



Chapter 4

Investment Return and Risk



Return

- The reward for investing.
 - Most returns are not guaranteed.
 - $E(r)$ is important factor in selection.
- Total Return consists of
 - Current Income
 - Appreciation



Importance of Return

- Allows comparison of
 - Investment alternatives
 - actual and $E(r)$
- Historical returns
 - allow comparison of past performance of various investment vehicles
 - Set base for $E(r)$



Level of $E(r)$

- Depends on
 - Internal characteristics
 - type of investment vehicle
 - investment's financing
 - customer base of the issuer
 - firm management.
 - External forces
 - war, shortages, political actions and events, inflation, deflation, and Federal Reserve actions



Time Value of Money

- Now is better than later
- Compounding
- Measures
 - Future Value
 - Present Value
- Good Investment
 - $\text{Cost} < \text{PV of Expected Benefits}$



Required Rate of Return

- Critical element critical in investor choice
- ROR an investor must earn to be fully compensated for ***risk***.

Required ROR = R_f + Risk Premium

R_f = Real ROR + Inflation Premium



Components of Req ROR

- The Risk-Free Rate (R_f)
 - 90-day US Treasury bill rate is common proxy
 - rises and falls with changes in expected rate of inflation.

- The Real Rate of Return
 - Return earned in a perfect world where all outcomes are certain
 - R_f - minus rate of inflation.



Components of Req. ROR

- Risk premium
 - Incorporates market, issue and issuer characteristics for which investors must be compensated.
 - Considers:
 - type of security
 - Industry and company considerations
 - Maturity
 - Other features



Holding Period Return (HPR)

- Holding period (HP)
 - the relevant period of time over which one wishes to measure total return.
 - usually one year or shorter.
- In comparing HPRs, must use same HP.

$$\text{HPR} = \frac{[\text{current income} + \text{capital gain(loss)}]}{\text{beginning investment value}}$$



Internal Rate of Return (Yield)

- Compounded annual ROR earned by a long-term investment;
 - a.k.a. the discount rate that equates PV of benefits to cost
- Determined by trial and error
- Assumption:
 - Cashflows are reinvested at same IRR



IRR/Yield

- Good investment: $IRR \geq$ Discount Rate



Growth Rate

- The compound annual rate of change in the value of a stream of income.
 - Often used to determine/estimate dividend growth



Risk

- Chance that actual return differs from $E(r)$
- The broader the range of possible returns (greater volatility) from an investment, the greater its risk
- Risk-return Tradeoff



Sources of Risk

- **Business Risk**

- uncertainty associated with company's earnings and ability to make payments
 - deals with asset side of the balance sheet

- **Financial Risk**

- uncertainty of payments attributable to capital structure
 - deals with liabilities side of the balance sheet



Sources of Risk

- **Purchasing power risk**

- chance that changing price levels (inflation / deflation) will adversely affect investment returns

- **Interest rate risk**

- chance that changes in interest rates will adversely affect a security's value
- Reinvestment Risk



Sources of Risk

- **Liquidity (marketability) risk**

- the risk of not being able to sell an investment quickly and at a reasonable price.

- **Tax (Regulatory) risk**

- the risk that Congress will enact tax laws that affect companies and investments adversely.



Sources of Risk

- **Market risk**

- Risks which affect all investments. Examples include war, changes in GDP growth, money supply changes, and so on.

- **Event risk**

- comes from an unexpected event that has a significant and usually immediate effect on the underlying value of an investment.



Review

- Review problems 3, 7, 8 and 9 in Volume III, Investments



Measuring Risk

- **Standard Deviation**

- Measures variability of returns around the average return of the investment.
- an absolute measure of risk.



Measuring Risk

- Average Return
 - arithmetic sum of all returns divided by the number of observations.
- Standard Deviation equals:

$$SD = \sqrt{\frac{\sum_{i=1}^n (\text{return for outcome } i - \text{avg. return})^2}{\text{total \# of outcomes} - 1}}$$



Measuring Risk

$$SD = \sqrt{\frac{\sum_{i=1}^n (\text{return for outcome } i - \text{avg. return})^2}{\text{total \# of outcomes} - 1}}$$

$$SD = \sqrt{\frac{\sum_{i=1}^n (r_i - \bar{r})^2}{n - 1}}$$



Comparing Investments

- If average returns are equal
 - the larger the standard deviation, the greater the risk.
- If average returns are not equal
 - Calculate the Coefficient of Variation
 - Equals $STD / (Avg. Return \times 100)$
 - This converts the standard deviation to a percentage of the average return.



Coefficient of Variation

- Measures relative dispersion of asset returns.
- Useful in comparing the risk of assets with differing average or expected returns.
- The higher the coefficient of variation, the greater the risk.



Assessing Risk

- Requires understanding of
 - Risk-return characteristics of alternative investment vehicles (Figure 4.2)
 - Acceptable level of risk
 - Risk-indifferent
 - Risk-averse
 - Risk-seeking
 - Investment decision process



Combining Risk & Return

1. Estimate $E(r)$ using historical return data as guideline

2. Assess the risk of the investment
 - a) Subjective
 - b) Standard deviation
 - c) Coefficient of variation
 - d) Beta



Combining Risk and Return

3. Evaluate the risk-return behavior of each alternative
 - a. make sure $E(r)$ is reasonable given the risk.

4. Select investments with highest expected returns given the risk the investor is willing to take



Review

- Review problems 144, 147 and 149 in Volume III, Investments