money-market securities to earn additional returns and may offer some portion of this income as rebates to the borrower.

The major benefit of securities lending to a portfolio manager is that it helps offset portfolio management costs.

The major risks of securities lending are:

- Quality of borrower (credit risk): A portfolio manager has the right to call back the borrowed shares at any point in time. However, the borrower may fail to deliver the shares on a timely basis. This risk is referred to as credit risk. Also, any dividends that are received on the borrowed shares need to be passed on to the portfolio manager. The risk of the borrower not making the dividend payments to the portfolio manager is also part of credit risk.
- Value of posted collateral (market risk): In case of a default by the borrower, the portfolio manager has the right to sell the collateral. However, if the market deteriorates the value of the collateral may fall and the portfolio manager has to bear the losses.

Investor Activism and Engagement by Passive Managers

Index fund managers are among the largest shareholders of many companies. Due to this, they have access to the senior management of companies. They can vote shares and participate in governance improvements. Better governance can lead to improvements in the operations and oversight of a company. This is likely to result in better share performance and returns. Therefore, voting and company engagement can be a return-enhancing activity for passive fund managers.

Arguably passive investors have a higher duty to improve governance relative to active investors. They have a long-term perspective as compared to active managers who have a relatively short-term view.

However, there are some counterarguments to this perspective:

- Passive investor may face potential conflicts of interest. Consider a large financial company that manages the pension fund of XYZ company and runs an index fund that contains XYZ company's stocks. Suppose XYZ becomes a target for a potential takeover. If the takeover is successful, then all existing relationships of the company including the pension fund arrangement will be reevaluated. This situation will

create a conflict of interest for the financial company. Because it is in the interest of the financial company to maintain its pension fund arrangement, it may support XYZ's current management and prevent the takeover. Conversely, the takeover may be beneficial to XYZ's shareholders and its index fund investors. In this case, the financial company may want to support the acquiring company.

- Company management may give more importance to active managers. The management is aware of the fact that passive managers are more interested in tracking the benchmark rather than seeking absolute returns.

Summary

LO: Compare factor-based strategies to market- capitalization-weighted indexing.

In factor-based strategies, we try to replicate the performance of a benchmark by creating a portfolio that has the same exposure to risk-factors as the benchmark. Some risk factors include growth, value, size, yield, momentum, quality, volatility, etc.

In market-capitalization weighted indexing, we create portfolios with the same weights of constituent securities as the benchmark index.

LO: Compare different approaches to index-based equity strategies.

The three main approaches to index-based equity investing are

- pooled investments (e.g. mutual funds and ETFs),
- derivatives-based approaches (using options, futures, and swaps), and
- separately managed equity index-based portfolios (a do-it-yourself method).

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

- In the full replication approach, all securities represented by the index are purchased.
- In the stratified sampling approach, we split the population into strata (or sub-groups) and then sample from each stratum.
- In the optimization approach, we try to maximize desirable characteristics or minimize undesirable characteristics subject to one or more constraints.

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

Tracking error is calculated as the standard deviation of the difference between the portfolio returns and the benchmark return. It measures the extent to which a portfolio tracks a benchmark.

The main reasons for tracking error are:

- Fees charged
- Number of securities
- Intra-day trading
- Trading commissions
- Cash holdings

The following approaches can be used to control tracking error:

- Minimize cash held
- Invest at valuations used by index providers
- Maintain a beta of 1 relative to the index.

- Keep risk factor exposures similar to those of the index.

LO: Explain sources of return and risk to an index-based equity portfolio.

Attribution analysis refers to the analysis of sources of return of the portfolio and the underlying index and identifying the reasons for the differences. The sources of return include: company-specific, sector, country, currency, etc. For passive managers, the most significant source of return is sector allocation.

Fund managers can lend shares to short-sellers and other market participants for a fee. This fee can help offset portfolio management costs. The main risks in this strategy are credit risk: the borrower may not return the borrowed securities and market risk: the value of the collateral may fall.

Passive fund managers can also actively engage with companies and help improve their governance. This can improve the performance of the company and generate better returns for the fund.

