

Seminar 4

Return Concept, CAPM

1. A Canada-based investor buys shares of Toronto-Dominion Bank (Toronto: TD.TO) for C\$72.08 on 15 October 2007, with the intent of holding them for a year. The dividend rate is C\$2.11 per year. The investor actually sells the shares on 5 November 2007, for C\$69.52. The investor notes the following additional facts:

- No dividends were paid between 15 October and 5 November.
 - The required return on TD.TO equity was 8.7 percent on an annual basis and 0.161 percent on a weekly basis.
- A. State the lengths of the expected and actual holding periods.
B. Given that TD.TO was fairly priced, calculate the price appreciation return (capital gains yield) anticipated by the investor given his initial expectations and initial expected holding period.
C. Calculate the investor's realized return.
D. Calculate the realized alpha.

- A. The expected holding was one year. The actual holding period was from 15 October 2007 to 5 November 2007, which is three weeks.
- B. Given fair pricing, the expected return equals the required return, 8.7 percent. The expected price appreciation return over the initial anticipated one-year holding period must be equal to the required return minus the dividend yield, $2.11/72.08 = 0.0293$ or 2.93 percent. Thus expected price appreciation return was $8.7\% - 2.93\% = 5.77$ percent.
- C. The realized return was $(\$69.52 - \$72.08)/\$72.08 = -0.03552$ or negative 3.55 percent over three weeks. There was no dividend yield return over the actual holding period.
- D. The required return over a three-week holding period was $(1.00161)^3 - 1 = 0.484$ percent. Using the answer to C, the realized alpha was $-3.552 - 0.484 = -4.036$ percent or -4.04 percent.

2. The estimated betas for AOL Time Warner (NYSE: AOL), J.P. Morgan Chase & Company (NYSE: JPM), and The Boeing Company (NYSE: BA) are 2.50, 1.50, and 0.80, respectively. The risk-free rate of return is 4.35 percent and the equity risk premium is 8.04 percent. Calculate the required rates of return for these three stocks using the CAPM.

For AOL Time Warner, the required return is

$$r = R_F + \beta [E(R_M) - R_F] = 4.35\% + 2.50(8.04\%) = 4.35\% + 20.10\% = \underline{24.45\%}$$

For J.P. Morgan Chase, the required return is

$$r = R_F + \beta [E(R_M) - R_F] = 4.35\% + 1.50(8.04\%) = 4.35\% + 12.06\% = \underline{16.41\%}$$

For Boeing, the required return is

$$r = R_F + \beta [E(R_M) - R_F] = 4.35\% + 0.80(8.04\%) = 4.35\% + 6.43\% = \underline{10.78\%}$$

3. The estimated factor sensitivities of TerraNova Energy to Fama-French factors and the risk premia associated with those factors are given in the following table:

	Factor Sensitivity	Risk Premium (%)
Market factor	1.20	4.5
Size factor	-0.50	2.7
Value factor	-0.15	4.3

- A. Based on the Fama-French model, calculate the required return for TerraNova Energy using these estimates. Assume that the Treasury bill rate is 4.7 percent.
 B. Describe the expected style characteristics of TerraNova based on its factor sensitivities.

A. The Fama-French model gives the required return as

$$r = \text{T-bill rate} + (\text{Sensitivity to equity market factor} \times \text{Equity risk premium}) + (\text{Sensitivity to size factor} \times \text{Size risk premium}) + (\text{Sensitivity to value factor} \times \text{Value risk premium})$$

For TerraNova Energy, the required return is

$$r = 4.7\% + (1.20 \times 4.5\%) + (-0.50 \times 2.7\%) + (-0.15 \times 4.3\%) = 4.7\% + 5.4\% - 1.35\% - 0.645\% = \underline{8.1\%}$$

B. TerraNova Energy appears to be a large-cap, growth-oriented, high market risk stock as indicated by its negative size beta, negative value beta, and market beta above 1.0.

4. Newmont Mining (NYSE: NEM) has an estimated beta of -0.2 . The risk-free rate of return is 4.5 percent, and the equity risk premium is estimated to be 7.5 percent. Using the CAPM, calculate the required rate of return for investors in NEM.

$$r = 0.045 + (-0.2)(0.075) = 4.5\% - 1.5\% = 3.0\%$$

This example indicates that Newmont Mining has a required return of 3 percent. When beta is negative, an asset has a CAPM required rate of return that is below the risk-free rate. Cases of equities with negative betas are relatively rare.

5.

Judy Chen is the primary portfolio manager of the global equities portfolio at Horizon Asset Management. Lars Johansson, a recently hired equity analyst, has been assigned to Chen to assist her with the portfolio.

Chen recently sold shares of Novo-Gemini, Inc. from the portfolio. Chen tasks Johansson with assessing the return performance of Novo-Gemini, with specific trade information provided in Exhibit 1.

EXHIBIT 1 Novo-Gemini, Inc. Trade Details

1. Novo-Gemini shares were purchased for \$20.75 per share.
 2. At the time of purchase, research by Chen suggested that Novo-Gemini shares were expected to sell for \$29.00 per share at the end of a 3-year holding period.
 3. At the time of purchase, the required return for Novo-Gemini based upon the capital asset pricing model (CAPM) was estimated to be 12.6% on an annual basis.
 4. Exactly 3 years after the purchase date, the shares were sold for \$30.05 per share.
 5. No dividends were paid by Novo-Gemini over the 3-year holding period.
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Chen explains to Johansson that, at the time of purchase, the CAPM used to estimate a required return for Novo-Gemini incorporated an unadjusted historical equity risk premium estimate for the US equity market. Chen notes that the US equities market has experienced a meaningful string of favorable inflation and productivity surprises in the past. She asks Johansson whether the historical equity risk premium should have been adjusted before estimating the required return for Novo-Gemini.

For another perspective on the reward to bearing risk, Chen asks Johansson to calculate a forward-looking equity risk premium for the US equity market using data on the S&P 500 index in Exhibit 2.

EXHIBIT 2 S&P 500 Index Data

Dividend yield, based on year-ahead aggregate forecasted dividends	1.2%
Consensus long-term earnings growth rate	4%
20-year US government bond yield	3%

Chen is now considering adding shares of Bezak, Inc. to the portfolio. Chen asks Johansson to calculate Bezak's weighted average cost of capital using the CAPM with the information provided in Exhibit 3.

EXHIBIT 3 Bezak, Inc.

Pretax cost of debt	4.9%
Long-term debt as a percent of total capital, at market value	25%
Marginal tax rate	30%
Bezak, Inc. beta	2.00
Estimated equity risk premium	5.5%
Risk-free rate	3.0%

Lastly, Chen asks Johansson to evaluate Twin Industries, a privately owned US company that may initiate a public stock offering. Johansson decides to adapt CAPM to estimate the required return on equity for Twin Industries. Using the MSCI / Standard & Poor's Global Industry Classification Standard (GICS), Johansson identifies a publicly traded peer company with an estimated beta of 1.09 that is much larger but otherwise similar to Twin Industries. Twin Industries is funded 49% by debt, while the publicly traded peer company is funded 60% by debt.

A.

Based upon Exhibit 1, the expected three-year holding period return for Novo-Gemini Inc. at the time of purchase was *closest* to:

- A. 39.76%.
- B. 42.76%.
- C. 44.82%.

Novo-Gemini shares were purchased for \$20.75 per share.

At the time of purchase, research by Chen suggested that Novo-Gemini shares were expected to sell for \$29.00 per share at the end of a 3-year holding period.

At the time of purchase, the required return for Novo-Gemini based upon the capital asset pricing model (CAPM) was estimated to be 12.6% on an annual basis.

Exactly 3 years after the purchase date, the shares were sold for \$30.05 per share. No dividends were paid by Novo-Gemini over the 3-year holding period.

$$R = (29 - 20.75) / 20.75$$

$$R = 0.3976$$

B.

Based upon Exhibit 1, the realized three-year holding period return for Novo-Gemini Inc. was *closest* to:

- A. 39.76%.
- B. 42.76%.
- C. 44.82%.

$$R = (30,05 - 20,75) / 20,75$$

$$R = 0,4482$$

C.

Based on Exhibit 2, the forward-looking estimate for the US equity risk premium is *closest* to:

- A. 2.2%.
- B. 5.8%.
- C. 8.2%.

Equity risk premium =

dividend yield on the index based on year-ahead aggregate forecasted dividends and aggregate market value

+ consensus long-term earnings growth rate

- current long-term government bond yield.

The equity risk premium = 1.2% + 4.0% - 3.0% = 2.2%.

D.

Based on Exhibit 3, and assuming interest on debt is tax-deductible, the weighted average cost of capital (WACC) for Bezak, Inc. is *closest* to:

- A. 10.87%.
- B. 11.36%.
- C. 13.61%.

Bezak, Inc.

Pretax cost of debt 4.9%

Long-term debt as a percent of total capital, at market value 25%

Marginal tax rate 30%

Bezak, Inc. beta 2.00

Estimated equity risk premium 5.5%

Risk-free rate 3.0%

The weighted average cost of capital is taking the sum product of each component of capital multiplied by the component's after-tax cost.

$$\text{Cost of equity} = \text{Risk-free rate} + [\text{Equity Risk Premium} \times \text{Beta}]$$

$$\text{Cost of equity} = 3.0\% + [5.5\% \times 2.00] = 14\%$$

WACC:

	Equity	Debt	WACC
Weight	0.75	0.25	
costs	14%	$(1 - 0.30) \times 4.9\%$	
Weight* costs	10.5%	+ 0.8575%	= 11.36%

E.

The estimate of beta for Twin Industries is *closest* to:

- A. 0.44.
- B. 0.85.
- C. 0.89.

$$\beta_u = \left[\frac{1}{1 + \left(\frac{D}{E}\right)} \right] \beta_t$$

$$\beta_u = \left[\frac{1}{1 + \left(\frac{0.60}{0.40}\right)} \right] (1.09)$$

$$\beta_u = 0.436, \text{ or } 0.44$$

$$\beta'_E \approx \left[1 + \left(\frac{D'}{E'}\right) \right] \beta_u$$

$$\beta'_E \approx \left[1 + \left(\frac{0.49}{0.51}\right) \right] (0.436)$$

$$\beta_u = 0.8549, \text{ or } 0.85$$

F.

A potential weakness of Johansson's approach to estimating the required return on equity for Twin Industries is that the return estimate:

- A. does not include a size premium.
- B. may overstate potential returns over the long-term.
- C. does not consider systematic risk arising from the economics of the industry.

6. The following facts describe Larsen & Toubro Ltd.'s component costs of capital and capital structure:

Component Costs of Capital	
Cost of equity based on the CAPM	15.6%
Pretax cost of debt	8.28%
Tax rate	30%
Target weight in capital structure	equity 80%, debt 20%

Based on the information given, calculate Larsen & Toubro's WACC.

Larsen & Toubro Ltd's WACC is 13.64 percent calculated as follows:

Equity	Debt	WACC
Weight	0.80	0.20
After-Tax Cost	15.6%	$(1 - 0.30)8.28\%$
Weight × Cost	12.48%	+ 1.16% = 13.64%

7.

An analyst wants to account for financial distress and market-capitalization as well as market risk in his cost of equity estimate for a particular traded company. Which of the following models is *most appropriate* for achieving that objective?

- A. The capital asset pricing model (CAPM).
- B. The Fama–French model.
- C. A macroeconomic factor model.

B is correct. The Fama–French model incorporates market, size, and value risk factors. One possible interpretation of the value risk factor is that it relates to financial distress.

The following information relates to Questions 7–12

An equity index is established in 2001 for a country that has relatively recently established a market economy. The index vendor constructed returns for the five years

prior to 2001 based on the initial group of companies constituting the index in 2001. Over 2004 to 2006 a series of military confrontations concerning a disputed border disrupted the economy and financial markets. The dispute is conclusively arbitrated at the end of 2006. In total, ten years of equity market return history is available as of the beginning of 2007. The geometric mean return relative to 10-year government bond returns over 10 years is 2 percent per year. The forward dividend yield on the index is 1 percent. Stock returns over 2004 to 2006 reflect the setbacks but economists predict the country will be on a path of a 4 percent real GDP growth rate by 2009. Earnings in the public corporate sector are expected to grow at a 5 percent per year real growth rate. Consistent with that, the market P/E ratio is expected to grow at 1 percent per year. Although inflation is currently high at 6 percent per year, the long-term forecast is for an inflation rate of 4 percent per year. Although the yield curve has usually been upward sloping, currently the government yield curve is inverted; at the short-end, yields are 9 percent and at 10-year maturities, yields are 7 percent.

7. The inclusion of index returns prior to 2001 would be expected to:

- A. **bias the historical equity risk premium estimate upwards.**
- B. bias the historical equity risk premium estimate downwards.
- C. have no effect on the historical equity risk premium estimate.

A is correct. The backfilling of index returns using companies that have survived to the index construction date is expected to introduce a positive survivorship bias into returns.

8. The events of 2004 to 2006 would be expected to:

- A. bias the historical equity risk premium estimate upwards.
- B. **bias the historical equity risk premium estimate downwards.**
- C. have no effect on the historical equity risk premium estimate.

B is correct. The events of 2004 to 2006 depressed share returns but 1) are not a persistent feature of the stock market environment, 2) were not offset by other positive events within the historical record, and 3) have led to relatively low valuation levels, which are expected to rebound.

10. A supply side estimate of the equity risk premium as presented by The Ibbotson–Chen earnings model is *closest* to:

- A. 3.2 percent.
- B. 4.0 percent.

C. 4.3 percent.

The forward dividend yield on the index is **1 percent (EINC)**. Stock returns over 2004 to 2006 reflect the setbacks but economists predict the country will be on a path of a 4 percent real GDP growth rate by 2009. **Earnings** in the public corporate sector are expected to grow at a **5 percent per year real growth rate (EGREPS)**. Consistent with that, the market **P/E ratio** is expected to grow at **1 percent per year (EGPE)**. Although inflation is currently high at 6 percent per year, the long-term forecast is for an **inflation rate of 4 percent per year (EINFL)**. Although the yield curve has usually been upward sloping, currently the government yield curve is inverted; at the short- end, yields are 9 percent and at 10-year maturities, yields are 7 percent.

$$ERP = (1 + \text{EINFL})(1 + \text{EGREPS})(1 + \text{EGPE}) - 1 + \text{EINC} - R_F$$

$$ERP = (1 + 0,04)(1 + 0,05)(1 + 0,01) - 1 + 0,01 - 0,07$$

$$ERP = 1,10292 - 1 + 0,01 - 0,07$$

$$ERP = 1,10292 - 1 + 0,01 - 0,07$$

$$ERP = 0,04292$$

11. Common stock issues in the above market with average systematic risk are *most likely* to have required rates of return:

- A. between 2 percent and 7 percent.
- B. between 7 and 9 percent.
- C. **9 percent or greater.**

A: Equity risk premium The Ibbotson- Chen, average systematic beta = 1.

$$7 + 1 * 4,292 = 11,292 \text{ procent}$$

B: The geometric mean return relative to 10-year government bond returns over 10 years is 2 percent per year.

$$7 + 1 * 2 = 9 \text{ procent}$$

12. Which of the following statements is *most accurate*? If two equity issues have the same market risk but the first issue has higher leverage, greater liquidity, and a

higher required return, the higher required return *is most likely* the result of the first issue's:

- A. greater liquidity.
- B. higher leverage.
- C. higher leverage and greater liquidity.

22. $r_f = 4,5\%$
 $r_m = 14,5\%$

$$r_A = 4,5 + 1,2 \cdot (14,5 - 4,5) = 16,5\%$$

$$r_B = 4,5 + 0,8 \cdot (14,5 - 4,5) = 12,5\%$$

↓ ML

