A PUBLIC POLICY PRACTICE NOTE

Forecasting Investment Returns and Expected Return Assumptions for Pension Actuaries

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American Academy of Actuaries

Pension Practice Council

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Developed by the Pension Practice Council of the American Academy of Actuaries

AMERICAN ACADEMY *of* ACTUARIES

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Forecasting Investment Returns and Expected Return Assumptions for Pension Actuaries

Background

- Introduction
- Topic 1: Actuarial professional guidance regarding the investment return assumption.
- Topic 2: The internal rate of return concept underlying return forecasts.

Calculation of a portfolio's expected investment return

- Topic 3: Mapping a portfolio's asset allocation to asset classes and sub-asset classes.
- Topic 4: Asset allocation basis: most recent versus investment policy targets.
- Topic 5: Adjustments for potential future changes in asset allocation.
- Topic 6: Impact of volatility and correlations on total portfolio return.

Capital Market Assumptions

Use of historical data and targeted rates of return

- Topic 7: Use of historical data.
- Topic 8: Reflecting targeted rates of return from an investment policy statement.
- Topic 9: Reflecting time horizons for determining expected returns.
- Topic 10: Use of different return expectations for different time periods.

Inflation, economic growth and interest rates

- Topic 11: Data to support an inflation expectation.
- Topic 12: Coordination of inflation assumptions by actuary and investment consultant.
- Topic 13: Data to support an assumption for economic growth.
- Topic 14: Modeling interest rates and the impact on future returns.

Fixed income asset classes

- Topic 15: Fixed income return expectations: direct calculation or implicit determination based on modeled interest rates.

- Topic 16: Return expectations for different credit quality (e.g., Treasury, corporate/credit, high yield).

Equity asset classes

- Topic 17: Using a dividend discount/dividend growth model to project future equity returns.
- Topic 18: Inclusion of share buybacks as a component of future equity returns.
- Topic 19: Impact of earnings growth on future equity returns.
- Topic 20: Reflecting P/E ratio changes and the CAPE metric in forecasting equity returns.
- Topic 21: Forecasting returns for equity sub-asset classes.
- Topic 22: Adjusting for currency/foreign exchange for non-U.S. assets.

Alternative asset classes

- Topic 23: Modeling returns for hedge fund investments and other alternative assets.
- Topic 24: Expected returns for real estate investments.
- Topic 25: Models used to forecast private equity returns.

Appendix: Resources available for assessing capital market assumptions

Glossary

Introduction

Pension actuaries select or recommend investment return assumptions for a variety of purposes, including accounting and financial reporting, public and multiemployer funding valuations, and projections of future funding and solvency levels or asset liability modeling. When selecting or recommending the expected investment return assumption, many actuaries rely on capital market assumptions (CMA) and modeling from outside parties, such as their firm's internal investment practice, the plan's investment consultant, or publicly available white papers or surveys. The range of capital market assumptions used by these outside parties can be significant. In some instances, actuaries might develop expected investment return assumptions on their own.

In either case, understanding capital market assumptions and models helps the actuary exercise appropriate professional judgment in selecting or recommending an expected investment return assumption. This includes determining how to apply return forecasts provided by an outside third party and whether any adjustments to the provided assumptions is warranted.

Information included in this document is intended to illustrate how actuaries select or recommend an expected investment return assumption or assess capital market models from an outside party and may also facilitate discussion with investment professionals to better understand the basis for their assumptions.

This practice note is not a promulgation of the Actuarial Standards Board, is not an actuarial standard of practice (ASOP) or an interpretation of ASOP, is not binding upon any actuary, and is not a definitive statement as to what constitutes generally accepted practice in the area under discussion. Events occurring subsequent to the publication of this practice note may make the practices described in the practice note irrelevant or obsolete.

This practice note was prepared by the Pension Practice Council of the American Academy of Actuaries, to provide information to actuaries on current and emerging practices in the selection of investment return assumptions based on anticipated future experience. The intended users of this practice note are the members of the actuarial organizations governed by the ASOPs promulgated by the Actuarial Standards Board.

This practice note may be helpful when setting assumptions, discussing assumptions recommended by third parties, or providing advice on setting assumptions for funding (where permitted by law), and for financial accounting in connection with funded U.S. benefit plans. It does not cover the selection and documentation of other economic assumptions or demographic assumptions.

The Pension Practice Council welcomes any suggested improvements for future updates of this practice note. Suggestions may be sent to the pension policy analyst of the American Academy of Actuaries at 1850 M Street NW, Suite 300, Washington, DC 20036 or by emailing pensionactuary@actuary.org.

Topic 1: Actuarial professional guidance regarding the investment return assumption.

The Actuarial Standards Board promulgates actuarial standards of practice (ASOPs) that provide professional guidance on various topics for actuaries when rendering actuarial services in the United States. The Code of Professional Conduct identifies the professional and ethical standards required of all U.S. actuaries. The U.S. Qualification Standards facilitate determining whether an actuary is qualified to perform a given assignment. The Code, the ASOPs, and the Qualification Standards constitute the professional guidance that applies to all actuarial work, including the process of selecting an investment return assumption.

Following are some of the current ASOPs that may be relevant to this topic. The list is not exhaustive, and other ASOPs may be applicable for some assignments.

- ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*.
- ASOP No. 23, *Data Quality*; the definition of "data" under this ASOP includes information derived mathematically from data.
- ASOP No. 41, *Actuarial Communications*.

Return to TOC

Topic 2: The internal rate of return concept underlying return forecasts.

An internal rate of return (IRR) is the interest rate at which the net present value of all cash flows for a corporate or financial investment, including the initial investment, is equal to zero. In a pension plan context, it is the discount rate that equates future payments with the current present value of those payments, a pension liability.

The yield on a bond or a fixed income benchmark is also an IRR, making the present value of all future coupons and the face value at maturity equal to the current price of the bond. These yields are used to develop the expected future returns on the bond or fixed income benchmark.

In addition, the IRR models for other asset classes such as equity or real estate provide a basis for their return expectations. For example, either dividend payouts or profits can be considered as the projected income cash flows for an equity investment. Accordingly, equity return estimates are often determined using a dividend discount model, in its simplest form called the Gordon Growth Model. The expected return for an equity investment is the IRR that equates the current equity price with the estimated future dividend cash flows and changes in price of the investment. For further discussion of this concept, see Topic 17.

Other examples of IRR models are models for a high-yield fixed income asset class (see Topic 16) or real estate direct property class model (see Topic 24).

Return to TOC

Topic 3: Mapping a portfolio's asset allocation to the asset classes and sub-asset classes.

Capital market models often differ in how they split up the universe of assets into asset classes and sub-asset classes. See below for examples of typical sub-asset classes for which capital market models may forecast returns. Sometimes a model includes overlapping sub-asset classes—for example, a model might include U.S. equity, international equity and global equity (which includes both U.S. and international equity). On the other hand, some investment strategies and funds may not fit well into any sub-asset class included in a capital market model. Identifying the market benchmark, either from a performance report or a prospectus, can be useful when mapping specific funds to a sub-asset class. In general, because there is no definitively correct approach to this type of mapping, resolving mapping issues often requires a degree of judgment to apply the return forecasts for sub-asset classes to a real-world portfolio.

When determining the expected return for a portfolio, each specific investment in the portfolio may not have a direct and obvious match. For example, assume a model splits the equity asset class into these three sub-asset classes (each with a different expected return and volatility expectation):

- U.S. large cap equity
- U.S. small cap equity
- International equity

Keeping in mind that there is not necessarily one right answer, here is how the mapping of some typical equity investments could be approached:

- A U.S. all cap equity index fund—"U.S. large cap equity" is an appropriate classification because large cap is 75% of the U.S. equity market.
- A mid cap fund—either "U.S. small cap equity" or 50% "U.S. large cap equity" and 50% "U.S. small cap equity" could represent this investment.
- A small cap value fund—"U.S. small cap equity" makes sense because the designations "growth" or "value" are not typically used to distinguish future return forecasts.
- A European small and mid-cap strategy—"International equity" could be the best fit.
- A global large cap developed markets equity fund—50% "U.S. large cap equity" and 50% "International equity" might be a reasonable choice because the U.S. makes up about 50% of the total global market capitalization. The fact that the international equity category would include small cap and emerging market might be immaterial in many situations.

- An international small cap fund—“International equity” might be a good choice because geographic classifications would normally be considered more relevant than size classifications.

Mapping some investments, especially hedge fund or derivative strategies, can be very challenging. If the approach underlying the strategy is clear, such an investment may be assigned to an appropriate equity, fixed income, or real asset class or sub-asset class. Some strategies defy classification and the return estimates of the firm managing the strategy may be used (see Topic 23).

Some of the most common equity sub-classes are:

- U.S. Equity—all large and small companies listed on U.S. exchanges
- U.S. Large Cap—typically includes companies with market capitalization above $5 billion
- U.S. Small Cap—typically includes companies with market capitalization below $1 billion
- U.S. Mid Cap—typically includes companies with market capitalization from $1 billion to $5 billion
- Global Equity—all U.S. and international equity including emerging markets
- International—equities on exchanges in any country outside the U.S.
- International Developed—equities on exchanges in developed countries outside the U.S.
- Emerging Markets—equities on exchanges in smaller, developing countries outside the U.S.

The list below shows some examples of common sub-classes of fixed income included in capital market models. Fixed income sub-classes are more numerous and can be more difficult to define precisely than equity sub-classes.

- U.S. Aggregate Bond (Core bond)—includes U.S. Treasuries, investment-grade corporate (no high yield), mortgage-backed and asset-backed (streams of credit card, car loan, or home equity payments) bonds in the same proportions that they exist in the U.S. market
- High Yield—“junk” bonds, with a credit rating below BBB (Baa by Moody’s)
- U.S. Short Duration—corporate, government bonds and other bonds that mature within three or five years
- U.S. Long Government/Credit—corporate and government bonds that mature at least 10 years in the future
- Intermediate Corporate—U.S. corporate bonds that mature between three and 10 years in the future
- International Fixed Income—corporate and government bonds issued in countries outside the U.S.

- International Fixed Income (hedged)—corporate and government bonds issued in countries outside the U.S. with currency risk hedged
- World Bonds—corporate and government bonds from all countries
- Emerging Market Debt—bonds issued by companies and governments of smaller, developing countries

The list below shows some examples of common sub-classes for alternative investments. Sub-asset classes for alternative investments can be very general, such as hedge funds (includes a wide variety of different strategies), or very specific, such as "long equity hedge funds" (hedge funds that derive returns mostly by investing in stocks that are expected to perform well).

Real Assets

- Real estate—residential, retail, industrial, and office space properties
- Direct real estate—real estate owned directly rather than through a fund
- Real Estate Investment Trusts (REITs)—publicly traded equity securities in companies that are based on real estate investment
- European real estate—properties in European countries
- Global infrastructure—investment in equity or debt for infrastructure projects around the world
- Farmland—direct investment or investment in funds owning land that produces food

Other Alternatives

- Private equity—equity investment in companies that are not publicly traded
- Hedge funds—a conglomeration of a wide variety of strategies that generally restrict investment to institutional and high-net-worth individuals
- Global macro hedge funds—strategies that attempt to invest in any kind of market at the right time based on macroeconomic information
- Commodities—investments in a wide variety of products related to food, energy, or metals like wheat, cattle, copper, gold, oil, or natural gas. Investment can be made directly, but most commodity investment is done through a futures market.
- Oil (a commodity)—investment in oil or oil futures

Return to TOC

Topic 4: Asset allocation basis: most recent versus investment policy targets.

The plan's asset allocation is one factor used in determining a plan's expected return. Pension plans typically have a formal investment policy statement (IPS) that describes the broad asset classes in which the trustees can invest, along with a percentage range of allocation to each asset category. This statement defines the plan's target asset allocation at the time of valuation. Three possible scenarios are:

1. The plan has an investment policy statement and the actual holdings are as stated in the policy: The asset allocation used for determining the expected return probably reflects the current allocation unless the allocation is to be changed in the future. (See Topic 5)
2. The plan does not have a formal investment policy statement: The actual asset allocation is used to determine an expected return. If the asset allocation will change in the future an average allocation over time might be used.
3. The asset allocation differs significantly from the policy statement: Understanding the reasons for the discrepancy helps determine whether the divergence is temporary or long term. If it is temporary, an assumed asset allocation aligned to the target allocation might be used. If the divergence is permanent, the assumed asset allocation would probably be based on the actual holdings.

In some cases, the IPS might only address the allocation between major asset classes, while not specifying how these allocations are divided among various sub-asset classes. The actual asset allocation for a pension fund can be used to identify an appropriate percentage allocation to asset and sub-asset classes for which a capital markets model develops explicit return expectations. For instance, the IPS may define a target of 60% and an allowable range of 40%-75% for equities, while the actual asset allocation includes small cap, large cap, international, and emerging market strategies. The actual allocation to each of those sub-asset classes can be used to determine an appropriate allocation to each sub-asset class for the analysis used to develop a return assumption.

Return to TOC

Topic 5: Adjustments for potential future changes in asset allocation.

Sometimes a pension plan's asset allocation is be expected to change over time. Situations in which this might occur include the following:

- The plan sponsor has decided to adopt a new investment strategy, and rather than implementing it all at once, will phase it in over a period of time.
- The plan population is maturing, and increasing cash outflows will make it advisable to adjust the asset allocation in the coming years.
- The investment policy statement calls for an asset allocation that changes dynamically based on the plan's funded ratio or other metric that is expected to change over time.

- A change is planned either into or out of an illiquid asset class such as private equity that may only be accomplished gradually.

The purpose of an actuarial measurement will help guide the decision about how to reflect these kinds of changes in an expected return assumption. If the measurement is a snapshot of the plan status at a single point in time (e.g., the actuarial accrued liability for a public or multiemployer plans) or is being used to determine corporate pension expense under Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) 715, it is usually considered appropriate to disregard anticipated future changes in the asset allocation. However, if the measurement is being used to develop a long-term contribution budget or other multi-period measure, it may be considered appropriate for the expected return assumption to take into account the anticipated changes. If the measurement is being used to satisfy funding, accounting, or other disclosure requirements, typically the applicable rules and regulations are considered.

If an actuary decides to reflect anticipated changes in the asset allocation in the expected return assumption, three ways he or she might accomplish this are:

- Development of a blended expected return assumption consisting of a single rate that reflects both the current and expected asset allocations.
- Use of a select-and-ultimate expected return assumption that anticipates different levels of investment returns for different future time periods.
- Basing the expected return assumption entirely on the anticipated future asset allocation, assigning no weight to the current allocation.

When the future asset allocation is expected to differ from the current allocation following a pattern of changes that is known in advance, developing a blended expected rate of return might approximate the impact of the change. This blend considers both the timing of future plan cash flows and the timing of the expected changes in the investment mix. For example, if an actuary expects the current investment mix to produce an average rate of return of 7.5%, and the plan will migrate to a new allocation that the actuary expects will produce an average rate of return of 7.0%, the actuary might very well choose to value the liabilities using an expected rate of return that falls between these expectations. The weighting of the two endpoints depends on how quickly the asset allocation is expected to change and the timing of projected plan cash flows.

A select-and-ultimate assumption uses different rates of return for different future time periods. For example, if the investment mix is expected to change three years in the future, the assumption could anticipate one level of return for the next three years and a different level of return after that. An actuary might also choose to develop a select-and-ultimate assumption that consists of several different rates covering different time periods. For example, if a maturing plan is expected to gradually shift into more fixed income and cash equivalents, the actuary might choose a select-and-ultimate assumption that consists of a series of three- or five-year intervals, with a steadily decreasing return expectation applying to each successive interval.

In some instances, the actuary might simply base the expected return on the asset allocation that is expected in the future, with no weight given to the current allocation. For example, if a plan is gradually moving a substantial portion of its assets into a private equity placement, the ultimate allocation once the transition is complete may be the most relevant.

Return to TOC

Topic 6: Impact of volatility and correlations on total portfolio return.

When developing an expectation for the total portfolio return based on the expectations for individual asset classes, it is important to understand whether the individual asset class expected returns are given on arithmetic or geometric basis. The portfolio's expected geometric return will be lower than the expected arithmetic return due to the impact of volatility. The higher the volatility of a portfolio, the bigger the difference between the expected geometric return and the expected arithmetic return.

The expected arithmetic return for a portfolio might well be calculated as the asset-allocation-weighted-average expected arithmetic return for each of the asset classes. However, the calculation is not as simple for the expected geometric (compound) return, which depends on:

- the assumed distribution of returns;
- the assumed correlations between returns for different asset classes;
- the assumed relationships between returns for different years; and
- the time horizon.

Two basic approaches to calculating the expected geometric return for a portfolio are:

1. Assume independent and identically distributed lognormal returns. Using the assumed correlations and the standard deviations for each asset class, the standard deviation of the portfolio is calculated directly. The expected geometric return over a long time horizon is calculated based on the arithmetic return and the standard deviation of the portfolio. An illustration of these calculations for a portfolio with two asset classes is shown in the table below.

Asset Class	Arithmetic Return	Geometric Return	Standard Deviation	Portfolio Allocation
Equity	8.0%	6.7%	17.0%	60%
Bond	3.5%	3.3%	6.0%	40%
			Correlation = 20%	

Portfolio Arithmetic Return	$0.6 * 8.0\% + 0.4 * 3.5\% = 6.2\%$
Portfolio Standard Deviation	$(0.6^2 * 17\%^2 + 2 * 0.6 * 0.4 * 17\% * 6\% * 20\% + 0.4^2 * 6\%^2)^{0.5} = 10.94\%$
Portfolio Geometric Return	$e\text{^}(ln(1.062) - ln(1 + (10.94\%\text{^}2) / (1.062\text{^}2)) / 2) - 1 = 5.64\%$

The expected geometric return shown above is the median of the distribution. (The geometric return over n years will converge to the median as n becomes large.) The expected geometric return is often approximated by subtracting half of the variance from the arithmetic return. In the example above, that approximation would result in a geometric return of $(6.20\% - (10.94\%\text{^}2) / 2) = 5.60\%$.

2. Instead of using the simplifying assumptions in the first approach, investment consultants might construct a stochastic model that also incorporates one or more of the following:
    a. Different distributions for investment returns
    b. Serial correlations between investment returns in one year and subsequent years (e.g., regression to the mean)
    c. Changes in capital market assumptions over time
    d. Dynamic correlations between asset classes

The arithmetic returns, standard deviations, and correlation assumptions are input for all asset classes along with any other assumptions the model requires, and a stochastic projection of the portfolio is run for an appropriate time horizon. The result of the stochastic modeling process is a probability distribution of geometric returns for the desired time horizon, and the 50^{th} percentile might be considered an estimate of the expected geometric return.

Return to TOC

Topic 7: Use of historical data.

Historical returns (and other capital market information) provide helpful data for thinking about future returns, but average returns from historical periods are not, by themselves, strong indicators of future returns. However, an analysis of historical data for components of return forecasts—yields, price/earnings (P/E) ratios, earnings growth relative to GDP growth, inflation, etc.—are used in conjunction with historical returns to understand how current levels of those factors might affect the individual components that make up an investment return assumption.[1]

Estimates of volatility and correlations, in contrast to returns, are often based primarily on historical information. Using history as a primary indicator of the future for these variables is relatively common. There are different opinions about what historical period is most relevant—the more history used, the larger the dataset, but the more distant the capital market environment is, on average, from the world today. Historical periods should cover a full market cycle (bear market, recovery, and bull market), which may be five to 20 years.

Different models for forecasting investment returns incorporate historical information in different ways. Several ways in which historical information are used:

- The mean for future returns (or interest rates) may be assumed to fully or partially revert to the historical mean over some period. Different experts may have different opinions about whether this is a reasonable assumption. While the historical mean provides an objective and potentially reasonable level for the mean to revert to, the future is likely to be different than the past. Levels of economic growth, demographic trends, globalization, monetary policy, dividend and buyback policies, changes in interest rates, and other factors will be different in the future than in the past.
- The mean for a future return is sometimes assumed to equal the historical mean. However, for most asset classes, current market conditions such as equity prices, anticipated levels of economic growth, interest rates, or expected inflation are better indicators of future returns.
- Historical risk premiums may be added to forecasted risk-free rates. For example, a calculation of the historical risk premium for equities relative to 10-year Treasury yields (or returns) can be determined based on historical data. This premium might be added to the current 10-year Treasury yield or a recent average of 10-year Treasury yields or an expected future average for 10-year Treasury yields. A more extensive "building block" approach might build up returns with inflation plus real interest rate plus term premium plus equity premium or

[1] See https://www.researchaffiliates.com/documents/IWM_Jan_Feb_2012_Expected_Return.pdf for an example of an analysis that considers past historical data in the development of a return expectation.

something similar. This approach provides a useful structure for estimating future returns. However, historical risk premiums can vary for many reasons and may not be good indicators of future risk premiums for the same reasons described above.

- Historical market data can be useful for other purposes, such as analysis of relationships and trends in economic and other capital market indicators. Some forecasting models are built based on such market data analysis. For example, regression analysis may be helpful in identifying relationships between private and public equity returns. Also, the "normal" yield curve shape assumed for a model may typically be based on historical analysis.

In some cases, historical information might not be used at all for estimating future returns. By itself, the use of historical data (or the lack of its use) is not an indicator of an appropriate or preferable process. However, in general, more sophisticated methods do not tend to use historical return information as a primary factor for estimating future returns.

Return to TOC

Topic 8: Reflecting targeted rates of return from an investment policy statement.

A very simple approach for determining expected returns is using a targeted rate of return specified in an investment policy statement (IPS) for the plan. However, this rate would not take into account current market conditions and might not bear any relationship to a reasonable return expectation. It might represent a minimum goal or could be an unrealistically high goal that would not be an appropriate assumption without further analysis.

Return to TOC

Topic 9: Reflecting time horizons for determining expected returns.

The validity of future return forecasts depends to some extent on the time horizon for the forecast. For instance, fixed income returns are relatively predictable over periods related to their maturity, as described in Topic 16. Equity returns are less predictable, but returns over 10-20 years have been shown to be correlated with price/earnings (or other similar) ratios. Shorter- or longer-period equity returns are not so closely related to P/E ratios at the beginning of the period. Because P/E ratios are the inverse of earnings yields, both future fixed income and equity returns are related to current yields and prices.

As the time horizon for a return forecast extends beyond 15-20 years, current market conditions (yields and prices) will have less relevance; it might be appropriate for forecasts extending decades in the future to incorporate long-term fundamental expectations, such as the level of sustainable economic growth. Such long-term expectations might be based on reversion to historical means or other considerations, and the period of transition from current conditions to assumed long-term equilibrium state is an important consideration.

Return to TOC

Topic 10: Use of different return expectations for different time periods.

An expected return assumption is applied to discount expected benefit payments to determine an actuarial liability for public and multiemployer plans. Because the expected returns might be different for different periods in the future, the same asset allocation could result in different effective discount rates for two pension plans with different benefit payment patterns. For many plans, the benefit payments for the next 10 years are likely to account for 40%-50% of the liability and therefore the returns expected over the first 10 years have a particularly significant effect on the liability.

Investment forecasts often assume some amount of reversion in prices or yields. For example, a forecast might assume that the equity P/E level will revert halfway to its historical average over the next 10 years. A forecast for fixed income returns might assume that 10-year bond yields will increase to a historical average over the next 10 years. A forecast that assumes these kinds of adjustments is likely to have different return expectations for periods after the first 10 years. The forecast returns after 10 years depends on the anticipated P/E and yield levels at the beginning of those future periods.

If a plan is valued on a date where bond yields are low and equity prices are high, a relatively low level of return might be assumed for the first 10 years. After 10 years, the return forecast could be higher if the forecast assumes that prices will drop and yields will increase. The bigger the adjustment that is assumed during the first 10 years, the lower the return expectation will be for that period, and consequently the higher the return expectation might be after the initial 10-year period.

When expected returns differ for different time periods, alignment of the expected returns with each future cash flow (benefit payment) from the plan might be done. This might be accomplished through the use of a select-and-ultimate return assumption. Alternatively, a single equivalent discount rate could be developed based on the expected benefit payments associated with either the present value of benefits or the accrued actuarial liability. Note that for a given set of return expectations, the single equivalent discount rate might be different for plans that have the same asset allocation but different maturity profiles.

Return to TOC

Topic 11: Data to support an inflation expectation.

Several different sources are readily available. One common estimate of market-based inflation expectation is the difference between the yields on nominal Treasury securities and Treasury Inflation Protected Securities (TIPS). This is often referred to as "break-even" inflation. Although break-even inflation is not viewed conceptually as a market expectation, the difference in yields for 10-, 20-, and 30-year securities provide an inflation estimate over each of those time frames. The yields on these securities are published by the Federal Reserve at http://www.federalreserve.gov/releases/h15/data.htm.

Alternatively, some government sources publish other estimates of inflation. The Federal Reserve (http://www.federalreserve.gov) has expressed an explicit inflation target of 2% measured by the annual change in price index for personal consumption expenditures (PCE). The Federal Reserve Bank of Cleveland publishes monthly forecasts of inflation for different time horizons at http://www.clevelandfed.org. Finally, the Congressional Budget Office (CBO) publishes a 10-year economic outlook, in which inflation is one of the fundamental variables that is forecast for the next 10-year period (see http://www.cbo.gov).

Office of the Chief Actuary (https://www.ssa.gov/OACT/index.html) of the Social Security Administration publishes the annual OASDI Trustees Report. As part of the documentation of key assumptions, it contains a report on economic assumptions that forecasts inflation and real GDP growth.

Return to TOC

Topic 12: Coordination of inflation assumptions by actuary and investment consultant.

Often, the capital market assumptions used by an investment consultant to develop the expected return for a portfolio incorporate a different inflation assumption than the inflation assumption used to project the benefit payments in the actuarial valuation. This discrepancy may be important in light of the requirement to use consistent economic assumptions under ASOP No. 27. Therefore, a careful assessment of rationale for both inflation assumptions is warranted before evaluating the options described below.

The significance of the real rate of return for the plan being valued is appropriately considered. The real rate of assumed return is significant for most pension plans. For a plan with benefits based on final salaries and with a fully inflation-sensitive cost-of-living adjustment (COLA), the inflation assumption does not have a material impact on the results if the real rate of return is not changed. However, for plans with caps or ceilings on the COLA, or for those with fixed COLAs, the nominal levels of both inflation and expected return are important. In that situation the consistency of the inflation assumption used by the actuary when determining the expected benefit payments and the inflation assumption underlying the investment consultant's model is more significant.

The following approaches are considered to coordinate the actuary's assumption and the investment consultant's assumption for inflation.

1. Making no adjustment to the investment consultant's return forecast or the actuarial assumptions used to project the benefit payments

This approach is straightforward and probably quite common. However, there are two potential problems with it:

- The expected real rate of return is not reasonable when the actuary's inflation assumption is subtracted from the investment consultant's return assumption.
- The expected rate of return (both real and nominal) determined by an investment consultant is likely to be different if a different level of inflation was used in the capital markets model. Unless the difference in assumptions is small, the other options described below might be considered.

2. Subtracting the investment consultant's inflation assumption from the expected rate of return to get an expected real rate of return and add that number to the actuary's inflation forecast.

This approach is useful if the plan liability is fully or mostly inflation-sensitive (e.g., if the plan depends on final salary and provides inflation-sensitive COLAs). However, it should be noted that most investment consultants forecast nominal rates of return rather than real rates of return, and expected real rates of return are likely to be different if based on a different level of future inflation. In other words, the real rate of return in a forecast changes if the assumed inflation rate is changed. Also, for plans with fixed-rate or constrained COLA provisions, more attention to the nominal levels of expected inflation and return may be warranted.

3. Adjusting the inflation assumption (and corresponding assumptions such as payroll growth and salary increase) in the actuarial valuation to be consistent with the inflation assumption in the capital market model used to determine expected future returns.

This approach creates a practical problem for the actuary who might end up needing to adjust inflation and salary assumptions more often than is preferred. Experience study results need to be adapted to the investment consultant's perspective. These challenges indicate this approach has not been in common use. However, it could be the approach that most reliably provides a consistent set of economic assumptions.

4. Suggesting that the investment consultant use the actuary's assumption for inflation as the basis for the capital market forecast.

Theoretically this provides a consistent set of economic assumptions. However, in addition to the practical issues with getting the parties to agree to this, this approach could compromise the validity of the investment consultant's methodology.

Return to TOC

Topic 13: Data to support an assumption for economic growth.

The real rate of economic growth is a key economic indicator and it is inherent in any forecast of the future economic environment and the capital markets' performance. Together with the inflation assumption, it underlies forecasts of future U.S. economic outcomes. Higher growth is associated with higher interest rates, and the rate of growth in profits (earnings per share) is generally considered to be associated with growth in Gross Domestic Product or GDP per capita.

As mentioned in Topic 11, the CBO regularly produces forecasts of the future 10-year economic outlook for which real GDP growth is one of the fundamental economic variables' assumptions.

Other sources include the Bureau of Labor Statistics and the Federal Reserve. The Board of Governors of the Federal Reserve System publishes Supervisory Scenarios for Annual Stress Tests Required under the Dodd-Frank Act annually. The baseline scenario for this required testing of bank holdings companies gives some insight into the Fed's view of the expected future real growth of the GDP, although typically over a relatively short period. This is also a useful source for historical data on real GDP growth.

The Office of the Chief Actuary (https://www.ssa.gov/OACT/index.html) of the Social Security Administration publishes the annual OASDI Trustees Report. As part of the documentation of key assumptions, it contains a report on economic assumptions that forecasts inflation and real GDP growth.

Return to TOC

Topic 14: Modeling interest rates and the impact on future returns.

As explained in Topic 2, interest rates and changes in rates are fundamental to determining asset prices and therefore are also a significant factor that affects returns. Ignoring investor sentiment and other market factors, a rise in rates will reduce the price of any financial asset (bonds, stocks, real estate, etc.). This relationship negatively impacts returns over a period of rising rates. The impact of interest rates is not as obvious and direct for stocks as for bonds, for example, because the economy may be improving when rates rise, with the resulting improvement in investor sentiment or other market factors offsetting the impact of rising rates on equity prices.

Forecasts of fixed income returns usually begin by forecasting the interest rate environment (U.S. Treasury curve) over the desired horizon. Often 10-year Treasury yields will serve as the key point on the yield curve for the forecast. A forecast may be based on a simplified reversion to a historical mean or may be based on a particular model for rates (usually with some element of mean reversion) such as CBO's methodology for projecting 10-year Treasury rates (see the Background Paper published in December 2007 [https://www.cbo.gov/publication/19349]).[2]

As described in Topic 15, returns for fixed income asset classes are typically determined directly from the interest rate forecast in a model. However, capital market models often do not incorporate a strong link between interest rates and equity returns despite the conceptual argument referred to above. Because interest rates affect all financial asset prices (regardless of how a particular model treats this relationship), an understanding of the central tendency of interest rates in a model during the forecast time horizon is useful.

Once the central 10-year rate (or other anchor point on the curve) path is determined, the rest of the yield curve can be modeled based on historical data or other models. Both the slope (e.g., the difference between the 1- and the 10-year Treasury rates) and the curvature (e.g., the sum of the 1- and the 30-year Treasury rates minus twice the 10-year Treasury rate) are determined to fill out the entire curve. Historical data for 1-, 10-, and 30-year Treasury rates is readily available from the U.S. Department of the Treasury website, for example as Constant Maturity Treasury (CMT) rates data at the following link: https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield.

Future curves for other levels of credit quality (e.g., AA, A, investment grade, etc.) can be determined by applying historical credit spreads either as a single spread or with spreads varying by maturity. In most capital market models credit spreads have a strong correlation with equity returns because investor sentiment that tends to drive up equity prices also tends to tighten credit spreads (i.e., increase the price of corporate bonds). See also Topic 16.

Return to TOC

Topic 15: Fixed income return expectations: direct calculation or implicit determination based on modeled interest rates.

In the past, it was common practice to develop fixed income returns directly, either by assuming current yields represent future return expectations, using historical return analysis, or using other approaches where the future interest rate environment is not modeled. More recently, forecasting economic fundamentals, including government and corporate interest rates, became part of capital markets models. Fixed income returns are then derived from current and future changes in government rates and credit spreads.

Future returns for a single bond might be directly determined fairly accurately over the period until its maturity by using the current yield. As a bond matures, any price changes are offset by

[2] See http://ritholtz.com/2016/07/forecasting-interest-rates-long-run/ for a discussion of interest rate models and forecasting.

the changes in yield that then apply until the maturity date. For bond funds (where the average duration is kept approximately the same), returns tend toward the initial "rolling yield," which is slightly higher than the yield to maturity over a period equal to about twice the duration—a slightly longer period than the maturity.[3] Thus, for most pension plans, current yield is a good direct indicator for the return over a period approximately equal to the average maturity of the bonds.

Capital market models usually develop fixed income returns indirectly from the future interest rates and credit spreads produced by the model. Determining fixed income returns directly may indicate a more simplistic approach. Such an approach would not effectively model the impact of changes in interest rates on returns over periods that are materially longer or shorter than the average bond maturity period. As described in the paragraph above, future fixed income returns are able to be determined with a fair amount of accuracy over periods related to their maturity/duration without sophisticated modeling. However, for periods that are different than the period until maturity of the bonds, modeling rates and spreads and estimating future returns from modeled rates and reflecting investment's duration is generally preferred for most capital market models.

Return to TOC

Topic 16: Return expectations for different credit quality (e.g., Treasury, corporate/credit, high yield).

When modeling the future interest rate environment, U.S. Treasury rates can be a good starting point. One approach to constructing the future long-term U.S. Treasury term structure and the transition from the current treasury curve is described in Topic 14.

For credit quality above high-yield ("junk") bonds, a future corporate or credit yield curve term structure might be constructed by adding credit spreads for the desired credit quality to the assumed underlying Treasury curve. The spreads are often based on historical analysis and can be graded across different maturities. Long-maturity investment-grade credit spreads have historically been higher than spreads for shorter maturities.

Returns could be calculated based on the assumed transition from current yields to the assumed long-term credit/corporate yield curve. This process is described in Topic 15.

Returns for some fixed income investments might be based on a linear combination of government and credit yields. For example, an asset class benchmarked to Bloomberg Barclays U.S. Aggregate Government/Credit Long Index may have an equilibrium yield comprised of 40% Government Long yield assumption and 60% Long Credit yield assumption.

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[3] See http://www.cfapubs.org/doi/pdf/10.2469/faj.v71.n2.4.

In the forecasting of high-yield bond returns, many models reflect an assumption about defaults and recovery. The model could be similar to that of investment-quality bond returns reflecting changes in assumed interest rate environment, or it may be a type of IRR model that explicitly forecasts future cash flows.

Return to TOC

Topic 17: Using a dividend discount/dividend growth model to project future equity returns.

The Gordon Dividend Discount Model is the basis for a common approach to assessing future equity returns. This model is used by equity analysts to assess the value of individual equities or equity markets. It provides a useful framework for forecasting future returns. Analyzing the components of returns and how they are likely to develop based on current market conditions and other factors has proved to be an effective approach to forecasting returns.[4]

The model is based on the principle that investors will receive returns through dividends (or stock buybacks—see Topic 18) and growth in earnings. In addition, the extended model reflects that equity returns include changes in the price that investors pay for earnings. The components of the model are shown below.

$$\text{Return} = \text{Dividend Yield} + \text{Growth} + \text{Change in P/E Ratio}$$

After breaking out growth into inflation and real growth and adding the potential for currency fluctuation in international investments, the following is a basic formula for returns or expected returns:

$$ER = DY + I + RG + \Delta P + \Delta C$$

- ER—expected return
- DY—dividend yield, sometimes including stock buybacks
- I—inflation
- RG—real earnings growth
- ΔP—change in price/earnings ratio
- ΔC—change in currency value for markets not invested in U.S. dollars

Dividend yield is the cash returned directly to investors. Dividend yields have decreased in recent decades, but stock buybacks have increased. The dividend yield is readily available for almost any market, although the impact of buybacks is harder to determine.

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[4] See https://www.researchaffiliates.com/documents/IWM_Jan_Feb_2012_Expected_Return.pdf for an example of an analysis that focuses on the components of equity returns.

Inflation plus real earnings growth together make up the growth component of equity returns. One idea underlying the model is that the money that is not paid out as dividends can be invested by a company to spur growth—companies that don't pay dividends may grow faster.

The change in price/earnings ratio has been the least predictable aspect of equity returns, but current P/E ratios have been shown to be negatively correlated with future returns. P/E ratios represent the price that investors pay to own a share of future earnings. Note that P/E ratios are the inverse of earnings yields—i.e., E/P is the earnings yield and is an indicator of future returns just as bond yields are an indicator of future bond returns, albeit less directly. Cyclically Adjusted Price-Earnings ratios (CAPE, as developed by Robert Shiller) are often used in this component model for forecasting returns.

The change in currency value represents the impact of exchange rates on investments and is only applicable for investments in other currencies.

Return to TOC

Topic 18: Inclusion of share buybacks a component of future equity returns.

When a company buys back its shares, it is distributing value to investors similar to a cash dividend. This happens because investors who still own shares own a larger portion of the company after the buyback. Buybacks can be thought of as another type of dividend or they can be considered as part of the earnings per share (EPS) growth because EPS goes up when the number of shares go down. Overall, dividends plus buybacks can be looked at as the total cash payout made by a corporation to its investors.

Buybacks have increased in recent years, while dividend payments have been decreasing since the 1980s. Buybacks are less consistent and predictable than dividends, but they are an important aspect of a model like the one described in Topic 17 for forecasting equity returns. Historical information on buybacks is available but is not as easy to find or use as information for dividends, and this is an even bigger issue for markets outside the U.S.

The effect of buybacks is offset by the dilution of ownership when a company issues new shares. Therefore, the effect of buybacks is generally net of new issuance.[5]

Return to TOC

Topic 19: Impact of earnings growth on future equity returns.

As explained in Topic 17, aside from price changes, equity returns are driven by two components (ignoring currency impact): cash payouts (dividends plus buybacks) and growth (inflation plus

[5] See "The Long-Run Drivers of Stock Returns: Total Payouts and the Real Economy", by P.U. Straehl and R.G. Ibbotson, published in *Financial Analysts Journal*, Third Quarter 2017; a copy of an earlier (2015) version of working paper can be obtained from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2715098.

real earnings growth). The dividend discount model (also known as the Gordon Growth Model) determines the present value of expected future dividends that grow over time to determine a current price for an equity security or equity market. The discount rate that makes the current present value of future payouts equal to the current equity price is the expected return on the equity investment (be that a single company or market index).

Real earnings growth is generally based on economic forecasts under the theory that corporate earnings will grow in line with the overall economy. Empirical evidence indicates that real earnings growth cannot be higher than real GDP per capita growth over long periods, but some capital markets models will use higher rates of growth for shorter-term forecasts.[6]

Return to TOC

Topic 20: Reflecting P/E ratio changes and the CAPE metric in forecasting equity returns.

Changes in P/E ratios translate directly to market returns: If P/E ratios go up by 2%, the total return will be 2% higher than if P/E ratios remain the same. Because P/E ratios are just the inverse of earnings yield (earnings yield = E/P) they provide a very useful indicator for future returns. Generally, the higher the starting P/E ratio (lower yield), the lower future returns are likely to be.[7]

P/E ratios go up when market sentiment improves (confidence increases), increasing accumulated returns and decreasing the potential for future returns. As explained in Topic 14, P/E ratios are also affected by interest rates—lower rates increase equity prices just as they do for bonds (or pension liabilities). However, the effect of interest rates on equity prices is not as direct and immediate as it is with bonds, because changes in investor sentiment or other market factors can also affect equity prices. In the short term, rates often go up when P/E ratios are going up, even though higher rates decrease the value of future earnings cash flow. In this case, better market sentiment is offsetting the impact of lower rates. Better market sentiment can be viewed as either higher expectation for earnings growth or a greater appetite for taking on risk, which translates into a willingness to accept lower future returns for the level of risk taken on in the equity market.

The most common type of P/E ratio used for return forecasting is the Cyclically Adjusted Price-Earnings (CAPE) ratio introduced by Robert Shiller in 2000. This concept smooths out the earnings in the P/E denominator by averaging them over 10 years after adjusting for inflation[8].

[6] See https://www.researchaffiliates.com/documents/FAJ-2003-Two-Percent-Dilution.pdf for a discussion of the relationship between real earnings growth and GDP.
[7] See *Irrational Exuberance* by Shiller for an empirical analysis of this relationship.
[8] Current and historical values of CAPE can be found at http://www.multpl.com/

Shiller CAPEs have been shown to be highly correlated with returns over the next eight to 20 years. An important issue to consider when using CAPE information is whether the definition of earnings has changed due to changes in accounting standards or corporate dividend policies. While variations on the CAPE metric have been created, most return forecasts are done using the original CAPE concept introduced by Shiller in *Irrational Exuberance*.

P/E ratios typically reported in the media are often not consistent with the CAPE concept. The CAPE concept uses GAAP earnings—the earnings required to be reported by accounting standards. Companies usually report pro forma earnings (also known as adjusted or operating earnings), which are typically higher than GAAP earnings. Most P/E ratios reported by the media use these non-GAAP earnings. In addition, P/E ratios are often based on earnings forecast for the next 12 months, rather than actual historical earnings.

Return to TOC

Topic 21: Forecasting returns for equity sub-asset classes.

The analysis of equity return expectations in this document focuses on the dividend discount model because it has become the most common approach among large investment firms. Other models for forecasting future returns include a market equilibrium (Black Litterman) approach or risk premium building blocks. These models determine return expectations based on Capital Asset Pricing Model (CAPM) theory in which return is correlated with risk. Some firms use the dividend discount model to determine expectations for five or 10 years and use an equilibrium approach to develop a longer-term assumption with no specific time horizon.

With a dividend discount approach, return expectations for equity sub-asset classes would be determined based on yields and P/E levels for those sub-asset classes (see Topic 17).

In some models, higher levels of risk (volatility) are directly correlated with higher expected returns. For example, a premium for small cap, foreign, or emerging market equities could be added to the return expectation for U.S. large cap equities. This approach is based on historical return data that shows higher volatility for these sub-asset classes that, according to CAPM, should drive an additional risk premium. However, in recent years, the view that historical analysis does not justify an additional premium has been gaining acceptance.

Return to TOC

Topic 22: Adjusting for currency/foreign exchange for non-U.S. assets.

The return on assets that are denominated in another currency includes the impact from any changes in the foreign exchange rate. The concepts of relative purchasing power parity (PPP) and interest rate parity (IRP) as well as other factors may be used to adjust return forecasts for foreign assets.

A simple forecast model might include no adjustments for currency fluctuations. Foreign returns are developed based on the foreign country or region's economy and financial markets and no adjustment is made for potential changes in the foreign exchange rates.

Purchasing power parity is the idea that the exchange rate between two countries is equal to the difference in purchasing power. Relative PPP predicts that currency values will adjust so that the purchasing power of each currency will stay approximately the same. This means that if inflation is 2% in the home country and 5% in a foreign country that the currency in the foreign country will lose value against the home country currency at the rate of 3% per year. Although relative PPP is sometimes used for forecasting returns, it is generally viewed as holding only over long time periods (decades-long time periods), if at all.

IRP is the idea that currency values will change over time to offset differences in interest rates. If the interest rate over one year is 2% in the home country and 4% in a foreign country, then the expected value of the currency in the home country one year in the future (the 1-year forward rate of exchange) will be 2% higher than the value of the currency in the foreign country. This relationship is generally only considered valid over short periods.

Economic growth is a factor that influences how a country's currency appreciates or depreciates relative to other currencies. If growth is high, a country will attract investors and the currency will appreciate.

Equity returns are viewed as negatively correlated to currency appreciation. If a country's currency depreciates, then the equity market is likely to increase in value because the country's goods have now become cheaper for other countries to buy.

Some investments hedge currency risk. If the interest rate over one year is 2% in the home country and 4% in a foreign country, then it will generally cost about 2% a year to hedge currency risk for that foreign currency—the cost of the hedge will offset the higher gains in the other country. Currency hedging is often used with foreign fixed income investments, but less often with growth assets like equities or real estate.[9]

Return to TOC

Topic 23: Modeling returns for hedge fund investments and other alternative assets.

Many hedge fund investments are simply variations on investing in basic asset classes like equities, fixed income, and real estate. Return estimates for these strategies would correlate to the forecasts for the relevant asset classes.

[9] See http://www.investopedia.com/exam-guide/cfa-level-1/global-economic-analysis/purchasing-power-interest-rate-parity.asp for additional discussion of purchasing power parity and interest rate parity.

Other strategies—for example, "market neutral" or "absolute return" strategies—attempt to create return that is uncorrelated with any market. These nontraditional investments pose a significant challenge in the determination of an expected rate of return. The actuary might rely more heavily on the investment adviser assumption about these asset classes than for more traditional investments. In fact, the investment adviser might in turn rely heavily on the asset manager for return assumptions. These might take the form of "CPI + 500 basis points (bps)" or "LIBOR + 300 bps" or something similar and may lack strong analytical or empirical support. Accordingly, actuaries might to consider using estimates that are more conservative.

The size of the alternative investment relative to the entire portfolio may make extensive analysis unnecessary. If warranted, the actuary might attempt to obtain from the investment adviser a basis for the assumptions provided. The following considerations could come into play when attempting to classify an alternative and set an appropriate return expectation:

- What the underlying holdings within the hedge fund or alternative strategy are,
- What the specific strategy employed by the investment is,
- Whether there is solid actual or back-test information to support a return expectation,
- Whether the expected return been adjusted for fees, and
- Whether there is a secondary market for the investment.

Return to TOC

Topic 24: Expected returns for real estate investments.

Real estate investments can be direct investments in any of various types of real estate such as office buildings, apartment complexes, single-family housing developments, warehouses, etc., or investments in Real Estate Investment Trusts (REITs). REITs are equity investments in companies that own or finance income-producing real estate. Pension funds might invest in individual REITs or in REIT funds. Investment in real estate might also be made by investing in a private commingled fund that invests directly in real estate.

The expected return for direct investments in real estate can be determined based on current yield plus expected growth, similar to equities (see discussion of IRR in Topic 2). An increase or decrease in market values component could also be included. Yield is sometimes referred to as the "capitalization rate" and is equal to the net operating income (rental income minus expenses) divided by the current market value of the property. Anticipated growth includes inflation. Data from a source such as the National Council of Real Estate Investment Fiduciaries (NCREIF) National Property index is used to help estimate future growth rates.

REITs may sometimes be modeled as real estate but may also be modeled as an equity investment. When an explicit return expectation is developed for REIT investments, the same IRR principles that apply to equity and real estate investments are applied. The expected return would be defined as current yield plus anticipated growth and any expected change in price is likely to be correlated with the return for both real estate and equities.

Return to TOC

Topic 25: Models used to forecast private equity returns.

Forecasting returns for private equity is challenging due to a lack of data. Private equity return expectations may be estimated by adding an illiquidity premium to the expected return for public equities. Some research papers identify this illiquidity premium at 2.5% to 3.0% based on historical analysis of available data. However, many practitioners opt for a more modest 1.0% to 2.5% illiquidity premium, as can be seen in their published capital market assumptions reports (see Appendix for a list of available sources).

Because private market values are not tracked on a daily basis, historical return information does not capture volatility in the same way as the return data for public equity does. Thus, volatility can be estimated in the same way as returns by adding, for example, 5% to the volatility estimated for public equities.

Some market indices are maintained for private equity, but the data might be viewed skeptically by investment professionals because market values are often self-appraised and data can be subject to survivorship bias. There are no observable market prices for private assets. Some models may include sub-asset classes for buyouts, venture capital, mezzanine debt, seed stage, or other types of private equity investment.

Some academic papers apply the CAPM to the historical relationship between private equity returns and public equity returns. According to CAPM, the level of risk in private equity should be consistent with the level of return. A regression is performed using excess returns over risk-free asset returns, such as Treasury bonds. To correct for inherent smoothness and lags in reporting of the private equity returns, such regression analysis is typically performed against lagged data for public equity premiums.

Return to TOC

Appendix: Resources available for assessing capital market assumptions

Some firms publish a paper each year that describes their capital market assumptions (CMAs) and their methodology underlying the assumptions. The list below shows some examples of firms that publish their CMA. This list is not exhaustive and inclusion on it is not an endorsement of the firms' assumptions or methodologies. Reading a sample of the papers is likely to enlighten actuaries about current practice among bigger investment consultant and asset management firms. The time horizon for the asset class return forecasts should be noted. The typical forecast covers five to 10 years, although sometimes the forecast is labeled "long-term" or other horizons specified. Thus, the forecast period may be much shorter than what the actuary would consider long term.

- Blackrock (website—quarterly)
- Research Affiliates (website—monthly)
- AQR
- BNY Mellon
- Franklin Templeton
- JP Morgan
- Northern Trust
- PCA
- Voya

BASIC REFERENCES (from Research Affiliates)

https://www.researchaffiliates.com/documents/IWM_Jan_Feb_2012_Expected_Return.pdf—explanation of basic forecasting and back-testing of results

https://www.researchaffiliates.com/en_us/asset-allocation.html—quick glance at regularly updated return forecasts for most asset classes

INFLATION AND OTHER ECONOMIC INDICATORS

https://www.bea.gov/—Bureau of Economic Analysis

www.federalreserve.gov—Federal Reserve

https://www.cbo.gov/—Congressional Budget Office

BLOG POSTS

https://blogs.cfainstitute.org/investor/2015/10/20/the-relatively-easy-way-to-forecast-long-term-returns/

http://www.bloomberg.com/gadfly/articles/2016-03-24/hedge-funds-have-a-performance-problem

https://www.thefelderreport.com/2016/06/14/warren-buffetts-favorite-valuation-tool-shows-stocks-are-even-less-attractive-than-record-low-yielding-bonds-right-now/

http://www.etf.com/sections/features-and-news/are-stocks-overvalued-survey-equity-valuation-models?nopaging=1

ASSET MANAGER PAGES

https://www.blackrock.com/institutions/en-us/insights/portfolio-design/capital-market-assumptions—Blackrock capital market assumption page; pretty easy to browse this in 10 minutes

https://www.researchaffiliates.com/en_us/asset-allocation/resources.html—same Research Affiliates website as above but here pointing to the extensive explanation of its approach to forecasting

RESEARCH OR LONG BLOG

http://www.cfapubs.org/doi/abs/10.2469/faj.v73.n3.4—this deals with an important question in return forecasting—how to deal with buybacks—and also provides a good basic model with great analysis of historical info

https://www.researchaffiliates.com/documents/FAJ-2003-Two-Percent-Dilution.pdf—seminal paper dealing with growth and buyback assumptions

http://www.philosophicaleconomics.com/2013/12/the-single-greatest-predictor-of-future-stock-market-returns/—interesting blog that includes thoughts on Shiller CAPE (cyclically adjusted price-earnings ratio)

Glossary

Absolute return—These strategies are designed to produce "alpha" (return that is different than the market return) rather than "beta" (the market return). Returns on these strategies should have a low correlation to equity or other market returns. For a more detailed discussion focusing on absolute return as a measure, see https://www.investopedia.com/terms/a/absolutereturn.asp.

Alternatives—"Alternative" is a term used to describe investments other than stocks and bonds. Real estate may or may not be considered an alternative investment, but private equity, hedge funds, and commodities (e.g., gold, oil) are all labeled as alternative investments. Alternatives are generally characterized as being more complex, less liquid, having more idiosyncratic risk, and less data to support forecasting future returns than stocks and bonds.

CAPE (Cyclically Adjusted Price-Earnings) ratio—The CAPE concept was developed by Robert Shiller in the early 2000s. Because earnings tend to fluctuate from year to year, the P/E ratio based on one year of earnings is less useful as an indicator of future returns than an indicator that smooths out earnings over time. The CAPE ratio typically uses 10 years of earnings, which are indexed with inflation and then averaged in the denominator of the P/E ratio. The CAPE ratio usually is applied to the markets in individual countries or large parts of those markets like the S&P 500. It has been shown to be highly correlated with future returns in virtually every stock market around the world.

Capital markets model/capital market assumptions/capital market expectations—Capital market assumptions (CMAs) are estimates for expected risk (volatility) and return for a given set of investment opportunities (asset classes). CMAs also consist of expectations of the relationship between these asset classes (correlations). CMAs are a key input for asset allocation, investment strategy, financial planning, and wealth planning activities.

Credit spread—A spread is the difference between two prices or yields. The additional yield on bonds from corporations or from other countries, states, or cities that is over and above the spread on U.S. Treasuries of the same maturity is called a credit spread. Credit spread represents credit risk, which is the risk that a bond issuer will default on its promised payments.

Derivative—These are investments with values that are dependent on another underlying investment vehicle (i.e., the performance is a derivative of the performance of the underlying vehicle). Derivatives are often leveraged investments and are therefore very risky by themselves. However, they may be used in hedging strategies, which reduce a risk faced by an investor. Common examples of derivatives include:

- Stock / equity options—an option to buy or sell a specific amount of an individual stock or an equity benchmark if the price goes above or below a defined threshold.

- Treasury futures—the investor agrees to take ownership (or sell future ownership) of a hypothetical Treasury security (note or bond) as of certain future date based on a price anticipated at that date.
- Interest rate swaps—one investor receives a long interest rate and pays a short interest rate, while the counterparty receives the short interest rate and pays the long interest rate.

Dividend and buyback policy—This is the stated intent or generally practiced approach that a company uses to define its dividend payouts or the buyback of shares.

Dynamic correlations—In some models, correlations between asset class returns are assumed to change over time—they are "dynamic." In many models correlations are assumed to be constant.

Equity risk premium or equity premium—The additional return that an investor expects to receive on an equity investment above the return on low-risk fixed income investments is the equity risk premium. The equity risk premium might be measured against long-duration (10-year or 30-year) bonds or, alternatively, against short-duration bonds. It may be measured against corporate/credit bonds or, more commonly, against Treasury yields. See https://www.investopedia.com/terms/e/equityriskpremium.asp.

Gordon Growth Model—This model originated as an approach for valuing individual equities. It is based on the idea that the intrinsic (fair) value of an equity investment can be assessed based on the anticipated cash flow to be received. By making an assumption about how current cash flows will grow and discounting them back to the valuation date, a fair value can be estimated. The basic form of the model is:

$$P = D / (r - g)$$

where:
P = price
D = dividend payout
r = cost of equity capital (expected equity return)
g = growth in dividends

Estimating a price using this formula allows an analyst to assess whether a stock is under- or overpriced. An implicit assumption of the formula is that profit that is not used to pay dividends will be used to invest and grow profits and dividends. The model can also be applied to equity indexes such as the S&P 500 to assess its price level.

The formula can be rearranged as

$r = D/P + g$ = dividend yield + growth

For determining an expected return, a component representing an anticipated change in price can be added and a currency component can be also added. This results in the formula typically used for forecasting future equity market returns that is covered in this practice note. See http://www.investinganswers.com/financial-dictionary/income-dividends/gordon-growth-model-5270.

Hedge funds—Hedge funds are pooled investment vehicles targeted at institutional and wealthy individual investors. These funds restrict investment to investors with a minimum net worth and are not subject to the same rules as other vehicles such as mutual funds or collective trusts. Hedge funds employ many diverse strategies, some focused on generating high returns and others focused on stable returns or returns that will be effective at diversifying and reducing portfolio volatility. The term "hedge fund" originates from the idea of lowering risk through "hedging," but many hedge funds do not focus on lowering risk. The first hedge funds reduced equity market risk by selling short some equities (see "Long Equity"). See https://www.investopedia.com/terms/h/hedgefund.asp.

Illiquidity premium—This premium is the additional yield or return on an investment because the market for buying and selling it may not be robust, so that an immediate sale or purchase cannot necessarily be made. Alternative investments such as private equity or hedge funds may be viewed as having an illiquidity premium relative to public markets. A portion of corporate bonds' yields may be viewed as an illiquidity premium relative to the rates of U.S. Treasury securities.

Investment Policy Statement (IPS)—Ideally an Investment Policy Statement establishes a clear understanding as to the investment objectives and policies applicable to an investment portfolio. It establishes reasonable expectations, objectives, and guidelines in the investment of the assets, and sets forth permitted asset classes, allocations and permissible ranges of exposure for the asset mix that can be expected to generate acceptable long-term returns at a level of acceptable risk

Internal rate of return (IRR)—The interest rate (yield or discount rate) that makes the present value of a set of cash flows, including the initial investment, equal to zero. The discount rate for determining the Present Value of Benefits (PVB) for a pension plan is the internal rate of return that makes the PVB amount equal to the negative value of the expected future payments. The IRR is commonly used to assess the potential value of making investments in corporate projects, such as building a new plant or developing a new drug. The IRR is also the expected return for an investment in fixed income or equity investments because it equates the future cash flows expected to be received with the negative value of the initial investment.

Lagged data—This is data from a prior time period. The most significant relationship for returns on one investment to returns on another investment may be a relationship to returns from a prior time period rather than the current time period. In that case, lagged data would be used.

LIBOR—The London Interbank Offered Rate has been a standard interest rate benchmark used for many purposes, such as defining rates for adjustable rate mortgages or rates for interest rate derivatives such as interest rate swaps. It is an average of rates used by banks in London to borrow from each other. There are separate LIBOR rates for several different currencies and borrowing periods. The intent is to discontinue LIBOR by the end of 2021, but as of the release of this practice note it is still in common use. See https://en.wikipedia.org/wiki/Libor.

Lognormal return—Because investment return results are "geometric," i.e., the product of individual year returns, they are often modeled with a lognormal distribution rather than a standard normal distribution. A standard normal distribution is most appropriate for an "arithmetic," i.e., additive process. See https://www.investopedia.com/articles/investing/102014/lognormal-and-normal-distribution.asp.

Long equity—Investing "long" means to own an asset and is the typical position of an investor. Investors can also sell assets "short" by borrowing money (because they don't own the asset, this represents the amount they would receive by selling it) and then selling the asset, thereby betting on a decline in value of the asset. Thus a long equity investment describes the typical investor position in an equity or equity fund or index. A short equity position would be a bet on a decline in the price of the equity or equity fund/index.

Long-term fundamentals—Fundamentals for an equity investment comprise primarily all the information in the 10-k and other financial reports but might also be considered to include other public information such as press releases and information about management. "Fundamentals" are typically juxtaposed with "technicals," which are the stock or stock index's price and volume and patterns of the price and volume. Technical analysis relies on analysis of charts that show trends in price and volume. The terms "fundamentals" and "technicals" are usually associated with equity investments but could also be applied to fixed income real estate or other investments.

Market benchmark—A market benchmark (commonly referred to as a "benchmark" or "index") is a group of securities or other investments that represents a particular market or market segment. The benchmark can be used to define investments for an index fund or to assess the performance of an actively managed portfolio. For example, an active equity fund that invests in small cap equities will measure its performance against a small cap benchmark such as the Russell 2000, MSCI Small Cap 1750 or S&P Small Cap 600.

Market equilibrium (Black Litterman) approach—This is an approach to forecasting returns that assumes markets (the bond market, stock market, real estate market, commodities markets, etc.) are in equilibrium, i.e., fairly priced relative to one another. See https://www.investopedia.com/terms/b/black-litterman_model.asp.

Market neutral—These strategies buy long and sell short in equal amounts such that there is no return from the market (usually the equity market). The only driver of returns is the performance of the long or short investment in individual securities relative to the market. See https://www.investopedia.com/terms/m/marketneutral.asp.

P/E (price-to-earnings) ratio—The P/E ratio indicates how expensive a stock or an equity index (e.g., the S&P 500) is. Just like pencils (per pencil) or potatoes (per pound), the price must be expressed as an amount per unit, which in the case of equities is a dollar of earnings. P/E ratios are important to forecasting equity returns because changes in the P/E ratio are one component of equity returns and because high P/E ratios tend to be followed by lower returns and vice versa.

Real assets—Assets such as real estate, infrastructure, farmland, commodities, etc. Real assets are distinguished from financial assets such as equities, fixed income, options, or futures.

Risk premium building blocks—Building blocks is an approach to developing an expected return that starts with expected inflation (or a low risk return on an asset like Treasury bills) and adds additional expected return based on risk. For example, inflation risk, term risk, and equity risk might be viewed as justifying additional expected return.

Roll yield (roll-down return)—The rolling yield is the one-year return from a bond when the yield curve does not change. The 1-year roll yield is higher than the yield to maturity on a bond when the yield curve slopes up because the yield on the bond decreases (which increases the price) as the maturity decreases. See https://www.investopedia.com/terms/r/rolldownreturn.asp.

Serial correlations—Correlations that are serial indicate that there is a relationship between data points over time. Typically, the value of a data point is related to the value of the previous data point and other data points that have occurred in the past.

Share buybacks—Companies sometimes purchase their own shares in the open market. A company may view this as a good use of cash if it perceives its shares as too cheap. It is also a way to share profits with shareholders without committing to a dividend, which is often viewed as a permanent payout. Share buybacks are taxed as capital gains, which may have advantages for shareholders when compared to the tax treatment of dividends.

Stochastic model—A model that uses probability distributions to estimate future outcomes (prices, returns, interest rates, etc.) for assets, investment portfolios, or liabilities such as pension liabilities.

Survivorship bias—Return information can be distorted when funds that are discontinued are not included. Funds that are discontinued typically have lower returns than funds that survive.

Target asset allocation—An investment policy statement will usually define a target asset allocation, often including acceptable ranges around the specific target. For example, a simple target asset allocation definition might look like this:

Asset class	Target	Range
Equity	50%	+/- 10%
Fixed Income	30%	+/- 5%
Real Estate	15%	+/- 3%

Term premium—The additional yield that one receives on a fixed income investment for investing in longer maturities is the term premium. The term premium results from interest rate risk (changes in market value due to changes in interest rates) and inflation risk (the loss of purchasing power due to inflation), both of which increase for longer-term investments.

Below there are links to definitions of additional investment or economic concepts:

- **Purchasing power parity (PPP)**
  https://www.investopedia.com/updates/purchasing-power-parity-ppp/

- **Interest rate parity (IRP)**
  https://www.investopedia.com/terms/i/interestrateparity.asp

- **NCREIF National Property index**
  https://www.ncreif.org/

- **<u>Personal consumption expenditures (PCE)</u>**
  https://www.bea.gov/faq/index.cfm?faq_id=518

- **<u>Real Estate Investment Trusts (REITs)</u>**
  https://www.reit.com/what-reit