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Academy of Professional Finance 专业金融学院

CFA Level II

Equity Investments

Return Concepts I

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Contents

- Realized holding period return, expected HPR, required return, return from convergence of price to intrinsic value, discount rate, and internal rate of return.
- Equity risk premium based on historical and forward-looking models
- CAPM, Fama-French model, Pastor-Stambaugh model, macroeconomic multifactor models and the build-up method.

Learning Outcome Statement 31

LOS 31.a: distinguish among realized holding period return, expected holding period return, required return, return from convergence of price to intrinsic value, discount rate, and internal rate of return.

- Holding period return: the sum of current yield (or cash flow yield) and capital gain.

$$holding\ period\ return\ r = \frac{P1 - P0 + CF1}{P0} = \frac{P1 - P0}{P0} + \frac{CF1}{P0}$$

- Annualized HPR is $(1 + r)^n - 1$

Learning Outcome Statement 31

LOS 31.a: distinguish among realized holding period return, expected holding period return, required return, return from convergence of price to intrinsic value, discount rate, and internal rate of return.

- Realized return – observed historical return.
- Expected return – based on forecasts of future prices and cash flows.
- Required return – the minimum return an investor requires given the asset's risk.
- Discount rate – the rate used to find the present value of an investment.

Learning Outcome Statement 31

LOS 31.a: distinguish among realized holding period return, expected holding period return, required return, return from convergence of price to intrinsic value, discount rate, and internal rate of return.

- Return from convergence of price to intrinsic value: $\frac{V0-P0}{P0}$.
- Expected return is the sum of required return and return from convergence of price to intrinsic value.
- Internal rate of return – the rate that equates the value of the discounted cash flows to the current price of the security.

Learning Outcome Statement 31

LOS 31.b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches.

- Equity risk premium = required return on equity index – risk-free rate
- The risk-free rate should correspond to the time horizon for the investment
- Note that an equity risk premium is an estimated value and may not be realized.

Learning Outcome Statement 31

LOS 31.b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches.

- Historical estimate of equity risk premium
  = historical mean return for equity market index
  - risk-free rate
  - Strength: simple and objective, unbiased if investors are rational
  - Weakness: assume constant mean and variance of the returns over time; biased if only firms that have survived during the estimate period (called survivorship bias)

Learning Outcome Statement 31

LOS 31.b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches.

- Forward-looking (or ex ante estimates) use current information and expectations concerning economic and financial variables.
  - Strength: doesn't rely on stationarity assumption and less subject to survivorship bias.
- There are three main categories of forward-looking estimates: Gordon growth model, supply-side models and estimates from surveys.

Learning Outcome Statement 31

LOS 31.b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches.

I. Gordon growth model (a.k.a constant growth model)

- Useful for developed economics and markets.
- GGM equity risk premium=

  (1-year forecasted dividend yield on market index)

  + (consensus long-term earnings growth rate)

  - (long-term government bond yield)

Learning Outcome Statement 31

LOS 31.b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches.

I. Gordon growth model (a.k.a constant growth model).

E.g. suppose company A's dividend yield is 2%, growth expectation is 6%, and long-term bond yields is 6%. What is GGM equity risk premium?
Ansser: (2+6-6)%=2%

- Weakness: (1)the forward-looking estimates will change through time and need to be updated. (2) assume stable growth rate, not appropriate in rapidly growing economies.

Learning Outcome Statement 31

LOS 31.b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches.

For fast-growing economics, use the following forward-looking model.

Equity index price=$PV_{rapid}(r) + PV_{transition}(r) + PV_{mature}(r)$

Learning Outcome Statement 31

LOS 31.b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches.

II. Macroeconomic Models (Supply-side estimates).

- Based on the relationships between macroeconomic variables and financial variables
- Strength: use proven models and current information
- Weakness: only appropriate for developed countries

Learning Outcome Statement 31

LOS 31.b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches.

II. Macroeconomic Models (Supply-side estimates).

- Ibbotson-Chen (2003) model

$$\text{equity risk premium} = [1+\hat{i}]\times[1+\widehat{rEg}]\times[1+\widehat{PEg}]-1+\hat{Y}-\widehat{RF}$$

where:

$\hat{i}$ = expected inflation

$\widehat{rEg}$ = expected real growth in GDP

$\widehat{PEg}$ = expected changes in the P/E ratio

$\hat{Y}$ = the expected yield on the index

$\widehat{RF}$ = the expected risk-free rate

Learning Outcome Statement 31

LOS 31.b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches.

II. Macroeconomic Models (Supply-side estimates).

- Ibbotson-Chen (2003) model
  - expected inflation = (YTM of 20-year T-bonds) – (YTM of 20-year TIPS)
  - growth in GDP = labor productivity growth rate + labor supply growth rate

Learning Outcome Statement 31

LOS 31.b: Calculate and interpret an equity risk premium using historical and forward-looking estimation approaches.

III. Survey estimates – use the consensus of the opinions from a sample of people.

- Strength: survey results are relatively easy to obtain
- Weakness: there may be a wide disparity between the consensuses obtained from different groups

Learning Outcome Statement 31

LOS 31.c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method

1. CAPM.
2. Multifactor Models

Required return=

$$\text{RF} + (factor\ sensitivity)_1 * (factor\ risk\ premium)_1 + \cdots + (factor\ sensitivity)_n * (factor\ risk\ premium)_n$$

Learning Outcome Statement 31

LOS 31.c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method

2.1 Fama-French model.

$$\text{required return of stock } j = RF + \beta_{mkt,j} \times (R_{mkt} - RF) + \beta_{SMB,j} \times (R_{small} - R_{big}) + \beta_{HML,j} \times (R_{HBM} - R_{LBM})$$

The latter two of these factors corresponds to the return of a zero-net investment in the corresponding assets. The goal is to capture the effect of other underlying risk factors.

Learning Outcome Statement 31

LOS 31.c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method

2.1 Fama-French model.

E.g. Given the following market and stock data, calculate the required return on equity using the CAPM and the Fama-French models

$(R_{mkt} - RF)$	$= 4.8\%$
$(R_{small} - R_{big})$	$= 2.4\%$
$(R_{HBM} - R_{LBM})$	$= 1.6\%$
risk-free rate	$= 3.4\%$

$\beta_{mkt,j}$	$= 1.2$
$\beta_{SMB,j}$	$= 0.4$
$\beta_{HML,j}$	$= -0.2$

CAPM: required return=3.4 +1.2*4.8=9.16%

FF model: required return= 3.4+1.2*4.8+0.4*2.4-0.2*1.6=9.48%

Learning Outcome Statement 31

LOS 31.c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method

2.2 Pastor-Stambaugh Model

Add a liquidity factor to the Fama-French model.

Less liquid assets should have a positive beta, while more liquid assets should have a negative beta.

LOS 31.c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method

2.2 Pastor-Stambaugh Model

E.g. Assume a liquidity premium of 6% and the following factor risk premiums as well as sensitivities for the stock, calculate the cost of capital using the Pastor-Stambaugh model

$(R_{mkt} - RF)$	$= 4.8\%$
$(R_{small} - R_{big})$	$= 2.4\%$
$(R_{HBM} - R_{LBM})$	$= 1.6\%$
risk-free rate	$= 3.4\%$

$\beta_{mkt,k}$	$= 0.9$
$\beta_{SMB,k}$	$= -0.2$
$\beta_{HML,k}$	$= 0.2$
$\beta_{liquidity,k}$	$= -0.1$

Cost of capital = 3.4+0.9*4.8-0.2*2.4+0.2*1.6-0.1*6= 6.96%

Learning Outcome Statement 31

LOS 31.c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method

2.3 Macroeconomic Multifactor Model

- Burmeister, Roll and Ross model includes the following 5 factors:

1. Confidence risk
2. Time horizon risk
3. Inflation risk
4. Business cycle risk
5. Market timing risk

Learning Outcome Statement 31

LOS 31.c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method

- Burmeister,Roll and Ross Model.
- E.g. use the following information to calculate the required return using a multifactor approach. The sensitivities for the stock is: 0.2, -0.2, 1.1,0.3, 0.4, respectively and risk-free rate is 3%

confidence risk	=	2.0%
time horizon risk	=	3.0%
inflation risk	=	4.0%
business cycle risk	=	1.6%
market timing risk	=	3.4%

Required return=3+0.2*2-0.2*3+1.1*4+0.3*1.6+0.4*3.4=9.04%

Learning Outcome Statement 31

LOS 31.c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method

3. Build-up Method

Required return = RF + equity risk premium
+ size premium
+ specific-company premium

- Applicable to closely held companies.

Learning Outcome Statement 31

LOS 31.c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method

3. Build-up Method

3.1Bond-yield plus risk premium method.

- Add a risk premium to the YTM of the company's long-term debt
- Applicable to companies that have publicly traded debt.

Learning Outcome Statement 31

LOS 31.c: Estimate the required return on an equity investment using the capital asset pricing model, the Fama-French model, the Pastor-Stambaugh model, macroeconomic multifactor models, and the build-up method

3. Build-up Method

3.1Bond-yield plus risk premium method.

E.g. Firm AA has bonds with 20-year 8% bond that is currently priced at 1100. An analyst estimates the equity risk premium for firm AA is 4%. Calculate the cost of equity using the bond-yield plus risk premium approach.

Answer: (1) 1000FV, 80PMT, 20N, -1100PV CPT I/Y=7.05%
(2) cost of equity = 7.05 + 4 =11.05%

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Thank You!