**FIN 254 LECTURE 22**

**RISK & RETURN**

**CHAPTER REFERENCE – CHP 6**

WHAT IS RISK IN FINANCIAL MANAGEMENT?

WHAT ARE THE DIFFERENT TYPES OF RISK?

WHAT IS THE RISK – RETURN TRADEOFF?

HOW DO WE CALCULATE RISK?

HOW DO WE MANAGE RISK?

Risk is defined as the chance that an investment's [actual return](http://www.investopedia.com/terms/a/actualreturn.asp) will be different than expected. This includes the possibility of losing some or all of the original investment. Risk is the uncertainty in the distribution of possible outcomes.

**Unsystematic risk**, also known as "[specific risk](http://www.investopedia.com/terms/s/specificrisk.asp)," "diversifiable risk" or "residual risk," is the type of uncertainty that comes with the company or industry you invest in. Unsystematic risk can be reduced through diversification. For example, news that is specific to a small number of stocks, such as a sudden strike by the employees of a company you have shares in, is considered to be unsystematic risk.

**Systematic risk**, also known as "market risk" or "un-diversifiable risk", is the uncertainty inherent to the entire market or entire market segment. Also referred to as [volatility](http://www.investopedia.com/terms/v/volatility.asp), systematic risk consists of the day-to-day fluctuations in a stock's price. Volatility is a measure of risk because it refers to the behavior, or "temperament," of your investment rather than the reason for this behavior. Because market movement is the reason why people can make money from stocks, volatility is essential for returns, and the more unstable the investment the more chance there is that it will experience a dramatic change in either direction.   
  
[*Interest rates*](http://www.investopedia.com/terms/i/interestrate.asp)*,* [*recession*](http://www.investopedia.com/terms/r/recession.asp) *and wars all represent sources of systematic risk because they affect the entire market and cannot be avoided through diversification. Systematic risk can be mitigated only by being hedged.*

**Beta** is a measure of the volatility, or systematic risk, of a security or a portfolio in comparison to the market as a whole. In other words, beta gives a sense of a stock's market risk compared to the greater market. Beta is also used to compare a stock's market risk to that of other stocks. Investment analysts use the Greek letter 'ß' to represent beta.

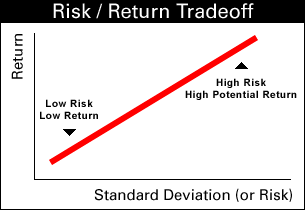
Beta is calculated using [regression](http://www.investopedia.com/terms/r/regression.asp) analysis, and you can think of beta as the tendency of a security's returns to respond to swings in the market. A beta of 1 indicates that the security's price will move with the market. A beta of less than 1 means that the security will be less volatile than the market. A beta of greater than 1 indicates that the security's price will be more volatile than the market. For example, if a stock's beta is 1.2, it's theoretically 20% more volatile than the market.

**The Risk Return trade-off**

Deciding what amount of risk you can take while remaining comfortable with your investments is very important.

In the investing world, the dictionary definition of risk is the chance that an investment's actual return will be different than expected. Technically, this is measured in statistics by standard deviation. Practically, risk means you have the possibility of losing some or even all of your original investment.

Low risks are associated with low potential returns. High risks are associated with high potential returns. The risk return trade-off is an effort to achieve a balance between the desire for the lowest possible risk and the highest possible return. The risk return trade-off theory is aptly demonstrated graphically in the chart below. A higher standard deviation means a higher risk and therefore a higher possible return.



A common misconception is that higher risk equals greater return. The risk return trade-off tells us that the higher risk gives us the possibility of higher returns. There are no guarantees. Just as risk means higher potential returns, it also means higher potential losses.

If the risk-free rate is currently 6 per cent, this means, with virtually no risk, we can earn 6 per cent per year on our money.

*The common question arises: who wants 6 per cent when index funds average 13 per cent per year over the long run (last five years)? The answer to this is that even the entire market (represented by the index fund) carries risk. The return on index funds is not 13 per cent every year, but rather -5 per cent one year, 25 per cent the next year, and so on. An investor still faces substantially greater risk and volatility to get an overall return that is higher than a predictable government security. We call this additional return, the risk premium, which in this case is 7 per cent (13 per cent - 6 per cent).*

**Diversification**

Diversification is a risk-management technique that mixes a wide variety of investments within a portfolio in order to minimize the impact that any one security will have on the overall performance of the portfolio.

Diversification essentially lowers the risk of your portfolio. There are three main practices that can help you ensure the best diversification:

* **Spread your portfolio among multiple investment vehicles** such as cash, stocks, bonds, mutual funds, and perhaps even some real estate. Alternately you could invest only in mutual funds but of varied types. For example you could invest 30 per cent in equity schemes, 40 per cent in debt/income schemes and 30 per cent in money market schemes. You could also invest in commodity funds although as and when permitted by SEBI
* **Vary the risk in your securities.** If you are investing in equity funds, then consider large cap as well as small cap funds. And if you are investing in debt, you could consider both long term and short term debt. It would be wise to pick investments with varied risk levels; this will ensure that large losses are offset by other areas
* **Vary your securities by industry.** This will minimize the impact of specific risks of certain industries

Diversification is the most important component in helping you reach your long-range financial goals while minimizing your risk. At the same time, diversification is not an ironclad guarantee against loss. No matter how much diversification you employ, investing involves taking on some sort of risk.

**Return, Risk And The Security Market Line - Expected Return, Variance And Standard Deviation Of A Portfolio**

[Expected return](http://www.investopedia.com/terms/e/expectedreturn.asp) is calculated as the weighted average of the likely profits of the assets in the portfolio, weighted by the likely profits of each asset class. Expected return is calculated by using the following formula:

|  |
| --- |
| [http://i.investopedia.com/inv/articles/site/Corpfin80.jpg](http://www.investopedia.com/terms/e/expectedreturn.asp) |

Written another way, the same formula is as follows: E(R) = w1R1 + w2Rq + ...+ wnRn  
  
*Example: Expected Return*For a simple portfolio of two [mutual funds](http://www.investopedia.com/terms/m/mutualfund.asp), one investing in [stocks](http://www.investopedia.com/terms/s/stock.asp) and the other in [bonds](http://www.investopedia.com/terms/b/bond.asp), if we expect the stock fund to return 10% and the bond fund to return 6% and our allocation is 50% to each asset class, we have the following:  
  
Expected return (portfolio) = (0.1)\*(0.5) + (0.06)\*(0.5) = 0.08, or 8%  
  
Expected return is by no means a guaranteed rate of return. However, it can be used to forecast the future value of a portfolio, and it also provides a guide from which to measure actual returns.  
  
Let's look at another example. Assume an [investment manager](http://www.investopedia.com/terms/i/investment-manager.asp) has created a portfolio with Stock A and Stock B. Stock A has an expected return of 20% and a weight of 30% in the portfolio. Stock B has an expected return of 15% and a weight of 70%. What is the expected return of the portfolio?  
  
E(R) = (0.30)(0.20) + (0.70)(0.15)  
= 6% + 10.5% = 16.5%  
  
The expected return of the portfolio is 16.5%.  
  
Now, let's build on our knowledge of expected returns with the concept of variance.  
  
Variance  
[Variance](http://www.investopedia.com/terms/v/variance.asp) (σ2) is a measure of the dispersion of a set of data points around their mean value. In other words, variance is a mathematical expectation of the average squared deviations from the mean. It is computed by finding the probability-weighted average of squared deviations from the expected value. Variance measures the variability from an average ([volatility](http://www.investopedia.com/terms/v/volatility.asp)). Volatility is a measure of risk, so this statistic can help determine the risk an investor might take on when purchasing a specific security.  
  
*Example: Variance*  
Assume that an analyst writes a report on a company and, based on the research, assigns the following probabilities to next year's sales:

|  |  |  |
| --- | --- | --- |
| Scenario | Probability | Sales ($ Millions) |
| 1 | 0.10 | $16 |
| 2 | 0.30 | $15 |
| 3 | 0.30 | $14 |
| 3 | 0.30 | $13 |

The analyst's expected value for next year's sales is (0.1)\*(16.0) + (0.3)\*(15.0) + (0.3)\*(14.0) + (0.3)\*(13.0) = $14.2 million.  
  
  
Calculating variance starts by computing the difference in each potential sales outcome from $14.2 million, then squaring:

|  |  |  |  |
| --- | --- | --- | --- |
| Scenario | Probability | Deviation from Expected Value | Squared |
| 1 | 0.1 | (16.0 - 14.2) = 1.8 | 3.24 |
| 2 | 0.30 | (15.0 - 14.2) = 0.8 | 0.64 |
| 3 | 0.30 | (14.0 - 14.2) = - 0.2 | 0.04 |
| 4 | 0.30 | (13.0 - 14.2) = - 1.2 | 1.44 |

Variance then weights each squared deviation by its probability, giving us the following calculation:  
  
(0.1)\*(3.24) + (0.3)\*(0.64) + (0.3)\*(0.04) + (0.3)\*(1.44) = 0.96

**The** [**Capital Asset Pricing Model**](http://www.investopedia.com/terms/c/capm.asp) **(CAPM)**

Pronounced as though it were spelled "cap-m," this model was originally developed in 1952 by Harry Markowitz and fine-tuned over a decade later by others, including [William Sharpe](http://www.investopedia.com/terms/w/william-f-sharpe.asp). The [capital asset pricing model](http://www.investopedia.com/terms/c/capm.asp) (CAPM) describes the relationship between risk and expected return, and it serves as a model for the pricing of risky securities.  
  
CAPM says that the expected return of a security or a portfolio equals the rate on a [risk-free security](http://www.investopedia.com/terms/r/riskfreeasset.asp) plus a risk premium. If this expected return does not meet or beat our required return, the investment should not be undertaken.  
  
The commonly used formula to describe the CAPM relationship is as follows:

|  |
| --- |
| Required (or expected) Return = [RF Rate](http://www.investopedia.com/terms/r/risk-freerate.asp) + (Market Return - [RF Rate](http://www.investopedia.com/terms/r/risk-freerate.asp))\*[Beta](http://www.investopedia.com/terms/b/beta.asp) |

CAPM Equation: kj = krf + β (km – krf)

Kj = Required return on security j;

krf = Risk free rate of interest;

β = Beta of security j;

Km = Return on the market index

For example, let's say that the current risk free-rate is 5%, and the [S&P 500](http://www.investopedia.com/terms/s/sp500.asp) is expected to return to 12% next year. You are interested in determining the return that Joe's Oyster Bar Inc (JOB) will have next year. You have determined that the stock's [beta](http://www.investopedia.com/terms/b/beta.asp) value is 1.9. The overall stock market has a beta of 1.0, so JOB's beta of 1.9 tells us that it carries more risk than the overall market; this extra risk means that we should expect a higher potential return than the 12% of the S&P 500. We can calculate this as the following:

|  |  |
| --- | --- |
| Required (or expected) Return = | 5% + (12% - 5%)\*1.9 |
| Required (or expected) Return = | 18.3% |

What CAPM tells us is that Joe's Oyster Bar has a required rate of return of 18.3%. So, if you invest in JOB, you should be getting at least 18.3% return on your investment. If you don't think that JOB will produce those kinds of returns, then you should consider investing in a different company.  
  
It is important to remember that high-beta shares usually give the highest returns. Over a long period of time, however, high beta shares are the worst performers during market declines.