

Module 2: Capital Market Expectations. / /

Reminder: Modified Duration = Sensitivity of bond price to 1% change of int rate.

$$\text{Macaulay Duration} = \text{Modified Duration} \times \text{YTM}$$

Forecasting F1 Return.

Approach ①: DCF Analysis.

includes analysis of YTM & Macaulay Duration.

Realized return might deviate from initial YTM!
if investment horizon < Macaulay duration:

Capital gain/loss impact > reinvestment impact.

if investment horizon > Macaulay duration:

reinvestment impact. > Capital gain/loss impact

Approach ②: Risk Premium/Building Blocks.

1. Short-term default-free rate
2. Term Premium

positive & related to duration

4 main drivers:

- Inflation uncertainty
- Recession Hedge
- Supply & Demand
- Business Cycle.

Other indicators :

- Ex ante (forecast) real yield
- Cochrane & Pizzati curve factor
- Kim & Wright premium
- Slope of the YC
- Supply indicators.
- Cyclical proxies

3. Credit Premium

4. Liquidity Premium



MODULE QUIZ 2.1

1. An investor has a bond portfolio with a yield to maturity (YTM) of 4 and a modified duration of 5. The investor expects to hold on to the bond portfolio for at least the next six years but expects that bond yields will gradually rise over the investment horizon by a total of 100 bps. **Determine** whether the investor will realize a higher or lower overall yield than the initial YTM.

Overall yield will be higher than initial YTM b/c macaulay duration = $5 \cdot (1.04) = 5.20$ Given the investment horizon is higher than that, bond return is higher than YTM b/c reinvestment yield will outweigh the fall in bond price

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Use the following information to answer Questions 2 and 3.

Lou Bee is looking to add two new securities to his fixed income portfolio and considers the following bonds (both noncallable):

- One-year government bond
- Five-year AA rated corporate bond

Bee has also gathered the following information:

Risk-free interest rate (one year)	2.5%
Term premium (five-year vs. one-year government bond)	60 bps
Credit premium (five-year AA corporate bond vs. five-year government bond)	30 bps
Liquidity premium on five-year AA corporate bonds	25 bps

2. The expected return of an equal-weighted investment in the two securities will be closest to:

- A. 2%.
- B. 3%.
- C. 4%.

3. The expected total risk premium of the two securities will be closest to:

- A. 0.6%.
- B. 1.2%.
- C. 1.7%.

Module 2.2: Emerging Market Bond Risk

Signs of emerging market susceptible to risk:

- Wealth concentration
- Income concentration & less diverse tax base.
- Greater dominance of cyclical industries
- Restrictions on capital flow & trade

Potential factors to look at before investing in those markets:

- deficit-to-GDP ratio to gauge fiscal policy.
IF $> 4\%$ \Rightarrow substantial credit risk
IF $70\% - 80\%$ \Rightarrow troublesome for emerging countries
- should expect a $\geq 4\%$ of real growth rate
- Current a/c deficit $\geq 4\%$ of GDP = potential difficulty
- Foreign debt levels $> 50\%$ of GDP or 200% of current a/c receipts \Rightarrow HIGH RISK.
- FX Reserves \div short-term debt $< 100\%$ \Rightarrow RISK.
 $> 200\%$ \Rightarrow STRONG



MODULE QUIZ 2.2

1. An analyst is evaluating an emerging market for potential investment. She notices that the country's current account deficit has been growing. Is this a sign of increasing risk? If so, explain why.

1. Yes, current a/c deficit usually results when exports $<$ imports. it can be problematic b/c the deficits must be financed thru external borrowing. if the EM becomes overleveraged, it may not be able to pay back its foreign debt. & may cause crisis to have foreign investors quickly withdraw their capital. Crisis are accompanied by currency devaluations & decline in EM asset values.

Module 2.3 : Forecasting Equity Returns

Grinold-Kroner Model

chg. in outstanding shares

$$E(R_E) \approx D/P + (\% \Delta E - \% \Delta S) + \% \Delta P/E$$

↑
Div Yield

↑

chg. of total earnings (NOMINAL GROWTH)

$$\approx (D/P - \% \Delta S) + \% \Delta E + \% \Delta P/E$$

Income Return

EXAMPLE: Calculating expected equity return using the Grinold-Kroner model

Suppose an analyst uses the Grinold-Kroner model to estimate the stock market return. The analyst estimates a 2.1% dividend yield, real earnings growth of 4.0%, long-term inflation of 3.1%, a 0.5% increase in shares outstanding, and an expansion of the P/E multiple of 0.3%.

What is the implied return on the stock market given these assumptions?

$$\text{Nominal Growth} = 4\% + 3.1\% = 7.1\%$$

$$E(R) = (2.1\% - 0.5\%) + 7.1\% + 0.3\% = 9.0\%$$



MODULE QUIZ 2.3

- At the beginning of the fiscal year, Tel-Pal, Inc. stock sells for \$75 per share. There are 2 million shares outstanding. An analyst predicts that the annual dividend to be paid in one year will be \$3 per share. The expected inflation rate is 3.5%. The firm plans to issue 40,000 new shares over the year. The price-to-earnings ratio is expected to stay the same, and nominal earnings will increase by 6.8%.

Based upon these figures, calculate the expected return on a share of Tel-Pal, Inc. stock in the next year.

- An analyst uses the Grinold-Kroner model and assumes an infinite time horizon and a P/E growth rate of 2%. Discuss one shortcoming of the P/E growth assumption.

$$1. \text{ Chg in S/O} = -\frac{40,000}{2MM}$$

$$\begin{aligned} \text{expected return} &= \frac{3}{75} + (6.8\% - 3.5\%) - \frac{40,000}{2MM} \times \\ &= 6.8\% + \frac{3}{75} - \frac{40,000}{2MM} \\ &= 8.8\% \end{aligned}$$

2. Infinite time horizon ignores the fact that the P/E ratio would likely revert to its long-term avg. A 2% constant growth rate would result in infinitely rising P/E ratio (which is implausible).

2.4. The risk premium approach

Equilibrium approach : The singer-Terhaar model

Start w/ CAPM :

$$R_i = R_f + \beta_{i,m} (R_m - R_f)$$

Step 1: $\beta_{i,m} = \frac{\text{Cov}(R_i, R_m)}{\text{var}(R_m)} = \rho_{i,m} \left(\frac{\sigma_i}{\sigma_m} \right) \quad ①$

$\rho_{i,m}$ = correlation b/w returns on i & global market portfolio

σ_i = S.D. of returns on i

σ_m = S.D. of returns on global market portfolio

Step 2: rearrange CAPM given ①,

$$RP_i = \beta_{i,m} RP_m = \rho_{i,m} \sigma_i \left(\frac{RP_m}{\sigma_m} \right)$$

now adjusts segmentation

Step 3 : $\rho_{i,m} = 1 \Rightarrow RP_i^S = \sigma_i \left(\frac{RP_i^S}{\sigma_i} \right)$

$$\text{Step 4: } RP = \phi RP^G + (1 - \phi) RP^S$$

where RP^G = globally integrated RP
 RP^S = segmented RP

Step ② & ③ will need to add illiquidity premium if any.

EXAMPLE: Calculating the risk premium using the Singer-Terhaar model

Suppose an analyst is valuing two equity markets. Market A is a developed market, and Market B is an emerging market. The investor's time horizon is five years. The other pertinent facts are as follows:

	Market A	Market B
Sharpe ratio	0.29	0.40
Volatility (standard deviation)	17%	28%
Correlation with global market	0.82	0.63
Degree of integration	80%	65%
Illiquidity premium	0%	2.3%
Risk-free rate is 5.0%		
Sharpe ratio of the global market is 0.29		

Calculate the risk premiums and expected returns for each market.

First, assuming full integration, $RP_i = \rho_{i,m} \bar{\sigma}_i$ (market share ratio).

$$RP_A = 0.82 \cdot 0.17 \cdot 0.29 = 4.04\%$$

$$RP_B = 0.63 \cdot 0.28 \cdot 0.29 + 2.3\% = 7.24\%$$

Second assuming full segmentation, $RP_i = \bar{\sigma}_i$ (market share ratio).

$$RP_A = 0.17 \cdot 0.29 = 4.93\%$$

$$RP_B = 0.28 \cdot 0.29 + 2.3\% = 13.50\%$$

$$\Rightarrow RP_A = 0.80 \cdot 4.04\% + 0.20 \cdot 4.93\% = 4.22\%$$

$$RP_B = 0.65 \cdot 7.24\% + 0.35 \cdot 13.50\% = 9.55\%$$

$$R_A = 5\% + 4.22\% = 9.22\%$$

$$R_B = 5\% + 9.55\% = 13.55\%$$



MODULE QUIZ 2.4

Use the following data to answer the questions below:

Sharpe ratio of the global portfolio	0.29
Standard deviation of the global portfolio	8.0%
Risk-free rate of return	4.5%
Degree of market integration for Market A	80%
Degree of market integration for Market B	65%
Standard deviation of Market A	18%
Standard deviation of Market B	26%
Correlation of Market A with global portfolio	0.87
Correlation of Market B with global portfolio	0.63

1. Calculate the risk premiums for Market A and Market B.

2. Calculate the expected return for each market.

$$\begin{aligned} \text{1. Full integration : } RP_A &= 0.87 \cdot 0.29 \cdot 0.18 = 4.54\% \\ RP_B &= 0.63 \cdot 0.29 \cdot 0.26 = 4.75\% \end{aligned}$$

$$\text{Full Segmentation : } RP_A = 0.29 \cdot 0.18 = 5.22\%$$

$$RP_B = 0.29 \cdot 0.26 = 7.54\%$$

$$(RP_i = U_i \frac{RP_M}{U_m})$$

$$\Rightarrow RP_A : 0.80 \cdot 4.54\% + (1 - .8) \cdot 5.22\% = 4.68\%$$

$$RP_B : 0.65 \cdot 4.75\% + (1 - .65) \cdot 7.54\% = 5.73\%$$

$$\text{2. } E(R)_A = 4.5 + 4.68 = 9.18\%$$

$$E(R)_B = 4.5 + 5.73 = 10.23\%$$

Module 2.5 : Forecasting Real Estate Return

2.c: how economic & competitive factors can affect expectations

Real Estate Cycles

Boom : Increased property value & demand

Bust : Falling demand due to overcapacity & overbuilding

Capitalization Rate.

cap rate = $E(R_{re})$ - NOI growth rate

$E(R_{re})$ = NOI growth rate + Cap rate

if investor has a finite time period

$E(R_{re})$ = NOI growth rate + Cap rate - %Δ cap rate

Risk Premiums on Real Estate

1. Term premium
2. Credit premium
3. equity risk premium

Combined risk premium > Corp. bonds
< equity

Public vs. Private Real Estate

Investors with less wealth can choose publicly traded real estate (e.g. REITs)

REITs generally are strongly correlated w/ equities in the short term. & w/ direct real estate in the long run.

REITs has higher returns & lower volatility than direct real estate

Retail REITs had the highest returns & 2nd lowest volatility.

Residential Real Estate Return

Overall, Residential Real Estate outperformed equity on an inflation-adjusted basis w/ low volatility



MODULE QUIZ 2.5

1. List two adjustments that analysts must make to the risk premiums calculated using equilibrium models.
2. Discuss how cap rates are related to vacancy rates and the availability of debt financing.

1. 1) Remove the impact of smoothing from the data
2) Adjust for illiquidity using a liquidity premium
2. Cap rates are positively related to changes in interest rates & vacancy rates. They are inversely related to the availability of credit & the availability of debt financing.

Module 2.6: FX Forecasting

2.f : major approaches to forecast FX rates.

2 Main Pillars :

① Trade in Goods & Services

- Trade flows
- Purchasing Power Parity (PPP)
- Current A/C. & FX Rate

② Adjustments to Cap Flow

1. Cap Mobility (expected % chg in FX rate)

$$\begin{aligned}
 E(\% \Delta S_{df}) = & (r^d - r^f) + (\text{Term}^d - \text{Term}^f) \\
 & + (\text{credit}^d - \text{credit}^f) \\
 & + (\text{Equity}^d - \text{Equity}^f) \\
 & + (\text{liquid}^d - \text{liquid}^f)
 \end{aligned}$$

*d: domestic
f: foreign*

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when there's relative improvement in investment opp.
⇒ Currency sees appreciation of "OVERSHOOT"

2. UIP ($\Delta FX \text{ Rate} = \Delta \text{Nominal Interest Rate}$)
carry trades is successful b/c of risk premium.

3. Portfolio balance & composition



MODULE QUIZ 2.6

1. Assume that Japanese inflation is projected to be a cumulative 8.2% over the next five years, while U.S. inflation is 13.2% over the same period. U.S. inflation is thus projected to be 5% higher. Stock prices have just started to rise and will continue to do so for some time. Explain which asset class should an investor in Japanese assets favor assuming PPP holds true.

1. PPP states that countries w/ high inflation will see their currency depreciate. Within Japan, the investor should invest in stocks b/c stock prices have just started to rise & will continue to do so for some time. Bond yields will soon rise & their prices will fall as the economy expands.

Module 2.7 : Volatility Forecasting

2.g : Methods of forecasting volatility

Variance - covariance (VCV) matrix

Sample VCV Matrix:

Factor-Based VCV Matrix.

The return of i th asset in the multi-factor model:

$$r_i = \alpha_i + \sum_1^K \beta_{ik} F_k + \epsilon_i$$

The variance of i th asset:

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

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

$N \times K$ factor sensitivities
 $K(K+1)/2$ factor elements

Downside of factor-based VCV:

- biased
 - inconsistent
- } not a problem in sample VCV.

Shrinkage estimate.

(i.e. combine sample w/ factor).

e.g.

$$\text{Sample Covariance} \xrightarrow{\text{green arrow}} \hat{\sigma}_{ij} = x \sigma_{ij} + (1-x) \text{cov}(i, j).$$

target est. covariance
(from factor-based model)



Smoothed Returns to estimate volatility

Smoothing of data leads to underestimating risk & overestimate returns & diversifications.

Important to adjust the impact of smoothing, by taking a weighted avg. of the current "true" returns & previously observed returns:

$$R_t = (1 - \lambda) r_t + \lambda R_{t-1} \quad 0 < \lambda < 1.$$

Portfolio variance is calculated as :

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

e.g. $\lambda = 0.6 \Rightarrow \text{var}(r) = 4 \cdot \text{var}(R).$

\uparrow
TRUE variance
 \uparrow
observed variance

ARCH Models.

$$\begin{aligned} \sigma_t^2 &= \gamma + \alpha \sigma_{t-1}^2 + \beta n_t^2 \\ &= \gamma + (\alpha + \beta) \sigma_{t-1}^2 + \beta (n_t^2 - \sigma_{t-1}^2) \end{aligned}$$

α, β, γ are non-negative, $(\alpha + \beta) < 1$, n_t is a random variable.

Higher $\alpha + \beta \Rightarrow$ higher emphasis on past info
(leading to volatility clustering)



MODULE QUIZ 2.7

1. A portfolio manager determines that in order to estimate the variance-covariance matrix used in the portfolio's asset allocation, the matrix will need 17 asset classes. The manager has obtained weekly sample return data over the last 6 months. The manager decided to also use the factor-based matrix approach, but does not use shrinkage estimation. **Determine** the strengths and shortcomings of the manager's approach.
2. **Discuss** one potential remedy to the manager's shortcomings.

1. The manager can use sample VCV matrix b/c the sample size (26 weeks) exceeds the no. of assets. (17 asset classes).

2. Use estimate shrinkage of the weighted averages of the sample & factor-based VCV metrics.

Module 2.8: Global Portfolio Adjustment

Trend growth is generally favorable to equities b/c it implies long-term earnings growth.

Trend growth is unfavorable to bonds b/c. it results in higher interest rate.

Analysts can use country-specific or global expectations via VCV matrices to adjust the allocations b/w equities & bonds.

Singer - Terhaar : More Global integration \rightarrow lower req. return
Analysts should increase allocations towards EM that are expected to see increased integrations. (& away from those w/ high integrations)

When economy is \textcircled{a} the trough, equities perform well, valuation ratios & earning growth are expected to increase. Analysts could use Grinold - Kroner to compute the required equity risk premium & increase portfolio equity weights

YC @ this stage is steep w/ high credit & term premiums

expectations of rising interest rate

⇒ bonds tend to underperform

⇒ analyst should reduce



MODULE QUIZ 2.8

A portfolio manager has a global portfolio invested in several countries and is considering other countries as well. The decisions the manager faces and the economic conditions in the countries are described in the following. In each case, the portfolio manager must reallocate assets based on economic conditions.

1. The portfolio manager has noticed that the yield curve is downward sloping in Country A. The current portfolio in this country is 60% stocks and 40% bonds.

Determine the appropriate reallocation within Country A. Suggest changes to the portfolio based on this information.

2. Country B has experienced declining prices and this trend is expected to continue. The manager has no funds invested in this country yet but is considering investments in bonds, equity, and real estate.

Determine the appropriate reallocation within Country B. In which assets should the manager invest?

3. The manager is considering the purchase of government bonds in either emerging Country C or Country D. The countries have the following characteristics:

Characteristics of Countries C and D

	Country C	Country D
Foreign exchange/short-term debt	147%	78%
Debt to GDP	42%	84%

Determine the appropriate reallocations within emerging Country C and Country D.

1. Downward sloping YC ⇒ recession & bonds tend to outperform. stocks b/c inflation & interest rates decrease of economy growth is slow.
(i.e. should reallocate stocks to bonds)

2. declining price ⇒ real estates & bonds X
Bonds. (b/c of dropping prices
⇒ no inflation & int rates are declining

real estate is not a good investment when the investment is financed w/ debt.

3. The manager should purchase the bonds of country C. Many EM bonds are denominated in a hard currency, so less risky countries have greater foreign currency reserves. Low level of leverage are also preferred. One measure of leverage is the debt-to-GDP ratio.

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