

Problem set for seminar 9

1. Portfolio managers who anticipate an increase in interest rates should
 - b. decrease the portfolio duration
2. The measure of performance which divides the portfolio's risk premium by the portfolio's beta is the
 - e. Treynor measure
3. Sharpe's performance measure divides the portfolio's premium by the
 - a. standard deviation of the rate of return
4. Under the performance attribution analysis method, the measures the manager's ability to form specific market segment portfolios that generate superior returns relative to the way in which the comparable market segment is defined in the benchmark portfolio weighted by the manager's actual market segment investment proportions.
 - a. selection effect
5. Information ratio portfolio performance measures
 - d. indicate historic average differential return per unit of historic variability of different return.
6. For a poorly diversified portfolio the appropriate measure of portfolio performance would be
 - b. the Sharpe measure because it evaluates portfolio performance on the basis of return and diversification.
7. A portfolio's gross selectivity is made up of
 - b. net selectivity
 - c. diversification.
8. Which of the following statements concerning performance measures is false?
 - d. All three measures examine both unsystematic & systematic risk.

8. a) the Sharpe measure c.) the Jensen measure
b) the Treynor measure
d) All three measures examine both unsystematic & systematic risk.
9. In the evaluation of bond portfolio performance, the policy effect refers to
a. the difference in portfolio duration & index duration.
10. In the characteristic Selectivity (CS) performance measure,
c. portfolio performance is measured by comparing the returns of each stock in the portfolio to the return of a benchmark portfolio. With the same aggregate investment characteristics as the security in question
11. The cost of active management is the coefficient σ_{ER} and it is sometimes referred to as
e. tracking error.
12. Portfolio managers are often evaluated using a boxplot of returns for a universe of investors over a specific period of time which is known as $\bar{\alpha}(n)$
d. peer group comparison
13. Suppose the expected return for the market portfolio & risk-free rate are 13% and 3%, respectively.
Stocks A, B, and C have Treynor measures of 0.24, 0.16, and 0.11, respectively. Based on this information an investor should.
e. hold stocks A, B and C

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14. Consider the data presented below on three mutual funds and the market

Fund	Beta	Standard Deviation (%)	Return (%)	R _f (%)
AAA	0.75	7.0	14	3

Compute the Sharpe Measure for the AAA fund.

$$\text{The Sharpe measure} = \frac{\text{Return} - R_f}{\text{Standard Deviation}} \\ = \frac{(14 - 3)}{7} = 1.57$$

s.c. 1.57.

Question 2 • page 1027 #1

The following portfolios are being considered for investment. During the period under consideration,

RFR = 0.07.

Portfolio	Return	Beta	σ_E
P	0.15	1.0	0.05
Q	0.20	1.5	0.10
R	0.10	0.6	0.03
S	0.17	1.1	0.06
Market	0.13	1.0	0.04

- Compute the Sharpe measure for each portfolio and the market portfolio.
- Compute the Treynor measure for each portfolio and the market portfolio.
- Rank the portfolios using each measure, explaining the cause for any difference you find in the rankings.

$$a) \text{The Sharpe measure} = \frac{\text{Return} - R_f}{\sigma_E}$$

$$S_p = \frac{0.15 - 0.07}{0.05} = \frac{0.08}{0.05} = 1.60 \quad S_Q = \frac{0.20 - 0.07}{0.10} = \frac{0.13}{0.10} = 1.30$$

$$S_R = \frac{0.10 - 0.07}{0.03} = \frac{0.03}{0.03} = 1.00 \quad S_S = \frac{0.17 - 0.07}{0.06} = \frac{0.10}{0.06} = 1.67$$

$$\text{Market} = \frac{0.13 - 0.07}{0.04} = \frac{0.06}{0.04} = 1.50$$

b) The Treynor measure = $\frac{\text{Return} - \text{RFR}}{\text{Beta}}$

$$T_p = \frac{0.15 - 0.07}{1.0} = \frac{0.08}{1.00} = 0.0800 \quad T_Q = \frac{0.20 - 0.07}{1.5} = \frac{0.13}{1.50} = 0.0867$$

$$T_R = \frac{0.10 - 0.07}{0.6} = \frac{0.03}{0.60} = 0.0500 \quad T_S = \frac{0.17 - 0.07}{1.10} = \frac{0.10}{1.10} = 0.0909$$

$$\text{Market} = \frac{0.13 - 0.07}{1.0} = \frac{0.06}{1.00} = 0.0600$$

Sharpe Treynor

P	2	3
Q	4	2
R	5	5 (lowest)
S	1	1 (highest)
Market	3	4

c) It is apparent from the rankings above that portfolio Q was poorly diversified since Treynor ranked it #2 and Sharpe ranked it #4. Otherwise, the rankings are similar.

Question 3: Page 1027 # 2.

An analyst wants to evaluate Portfolio X, consisting entirely of U.S. common stocks, using both the Treynor and Sharpe measures of portfolio performance. The following table provides the average annual rate of return for Portfolio X, the market portfolio portfolio (a) measured by the Standard and Poor's 500 Index), and U.S. Treasury bills (T-bills) during the past 8 years.

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#2.

	R_i	σ_i	β_i
Annual Average Rate of Return		Standard Deviation of Return	Beta
Portfolio X	10%	18%	0.60
S&P 500	12	13	1.00
T-bills	6	n/a	n/a

- a) Calculate both the Treynor measure and the Sharpe measure for both Portfolio X and the S&P 500. Briefly explain whether Portfolio X underperformed, equaled, or outperformed the S&P 500 on a risk-adjusted basis using both the Treynor measure and the Sharpe measure.
- b) Based on the performance of Portfolio X relative to the S&P 500 calculated in Part a, briefly explain the reason for the conflicting results when using the Treynor measure versus the Sharpe measure.
- 2) a) The Treynor measure (T) relates the rate of return earned above the risk-free rate to the portfolio beta during the period under consideration. Therefore, the Treynor measure shows the risk premium (excess return) earned per unit of systematic risk:

$$\text{The Treynor measure} = \frac{\text{Return} - R_f}{\text{Beta}}$$

$$T_i = \frac{R_i - R_f}{\beta_i}$$

Where;

R_i = average rate of return for portfolio i during the specified period

R_f = average rate of return on a risk-free investment during the specified period.

β_i = beta of portfolio i during the specified period.

Treynor Measure

$$T = \frac{10\% - 6\%}{0.60}$$

$$T = \frac{(0.1 - 0.06)}{0.6} = 0.067$$

Market (S&P 500)

$$T_M = \frac{12\% - 6\%}{1.00} = 6.0\%$$

The Treynor measure examines portfolio performance in relation to the security market line (SML). Because the portfolio would plot above the SML, it outperformed the S&P 500 Index. Because T was greater than T_M , 6.7% vs 6.0%, respectively, the portfolio clearly outperformed the market index.

The Sharpe measure (S) relates the rate of return earned above the risk free rate of the total risk of a portfolio by including the standard deviation of returns. Therefore, the Sharpe measure indicates the risk premium (excess return) per unit of total risk:

$$\text{The Sharpe measure} = \frac{\text{Return} - \text{RFR}}{\sigma_i}$$

$$\boxed{S = \frac{R_i - R_f}{\sigma_i}}$$

Where

σ_i = standard deviation of the rate of return for portfolio i during the specified period.

Sharpe Measure

$$S = \frac{10\% - 6\%}{18\%} = 0.222$$

Performance Relative to the Market (S&P 500)
 \Rightarrow Underperformed

Market (S&P 500)

$$S_M = \frac{12\% - 6\%}{13\%} = 0.462$$

The Sharpe measure uses total risk to compare with the capital market line (CML). The portfolio would plot below the CML, indicating that it underperformed the market. Because S was less than S_M , 0.222 vs 0.462, respectively, the portfolio underperformed the market.

- 2 b) The Treynor measure assumes that the appropriate risk measure for a portfolio is its systematic risk, or beta. Hence, the Treynor measure implicitly assumes that the portfolio being measured is fully diversified. The Sharpe measure is similar to the Treynor measure except that the excess return on a portfolio is divided by the standard deviation of the portfolio.

For perfectly diversified portfolios (that is, those without any unsystematic or ~~specific~~ specific risk), the Treynor and Sharpe measures would give consistent results relative to the market index because the total variance of the portfolio would be the same as its systematic variance (beta). A poorly diversified portfolio could show better performance relative to the market if the Treynor measure is used but lower performance relative to the market if the Sharpe measure is used. Any difference between the two measures relative to the markets would come directly from a difference in diversification.

In particular, Portfolio X outperformed the market if measured by the Treynor measure but did not perform as well as the market using the Sharpe measure. The reason is that Portfolio X has a large amount of unsystematic risk. Such risk is not a factor in determining the value of the Treynor measure for the portfolio, because the Treynor measure considers only systematic risk.

The Sharpe measure, however, considers total risk (that is, both systematic and unsystematic risk). Portfolio X, which has a low amount of systematic risk, could have a high amount of total risk, because of its lack of diversification. Hence, Portfolio X would have a high Treynor measure (because of low systematic risk) and a low Sharpe measure (because of high total risk).

Question 4 : page: 1027-1028 # 3.

3. You have been assigned the task of comparing the investment performance of five different pension fund managers. After gathering 60 months of excess returns (i.e., returns in excess of the monthly risk-free rate) on each fund as well as the monthly excess returns on the entire stock market, you perform the regressions of the form:

$$(R_{\text{fund}} - RFR)_t = \alpha + \beta (R_{\text{mkt}} - RFR)_t + \epsilon_t$$

You have prepared the following summary of the data, with the standard errors for each of the coefficient listed in parentheses.

Portfolio	Regression Data			$(R_{\text{Fund}} - RFR)$	
	α	β	R^2	Mean	σ
ABC			94.1%		
DEF			91.6		
GHI			68.6		
JKL			64.1		
(MNO)			94.8		

#3

- a) Which fund had the highest degree of diversification over the sample period?
 How is diversification measured in this statistical framework?
- b) Rank those funds' performance according to the Sharpe, Treynor, and Jensen measures.
- c) Since you know that according to the CAPM the intercept of those regressions (i.e., alpha) should be zero, this coefficient can be used as a measure of the value added provided by the investment manager.
 Which funds have statistically outperformed and underperformed the market using a two-sided 95% confidence interval?
 (Note: The relevant t-statistic using 80 observations is 2.00).

- 3 a) • Portfolio MNO enjoyed the highest degree of diversification since it had the highest R^2 (94.8%).
 • The statistical logic behind this conclusion comes from the CAPM which says that all fully diversified portfolios should be priced along the security market line.
 • R^2 is a measure of how well assets conform to the security market line, so R^2 is also a measure of diversification.

- b) Note the mean returns are net of the risk-free rate.

Fund	Treynor	Sharpe	Jensen
ABC	0.975 (4)	0.857 (4)	0.192 (4)
DEF	0.715 (5)	0.619 (5)	-0.053 (5)
GHI	1.574 (1)	1.179 (1)	0.463 (1)
JKL	1.262 (2)	0.915 (3)	0.355 (2)
MNO	1.134 (3)	1.000 (2)	0.296 (3)

3 c) calculate the t-statistic for each alpha.

The t-stat is given by the estimate of the coefficient divided by the standard error of that estimate.

For example, for ABC, $t\text{-stat} = \frac{0.192}{0.11} = 1.7455$

Fund	<u>t(alpha)</u>
ABC	1.7455 (3)
DEF	-0.2789 (5)
GHI	2.4368 (1)
JKL	1.6136 (4)
MNO	2.1143 (2)

Only GHI and MNO have significantly positive alphas at a 95% level of confidence.