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Portfolio Evaluation

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How do you evaluate the following Fund Performance? Tick one:
(a) * Poor (b) ***** Good (c) *** Average

Mini Case Study:

It is an Ultra Short Duration fund. Fund objective is to invest in highly liquid debt and money market instruments, such that Macaulay duration of the portfolio is 3 -6 months. The fund invested about half the portfolio in high yield Corporate Papers 2-5 years maturity. The fund return is one of the best in the market.

Portfolio Evaluation

Key Learning Outcome

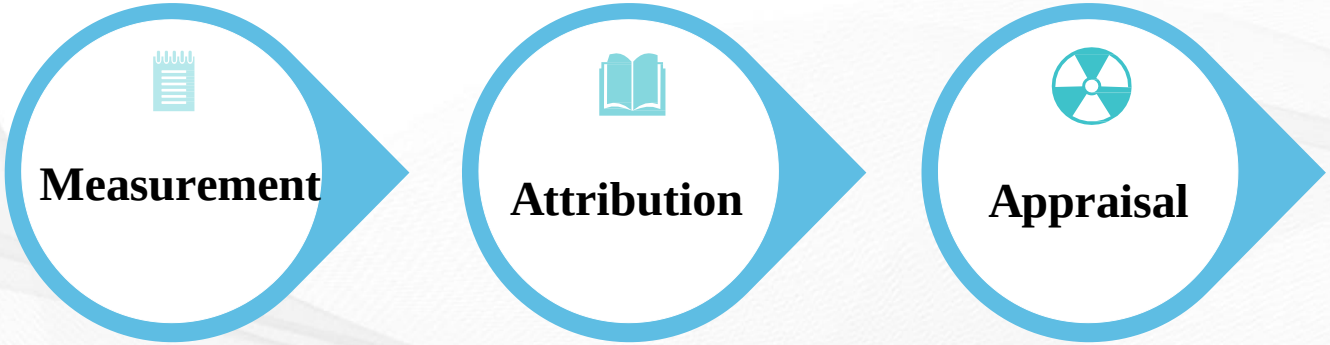
- A vital tool in investment processes
- Components of Portfolio Evaluation

Portfolio (Performance) Evaluation

Portfolio management is a 3-steps process: Planning, Execution and Evaluation Portfolio Evaluation (Performance Evaluation) is an essential tool for understanding the quality of the investment processes, performance results and the methods to improve it. It is a feedback mechanism to:

- Assess the quality of the investment approaches.
- Identify strengths, weaknesses, key decisions and results.
- Focus on poor performance and how to improve it.

Components of Performance Evaluation



what was the portfolio's performance?

how was the performance achieved?

performance achieved through manager skill or luck?

Performance Measurement

Key Learning Outcome

- Holding Period Return
- Arithmetic Return
- Geometric Return

Holding Period Returns

Total / Holding Period Return

Price Return

Income Return

$$R = \frac{V_1 - V_0 + D}{V_0} = \frac{V_1 - V_0}{V_0} + \frac{D}{V_0}$$

Where:

V1 = Price of Asset in End of the Period V0 = Price in the Beginning of the period D = Income received during the period

Holding Period Return - Example

An asset was held for the month of April 2011. The end of March 2011 price was Rs. 228.78, and the end of April 2011 price was Rs. 226.35. In addition, income of Rs. 10 was received at the end of April. What was the asset's total return for the month of April?

Total Return = (V1 - V0+ D) / V0 = (226.35 - 228.78 + 10)/228.78 = 3.31%

The price and income returns can also be calculated separately as follows:

Price Return = (V1 - V0)/ V0 = (226.35 - 228.78)/228.78 = -1.06%

Income Return = D/ V0 = 10/ 228.78 = 4.37%

Total Return = Price Return + Income Return = -1.06% + 4.37% = 3.31%

Multi Period Returns

An arithmetic average is the sum of a series of numbers divided by the count of that series of numbers.

$$A = \frac{1}{n}\sum_{i=1}^{n} a_i = \frac{a_1 + a_2 + \ldots + a_n}{n}$$

where:

$a_1, a_2, \ldots, a_n$ = Portfolio returns for period n

n = Number of periods

Popularly called Geometric Mean Return, it is primarily used for investments that are compounded. It is used to calculate average rate per period on investments that are compounded over multiple periods.

$$\left(\prod_{i=1}^{n} x_i\right)^{\frac{1}{n}} = \sqrt[n]{x_1 x_2 \ldots x_n}$$

where:

$x_1, x_2, \cdots$ = Portfolio returns for each period

n = Number of periods

Multi-Period Returns - Example

Calculate the Average (Arithmetic Mean) and Geometric return for the following 5 years:

Years	Return	Wealth Ratio
1	10.5%	1.105
2	-3.6%	1.065
3	20.7%	1.286
4	6.4%	1.368
5	12.3%	1.536

Arithmetic Mean Returns

$$= (.105 + (-.036) + .207 + .064 + .123)/5 = \mathbf{.0926 \text{ or } 9.26\%}$$

Geometric Mean Returns

$$= (1.105 * .964 * 1.207 * 1.064 * 1.123)^{(1/5)} - 1 = \mathbf{.0897 \text{ or } 8.97\%}$$

Performance Report

Total Performance Summary
TOTAL GROSS OF FEES
06/30/20XX

Report ID:
Reporting Currency: USD

Group Label Account Name Benchmark Name	Account Number Benchmark Number	Market Value (M) $	% of Total	Month	Quarter	Fiscal YTD	Annualized 1 Year	Annualized 3 Years	Annualized 5 Years	Inception Date
Total Plan		**824.08**	**100.00**	**0.27**	**8.38**	**2.17**	**-16.35**	**-0.53**	**4.79**	**7/31/1981**
Total Fund Benchmark				*0.11*	*13.76*	*6.10*	*-16.30*	*-2.06*	*3.47*	*7/31/1981*
Excess Return				**0.15**	**-5.38**	**-3.93**	**-0.05**	**1.54**	**1.32**	**7/31/1981**
Total Large Cap US Equity										
Pimco Stocks Plus		48.16	5.84	1.10	22.64	10.11	-26.09	-8.09	-2.26	12/31/1994
S&P 500 - Total Return Index	*IX1F00079488*			*0.20*	*15.93*		*-26.21*	*-8.22*	*-2.24*	*12/31/1994*
Excess Return				**0.90**	**6.72**		**0.13**	**0.14**	**-0.02**	**12/31/1994**
Franklin Portfolio Associates		12.32	1.49	0.78	14.40	-2.38	-33.39	-13.05	-3.15	10/31/2003
S&P 500 - Total Return Index	*IX1F00079488*			*0.20*	*15.93*		*-26.21*	*-8.22*	*-2.24*	*10/31/2003*
Excess Return				**0.59**	**-1.53**		**-7.18**	**-4.83**	**-0.91**	**10/31/2003**
Total Mid Cap US Equity										
LA Capital Midcap Growth		16.34	1.98	-0.07	18.55	14.21	-28.78	-6.42	1.48	7/31/2004
Russell Midcap Growth Index	*IX1F00056628*			*0.46*	*20.67*		*-30.33*	*-7.93*	*-0.44*	*7/31/2004*
Excess Return				**-0.54**	**-2.12**		**1.55**	**1.50**	**1.92**	**7/31/2004**
Systematic Midcap Value		16.59	2.01	0.60	12.93	6.64	-27.66	-4.83	4.55	7/31/2004
Russell Midcap Growth Index	*IX1F00056628*			*0.46*	*20.67*		*-30.33*	*-7.93*	*-0.44*	*7/31/2004*
Excess Return				**0.13**	**-7.74**		**2.67**	**3.10**	**4.99**	**7/31/2004**

Performance Attribution

Key Learning Outcome

- Introduction
- Attribution effects

Performance Attribution

Framework for decomposing portfolio returns relative to the benchmark:

Source of Active Return

Drill down analysis of source of return

Decompose Active return

Segregation of active returns into different factors, like Sector Allocation (e.g. overweight, underweight) and Security Selection. (e.g. HDFC Bank, SBI, Axis or Federal)

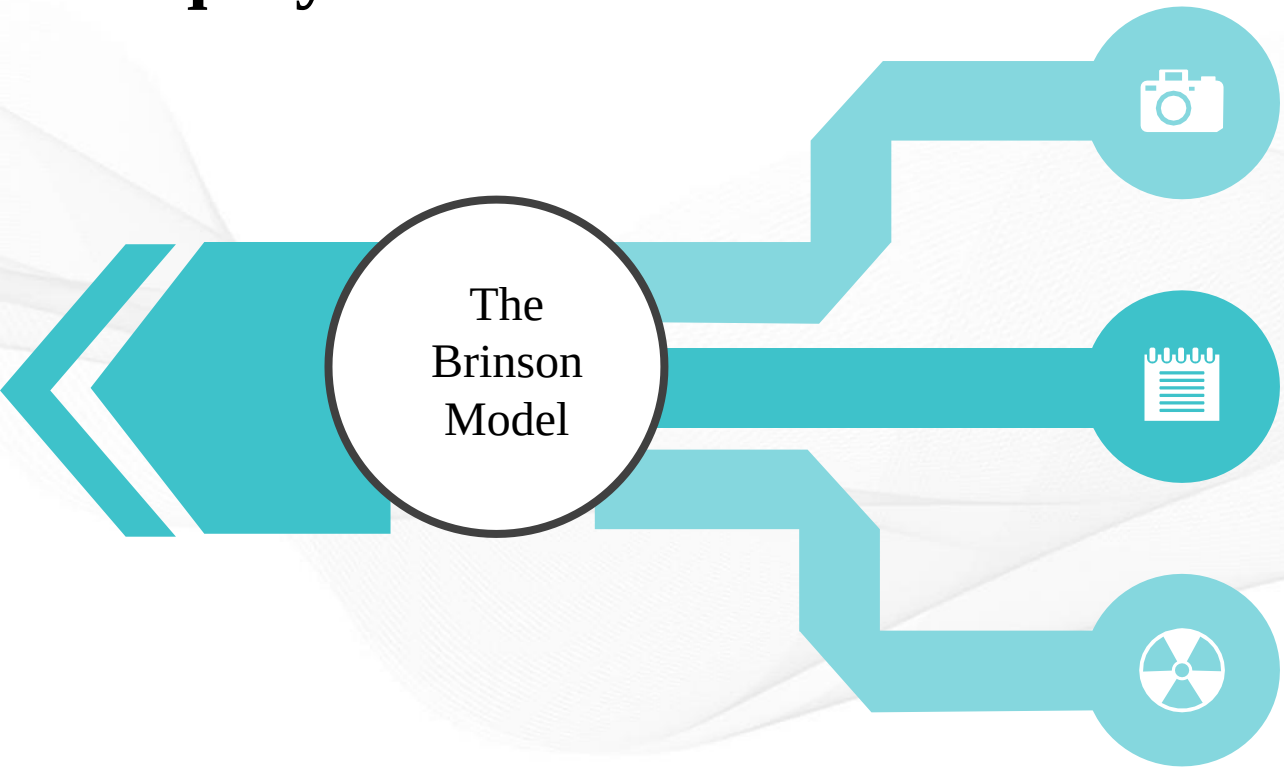
Return Contribution analysis

Decompose portfolio returns relative to Benchmark
(e.g. overweight versus underweight in Sector/ Security)

Manager Style Analysis

Skill (e.g. overweight versus underweight relative to Benchmark) determines the quality of Investment Manager

Equity Attribution Effect



Allocation Effect

The Value addition in the performance due to Sector allocation skill of Manager.

Selection Effect

The value addition in the portfolio performance due to the skills of security/ stock picking.

Interaction Effect

The combined effect of Allocation and Selection interaction.

Equity Attribution Effect: Example

Portfolio Return Attribution Analysis: (Time Period: Past 12 Months)

Portfolio Return	Benchmark Return	Excess Return	Allocation Effect	Selection Effect
5.24%	3.24%	2.00%	−0.50%	2.50%

The investment decisions generated a positive excess return of 200 basis points (bps) relative to the benchmark.

Attribution of 200 bps:

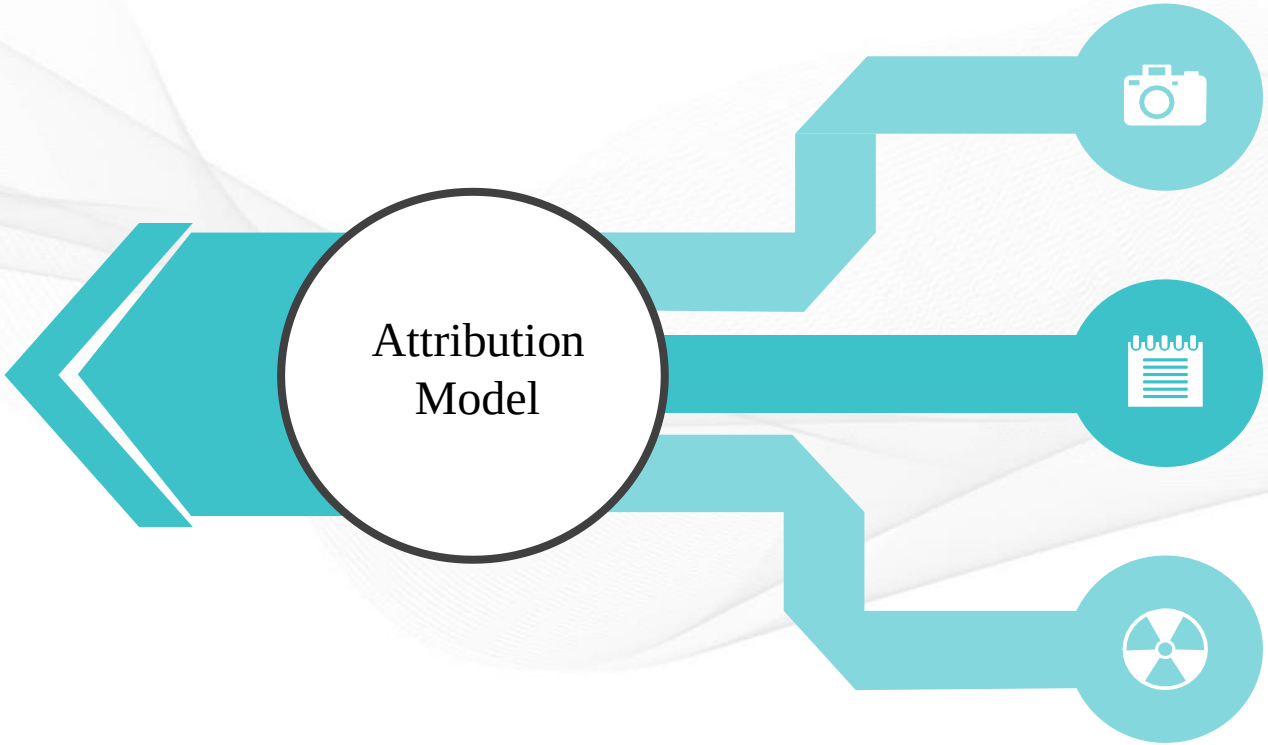
Allocation Effect: ***Negative 50 bps***, indicates that the allocation decisions over the past 12 months

had a
negative impact on the total portfolio performance.

Selection Effect: ***Positive 250 bps***, the *positive* selection effect indicates that the security selection decisions—decisions to overweight or underweight securities relative to their benchmark weights—*added* 250 bps to the excess return.

Our return attribution analysis implies that the portfolio manager's security selection decision was far superior to his or her asset allocation decision for the past 12 months.

Fixed Income Attribution Effect



Carry Effect

Value addition in the bond portfolio because of rate of the bonds.

Yield Curve Effect

The alpha contribution due to change in the yield curve.

Credit Effect

Effect in the active return due to change in the credit spread of asset.

Performance Appraisal

Key Learning Outcome

- Introduction
- Appraisal Measures

Performance Appraisal

- Performance appraisal identifies and measures Risk (Beta, Standard Deviation) and Returns while focusing on Risk-Adjusted Return.
- Provides the information to assess how effectively money has been invested given the risks.
- Ranking investment managers who follow similar investment disciplines.
- Seeks to ascertain whether added value was a result of managerial skill.

Performance Appraisal Measures

The professional investment literatures have developed several measures to assess returns relative to the risk of portfolio. This includes:

- Sharpe Ratio
- Jensen’s Alpha
- Treynor Ratio
- Sortino Ratio

Sharpe ratio

$$S_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\sigma}_A}$$

The **Sharpe ratio** measures the additional return for bearing risk above the risk-free rate, stated per unit of return volatility. In performance appraisal, this additional return is often referred to as **excess return**.

The Sharpe ratio is commonly used on an *ex post* basis to evaluate historical risk- adjusted returns, as

Where:

RA= Average return of

Portfolio rf. = Average

risk free return

σA = Volatility of the portfolio return

Sharpe ratio - Example

Investment Manager A generates a return of 20%, and Investment Manager B generates a return of 12%. The risk-free rate is 5%, and manager A's portfolio has a standard deviation of 8% while manager B's portfolio has a standard deviation of 5%. Compute Sharpe ratio and see which manager has better Risk adjusted return.

	Manager A	Manager B
Risk free Rate	5%	
Return	20%	12%
Standard Deviation	8%	5%
Sharpe Ratio	**(.20-.05)/.08=1.88**	**(.12-.05)/.05=1.40**

{Manager A has better Sharpe Ratio Measure}

One weakness of the Sharpe ratio is that the use of standard deviation as a measure of risk assumes investors are indifferent between upside and downside volatility.

Jensen’s alpha

- **Jensen's Alpha**, also known as the **Jensen's** Performance Index, is a measure of the excess returns earned by the portfolio compared to returns suggested by the CAPM model*. It represents by the symbol α. The value of the excess return may be positive, negative, or zero
- Jensen's measure is commonly referred to as alpha. When a manager outperforms the market concurrent to risk, they have "delivered alpha" to their clients.
- The measure accounts for the risk-free rate of return for the time period.

*CAPM  $ERi = Rf + \beta i\ (ERm - Rf)$

where

ERi= expected return of investment, Rf=risk free rate, βi=beta of the investment, $(ERm - Rf)$ = market risk premium

Jensen’s alpha - Example

Portfolio C delivered an average annualized return of 11.0%, with an annualized standard deviation of 14.0% based on the past 60 months of data. The market index returned 12.0% per year over the same time period, with an annualized standard deviation of 16.0%. A market model regression estimates beta of 0.90 for Portfolio C. Assuming the risk-free rate is 3.0% per year, the Jensen's alpha is:

Alpha (α) = R(i) - (R(f) + B x (R(m) - R(f)))

where:

R(i) = the realised return of the portfolio or investment R(m) = the realised return of the appropriate market index R(f) = the risk-free rate of return for the time period

B = the beta of the portfolio of investment with respect to the chosen market index

Jensen’s alpha = 11.0% – [3.0% + 0.90(12.0% – 3.0%)] = –0.10% = -.001

Treynor Ratio

$$T_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\beta}_A}$$

The Treynor ratio measures the excess return per unit of systematic risk. With the Treynor ratio, as
well as the systematic-risk-based appraisal measures that follow, need to carefully choose an
efficient market benchmark against which to measure the systematic risk of the manager's fund. *The usefulness of the Treynor ratio depends on whether systematic risk or total risk is most appropriate in evaluating performance.*

Where:

RA = Average return of

Portfolio rf. = Average risk

free return βA = Beta

Suppose the average return generated by fund is 10% and the risk-free rate is 6%. If the fund's historical beta is 1.5, then the **Treynor Ratio** will be?

Treynor Ratio = (10% -6%)/1.5 = **2.67**

Sortino Ratio

$$\widehat{\mathrm{SR}}_D = \frac{\bar{r}_p - \bar{r}_T}{\hat{\sigma}_D}$$

The Sortino ratio is a modification of the Sharpe ratio that penalizes only those returns that are lower than a user-specified return. The Sharpe ratio penalizes both upside and downside volatility equally.

Sortino ratio penalizes managers only for "harmful" volatility and is a measure of return per unit of
downside risk. It is most relevant when one of the investor's primary objectives is capital preservation.

Where:

$\bar{r}_p$ = *average portfolio return*

$\bar{r}_T$ = *Target Return*

σD = *Semi standard deviation*

Sortino Ratio - Example

$$\widehat{\mathrm{SR}}_D = \frac{\bar{r}_p - \bar{r}_T}{\hat{\sigma}_D}$$

Portfolio B delivered 10.0% annual returns on average over the past 60 months. Its average annual volatility as measured by standard deviation was 14.0%, and its downside volatility as measured by target semi-standard deviation was 8.0%. Assuming the target rate of return is 3.0% per year. Calculate the Sortino ratio of portfolio B. It is

= (10% - 3%)/ 8% = .88

Key Takeaways

- Performance measurement provides an overall indication of the portfolio's performance.
- Performance attribution builds on performance measurement to explain how the performance was achieved.
- Performance appraisal leverages both returns and attribution to infer the quality of the investment process.
- An effective attribution process must reconcile to the total portfolio return/risk, reflect the investment decision- making process, quantify the active portfolio management decisions, and provide a complete understanding of the excess return/risk of the portfolio.
- Return attribution analyzes the impact of investment decisions on the returns, whereas risk attribution analyzes the risk consequences of the investment decisions.
- Fixed-income attribution considers the unique factors that drive bond returns, including interest rate risk and default
risk.

- Investment performance appraisal ratios—Sharpe Ratio, Jensen's Alpha, Treynor's Ratio and Sortino Ratio

measure investment skill.

- Appraisal ratios must be used with care, noting the assumptions of each ratio and affording the appropriateness to the measured investment process, risk tolerance, and investor time horizon.

- Although appraisal ratios help identify manager skill (as opposed to luck), they often are based on investment
return data, which are often limited and subject to error.

- Evaluation of investment manager skill requires the use of a broad range of analysis tools, with fundamental understanding of how the tools work, how they complement each other, and their specific limitations.

Further Reading

- Performance Measurement : https://blogs.cfainstitute.org/investor/2012/06/01/performance-_measurement-and-attribution-the-what-why-and-how-of-the-investment-_management-process/
- Diversification : https://www.investopedia.com/terms/d/diversification.asp
- Performance Evaluation :https://www.cfainstitute.org/-/media/documents/support/programs/investment-foundations/19-_performance-evaluation.ashx?la=en&hash=F7FF3085AAFADE241B73403142AAE0BB1250B31_1
- Risk Analysis : https://www.investopedia.com/terms/r/risk-analysis.asp

Thank You