**Risk and Return and Stock Valuation**

**Learning Problems**

**Answer Keys**

**Problem: Diversification at Agnew with Assets A and B**

1.

|  |
| --- |
| **Asset A** |
| **Economic Forecast** | **Probability (P)** | **Return (R)** | **Expected Return E(R)** | **R – E(R)** | **(R – E(R))2** | **P (R – E(R))2** |
| Down | .2 | -20.0% | -4.0% | -38.5% | 1,482.25 | 296.45 |
| Average | .5 | 15.0% | 7.5% | -3.5% | 12.25 | 6.13 |
| Up | .3 | 50.0% | 15.0% | 31.5% | 992.25 | 297.68 |
| **E(R) =** | **18.5%** | **Variance =**  | **600.26** |
| **Standard Deviation =** | **24.5** |
| **Coefficient of Variation =**  | **24.5/18.5 = 1.32** |

|  |
| --- |
| **Asset B** |
| **Economic Forecast** | **Probability (P)** | **Return (R)** | **Expected Return E(R)** | **R – E(R)** | **(R – E(R))2** | **P (R – E(R))2** |
| Down | .2 | 50.0% | 10.0% | 38.5% | 1,482.25 | 296.45 |
| Average | .5 | 15.0% | 7.5% | 3.5% | 12.25 | 6.13 |
| Up | .3 | -20.0% | -6.0% | -31.5% | 992.25 | 297.68 |
| **E(R) =** | **11.5%** | **Variance =**  | **600.26** |
| **Standard Deviation =** | **24.5** |
| **Coefficient of Variation =**  | **24.5/11.5 = 2.13** |

**Note:** The return (R) is calculated as the annual cash flow divided by the investment. The coefficient of variation measures the standard deviation of an investment’s return relative to the investment’s return and is a measure of risk.

2.

|  |
| --- |
| **Asset A + B (50%/50%)** |
| **Economic Forecast** | **Probability (P)** | **Return (R)** | **Expected Return E(R)** | **R – E(R)** | **(R – E(R))2** | **P (R – E(R))2** |
| Down | .2 | 15.0% | 3.0% | - | - | - |
| Average | .5 | 15.0% | 7.5% | - | - | - |
| Up | .3 | 15.0% | 4.5% | - | - | - |
| **E(R) =** | **15.0%** | **Variance =**  | **-** |
| **Standard Deviation =** | **-** |
| **Coefficient of Variation =**  | **-** |

**Note:** The return (R) of a portfolio consisting of 50% Asset A and 50% Asset B is (.5)(-20.0%) + (.5)(50.0%) = 15.0% in the down scenario, (.5)(15.0%) + (.5)(15.0%) = 15.0% in the average scenario, and (.5)(50.0%) + (.5)(-20.0%) = 15.0% in the up scenario.

3. Diversification can be used to reduce the risk that must be incurred to earn a specified return. In Part 2, investment risk has been eliminated totally and the investor will earn a return of 15.0% each year. In reality, diversification can be used to reduce risk but generally not eliminate it. Most investment returns are positively correlated with each other, so the amount of risk that can be eliminated is limited. Only non-systematic risk can be eliminated through diversification and not systematic risk.

**Problem: Diversification at Agnew with Assets A and C**

1.

|  |
| --- |
| **Asset C** |
| **Economic Forecast** | **Probability (P)** | **Return (R)** | **Expected Return E(R)** | **R – E(R)** | **(R – E(R))2** | **P (R – E(R))2** |
| Down | .2 | 1.0% | .2% | -13.2% | 174.24 | 34.85 |
| Average | .5 | 10.0% | 5.0% | -4.2% | 17.64 | 8.82 |
| Up | .3 | 30.0% | 9.0% | 15.8% | 249.64 | 74.89 |
| **E(R) =** | **14.2%** | **Variance =**  | **118.56** |
| **Standard Deviation =** | **10.89** |
| **Coefficient of Variation =**  | **10.89/14.20 = .77** |

|  |
| --- |
| **Asset A + C** |
| **Economic Forecast** | **Probability (P)** | **Return (R)** | **Expected Return E(R)** | **R – E(R)** | **(R – E(R))2** | **P (R – E(R))2** |
| Down | .2 | -9.5% | -1.90% | -25.85% | 668.22 | 133.64 |
| Average | .5 | 12.5% | 6.25% | -3.85% | 14.82 | 7.41 |
| Up | .3 | 40.0% | 12.00% | 23.65% | 559.32 | 167.80 |
| **E(R) =** | **16.35%** | **Variance =**  | **308.85** |
| **Standard Deviation =** | **17.57** |
| **Coefficient of Variation =**  | **17.57/16.35 = 1.07** |

2. Diversification does not always reduce the risk that must be incurred to earn a specified return. The returns of Asset A and C are highly correlated which means the asset returns move closely together, so Asset C is not useful as a diversifying asset.

**Problem: Calculating Beta at Potter**

1.

|  |  |  |
| --- | --- | --- |
| **Period** | **Stock Index Return (X)** | **Potter** **Return (Y)** |
| 1/12 | 3.19% | 6.46% |
| 2/12 | 5.21% | .88% |
| 3/12 | 1.77% | −6.50% |
| 4/12 | 0.00% | −5.09% |
| 5/12 | 3.05% | 1.54% |
| 6/12 | −3.81% | −4.37% |
| 7/12 | 3.53% | 2.09% |
| 8/12 | 1.56% | −2.17% |
| 9/12 | −1.53% | 3.43% |
| 10/12 | .94% | −2.64% |
| 11/12 | −3.50% | −3.03% |
| 12/12 | 8.81% | −1.69% |
| **Beta = .32** |

**Note:** Calculate Beta using Excel (Fx, Statistical, Slope (Y,X)). Y appears first then X when calculating Beta using this function.

**Problem: Calculating Beta at Cascade**

1.

|  |  |  |
| --- | --- | --- |
| **Period** | **Stock Index Return (X)** | **Cascade Return (Y)** |
| 1/12 | 3.19% | 11.10% |
| 2/12 | 5.21% | 18.29% |
| 3/12 | 1.77% | 5.08% |
| 4/12 | 0.00% | 1.38% |
| 5/12 | 3.05% | −1.81% |
| 6/12 | −3.81% | −3.01% |
| 7/12 | 3.53% | 7.62% |
| 8/12 | 1.56% | −1.98% |
| 9/12 | −1.53% | −1.59% |
| 10/12 | .94% | −6.42% |
| 11/12 | −3.50% | −4.16% |
| 12/12 | 8.81% | 14.57% |
| **Beta = 1.74** |

**Note:** Calculate Beta using Excel (Fx, Statistical, Slope (Y,X))

2.

Beta = (.3)(.32) + (.7)(1.74) = 1.31

3.

The sample size of just 12 observations is too small. Normally 60 monthly observations over the last five years are used.

**Problem: Calculating Beta at Jamieson**

1. Beta = 1.25 Note: Calculate Beta using Excel (Fx, Statistical, Slope (Y,X))

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Stead** | **S&P 500** | **Stead Return** | **S&P 500 Return** |
| 2107-01-03 | 109.44 | 2,275 | 0.0501 | 0.0161 |
| 2016-12-01 | 104.22 | 2,239 | 0.0596 | 0.0182 |
| 2016-11-01 | 98.36 | 2,199 | 0.0694 | 0.0343 |
| 2016-10-03 | 91.98 | 2,126 | -0.0018 | -0.0194 |
| 2016-09-01 | 92.15 | 2,168 | -0.0170 | -0.0014 |
| 2016-08-01 | 93.74 | 2,171 | -0.0155 | -0.0014 |
| 2016-07-01 | 95.22 | 2,174 | -0.0119 | 0.0357 |
| 2016-06-01 | 96.37 | 2,099 | -0.0141 | 0.0010 |
| 2016-05-02 | 97.75 | 2,097 | -0.0391 | 0.0155 |
| 2016-04-01 | 101.73 | 2,065 | 0.0398 | 0.0024 |
| 2016-03-01 | 97.84 | 2,060 | 0.0396 | 0.0663 |
| 2016-02-01 | 94.11 | 1,932 | -0.0031 | -0.0041 |
| 2016-01-04 | 94.40 | 1,940 | -0.0881 | -0.0509 |
| 2015-12-01 | 103.52 | 2,044 | -0.0681 | -0.0173 |
| 2015-11-02 | 111.08 | 2,080 | -0.0023 | 0.0005 |
| 2015-10-01 | 111.34 | 2,079 | 0.1128 | 0.0828 |
| 2015-09-01 | 100.05 | 1,920 | 0.0032 | -0.0264 |
| 2015-08-03 | 99.73 | 1,972 | -0.1510 | -0.0627 |
| 2015-07-01 | 117.47 | 2,104 | 0.0574 | 0.0199 |
| 2015-06-01 | 111.09 | 2,063 | 0.0342 | -0.0209 |
| 2015-05-01 | 107.42 | 2,107 | 0.0152 | 0.0101 |
| 2015-04-01 | 105.81 | 2,086 | 0.0364 | 0.0087 |
| 2015-03-02 | 102.09 | 2,068 | 0.0078 | -0.0171 |
| 2015-02-02 | 101.30 | 2,104 | 0.1442 | 0.0546 |
| 2015-01-02 | 88.53 | 1,995 | -0.0343 | -0.0311 |
| 2014-12-01 | 91.67 | 2,059 | 0.0310 | -0.0044 |
| 2014-11-03 | 88.91 | 2,068 | 0.0124 | 0.0248 |
| 2014-10-01 | 87.82 | 2,018 | 0.0264 | 0.0233 |
| 2014-09-02 | 85.56 | 1,972 | -0.0095 | -0.0155 |
| 2014-08-01 | 86.38 | 2,003 | 0.0466 | 0.0373 |
| 2014-07-01 | 82.53 | 1,931 | 0.0016 | -0.0148 |
| 2014-06-02 | 82.40 | 1,960 | 0.0206 | 0.0187 |
| 2014-05-01 | 80.74 | 1,924 | 0.0589 | 0.0212 |
| 2014-04-01 | 76.25 | 1,884 | -0.0091 | 0.0064 |
| 2014-03-03 | 76.95 | 1,872 | -0.0091 | 0.0070 |
| 2014-02-03 | 77.66 | 1,859 | 0.1129 | 0.0426 |
| 2014-01-02 | 69.78 | 1,783 | -0.0496 | -0.0352 |
| 2013-12-02 | 73.42 | 1,848 | 0.0963 | 0.0233 |
| 2013-11-01 | 66.97 | 1,806 | 0.0286 | 0.0279 |
| 2013-10-01 | 65.11 | 1,757 | 0.0635 | 0.0446 |
| 2013-09-03 | 61.22 | 1,682 | 0.0601 | 0.0300 |
| 2013-08-01 | 57.75 | 1,633 | -0.0590 | -0.0314 |
| 2013-07-01 | 61.37 | 1,686 | 0.0237 | 0.0498 |
| 2013-06-03 | 59.95 | 1,606 | 0.0012 | -0.0153 |
| 2013-05-01 | 59.88 | 1,631 | 0.0037 | 0.0207 |
| 2013-04-01 | 59.66 | 1,598 | 0.1065 | 0.0185 |
| 2013-03-01 | 53.92 | 1,569 | 0.0405 | 0.0359 |
| 2013-02-01 | 51.82 | 1,515 | 0.0131 | 0.0111 |
| 2013-01-02 | 51.15 | 1,498 | 0.0821 | 0.0505 |
| 2012-12-03 | 47.27 | 1,426 | 0.0181 | 0.0071 |
| 2012-11-01 | 46.43 | 1,416 | 0.0109 | 0.0028 |
| 2012-10-01 | 45.93 | 1,412 | -0.0604 | -0.0201 |
| 2012-09-04 | 48.88 | 1,441 | 0.0569 | 0.0242 |
| 2012-08-01 | 46.25 | 1,407 | 0.0067 | 0.0203 |
| 2012-07-02 | 45.94 | 1,379 | 0.0130 | 0.0125 |
| 2012-06-01 | 45.35 | 1,362 | 0.0611 | 0.0397 |
| 2012-05-01 | 42.74 | 1,310 | 0.0603 | -0.0629 |
| 2012-04-02 | 40.31 | 1,398 | -0.0151 | -0.0071 |
| 2012-03-01 | 40.93 | 1,408 | 0.0425 | 0.0307 |
| 2012-02-01 | 39.26 | 1,366 | 0.0795 | 0.0412 |
| 2012-01-03 | 36.37 | 1,312 | 0.0374 | 0.0429 |
| 2011-12-01 | 35.06 | 1,258 |  |  |

1. kc = .04 + 1.25 (.05) = .1025 or 10.25%

**Problem: Holding Returns**

1.

**Ada**

kc = $\frac{2.50}{49.50}$ + .0220 = .0505 + 0.0220 = .0725 or 7.25%

**Freemont**

kc = $\frac{1.20}{82.34}$ + .0910 = .0146 + 0.0910 = .1056 or 10.56%

2.

Freemont is a growth company with a low dividend yield and a high capital gains yield. Earnings are being retained in the company to fund a much higher growth rate than at Ada. Freemont is the best candidate for the 3-Star Growth Fund.

**Problem: Valuing Common Shares at Lance**

1. kc = .05 + .85 (.08 - .05) = .0755 or 7.55%

Po = $\frac{\left(10\right)(1+.05)}{.0755-.05}$ = 411.76

No. The share is undervalued, so the company should wait until the market corrects itself and the share price rises to the intrinsic value of CAD 411.76.

1. kc = .05 + .45 (.08 - .05) = .0635

Po = $\frac{\left(10\right)(1+.05)}{.0635-.05}$ = 777.78

3.

**Baseline**

P0 = $\frac{\left(10\right)(1+.07)^{1}}{(1+.0775)^{1}}$ + $\frac{\left(10\right)(1+.07)^{2}}{(1+.0775)^{2}}$ + $\frac{\left(10\right)(1+.07)^{3}}{(1+.0775)^{3}}$ + $\frac{\frac{\left(10\right)\left(1+.07\right)^{3}(1+.05)}{(.0755-.05)}}{(1+.0755)^{3}}$ = 435.18

No. Again, the share is undervalued, so the company should wait until the market corrects itself and rises to the intrinsic value of CAD 435.18.

**Best Case**

P0 = $\frac{\left(10\right)(1+.09)^{1}}{(1+.0775)^{1}}$ + $\frac{\left(10\right)(1+.09)^{2}}{(1+.0775)^{2}}$ + $\frac{\left(10\right)(1+.09)^{3}}{(1+.0775)^{3}}$ + $\frac{\left(10\right)(1+.09)^{4}}{(1+.0775)^{4}}$ + $\frac{\left(10\right)(1+.09)^{5}}{(1+.0775)^{5}}$ + $\frac{\frac{\left(10\right)\left(1+.09\right)^{5}(1+.06)}{(.0755-.06)}}{(1+.0755)^{5}}$ = 783.28

**Worst Case**

P0 = $\frac{\left(10\right)(1+.06)^{1}}{(1+.0775)^{1}}$ + $\frac{\left(10\right)(1+.06)^{2}}{(1+.0775)^{2}}$ + $\frac{\frac{\left(10\right)\left(1+.06\right)^{2}(1+.04)}{(.0755-.04)}}{(1+.0755)^{2}}$ = 304.14

|  |  |  |
| --- | --- | --- |
| Worst case | 304.14 x .25 | 76.04 |
| Baseline | 435.18 x .50 | 217.59 |
| Best case | 783.28 x .25 | 195.82 |
| Expected value | 489.45 |

Assuming a symmetrical distribution, the expected value of the three different scenarios indicate that the share is still undervalued. If the worst-case scenario has a higher probability which means the distribution is not normal, it may now be suitable to issue new shares though.

**Problem: Valuing Common Shares at Jackson**

1. kc = .04 + 1.25 (.09 - .04) = .1025 or 10.25%

Po = $\frac{\left(7\right)(1+.04)}{(.1025-.04)}$ = 116.48

Based on this valuation, the current share price will likely fall to its intrinsic value of CAD 116.48. Investors should sell the share short which means they will profit from a falling stock price. If the intrinsic value is above the current market price, investors should buy the shares or go long to benefit from a rising share price.

1. kc = .04 + 1.10 (.09 - .04) = .095 or 9.5%

Po = $\frac{\left(7\right)(1+.04)}{(.095-.04)}$ = 132.36

The investment is fairly valued as the estimated market price and current market price are the same.

3.

P0 = $\frac{\left(7\right)(1+.08)^{1}}{(1+.1025)^{1}}$ + $\frac{\left(7\right)(1+.08)^{2}}{(1+.1025)^{2}}$ + $\frac{\frac{\left(7\right)\left(1+.08\right)^{2}(1+.04)}{(.1025-.04)}}{(1+.1025)^{2}}$ = 125.35

Sell the share short still, although the profit potential is less than in Part 1.

**Problem: Valuing Common Shares at Alexa**

1. kc = .04 + 1.36 (.10 - .04) = .1216 or 12.16%

P0 = $\frac{\left(3\right)(1+.08)^{1}}{(1+.1216)^{1}}$ + $\frac{\left(3\right)(1+.08)^{2}}{(1+.1216)^{2}}$ + $\frac{\left(3\right)(1+.08)^{3}}{(1+.1216)^{3}}$ + $\frac{\frac{\left(3\right)\left(1+.08\right)^{3}(1+.03)}{(.1216-.03)}}{(1+.1216)^{3}}$ = 38.47

No. The share is currently overvalued and should eventually fall to its intrinsic value.

**Problem: Valuing Common Shares at McEwan**

1. kc = .05 + 1.15 (.10 - .05) = .1075 or 10.75%

Po = $\frac{\left(8.50\right)(1+.05)}{(.1075-.05)}$ = 155.22

1. The company should not issue new shares. The market is undervaluing its shares at this time.

3.

P0 = $\frac{\left(8.50\right)(1+.08)^{1}}{(1+.1075)^{1}}$ + $\frac{\left(8.50\right)(1+.08)^{2}}{(1+.1075)^{2}}$ + $\frac{\left(8.50\right)(1+.08)^{3}}{(1+.1075)^{3}}$ + $\frac{\frac{\left(8.50\right)\left(1+.08\right)^{3}(1+.05)}{(.1075-.05)}}{(1+.1075)^{3}}$ = 168.19

**Problem: Valuing Common Shares at Spider**

1. kc = .04 + 1.3 (.06) = .118 or 11.8%

P0 = $\frac{\left(2\right)(1+.15)^{1}}{(1+.118)^{1}}$ + $\frac{\left(2\right)(1+.15)^{2}}{(1+.118)^{2}}$ + $\frac{\frac{\left(2\right)\left(1+.15\right)^{2}(1+.04)}{(.118-.04)}}{(1+.118)^{2}}$ = 32.40

1. The share should not be purchased as they are overvalued. If possible, the share should be sold short to profit from a falling price.

**Problem: Valuing Preferred Shares at Roanoke**

1. kp = 9.22%

Vo = $\frac{\left(.035\right) \left(100\right)}{.0922 }$ = CAD 37.96

**Problem: Valuing Common Shares at Klondike**

1. kc = .04 + 1.3 (.055) = .1115 or 11.15%

Vo = $\frac{2.50}{.1115-(- .05) }$ = CAD 15.48

**Problem: Valuing Common Shares at Samantha**

1.

V0 = $\frac{7.55}{(1+ .1080)^{1}}$ + $\frac{8.91}{(1+ .1080)^{2}}$ + $\frac{10.07}{(1+ .1080)^{3}}$ + $\frac{10.88}{(1+ .1080)^{4}}$ + $\frac{\frac{11.21}{(.1080 -.03)}}{(1+ .1080)^{4}}$ =

kc = .04 + 1.36 (.05) = .1080 or 10.80%

**Dividend Growth**

Year 1 (6.40) (1 + .18) = 7.55

Year 2 (7.55) (1 + .18) = 8.91

Year 3 (8.91) (1 + .13) = 10.07

Year 4 (10.07) (1 + .08) = 10.88

Year 5 (10.88) (1 + .03) = 11.21

**Problem: Valuing Common Shares at Rideau**

1. (10.0 + 11.0 + 12.8 + 11.1 + 9.7) / 5 = 10.92

**Based on Trailing EPS**

P0 = (10.92) (3.55) = 38.77

**Based on Leading EPS**

P0 = (10.92) (3.72) = 40.62

Rideau’s common shares appear to be undervalued especially based on leading EPS data. The analyst should recommend that their clients buy this share to benefit from the rising price in the future.

**Problem: Valuing Common Shares at Hi-Tech**

1. (14.29 + 16.17 + 16.08 + 14.77 + 15.48 + 18.16) / 6 = 15.82

**Based on Trailing EPS**

P0 = (15.82) (4.51) = 71.35

**Based on Leading EPS**

P0 = (15.82) (3.51) = 55.53

Hi-tech’s common shares appear to be fairly valued based on forward looking data which reflects the effect of product delays on earnings. Jackson may still decide to recommend Hi-tech as a “buy” if she feels the decline in EPS in a one-time event and that EPS will return to previous levels after 2016.

**Problem: Market-Weighted Stock Index**

1.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Base Year** | **Base Year Value** | **Year 1** | **End of Year 1 Value** |
| **Price** | **Shares Outstanding** | **Price** |
| Share A | 15.20 | 120,500 | 1,831,600 | 17.70 | 2,132,850 |
| Share B | 8.20 | 95,000 | 779,000 | 6.40 | 608,000 |
| Share C | 12.30 | 85,400 | 1,050,420 | 14.50 | 1,238,300 |
| Share D | 20.80 | 134,000 | 2,787,200 | 21.60 | 2,894,400 |
| Share E | 19.70 | 102,400 | 2,017,280 | 23.30 | 2,385,920 |
| **Total** | 8,465,500 |  | 9,259,470 |

= $\frac{9,259,470}{8,465,500}$ x 1000 = 1093.79

2.

Annual return = $\frac{(1,093.79 -1,000)}{1,000}$ = .0938 or 9.38%

Annual return is inaccurate because it does not include any dividends distributed to shareholders during the year. A total return index corrects this problem by assuming all dividends are reinvested in company shares.