LM2 Capital Market Expectations, Part 2 Forecasting Asset Class Returns

Ver 1.0

1. Introduction

This is the second of two readings on capital market expectations. This reading builds on the fundamental concepts discussed in Part 1. The focus of this reading is on forecasting returns for specific asset classes.

Section 2 provides an overview of the tools and techniques used to develop capital market expectations. Sections 3-7 cover specific asset classes – fixed income, equity, real estate, and currencies. Section 8 covers forecasting volatility. Finally, Section 9 discusses the use of macroeconomic analysis to develop and justify adjustments to a global portfolio.

2. Overview of Tools and Approaches

The Nature of the Problem

Developing capital market expectations is not as simple as estimating constant but unknown parameters like the expected returns, variances, and covariances for different asset classes. The time horizon matters and estimates depend heavily on the horizon selected. For example, the expected returns for equity over the next 3 months may be very different from the expected return over the next 5 years. Also, for the same time horizon, the estimates are not constant, and they change over time. For example, the expected return for equity for the year 2022 may be different from the expected return for equity for the year 2023.

While developing CME, we should determine what information will be used as the basis for forecasts and how this information will be incorporated into the forecast. Typically, we are trying to forecast the probability distribution of expected returns for different asset classes. Therefore, the expected return is the most important consideration. We also factor in risk measures such as variances and covariances.

Approaches to Forecasting

There are three high-level tools for forecasting:

1. Formal tools: They include well-recognized research methods. Independent users of these tools will use the same definitions and can arrive at the same results.
2. Surveys: They involve asking a group of experts for their opinions; this helps gauge consensus views.
3. Judgment: Judgement is required throughout the forecasting process. For example, when deciding on an appropriate model and choosing the model parameters.

Formal tools can be further classified into three broad categories:

- Statistical methods:
    - The first approach involves using well-known sample statistics such as sample means, variances, and correlations to draw inferences about future return distributions. A drawback of this approach is that it suffers from sampling errors, and the predictions may not be accurate.

  - The second approach, shrinkage estimation, involves taking a weighted average of two estimates, one based on historical sample data and the other based on the analyst's knowledge and judgment. This approach helps reduce the forecast error of the first approach.
  - The third approach, time-series estimation, involves forecasting a variable based on lagged values of the variable being forecasted.

- Discounted cash flow models: These models are based on the idea that an asset's value is equal to the present value of its expected cash flows. Given the asset's current market price and future cash flows, these models can also be used to estimate the implied required rate of return.
- Risk premium models: These models start with the risk-free rate and add one or more premiums to compensate investors for the additional risks of investing in the asset. Common risk premium models: (1) an equilibrium model, such as the CAPM, (2) a factor model, and (3) building blocks.

3. Forecasting Fixed-Income Returns

Applying DCF to Fixed Income

Fixed income securities have finite maturities and reasonably well-defined cash flows. Therefore, DCF is the most precise method of forecasting fixed income returns.

Yield to maturity (YTM) is the discount rate that equates the present value of a bond's cash flows to its current market price. It is the most commonly quoted metric of expected returns for bonds and is a reasonably good approximation of the actual returns that an investor will eventually realize.

However, the realized rate of return may not be equal to the initial YTM for two reasons:

1. If the investment horizon is shorter than the bond's maturity, a change in YTM will generate a capital gain/loss.
2. The cash flows from the bond may be invested at rates above or below the initial YTM.

The investment horizon is compared with a bond's Macaulay duration to evaluate which impact will dominate. (Macaulay duration = Modified duration x (1+r))

- Over horizons shorter than the Macaulay duration, capital gain/loss impact will dominate
- Over horizons longer than the Macaulay duration, reinvestment impact will dominate.

Example: Forecasting Return Based on Yield to Maturity
(*This is based on Example 1 from the curriculum.*)

A fixed income portfolio has a YTM of 1% and a modified duration of 4.84. Bond yields are expected to rise by 200 bps over the next two years. Compared to the initial YTM, what

return can be expected over:

1. A two year horizon.
2. A seven year horizon.

Solution:

The Macaulay duration of the portfolio is 4.89 (= 4.84 × 1.01).

Since bond yields are expected to rise, bond prices will come down i.e. there will be a capital loss. However, reinvestment income will go up, because the coupons can be reinvested at higher rates.

For a two year horizon, which is shorter than the Macaulay duration of 4.89 years, the capital loss impact will dominate and the expected return will be lower than the initial YTM.

Calculations: Ignoring convexity (which is not given), the capital loss at the end of two years will be approximately 9.68% (= 4.84 × 2%). Assuming yields rise linearly over the initial two-year period, the higher reinvestment rates will boost the cumulative return by approximately 1.0% over two years, so the annual return over two years will be approximately –3.3% [= 1.00 + (–9.68 + 1.0)/2].

For a seven year horizon, which is longer than the Macaulay duration of 4.89 years, the reinvestment impact will dominate and the expected return will be higher than the initial YTM.

Calculations: Reinvesting for five more years at the 2.0% higher rate adds another 10.0% to the cumulative return. The seven-year annual return would be about 1.199% [= 1.00 + (–9.68 + 1.0 + 10.0)/7]

The Building Block Approach to Fixed-Income Returns

The building block approach estimates the expected return of a security as the sum of the following components:

- Short-term default-free rate: Rate on the highest-quality, most liquid instrument with a maturity that matches the forecast horizon.
- Term premium: Additional expected return based on the term of the bond.
- Credit premium: Additional expected return for bearing the risk of credit losses.
- Liquidity premium: Additional expected return for holding less liquid bonds.

We will now discuss these components in more detail.

Short-term default-free rate:

- It is usually the rate on a government T-bill which is issued frequently – say, every three months.
- This T-bill rate is closely linked to the central bank's policy rate.

- In extreme circumstances, such as when short-term rates are negative, a normalized rate should be used.
- Forecast horizons are generally, much longer than the maturity of the short-term reference instrument. In such scenarios, we estimate the return that would be generated by rolling the short-term instrument over the forecast horizon. This approach takes into account the likely path of short-term rates. The rates implied by futures contracts for short-term instruments are usually interpreted as the market's expected path of short-term rates.

Term Premium:

- The term premium is positive and increases with maturity. It is roughly proportional to the duration of the bond, i.e. higher duration bonds will have higher term premiums.
- The term premium varies over time. At any point in time, the term premium has to be estimated based on the information available at that point. This estimate will not remain constant; as the economic situation changes, the term premium will also change.
- The term premium is positively related to the slope of the yield curve. If the yield curve steepens then, the term premium increases.
- Four main drivers of term premium are:
    - Level-dependent inflation uncertainty – As inflation increases the level of uncertainty about inflation also increases. The term premium considers both inflation expectations and the uncertainty about inflation. The higher the future inflation uncertainty, the higher the term premium.
    - Ability to hedge recession risk –Bonds that help investors hedge recession risk have lower term premiums.
    - Relative supply and demand of long-maturity bonds versus short-maturity bonds.
    - Effects of business cycles - The slope of the yield curve and level of term premiums are also related to the business cycle.

Credit premium:

- The credit premium considers both the expected losses (default losses) and the risk of expected losses. Therefore, the credit premium is higher than simply the expected level of losses.
- The credit premium is driven by different factors depending on credit quality. For AAA-rated bonds, credit premiums mainly reflect the risk of a rating downgrade. For bonds rated between A and BBB, credit premiums are mainly affected by the business cycle; when the economy is strong, credit premiums are low, and vice versa. Non-investment grade bonds, i.e., bonds below BBB rating have high credit premiums, and the premiums depend heavily on the state of the economy.

- The credit premium is positively related to equity market volatility. During times of high volatility, credit premiums increase.
- Credit premium is positively related to the slope of the yield curve. If the yield curve steepens, credit premiums increase.

Credit premiums tend to be larger at the short end of the yield curve due to 'event risk.' Event risk can lead to situations where default can cause substantial losses.

Liquidity premium:

- The liquidity premium is higher for less liquid bonds and vice versa.
- In general, liquidity is high for bonds that are (a) priced near par (b) relatively new, (c) from a relatively large issue, (d) from a well-known issuer, (e) simple in structure, and (f) high quality.
- The baseline estimate of the liquidity premium is the yield spread between the highest-quality issuer in the market (usually the sovereign) and the next highest-quality large issuer (often a government agency).

4. Risks in Emerging Market Bonds

All the same risks in developed bond markets such as interest rate risk, default risk, etc also exist in emerging bond markets. However, emerging bond markets also have the following two additional risks:

Economic Risks/Ability to Pay

The following factors indicate higher economic risks and a lower ability to pay.

- Greater concentration of wealth and income; less diverse tax base.
- Greater dependence on specific industries, especially cyclical industries, such as commodities and agriculture; low potential for pricing power in world markets.
- Restrictions on trade, capital flows, and currency conversion.
- Poor fiscal controls and monetary discipline.
- Less educated and less skilled workforce; poor or limited physical infrastructure; lower level of industrialization and technological sophistication.
- Reliance on foreign borrowing, often in hard currencies not their own.
- Small/less sophisticated financial markets and institutions.
- Susceptibility to capital flight; perceived vulnerability contributing to actual vulnerability.
  Signs of vulnerability: Fiscal deficit to GDP > 4%, Debt to GDP > 70%, Annual real growth rate < 4%, Foreign debt > 50% of GDP, current account deficits > 4% of GDP, and foreign exchange reserves < 100% of short-term debt.

Political and Legal Risks/Willingness to Pay

- Emerging markets usually have weak property laws and weak enforcement of contract

laws.

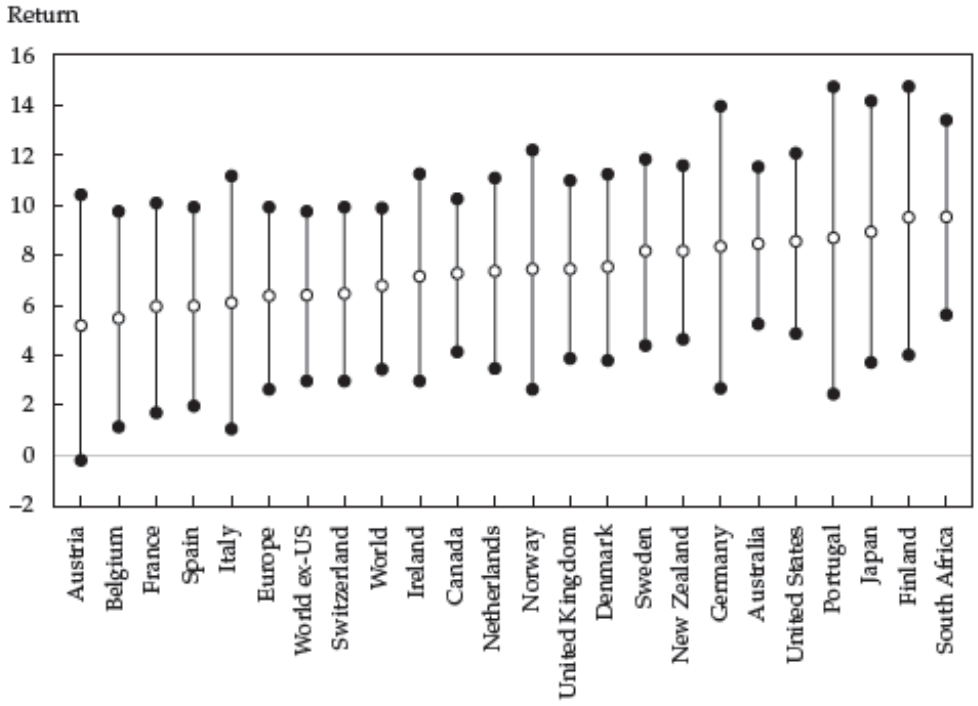
- The principle of sovereign immunity makes it difficult to force a sovereign borrower to pay its debt.
- Questions for an investor to consider include: Is there a history of violations of property rights? Is the judicial system effective? Are political institutions stable?

5. Forecasting Equity Returns

Historical Statistics Approach to Equity Returns

Exhibit 3 from the curriculum shows equity returns for the period 1900-2017 for several countries. For each country, the exhibit plots the mean real return with a 95% confidence interval.

Over this period, the mean returns range from 5.0% for Austria to 9.4% for South Africa. Note that both of these values lie within the confidence interval for every country. Therefore, statistically, there is no real difference between the mean returns of these markets.



Source: Dimson, Marsh, and Staunton (2018, Chapter 1, Table 1. Real, local currency percent returns).

The major issue with using historical data to forecast equity returns is that equity returns are extremely volatile. This volatility (or the 'noise') is largely due to fluctuations in the P/E and E/GDP ratios. Therefore, using historical data to forecast equity mean returns does not lead to reliable forecasts, and we should use other more precise methods.

DCF Approach to Equity Returns

Gordon Growth Model

The most commonly used DCF approach to forecast equity returns is the Gordon growth model. According to this model, the price of equity can be expressed as:

$$P = \frac{D_1}{r - g}$$

This equation can be rearranged to calculate the required rate of return.

$$r = \frac{D_1}{P} + g$$

The advantage of this method over the historical approach is that the 'noise' factor does not impact the projections.

Grinold-Kroner model

A more refined version of the Gordon growth model is the Grinold-Kroner model. According to this model, the expected return on equity can be expressed as:

$$E(R_e) \approx \frac{D}{P} + (\%\Delta E - \%\Delta S) + \%\Delta P/E$$

where:
$E(R_e)$ = expected return on equity
D/P = dividend yield
$\%\Delta E$ = expected percentage change in total earnings
$\%\Delta S$ = expected percentage change in shares outstanding
$\%\Delta P/E$ = expected percentage change in the price-to-earnings ratio

The term ($\%\Delta E - \%\Delta S$) is the growth rate of earnings per share. Net share repurchases ($\%\Delta S < 0$) indicate that earnings per share grow faster than total earnings.

While using this model, the analyst should consider the time horizon and select values for inputs that are appropriate for the time horizon. For example, suppose the current P/E is 16, and the analyst believes that it will revert to a level of 20 and be stable thereafter. For various time horizons, this belief gives us the following P/E growth rates: 4.56% for 5 years, 2.26% for 10 years, and 0.75% for 30 years. Using the 10-year number of 2.26% for a very long term will be inappropriate because this implies that the P/E ratio will continue to grow forever.

In the very long term, the Grinold-Kroner model simplifies to the Gordon growth model because the $\%\Delta P/E$ and $\%\Delta S$ terms tend to zero in the long term.

Fundamental Valuation Metrics

While forecasting equity returns, many analysts also look at valuation metrics such as the

P/E, P/CF, P/S, etc. These metrics will have a long-term historical average value to which they will revert. Thus, these metrics can help project how prices will change in the intermediate future and what returns to expect.

However, a challenge with using fundamental valuation metrics is that they tend to fluctuate with the business cycle. To deal with this issue, analysts 'cyclically adjust' the valuation measures. A popular metric is CAPE – cyclically adjusted P/E (CAPE). For this measure, the current price level is divided by the average level of earnings for the last 10 years (adjusted for inflation), rather than by the most current earnings.

Example: Forecasting the Equity Return Using the Grinold–Kroner Model
(*This is based on Example 4 of the curriculum.*)

An analyst is using the Grinold–Kroner model to estimate the equity market return. He makes the following forecasts:

- Dividend yield = 2.25%
- Rate of net share repurchases = 1%
- Long-term corporate nominal earnings growth rate = 6%
- An expansion rate for the P/E multiple of 0.25% per year

What is the expected equity market return based on these forecasts?

Solution:

Expected return = $\frac{D}{P} + (\%\Delta E - \%\Delta S) + \%\Delta P/E$ = 2.25% + [6.0% – (–1.0%)] + 0.25% = 9.5%.

Risk Premium Approaches to Equity Returns

'Equity premium' is most often defined as the difference between equity versus T-bill returns. However, sometimes, the same term is also defined as the difference between equity vs. default-free bond returns. The difference between these two definitions is the term premium built into the expected return on default-free bonds. The equity versus T-bill premium reflects a single combined premium; whereas the equity versus bonds, premium reflects a building block approach toward developing expected equity returns.

However, the problem with the risk premiums approach is that equity returns are much more volatile than T-bills and bond returns; forecasting either definition of equity premium is just as difficult as forecasting the actual level of equity returns. Therefore, the risk premium approach is not very useful to forecast equity returns.

An Equilibrium Approach - Singer–Terhaar model

The Singer-Terhaar model combines two underlying CAPM models. The first assumes complete global integration of markets and asset classes. The second assumes complete segmentation of markets and asset classes.

Under this model, the risk premium estimate for an asset class is expressed as:

$RP_i = \varphi RP_i^G + (1 - \varphi)RP_i^S$

where:
RP_i^G = risk premium assuming global integration
RP_i^S = risk premium assuming total segmentation
φ = degree of global integration

The risk premium for an asset class under the assumption of global integration is calculated as:

$$RP_i^G = \rho_{i,GM}\,\sigma_i\,\frac{RP_{GM}}{\sigma_{GM}}$$

where:
$\rho_{i,GM}$ = correlation between the asset class and the global market portfolio
σ_i = standard deviation of the asset class
$\frac{RP_{GM}}{\sigma_{GM}} = \frac{\text{risk premium of global market portfolio}}{\text{Std dev of global market portfolio}} = \text{Sharpe ratio for the global market portfolio}$

The risk premium for an asset class under the assumption of complete segmentation is calculated as:

$$RP_i^S = \sigma_i\,\frac{RP_i^S}{\sigma_i}$$

where:
σ_i = standard deviation of the asset class
$\frac{RP_i^S}{\sigma_i} = \frac{\text{risk premium for the asset class}}{\text{Std dev of the asset class}} = \text{Sharpe ratio for the asset class}$

The curriculum illustrates the Singer-Terhaar model through the following example.

Example:

Consider the following projections for German shares and bonds.

	German Shares	**German Bonds**
Volatility (σ_i)	17.0%	7.0%
Correlation with global market ($\rho_{i,M}$)	0.70	0.50
Degree of integration (φ)	0.85	0.85
Segmented market Sharpe ratio $\left(\frac{RP_i^S}{\sigma_i}\right)$	0.35	0.25

The risk-free rate is 1.0%, and the investor's estimate of the global Sharpe ratio is 0.30.

The fully integrated risk premiums for each asset class can be calculated as:
Equities: 0.70 × 17.0% × 0.30 = 3.57%.
Bonds: 0.50 × 7.0% × 0.30 = 1.05%.

The fully segmented risk premiums for each asset class can be calculated as:
Equities: 17.0% × 0.35 = 5.95%.
Bonds: 7.0% × 0.25 = 1.75%.

Based on 85% integration (φ = 0.85), the final risk estimates can be calculated as:
Equities: (0.85 × 3.57%) + (1 – 0.85) × 5.95% = 3.93%.
Bonds: (0.85 × 1.05%) + (1 – 0.85) × 1.75% = 1.16%.

The expected returns for German shares and German bonds can be calculated by adding the risk-free rates.
Equities: 3.93% + 1% = 4.93%
Bonds: 1.16% + 1% = 2.16%

Example: Using the Singer–Terhaar Model
(*This is Example 5 from the curriculum.*)

An analyst believes the equity market in one of the emerging markets that she models has become more fully integrated with the global market. As a result, she expects it to be more highly correlated with the global market. However, she thinks its overall volatility will decline. Her old and new estimates are as follows:

	Previous Data	**New Data**
Volatility (σ_i)	22.0%	18.0%
Correlation with global market ($\rho_{i,M}$)	0.50	0.70
Degree of integration (φ)	0.55	0.75
Sharpe ratio (global and segmented markets)	0.30	0.30

If she uses the Singer–Terhaar model, what will the net impact of these changes be on her risk premium estimate for this market?

Solution:

The segmented market risk premium will decline from 6.6% (calculated as 22.0% × 0.30 = 6.6%) to 5.4% (= 18% × 0.30). The fully integrated risk premium will increase from 3.30% (= 0.50 × 22.0% × 0.30) to 3.78% (= 0.70 × 18.0% × 0.30). The weighted average premium will decline from 4.79% [= (0.55 × 3.30%) + (0.45 × 6.60%)] to 4.19% [= (0.75 × 3.78%) + (0.25 × 5.40%)], so the net effect is a decline of 60 bps.

Risks in Emerging Market Equities

Emerging market equities expose investors to the same underlying risks as emerging market debt does:

- More fragile economies
- Lower degree of informational efficiency
- Less stable political and policy frameworks

- Weaker legal protection

Also, emerging market investors have to pay specific attention to how the value of their ownership claims may be diluted or taken away by the government, corporate insiders, or dominant shareholders.

When making investments in emerging markets, areas of concern should include:

- Standards of corporate governance
- Accounting and disclosure standards
- Property rights laws
- Checks and balances on government actions

6. Forecasting Real Estate Returns

Historical Real Estate Returns

Real estate is different from equities and bonds because it represents actual physical assets rather than financial assets. Real estate investments are heterogeneous, indivisible, and immobile.

Generally, real estate valuation depends heavily on appraisals rather than transactions. Therefore, historical return data is subject to smoothing; and volatility and correlations are understated.

Real Estate Cycles

Real estate is subject to boom-bust cycles that both drive and are driven by the business cycle. Businesses and households need real estate, so the demand for real estate is high. However, this demand can change relatively quickly. Since the supply of real estate is large but fixed at a given point in time, property values exhibit strong cyclical patterns. When an economy is just coming out of recession, a perception of rising demand from businesses and households drives the development of new properties. As property development starts rising it further stimulates the economy and leads to a boom. However, often the demand for real estate is overestimated, and the supply eventually exceeds the demand, leading to a bust in the business cycle.

The supply and demand imbalance effects on actual rents and occupancy rates depend primarily on the type and quality of the property. High-quality properties with long leases have little turnover. Therefore, the fluctuations in actual rents and occupancy rates are low so the riskiness of high-quality properties is low. On the other hand, low-quality properties are more sensitive to the business cycle.

Capitalization Rates

The capitalization rate or cap rate is the standard valuation metric for commercial real estate. It is calculated as:

Cap rate = net operating income in the current period/property value

Given the cap rate of comparable properties and the estimated net operating income of the subject property, we can use the above formula to value the subject property.

The cap rate can also be used to estimate the expected return on real estate.

$E(R_{re})$ = Cap rate + NOI growth rate – %ΔCap rate.

This equation is similar to the Grinold-Kroner model for equities; the cap rate is the same as dividend yield, NOI growth rate is analogous to the earnings growth rate, change in cap rate can be taken as a change in P/E which tends to zero over the long-run.

Cap rates are higher for riskier property types, lower-quality properties, and less attractive locations. Exhibit 6 from the curriculum shows private market cap rates as of 30 June 2021 for US commercial properties differentiated by type, location, and quality.

Exhibit 6: Private Market Cap Rates (%) as of 30 June 2021

Property Type	Average	Higher Risk	Lower Risk
Hotels	53.0	Limited Service 7.7	Full Service 7.1
Health Care	4.86	Skilled Nursing 9.5	Medical Office 5.7
Retail Malls	6.8	Low Productivity 8.8	High Productivity 5.0
Industrial	3.74		
Office	5.0	Secondary Cities 6.6	Gateway Cities 4.7
Apartments	4.55		

Source: CenterSquare Investment Management (2018).

Cap rates reflect long-term discount rates. If long-term interest rates rise, cap rates also increase. Credit spreads and availability of credit impact cap rates too; when credit spreads increase cap rates increase.

The Risk Premium Perspective on Real Estate Expected Return

Real estate returns have several premiums:

- Term premium: As a very long-lived asset with relatively stable cash flows, income-producing real estate has a high duration. The term premium is directly proportional to duration. Therefore, real estate has a significant term premium.
- Credit premium: A fixed-term lease is like a corporate bond issued by the leaseholder (tenant) secured by the property.
- Equity premium: Owners bear the risk of property value fluctuations, as well as the risk associated with rent growth, lease renewals, and vacancies.
- Liquidity premium: Real estate trades infrequently and is costly to transact.

The risk premium for real estate is between corporate bonds and equities.

Real Estate in Equilibrium

Real estate can be incorporated into an equilibrium framework, but some adjustments and considerations are required.

- The impact of smoothing should be removed.
- Adjustments for illiquidity are needed.
- Investors should also recognize that real estate investments are more likely to be impacted by region-specific factors as compared to other investments such as stocks and bonds.

Public vs. Private Real Estate

Private real estate investments include direct investment in real estate. Public real estate investments include investments through REITs (Real estate investment trusts).

Before comparing direct investments with REITs, some adjustments are required. One such adjustment is unlevering returns. Exhibit 7 from the curriculum compares the returns and standard deviation of direct real estate with levered and unlevered returns and standard deviations of REITs.

	Mean Return (%)			Standard Deviation (%)		
	Direct Real Estate	REITs		Direct Real Estate	REITs	
		Unlevered	Levered		Unlevered	Levered
Aggregate	8.80	9.29		11.09	9.71	
Apartment	9.49	9.08	11.77	11.42	9.50	20.69
Office	8.43	9.37	10.49	10.97	10.58	23.78
Industrial	9.00	9.02	9.57	11.14	11.65	23.46
Retail	8.96	9.90	12.04	11.54	10.03	23.73

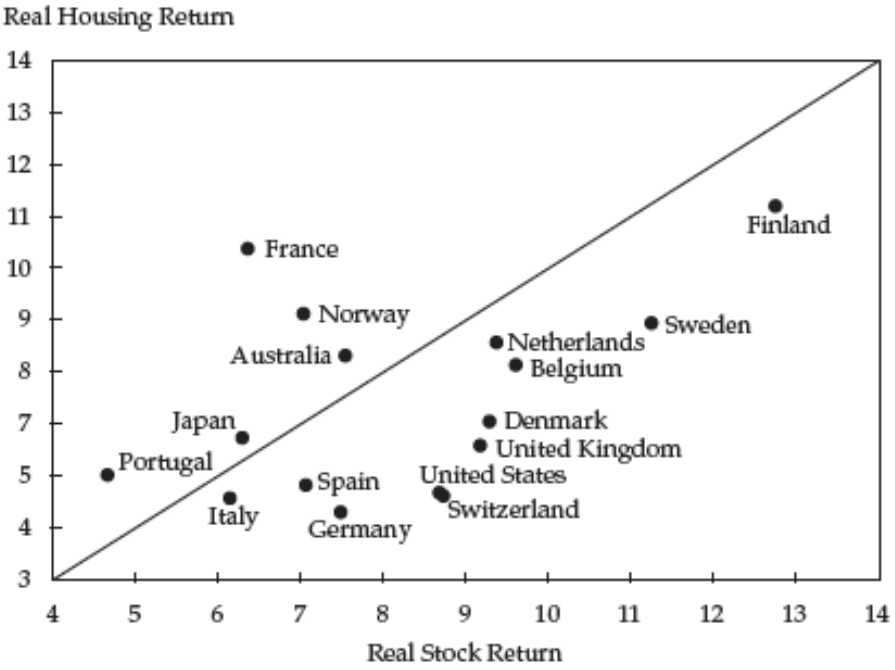
Source: Ling and Naranjo (2015, Table 1).

Deleveraging the REITs significantly reduces both their mean returns and their volatilities. The deleveraged REIT returns are more similar to direct real estate returns than levered REIT returns. This implies that REIT investors are not sacrificing performance for liquidity.

REITs act like stocks in the short run and like real estate in the long run. They are more correlated with direct real estate and less correlated with equities over long time horizons.

Long-Term Housing Returns

Residential real estate is about 75% of the total value of developed real estate globally. Exhibit 8 from the curriculum plots the real equity and housing returns by country.



Note: Annual percentage returns are shown.
Source: Jordà et al. (2017).

In some countries (above the diagonal line)real estate has performed better than equities. But in most countries (below the diagonal line) real estate has underperformed equities.

7. Forecasting Exchange Rates

Currency exchange rates are very difficult to forecast because they depend on government actions, financial systems, legal systems, and geographies. However, given the increasing level of globalization and integration of financial markets, investment managers have to forecast exchange rates. To do this they need to identify and assess forces that are likely to exert the most influence on exchange rates.

Focus on Goods and Services, Trade, and the Current Account

There are three ways in which trade in goods and services can influence the exchange rate.

- **Trade Flows**: Provided they can be financed; trade flows do not usually exert a significant impact on exchange rates. However, if trade flows become very large relative to financing/investment flows, then this is a warning sign of a potential currency crisis.
- **Purchasing Power Parity**: The underlying mechanism for PPP is quasi-arbitrage. PPP is based on the law of one price, which states that identical goods should trade at the same price across countries when valued in terms of a common currency. The relative version of PPP states that:
  Expected percentage change in exchange rate = difference in expected inflation rates

For instance, if the foreign inflation rate is 10% and the domestic inflation rate is 5%, the $S_{f/d}$ the exchange rate must appreciate by 5% to maintain the relative competitiveness of both regions. In other words, the country with the higher inflation rate will see a devaluation of its currency.

PPP is often violated in the short term, but it is a reasonable guide to currency movements over multi-year horizons.

- **Competitiveness and Sustainability of the Current Account**: The extent to which the current account balance influences the exchange rate depends primarily on whether it is likely to be persistent and whether it can be sustained. Relatively small imbalances (less than 2% of GDP) are not likely to impact exchange rates. Larger but temporary imbalances are also not likely to impact exchange rates.

  If we have a large and persistent imbalance, the source of the imbalance should be considered to evaluate the impact on exchange rates. If the current account deficit is due to strong, profitable investment spending, then it is likely to be sustainable. Whereas, if the current account deficit is due to low private savings, and investments made in non-productive projects, then this deficit will not be sustainable and can eventually lead to a currency crisis.

Focus on Capital Flows

Capital is mobile it can enter or leave a country quickly, but it takes time for trade balances to adjust. Therefore, drivers of the current account adjust gradually; short-term and intermediate term adjustments happen in the capital account.

Implications of Capital Mobility

Capital will flow to countries with the highest risk-adjusted expected return. The exchange rate will be driven to the point at which the expected percentage change equals the "excess" risk-adjusted expected return on the portfolio of assets denominated in the domestic currency over that of the portfolio of assets denominated in the foreign currency. This concept can also be expressed using a building block approach:

$$E(\%\Delta S_{d/f}) = (r^d - r^f) + (Term^d - Term^f) + (Credit^d - Credit^f) + (Equity^d - Equity^f) + (Liquid^d - Liquid^f).$$

The expected change in the exchange rate will reflect the differences in the nominal short-term interest rates (r), term premiums (Term), credit premiums (Credit), equity premiums (Equity), and liquidity premiums (Liquid) in the two countries.

For example, suppose the domestic market has a 1% higher short-term rate, a 0.25% lower term premium, a 0.50% higher credit premium, and the same equity and liquidity premiums as the foreign market. The expected change in the exchange rate can be calculated as:

$E(\%\Delta S_{d/f}) = 1\% - 0.25\% + 0.5\% = 1.25\%$. i.e. domestic currency will weaken, and foreign currency will strengthen.

It may seem counterintuitive that the domestic currency will depreciate even though its portfolio offers a higher risk-adjusted return. This can be understood through a theory proposed by Dornbusch, called the overshooting mechanism. In the short term, the domestic currency will appreciate because capital will flow into the country to seek a higher risk-adjusted return. However, in the long run, the domestic currency will eventually depreciate.

The overshooting mechanism implies that there are likely to be three phases in response to relative movements in investment opportunities.

- In the first phase, the short-term, the domestic currency will appreciate as capital flows into the country.
- In the second phase, the intermediate term, there will be consolidation as investors begin to question the level of the exchange rate.
- In the third phase, the long-term, the domestic currency will depreciate to the level predicted by the above equation.

Uncovered Interest Rate Parity and Hot Money Flows

Uncovered interest rate parity predicts that: Expected percentage change in exchange rate = nominal interest rate differential. The relationship between the expected change in the spot exchange rate over the investment horizon and the interest rate differential is given as:

$\%\Delta s^{e}_{f/d} = i_f - i_d$ Where ΔS^{e} indicates the change in the spot rate expected for *future* periods. So, if the risk-free nominal rate in the domestic currency is higher than the rates in the foreign currency, the domestic currency will depreciate, and the foreign currency will appreciate.

However, imperial evidence suggests that carry trades are profitable on average, which is contrary to the predictions of uncovered interest rate parity. In other words, uncovered interest rate parity does *not* hold over short and medium periods. Studies have found that "*high-yield currencies, on average, have not depreciated, and low-yield currencies have not appreciated, to the levels predicted by interest rate differentials."* This contradiction is resolved by assuming that uncovered interest rate parity will hold in the long term, whereas carry trades exploit short term opportunities.

Hot money flows refer to vigorous flows of capital in response to interest rate differentials. In the short run, there can be an exchange rate overshoot as hot money chases higher returns. Therefore, instead of depreciating as predicted by UIP, the exchange rate is likely to overshoot its long-run PPP path in the short run, leading to an appreciation of the domestic currency. Hot money flows can be problematic for the financial systems of a country. Therefore, central banks often try to combat hot money flows by intervening in the currency market to *stabilize* the impact.

Portfolio Balance, Portfolio Composition, and Sustainability Issues

Each country/currency has a unique portfolio of assets that makes up part of the global "market portfolio." Exchange rates provide an across-the-board mechanism for adjusting the relative sizes of these portfolios to match investors' desire to hold them.

A large persistent current account deficit funded in local currency will put downward pressure on the exchange rate in the long term.

- As discussed previously, *the source of the deficit matters*; if the deficit is due to large investments in profitable projects, then the deficit will be sustainable.
- Few currencies such as the US dollar have a *special status*, known as the Special status of reserve currencies. A bulk of official reserves are held in these currencies. It is considered viable to maintain a small current account deficit in the reserve-currency country because it helps provide liquidity to the global financial system.

The composition of a particular currency's portfolio matters. For the stability of the country's financial system:

- FDI flows are most favorable. They indicate a long-term commitment and help improve the productivity of an economy.
- Portfolio investments are less favorable compared to FDI. It is less permanent as compared to FDI, but they still represent a residual claim on profitability, and there is no obligation to repay.
- Debt-based financing is the least favorable because debt has to be serviced and repaid/refinanced. High debt (rising debt/GDP ratio) can lead to debt sustainability issues.
- Hot money flows, leading to large or rapid accumulation of short-term borrowing can cause a currency crisis.

8. Forecasting Volatility

So far, we have discussed how to forecast expected returns for different asset classes. To construct portfolios, along with expected returns, we also need the expected risk of these asset classes. In this section, we will focus on how to forecast variances and covariances (measures of risk) for different asset classes.

Estimating a Constant VCV Matrix with Sample Statistics

The most basic method of estimating variances and covariances is to use corresponding sample statistics computed from historical return data. These elements are then assembled into a variance-covariance (VCV)matrix.

The sample statistic method is used for estimating constant variances and covariances, i.e. we assume that the variances and covariances do not change over time.

The advantages of this method are:

- It is conceptually simple.
- The sample VCV matrix is an unbiased estimate of the true VCV structure.

The disadvantages of this method are:

- It cannot be used for a large number of asset classes, because if the number of assets exceeds the number of historical observations, then some portfolios will erroneously appear to be riskless.
- It is subject to substantial sampling error.
- It does not impose cross-sectional consistency since each element is estimated without considering other elements.

To mitigate the first two disadvantages, we should use a sample size that is at least 10 times the number of assets.

VCV Matrices from Multi-Factor Models

Another method of estimating VCV matrices is to use multi-factor models. In a model with K common factors,

The return on the i^{th} asset is given by:

$$r_i = \alpha_i + \sum_{k=1}^{K} \beta_{ik} F_k + \varepsilon_i$$

where:
α_i = constant intercept
β_{ik} = asset's sensitivity to the kth factor return
F_k = kth common factor return
ε_i = stochastic term with a mean of zero that is unique to the ith asset

The variance of the i^{th} asset is given by:

$$\sigma_i^2 = \sum_{m=1}^{K} \sum_{n=1}^{K} \beta_{im} \beta_{in} \rho_{mn} + v_i^2$$

where:
ρ_{mn} = covariance between the m^{th} and n^{th} factors
v_i^2 = variance of the unique component of the i^{th} asset's return

The covariance between the i^{th} and j^{th} assets is given by:

$$\sigma_{ij} = \sum_{m=1}^{K} \sum_{n=1}^{K} \beta_{im} \beta_{jn} \rho_{mn}$$

Linear factor models impose a structure on the VCV matrix which makes it possible to handle a very large number of asset classes. Therefore, this method helps overcome the

drawback of the sample statistic method. The covariances are fully determined by exposures to a smaller number of common factors. Each variance includes an asset-specific component.

With N assets, there are [N(N – 1)/2] distinct covariance elements in the VCV matrix. For example, if N =100, there are 4,950 distinct covariances to be estimated using the sample statistic method. The factor model reduces this problem to estimating [N × K] factor sensitivities plus [K(K + 1)/2] elements of the factor VCV matrix, Ω. With N = 100 and K = 5, this would mean "only" 500 sensitivities and 15 elements of the factor VCV matrix—nearly a 90% reduction in items to estimate.

The advantages of this method are:

- It can handle a large number of asset classes.
- It gives a relatively simple VCV matrix (based on a reduced number of parameters to estimate) with substantially less estimation error than the sample VCV matrix.
- A well-specified factor model can also improve cross-sectional consistency.

The disadvantages of this method are:

- The VCV matrix is biased; the expected value is not equal to the true VCV matrix.
- The VCV matrix is also inconsistent; it does not converge to the true matrix as the sample size gets arbitrarily large.
  (In contrast, the sample VCV matrix was both unbiased and consistent.)

Shrinkage Estimation of VCV Matrices

In this method, the information in the sample data (sample VCV matrix) is combined with an alternative estimate. Typically, the alternative estimate is the target VCV matrix, which assumes 'prior' knowledge of the structure of the true VCV matrix.

Each element of the final shrinkage estimate of the VCV matrix is a weighted average of the corresponding elements of the sample VCV matrix and the target VCV matrix. The analyst must use judgment to decide how much weight to put on the target matrix and how much weight to put on the sample data.

The major advantage of the shrinkage estimation method is that it helps reduce the impact of estimation error on the final matrix. It improves the efficiency of the estimate by lowering the mean-squared error compared to the sample VCV matrix.

However, the disadvantage of this method is that the shrinkage estimator is biased.

Estimating Volatility from Smoothed Returns

The available return data for some asset classes such as real estate and private equity reflect the smoothing of unobservable underlying "true" returns. Smoothing reduces the volatility of observed data and distorts correlations with other asset classes. Smoothed data understates the risk and overstates the diversification benefits of these asset classes. Failure to adjust for

the impact of smoothing while constructing portfolios will result in poor asset allocation decisions.

The observed returns are a weighted average of the current and past true unobservable returns.

$R_t = (1 - \lambda) r_1 + \lambda R_{t-1}$ where λ is a weight between 0 and 1

The portfolio variance is then calculated as:

$\text{var}(r) = \left(\frac{1+\lambda}{1-\lambda}\right) \text{var}(R) > \text{var}(R)$

One shortcoming of this model is that the true current return is not directly observable. Proxies for estimating the true return include using an asset index.

To adjust for the impact of smoothing an analyst can assume a relationship between unobservable return and one or more observable variables. For private real estate, a REIT index can be chosen. For private equity, an analyst can use an index of similar publicly traded equities.

Time-Varying Volatility: ARCH Models

Financial asset returns exhibit volatility clustering. Often, there are periods of high and low volatility. Autoregressive conditional heteroskedasticity (ARCH) models help address these time-varying volatilities.

One of the simplest and most used ARCH models specifies time 't' variance as a linear combination of time (t - 1) variance and a new 'shock' to volatility.

$$\sigma_t^2 = \gamma + \alpha\sigma_{t-1}^2 + \beta\eta_t^2 = \gamma + (\alpha + \beta)\sigma_{t-1}^2 + \beta(\eta_t^2 - \sigma_{t-1}^2)$$

With appropriate parameter values, the model captures the volatility clustering (time-varying volatilities) characteristic of financial asset returns.

9. Adjusting a Global Portfolio

In this section, we will discuss the factors to consider when making adjustments to a global investment portfolio.

Macro-Based Recommendations

To keep the discussion simple, we will consider a simple portfolio with only two asset classes global equities and bonds, and limit our potential recommendations to the following:

- Change the overall allocations to equities and bonds.
- Reallocate equities/bonds between countries.
- Adjust the average credit quality of our bond portfolios.
- Adjust duration and positioning on the yield curves.
- Adjust our exposures to currencies.

We will now evaluate the impact of some macroeconomic variables on our portfolio.

Trend Growth

- Higher trend growth is favorable for equities because it implies more rapid long-run earnings growth.
- However, higher trend growth is unfavorable for bonds because it implies higher real interest rates, which will cause bond values to decline.
- Therefore, when we have a high trend growth, we should increase our allocation to equities and reduce our allocation to bonds.

Global Integration

- A higher level of integration implies that prices will rise and required returns will fall.
- An investor should invest in markets that are likely to become more integrated.

Phases of the Business Cycle

- As an economy approaches the trough of the business cycle, equity allocation should be increased, and bond allocation should be reduced.
- As an economy approaches the peak of the business cycle, the bond allocation should be increased, and equity allocation should be reduced.
- Adjustments to the bond portfolio should be made based on changes in the yield curve and credit spreads. For example, if credit spreads are likely to widen, we should avoid risky bonds.
- Analysts should also consider the fact that business cycles across different regions may not be synchronized. The recommended approach here is to reduce equity allocation in markets nearing peak and increase equity allocation in regions that are closer to the trough of their business cycles.

Monetary and Fiscal Policies

- Asset prices reflect monetary and fiscal policies that are expected by the market.
- Opportunities to add value by reallocating the portfolio are likely to arise from:
    - structural policy changes.
    - response to policy measures that is not as expected.

Current Account Balances

- A rising current account deficit will put upward pressure on real required returns and asset prices will come down.
- The recommendation here is to reallocate portfolio assets from countries with secularly rising current account deficits to those with secularly rising current account surpluses (or narrowing deficits).

Capital Accounts and Currencies

- Currencies are primarily influenced by capital flows.
- If assets in a particular currency offer a relatively high risk-adjusted expected return, an analyst should assess the stage in the overshoot cycle, to determine if there is meaningful appreciation yet to come or if the currency has already overshot and will decline. Analysts can increase or decrease allocation to such a currency accordingly.

Quantifying the Views

The curriculum provides the following steps that an analyst can use to quantify the views underlying his or her recommendations.

- **Step 1:** Use appropriate techniques to estimate the VCV matrix for all asset classes.
- **Step 2:** Use the Singer–Terhaar model and the estimated VCV matrix to determine equilibrium expected returns for all asset classes.
- **Step 3:** Use the Grinold–Kroner model to estimate returns for equity markets based on assessments of economic growth, earnings growth, valuation multiples, dividends, and net share repurchases.
- **Step 4:** Use the building block approach to estimate expected returns for bond classes based primarily on cyclical and policy considerations.
- **Step 5:** Establish directional views on currencies relative to the portfolio's base currency based on the perceived attractiveness of assets and the likelihood of having overshot sustainable levels. Set modest rates of expected appreciation/depreciation.
- **Step 6:** Incorporate a currency component into expected returns for equities and bonds.
- **Step 7:** Use the Black–Litterman framework (described in a later reading) to combine equilibrium expected returns.

Summary

LO: Discuss approaches to setting expectations for fixed-income returns.

DCF approach

Fixed income securities have finite maturities and reasonably well-defined cash flows. Therefore, DCF is the most precise method of forecasting fixed income returns. YTM is the most commonly quoted metric of expected returns for bonds and is a reasonably good approximation of the actual returns that an investor will eventually realize.

Building block approach

The building block approach estimates the expected return of a security as the sum of the following components:

- Short-term default-free rate: Rate on the highest-quality, most liquid instrument with a maturity that matches the forecast horizon.
- Term premium: Additional expected return based on the term of the bond.
- Credit premium: Additional expected return for bearing the risk of credit losses.
- Liquidity premium: Additional expected return for holding less liquid bonds.

LO: Discuss risks faced by investors in emerging market fixed-income securities and the country risk analysis techniques used to evaluate emerging market economies.

Emerging market debt exposes investors to additional risks with respect to:

- Ability to pay – related to economic risks
- Willingness to pay – related to political and legal risks

To evaluate emerging market economies an investor can look at the following indicators: Fiscal deficit to GDP > 4%, Debt to GDP > 70%, Annual real growth rate < 4%, Foreign debt > 50% of GDP.

LO: Discuss approaches to setting expectations for equity investment market returns.

Historical Statistics Approach

The major issue with using historical data to forecast equity returns is that equity returns are extremely volatile. This volatility (or 'noise') is largely due to fluctuations in the P/E and E/GDP ratios. Therefore, using historical data to forecast equity data does not lead to reliable forecasts.

DCF Approach

The most commonly used DCF approach to forecast equity returns is the Gordon growth model. According to this model, the required return on equity can be calculated as:

$$r = \frac{D_1}{P} + g$$

A more refined version of the Gordon growth model is the Grinold-Kroner model. According to this model, the expected return on equity can be expressed as:

$$E(R_e) \approx \frac{D}{P} + (\%\Delta E - \%\Delta S) + \%\Delta P/E$$

Risk Premium Approaches

Forecasting the equity premium directly is just as difficult as projecting the absolute level of equity returns, so the building block approach is not of much use.

The Singer-Terhaar model combines two underlying CAPM models. The first assumes complete global integration of markets and asset classes. The second assumes complete segmentation of markets and asset classes.

Under this model, the risk premium estimate for an asset class is expressed as:

$RP_i = \varphi RP_i^G + (1 - \varphi)RP_i^S$

The risk premium for an asset class under the assumption of global integration is calculated as:

$$RP_i^G = \rho_{i,GM}\,\sigma_i \frac{RP_{GM}}{\sigma_{GM}}$$

The risk premium for an asset class under the assumption of complete segmentation is calculated as:

$$RP_i^S = \sigma_i \frac{RP_i^S}{\sigma_i}$$

LO: Discuss risks faced by investors in emerging market equity securities.

Emerging market equities expose investors to the same underlying risks as emerging market debt does:

- More fragile economies
- Less stable political and policy frameworks
- Weaker legal protection

Also, emerging market investors have to pay specific attention to ways in which the value of their ownership claims may be diluted or taken away by the government, corporate insiders, or dominant shareholders.

LO: Explain how economic and competitive factors can affect expectations for real estate investment markets and sector returns.

Real estate is subject to boom-bust cycles that both drive and are driven by the business cycle. When an economy is just coming out of a recession, a perception of rising demand from businesses and households drives the development of new properties. As property development work starts rising it further stimulates the economy and leads to a boom. However, often the demand for real estate is overestimated, and the supply eventually exceeds the demand, finally leading to a bust in the business cycle.

The capitalization rate or cap rate is the standard valuation metric for commercial real estate. It is calculated as:

Cap rate = net operating income in the current period/property value

Cap rates are higher for riskier property types, lower-quality properties, and less attractive locations.

LO: Discuss major approaches to forecasting exchange rates.

Focus on Goods and Services, Trade, and the Current Account

There are three ways in which trade in goods and services can influence the exchange rate.

- Trade Flows: Provided they can be financed; trade flows do not usually exert a significant impact on exchange rates.
- Purchasing Power Parity: PPP is based on the law of one price, which states that identical goods should trade at the same price across countries when valued in terms of a common currency. The relative version of PPP states that:
  Expected percentage change in exchange rate = difference in expected inflation rates

  PPP is often violated in the short term, but it is a reasonable guide to currency movements over multi-year horizons.
- Competitiveness and Sustainability of the Current Account: The extent to which the current account balance influences the exchange rate depends primarily on whether it is likely to be persistent and whether it can be sustained.

Focus on Capital Flows

Capital will flow to countries with the highest risk-adjusted expected return. The exchange rate will be driven to the point at which the expected percentage change equals the "excess" risk-adjusted expected return on the portfolio of assets denominated in the domestic currency over that of the portfolio of assets denominated in the foreign currency.

The overshooting mechanism implies that there are likely to be three phases in response to relative movements in investment opportunities.

- In the first phase, the short-term, the domestic currency will appreciate as capital flows into the country. (Hot money)
- In the second phase, the intermediate term, there will be consolidation as investors begin to question the level of the exchange rate.
- In the third phase, the long-term domestic currency will depreciate to the level predicted by the above equation.

Portfolio Balance, Portfolio Composition, and Sustainability Issues

Each country/currency has a unique portfolio of assets that makes up part of the global "market portfolio". Exchange rates provide an across-the-board mechanism for adjusting the

relative sizes of these portfolios to match investors' desire to hold them.

In the long run, the relative size of each currency portfolio depends mainly on relative trend growth rates and current account balances

LO: Discuss methods of forecasting volatility.

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VCV Matrices from Multi-Factor Models
Another method of estimating VCV matrices is to use multi-factor models. Linear factor models impose a structure on the VCV matrix which makes it possible to handle a very large number of asset classes. Therefore, this method helps overcome the drawback of the sample statistic method. The covariances are fully determined by exposures to a smaller number of common factors. Each variance includes an asset-specific component.

Shrinkage Estimation
In this method, the information in the sample data (sample VCV matrix) is combined with an alternative estimate. Typically, the alternative estimate is the target VCV matrix, which assumes 'prior' knowledge of the structure of the true VCV matrix.

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To adjust for the impact of smoothing an analyst can assume a relationship between unobservable return and one or more observable variables. For private real estate, a REIT index can be chosen. For private equity, an analyst can use an index of similar publicly traded equities.

Time-Varying Volatility: ARCH Models
Financial asset returns exhibit volatility clustering. Autoregressive conditional heteroskedasticity (ARCH) models help address these time-varying volatilities. One of the simplest and most used ARCH models specifies 'time t' variance as a linear combination of time (t – 1) variance and a new 'shock' to volatility.

LO: Recommend and justify changes in the component weights of a global investment portfolio based on trends and expected changes in macroeconomic factors.

Trend growth: When we have a higher trend growth, we should increase our allocation to equities and reduce our allocation to bonds.

Global Integration: An investor should invest in markets that are likely to become more integrated.

Phases of the Business Cycle: As an economy approaches the trough of the business cycle, equity allocation should be increased and bond allocation should be reduced. As an economy

approaches the peak of the business cycle, the bond allocation should be increased and equity allocation should be reduced

Monetary and Fiscal Policies: Opportunities to add value by reallocating the portfolio are likely to arise when:

- There are structural policy changes.
- The response to policy measures is not as expected.

Current account balances: An investor should reallocate portfolio assets from countries with secularly rising current account deficits to those with secularly rising current account surpluses (or narrowing deficits).

Capital Accounts and Currencies: If assets in a particular currency offer a relatively high risk-adjusted expected return, an analyst should assess the stage in the overshoot cycle, to determine if there is meaningful appreciation yet to come or if the currency has already overshot and will decline. Analysts can increase or decrease allocation to that country accordingly.