

Risk & Return relationship

24 January, 2020

Return

Return	<ul style="list-style-type: none">● Is the payoff that an investor receives from an investment
Components	<ul style="list-style-type: none">● Income : interest (debt securities) or dividends (equity securities, funds)● Price Change (+ / -)
Terminology	<ul style="list-style-type: none">● Yield : Income component, expressed as % of purchase price<ul style="list-style-type: none">● Income / Purchase price, or● Dividend / Purchase price● Capital Gain : appreciation in price<ul style="list-style-type: none">● $[(\text{End Value} - \text{Start Value}) / \text{Start Value}] * 100$
Total Return	<ul style="list-style-type: none">● Income + Price Change, or● Yield + Capital Gain

Risk

Definition

Risk is broadly defined as the chance that an investment's actual return will be different than expected. Reasons for such deviation could be :

- Loss of principal, or
- Unable to meet the target return, or
- Loss of purchasing power.

Examples

- Inflation Risk
- Business Risk
- Political Risk
- Liquidity Risk
- Interest Rate Risk
- Foreign Exchange Risk
- Credit or Default Risk

Categories of Risk

Unsystematic Risk

- Firm Specific
- Risk can be eliminated by investing in many different assets
- Diversifiable – as drop in one asset will have a small effect on the portfolio
- No investor is compensated for taking diversifiable risk

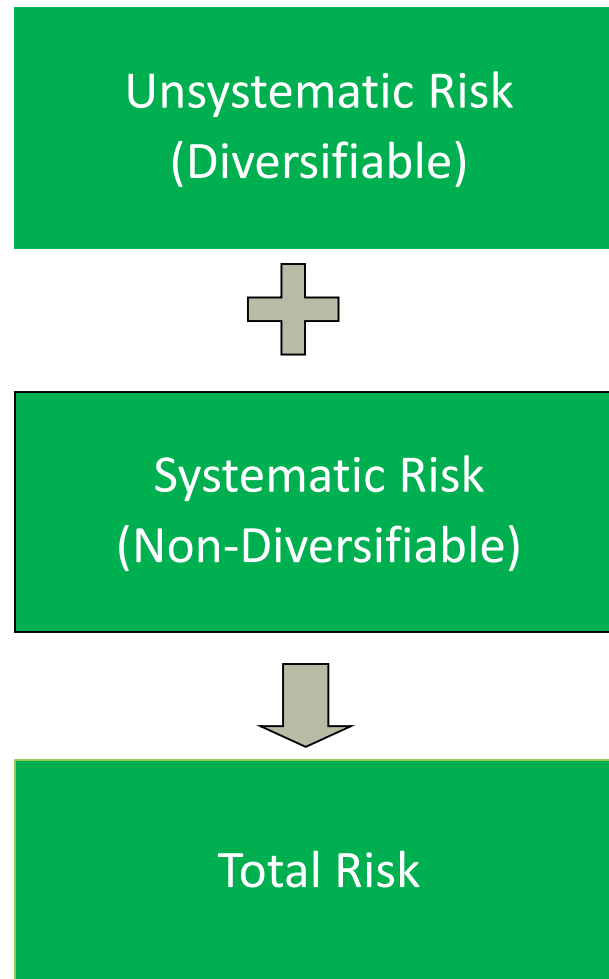
- Business Risk – competitors pricing, management risk etc.
- Financial Risk- Excess Leverage etc.

Systematic Risk

- Correlated with market
- Risk cannot be eliminated, even by investing in many different assets
- Non-diversifiable because a drop in one asset will be felt in other portfolio assets
- Expected return is the amount needed to compensate for non diversifiable risk

- Arise due to inflation, interest rates,
- Government policies, overall sentiments for equities

Total Risk



Measuring Risk

Standard Deviation

- Measure of how widely values are dispersed from the average value (the mean).
- Higher the dispersion greater the Standard Deviation or Variance.

Beta

- Measures the degree to which securities price fluctuates in relation to the overall market.

Measuring Risk : Standard Deviation

Date	1 year rolling return (x_i)	$x_i - \mu$	$(x_i - \mu)^2$
31-Jan-06	12.50%	9.88%	0.98%
28-Feb-06	17.60%	14.98%	2.24%
31-Mar-06	8.30%	5.68%	0.32%
30-Apr-06	0.50%	-2.13%	0.05%
31-May-06	-5.60%	-8.23%	0.68%
30-Jun-06	-11.50%	-14.13%	2.00%
31-Jul-06	-4.60%	-7.23%	0.52%
31-Aug-06	6.00%	3.38%	0.11%
30-Sep-06	7.90%	5.28%	0.28%
31-Oct-06	13.50%	10.88%	1.18%
30-Nov-06	-9.70%	-12.33%	1.52%
31-Dec-06	-3.40%	-6.03%	0.36%
Total	31.50%		10.24%

$\sum x_i$	31.50%
n	12
$\mu = \sum x_i / n$	2.63%

$\sum (x_i - \mu)^2$	10.24%
$\sum [(x_i - \mu)^2 / n]$	0.85%

σ^2	0.85%	Variance
σ	9.24%	Standard Deviation

Using MS-Excel σ 9.24%

STDEV.P

Number1 H6:H17 = {0.125;0.176;0.083}

Number2 | = number

Number3 | = number

= 0.092355405

Calculates standard deviation based on the entire population given as arguments (ignores logical values and text).

Number2: number1,number2,... are 1 to 30 numbers corresponding to a population and can be numbers or references that contain numbers.

Formula result = 0.092355405

OK Cancel

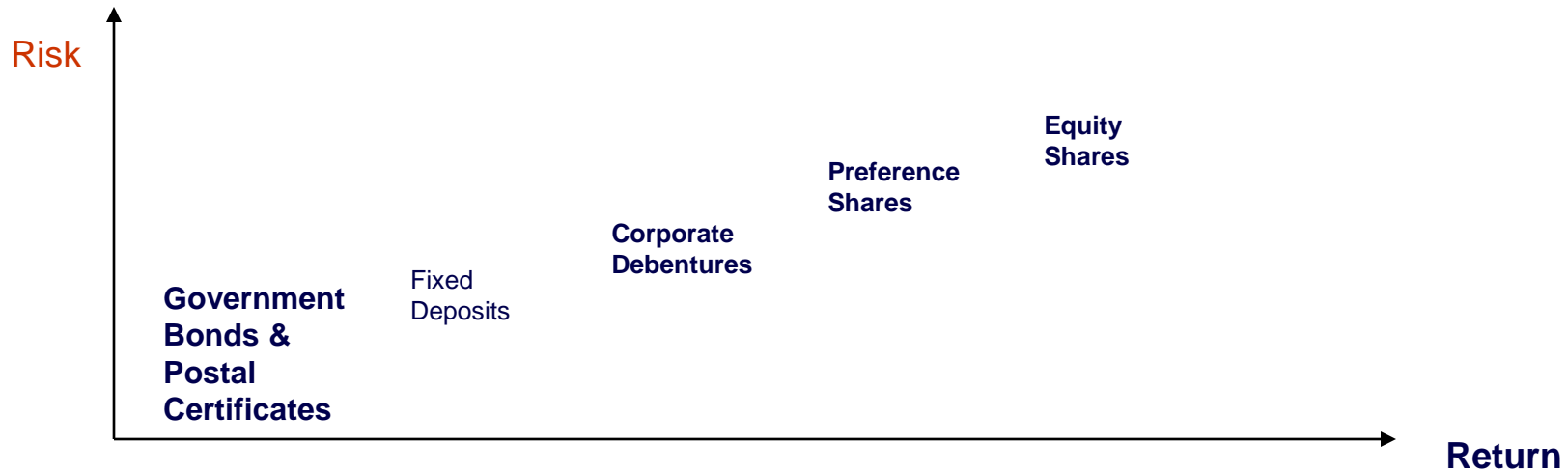
Measuring Risk : Beta

- Measures the degree to which a security's price fluctuates in relation to the overall market
- Tells us how the asset price tends to move when the market moves
- Measure of market risk

Measuring Risk : Beta

Negative Beta	Inverse relationship to the market - Possible but highly unlikely, Example – Gold stocks as gold prices move up when markets decline
Beta of Zero	Value of asset remains unchanged regardless of market movement, Example : Cash
Beta between 0 and 1	Companies whose stock prices are less volatile than the market, Example : Utility or consumer goods
Beta of 1	Represents the volatility of the market Example : Index Funds
Beta > 1	Volatility of the stock is greater than the broad-based index, Example : Growth Sectors like Technology

Risk Return tradeoff



There is no free lunch in markets

Higher expected returns necessitates bearing of higher risk either in terms of risk of losing of capital or volatility of returns

Risk Return tradeoff - Equities



The overall risk is lower in diversified portfolio or mutual funds due to diversification

Single stocks carry more stock specific risks

Futures are more riskier and have a higher expected return profile due to presence of leverage.

Remember "There is no free lunch in the markets"

Performance Measures

Risk Adjusted Returns

- Measures the performance of a security or portfolio for the risk taken by the security or portfolio
- $RAR = \text{Return} / \text{Risk}$
- Investors who assume more risk expect higher returns

Popular Performance Measure

- Sharpe Ratio
- Treynor Ratio
- Jensen's Alpha

Performance Measure : Sharpe Ratio

$$\text{Sharpe Ratio} = \frac{\text{Total portfolio return} - \text{Risk-free rate}}{\text{Portfolio standard deviation}}$$

- Measures excess return per unit of TOTAL RISK.
- Also known as "excess return to variability" ratio

Market data: Risk Free Return = 5%

Portfolio Data: Portfolio Return = 12% Beta = 1.2

Portfolio Std Dev = 14 %

$$\text{Sharpe Measure} = \frac{0.12 - .05}{.14} = 0.50$$

Higher values indicate superior performance

Performance Measure : Treynor Ratio

$$\text{Treynor Ratio} = \frac{\text{Total portfolio return} - \text{Risk-free rate}}{\text{Portfolio Beta}}$$

- Measures excess return per unit of SYSTEMATIC RISK
- Also known as "excess return to volatility" ratio

Market data: Risk Free Return = 6%

Portfolio Data: Portfolio Return = 10% Beta = 0.9

$$\text{Treynor Measure} = \frac{.10 - .06}{0.9} = 0.044$$

Higher values indicate superior performance

Performance Measure : Jensen's Alpha

Alpha = Actual Rate of Return - Rate of Return predicted by CAPM

Jensen's Alpha = Portfolio Return – [Risk free return + (Market Return – Risk free Return) * Beta]

CAPM Required Return

- Indicator of Portfolio Manager's performance.
- Higher the Alpha indicate the ability of fund managers to generate excess returns than the expected market return

Alpha is widely used to evaluate mutual fund and portfolio manager's performance

Thank You