MODERN PORTFOLIO THEORY

1. *Modern Portfolio Theory*

- **Background**
  - The Primary principle upon which Modern Portfolio Theory is based (MPT) is the RANDOM WALK HYPOTHESIS which sates that the movement of asset prices follows an Unpredictable path: the path as a TREND that is based on the long-run nominal growth of corporate earnings per share, but fluctuations around the trend are random. There are 3 Forms of the Hypothesis:
    - *Weak Form*: Security Prices reflect ALL information about price & trading behavior in the market. Thus, analyzing the security's or market's data contains NO information that enables predictions on future price to be made. Thus, CHARTING & TECHNICAL ANALYSIS do NOT Work
    - *Semi-strong Form:* The Markets react quickly to new public information, whether it relates to trading activity (weak form) or fundamental earnings. Studying historical information, thus, is not too relevant and won't enable superior results..
    - *Strong Form:* All relevant information knowable about a company is already imbedded in the price of a security Only new information produces systematic (non-random) price changes. Since new information enters the marketplace randomly, asset price movements are random.
- **Efficient Pricing Structure**
  - The EFFICIENT MARKET THEORY states that asset prices are set in the market by the MARGINAL Buyer & Seller. These buyers & sellers are motivated by various factors; both rational & irrational. The market is not efficient in the sense that it prices securities correctly, but it is efficient in the sense that the market is a reasonable speculation. Efficiency means there is even odds on winning or losing.
- **Return as a Random Variable**
  - When Security prices are determined within an efficient market structure, a PROBABILITY DISTRIBUTION can be used to describe them. If the normal probability distribution is assumed as an appropriate description of the return function, then one needs to know 2 parameters
    - Expected Return: the return around which the probability distribution is centered; the expected value or mean of the probability distribution of returns
    - Standard Deviation: The parameter which describes the width & shape of the distribution of possible returns
  - *Measuring Risk*: Risk exists when more than one outcome is possible from an investment. It can be defined as the probability that the ACTUAL RETURN will be SIGNIFICANTLY DIFFERENT from the EXPECTED RETURN. With small standard deviations, there is little chance that the actual return will be significantly different from the expected return. With large standard deviations, there is a good chance that the actual return will be significantly different from the expected return. The SOURCES of Risk are Business risk, financial risk, Liquidity risk, and exchange rate/country risk (for foreign stocks). The Variance and Standard Deviations of Returns are MEASURES of Risk. In reality, the distribution of returns is probably NOT NORMAL (probably log-normal, and

should be stated on a continuously compounded basis rather than on annualized compounded basis)

- **Alternative Definitions of Risk**
  - While σ is used mostly in the CFA, there are other ways to Measure Risk
    - The RANGE of Returns, which is naïve as only extreme values are considered
    - The SEMI-VARIANCE of returns, which is the variance of ONLY those returns below zero (or some min. target return)
    - RELATIVE LOWER PARTIAL MOMENTS of the 2nd Order or higher. These count only the probability that an asset's return will fall BELOW some benchmark return as a risk event and penalize Large return shortfalls from the benchmark return proportionately more than small return shortfalls
- **Alternative Measures of Investment Risk**
  - σ is the conventional way of measuring risk. But there are several problems with this measure
    - Variance Measures UNCERTAINTY, but that is not the same thing as risk. For example, if 2 investments have the same level of variance, however one has a variance that is always significantly above the expected return (positive bias), then that should not be considered as risky as the equally variable security that's returns vary equally around the expected return.
    - Variance is a SQUARED TERM. Thus, it treats any deviation above the mean return as being as risky as any deviation below the mean return. This says that Outperforming the expected return is just as risky as under-performing it
    - Using variance as a measure of risk is only applicable to distributions that are NORMAL. When distributions are SKEWED, more parameters should be used. Whenever a portfolio contains options, it's returns will be skewed
    - For Variance to be a meaningful measure of risk, it must be assumed that the distributions of returns is STATIONARY, meaning that the mean & variance of the returns remain constant over time. This is not probable
  - Due to these shortcomings MARKOWITZ suggested that the variance not be used to measure the risk of a portfolio. He suggested SEMI-VARIANCE be employed. But, when he wrote his seminal work, computing was not available, so he ASSUMED investment returns were normally distributed and that variance could be used as the measure of risk. But, this is not realistic today.
- **Characteristics of a Good Measure of Investment Risk**
  - Should Define Risk as the PROBABILITY of Producing a Return that is LESS than SOME Minimum Objective which the investor wishes to obtain. Variance does not do this. Variance measure doing differently from expected → different can be better OR worse, and the expected return could be higher or lower than the investor's minimum objective
  - Should assess both the PROBABILITY that the actual return will be less than the min. return objective and also the SEVERITY of the Shortfall (like insurance risk: Frequency & Severity)

- Should recognize that Investors are RISK AVERSE. Thus, their utility functions are NTO linear, they are quadratic or logarithmic. (investors are not twice as unhappy to lose 20% as 10%; probably 4 times as unhappy)

- **Devising a Good Measure of Investment Risk**
  - The FIRST Criterion of a good measure of investment risk is that it should be a RELATIVE measure of risk (i.e., it should define risk as the probability that a portfolio's return will fall below some BENCHMARK RETURN R_B. This Benchmark return is the minimum return objective of the investor. Some possible Benchmarks include →
    - $R_B = 0$. Risk is when a portfolio's return is zero or less.
    - $R_B = I$. Risk that the portfolio will grow as fast as inflation. If not, the investor loses purchasing power & wealth
    - $R_B = R_M$. Risk that the portfolio under-performs the Market
    - $R_B = R_{\text{Avg. Portfolio Manager}}$. Risk of under-performing peers
    - R_B = Actuarial Assumptions (like Pensions & Insurance)
  - When Risk is Defined that the Portfolio's Actual Return (R_P) will fall below the Benchmark (R_B), There are a few ways to QUANTIFY that risk in a Single Summary Measure
    - **VAR** – Value At Risk Analysis. When disaster strikes, what's the most that can be lost. (but, this measure does not consider the probability of the worst possible outcome)
    - **Relative First Order Lower Partial Moment** – measures the expected shortfall below the Benchmark.

      $$RLPM_1 = \Sigma(R_P - R_B) * P(R_P - R_B)$$

      This works for both normal & non-normal distributions. But, it does assume that the investor utility functions are linear, rather than quadratic or logarithmic.
    - **Relative Semivariance** – aka the RELATIVE SECOND-ORDER LOWER PARTIAL MOMENT. This formulation measures risk as a shortfall from the benchmark return with ONLY UNDERPERFORMANCE being construed as Risk and this causes the disutility of the portfolio to rise with the square of the shortfall

      $$RLPB_2 = \Sigma(R_P - R_B)^2 * P(R_P - R_B)$$

      Note: only use for levels of R_P where ($R_P - R_B \leq 0$)

      Van Harlow's Study comparing stock/bond portfolios generated using this measure of risk shows that this measure of risk produces Allocations that are slightly more concentrated in bonds than portfolios constructed in the traditional manner. Thus, conventionally generated portfolios seem to have more built-in risk than assumed, and in times of crises, perform worse than expected.
    - **Higher Order Relative Lower Partial Moments** – These may produce even better results than relative semivariance. This is because relative semivariance measures assume that investor utility functions are quadratic. But, there are some indications that Investor Utility functions are not:
      - A quadratic utility function implies that the second derivative of the utility function will always be negative. This means wealthier

investors prefer less risk than poor investors. This has not been proved empirically.

- Some empirical evidence show investor utility functions are DISCONTINUOUS; i.e., risk aversion increases sharply & discontinuously at retirement.
- If the utility function is NOT quadratic, the relative semivariance risk measure might be too simplistic. Perhaps a skewed distribution can be described using MEAN, VARIANCE, & SKEWNESS (which is the 3rd Moment).
- RELATIVE SEMISKEWNESS → RELATIVE 3rd-ORDER LOWER PARITAL MOMENT
  $RLPM_3 = \Sigma(R_P - R_B)^3 * P(R_P - R_B)$
  Note: only use for levels of R_P where $(R_P - R_B \leq 0)$
  This measure of Risk is similar to semivariance, but it makes adverse outcomes even more unfavorable (due to the cubing).
- In addition to being Skewed, return distributions could be PLATYKURTIC or LEPTOKURTIC or MESOKURTIC (appear symmetrical and normal, but not).
- When try to use Relative 4th Order Lower Partial Moment, will find it almost impossible to achieve an Optimal Portfolio Mix

- **Non-Constant Benchmark Returns**
  - In the above analysis, R_B, was assumed to be constant. But, benchmark returns are usually dynamic. But, when R_B is fluid, the modeling process becomes more complex because both R_P & R_B would be probability distributions. May need to use Money Carlo methods to perform the analysis.

2. *Portfolio Construction*

- **Basics**
  - For a 2 Asset Portfolio, use Weightings

$R_P = w_1R_1 + w_2R_2$

$\sigma^2_P = w_1\sigma^2_1 + w_2\sigma^2_2 + 2w_1w_2COV_{1,2}$

$COV_{1,2} = r_{1,2}\sigma_1\sigma_2$

$\sigma^2_P = w^2_1\sigma^2_1 + w^2_2\sigma^2_2 + 2w_1w_2r_{1,2}\sigma_1\sigma_2$

$r_{1,2}$ = correlation coefficient

For Example:

ASSET	R	σ	w
1	10%	+/- 20%	50%
2	10	+/- 20	50

WHEN RATES of RETURN on the 2 Assets are UNCORRELATED ($r_{1,2} = 0$)

$R_P = (.5)(.10) + (.5)(.10) = 10\%$

$\sigma^2_P = (.25)(400) + (.25)(400) + 0 = 200$

$\sigma_P = +/- 14.1\%$

Notice, the individual assets have Standard Deviations of 20%, but the Portfolio has a Standard Deviation of 14.1%, yet the Expected Return has not been effected. Thus, Diversification of Uncorrelated Assets REDUCES RISK and IMPROVES the Return:Risk Ratio

WHEN RATES of RETURN on the 2 Assets are PERFECTLY CORRELATED ($r_{1,2} = 1$)

$R_P = (.5)(.10) + (.5)(.10) = 10\%$

$\sigma^2_P = (.25)(400) + (.25)(400) + (2)(.5)(.5)(1)(20)(20) = 400$

$\sigma_P = +/- 20\%$

Diversification does NOT improve the Return:Risk Ratio if the combines assets have perfectly correlated returns

WHEN RATES of RETURN on the 2 Assets are PERFECTLY NEGATIVELY CORRELATED → Hedged ($r_{1,2}$=-1)

$R_P = (.5)(.10) + (.5)(.10) = 10\%$

$\sigma^2_P = (.25)(400) + (.25)(400) + (2)(.5)(.5)-(1)(20)(20) = 0$

Risk is thus minimized and perfectly hedged.

- **The General Case of N Assets**

  THREE ASSETS

  $R_P = w_1R_1 + w_2R_2 + w_3R_3$

  $\sigma^2_P = w^2_1\sigma^2_1 + w^2_2\sigma^2_2 + w^2_3\sigma^2_3 + 2w_1w_2COV_{1,2} + 2w_1w_3COV_{1,3} + 2w_2w_3COV_{2,3}$

  FOUR ASSETS

  $R_P = w_1R_1 + w_2R_2 + w_3R_3 + w_4R_4$

  $\sigma^2_P = w^2_1\sigma^2_1 + w^2_2\sigma^2_2 + w^2_3\sigma^2_3 + w^2_4\sigma^2_4 + 2w_1w_2COV_{1,2} + 2w_1w_3COV_{1,3} + 2w_1w_4COV_{1,4} + 2w_2w_3COV_{2,3} + 2w_2w_4COV_{2,4} + 2w_3w_4COV_{3,4}$

  Thus, for any n-asset portfolio, as long as know the following parameters, one can derive the risk/return characteristics

  R_A, σ_A $COV_{A,I}$ or $r_{A,i}$. With N Assets, there are N(N-1)/2 such pairs, and the weightings of the portfolio

- **Combining Risky Assets with a Risk-free Asset**
  - If a Risky Asset is combined with a risk-free asset, the following return/variance relationships will exist:

    $R_P = R_F + [(R_R-R_F)/\sigma_R]\sigma_P$

    Where R_P = Return of the Portfolio

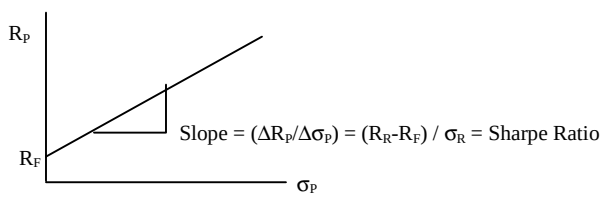
    σ_P = Standard Deviation of the Portfolio

    R_R = Return on the Risky Asset

    σ_R = Standard Deviation of the Risky Asset

    R_F = Return on the Risk-free Asset

    σ_F = Standard Deviation of the Risk-free Asset



    Note the Trade-off between RETURN & RISK of this relationship is the Slope of the Line. This is Called the **SHARPE RATIO (S)**. It is a Measure of the Risk Adjusted Return

    $S = (\Delta R_P / \Delta\sigma_P) = (R_R - R_F) / \sigma_R$

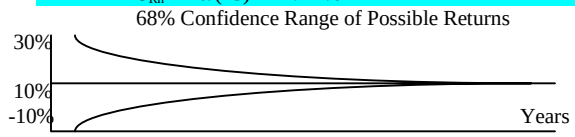
- **Multi-period Risk: The Importance of the Time Horizon**
  - The risk (σ) associated with the AVERAGE annual rate of return on an asset DECREASES with the Square Root of time

    $\sigma_{Rn} = \sigma_{R1} / (n)^{.5}$

    For Example: Suppose that a portfolio has an Expected Return of 10% with a σ of +/- 20% over a 1-year time horizon. Thus, in any year, the portfolio's actual return has a 68% possibility of being somewhere in the range of 10%+/-20%. But, when the time horizon is lengthened to 25 years, the AVERAGE Expected Return will remain 10% per year, but the σ will fall to only +/- 4% PER YEAR.

    $\sigma_{Rn} = 20/(25)^{.5} = +/- 4\%$

    68% Confidence Range of Possible Returns

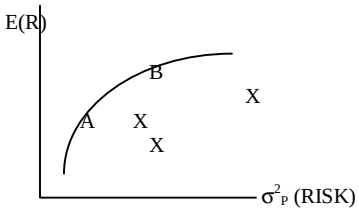


- This is the LAW of AVERAGES or the LAW of LARGE NUMBERS. In any one year, actual results may vary considerably from what is expected, but over time, on average, results are likely to be closer to expectations (lower σ) than in any one period. So, as the time horizon approaches very large values, the actual average return approaches the expected average return.
- However, the risk Does NOT necessarily DECRASE with the square root of an investor's time horizon because →
    - The σ that is reduced by the square root of time is that of the portfolio's PER YEAR AVERAGE RATE of RETURN, rather than that of ENDING WEALTH. If positive returns are reinvested, then even a smaller σ in any one year could mean dramatic losses.
        - Risk, defined as the probability of LOSING Money (from the original investment) does decrease as the time horizon expands
        - But, if risk is defined s generating a result that is reasonably close to what was expected, risk does NOT decrease by investing over a long time horizon. Over 25 years, worst-case, it could be only 13.5% of its expected value.
        - This shows a potential conflict between Investors & Mangers: Managers base their performance over time on the average rate of return they have generated and the variance of that return. This leads them to invest in more risky assets as the time horizon increases because this should provide a larger return:risk ratio. But, for a client interested primarily in obtaining a certain portfolio value at the end of a time horizon, investing in risky assets increases the uncertainty of what the dollar value of the portfolio will be at the end of the time horizon. Thus, as to which asset mix is best, most investors purchase a mix of assets in an attempt to obtain a reasonably high expected ending portfolio value with reasonable certainty
    - Another problem in the theory that the Average Expected Return is Attainable with GREATER certainty as the time horizon is that it requires the EXPECTED RETURN to REMAIN CONSTANT over the ENTIRE TIME HORIZON. If this assumption does not hold, then there is no average expected return toward which to gravitate over time.
    - STANDARD DEVIATION (risk) of the Portfolio is assumed to be Kept CONSTANT over the time horizon. If this is not true, then the theory does not hold
- CONCLUSION: if Risk is defined as how close one's ending wealth will come to what is expected based upon expected return and risk, then investing for longer time periods will NOT reduce this risk that is inherent in risky assets (time diversification does NOT work): This conclusion is valid under the following conditions
    - Risky Asset Returns are Randomly Distributed
    - Investor's Wealth depends ONLY on Investment results
    - Willingness to Accept Risk is NOT a function of their Wealth.

- Despite Problems with the THEORY that suggests risk cannot be reduced over time, there are some VALID Reasons for being more willing to invest in risky assets when the investment time horizon is LONG (as opposed to short) →
  - If returns are NOT random from year-to-year, but rather they tend to revert to some Mean value, and the Investor is MORE AVERSE to Risk than the degree of Risk Aversion that is implied in a Utility function based on the logarithm of wealth, then RISKIER ASSETS will tend to be chosen as the time horizon lengthens.
  - If factors that would cause the risky asset to produce a terminal value that is close to the lower end of its confidence range also cause the riskless asset to do poorly, then RISKIER assets can be chosen as the time horizon increases.
  - Investor can make adjustments in long-term time frames that can not be made in shorter-term time frames.
  - If the utility function of the investor is discontinuous
  - The investor is Irrational

- **Cross-Sectional Asset Diversification**
  - The Same argument that applies for Time Diversification also applies to Diversification ACROSS assets, if increased diversification requires a commensurate increase in invested capital. (?)

- **The Markowitz (Mean-Variance) Efficient Frontier**



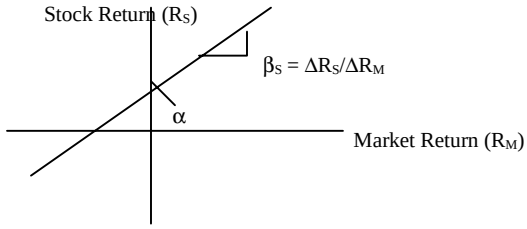
  - All Points lying on the EFFICIENT FRONTIER (such as A & B) offer the highest Expected Return relative to all other portfolios of comparable risk. Portfolios that lie on the efficient frontier are superior to portfolios located inside the frontier because they have higher risk:return ratios.
  - Single Asset Portfolios lie will within the efficient frontier because they have high levels of Market & Specific Risk. Multi-asset Portfolios lie closer to the efficient frontier because diversification causes their specific risk to be reduced by the law of large numbers. Ultimately, portfolios lying on the Efficient Frontier will be those whose specific risks have been eliminated by diversification: they are the efficiently diversified portfolios
  - The OBJECTIVE of Portfolio Management is to find the OPTIMAL portfolio for an investor. These Portfolios share 2 Characteristics→
    - LIES on the EFFICIENT FRONTIER
    - Possess Only So Much RISK as the CLIENT is Willing to Assume
  - The Slope of the Efficient Frontier at any point depicts how much extra expected return is obtained by taking some more risk. This is called the Return/Risk Trade-off. Return/Risk Tradeoff = $\Delta R_P / \Delta \sigma_P$
  - The amount of Satisfaction that an investor obtains from his investment can be depicted by a Series of INDIFFERENCE CURVES

- The Optimum Portfolio for any investor is one that lies on the Efficient Frontier at the point of Tangency with that indifference curve that represents the highest possible utility for the investor. This point of tangency occurs where the investor's risk-aversion factor (A) equals the slope of the return/risk tradeoff ratio of the efficient frontier

  $A = \Delta R_P / \Delta\sigma_P$
- The More risk-averse an investor is, the lower will be the optimal portfolio on the return/risk spectrum defined by the efficient frontier

o ***β as a Measure of Relative Risk***

- Measuring Risk by the variance of the portfolio returns is cumbersome. It is simpler to regress the percentage price changes of stocks against corresponding percentage price fluctuation in the market index. Ignoring dividends, the resulting regression is called the CHARACTERISTIC Line of the Stock



- Three Parameters of the Characteristic Line are vital
  - *Alpha (α)* – The value of R_S that is associated with a market return (R_M) of zero. This is the expected return of the stock when the market does not change. Sometimes, this is the UNSYSTEMATIC (or Specific) RETURN.
  - *Beta (β)* – The β of the stock is the Slope of its Characteristic Line. It measures the degree to which the return of the stock is likely to change for every percent change in the return on the market. It is sometimes known as the SYSTEMATIC (or market) RETURN

    $\beta_S = COV_{S,M} / \sigma^2_M = (\sigma_S\sigma_M r_{S,M}) / \sigma^2_M$
  - *Standard Error of Estimate (σ_{SM})* – This measures the degree to which the characteristic line does NOT determine the performance of the stock relative to the market. It measures the stock's SPECIFIC RISK
  - The Variance of the Returns of a Stock measures the Stock's Risk. From the Characteristic Line regression analysis

    $\sigma^2_S = \beta^2_S\sigma^2_M + \sigma^2_{SM}$

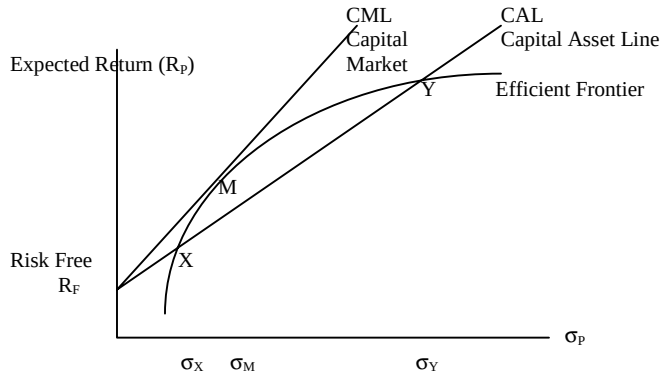
    Systematic Unsystematic

    Total Risk consists of Systematic (Market) and Unsystematic (Specific) Risk
- Portfolios can be Analyzed like stocks. Thus, Portfolios also have betas. The β of a Portfolio is comprised of the weighted average of the Betas of the Individual Stocks in the Portfolio

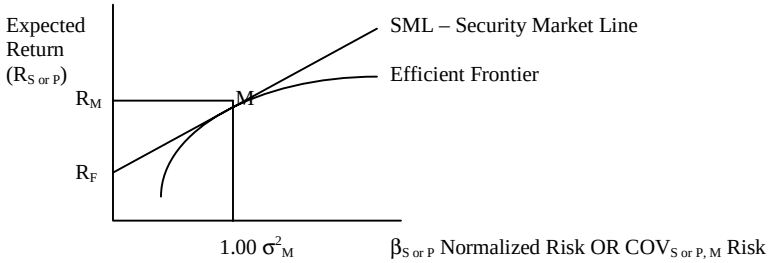
  $\beta_P = \Sigma w_S\beta_S = w_1\beta_1 + w_2\beta_2 + \ldots + w_n\beta_n$

- For Large Portfolios, the law of large numbers can be relied upon to Reduce Specific Risk. In the limit, as N approaches infinity, this term tends toward zero. So, a well-diversified Portfolio will have NO Specific Risk; just Systematic (Market) Risk
  $\sigma^2_{PM} = (\Sigma\sigma^2_{SM}) / N$
- For uncorrelated securities, a portfolio with as few as 30-40 stocks can reduce about 70-90% of the Unsystematic Risk

- **The Capital Asset Pricing Model (CAPM)**
  - The Efficient Frontier depicts the Return-Risk relationship for portfolios consisting of Risky Assets. But, there is an alternative to investing in risky assets: it is to invest in a riskless asset that has no standard deviation.

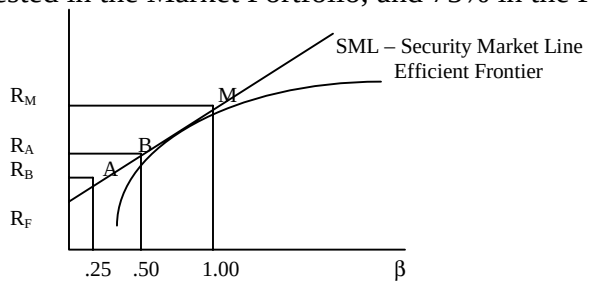


  - The CAPITAL ASSET LINE cuts the efficient frontier in 2 places, X & Y. Thus, the CAL represents combinations of portfolios comprised of various mixes of the risk-free portfolio, X & Y. Any Portfolio that lies on this particular Capital Asset Line has the Same SHARPE RATIO. The Steeper the CAL, the better the portfolios (return – variance ratio) that lie on it
    Slope of CAL = Sharpe Ratio = $[(R_X-R_F)/\sigma_X] = [(R_Y-R_F)/\sigma_Y]$ etc.
  - The most efficient portfolio is the one that is just tangent to the efficient frontier. This is the Market Portfolio line and is the CAPITAL MARKET LINE
    $R_P = R_F + [(R_M-R_F)/\sigma_M]\sigma_P$
  - The Expected Return of any portfolio which lies on the CML can be calculated from this relationship. As the Market Portfolio (M) is a completely diversified portfolio, it must have only SYSTEMATIC RISK. Plus, all portfolios on the CML are perfectly correlated with Portfolio M since they all have only Systematic Risk.
  - The General Form of the CAPM is:
    $R_P = R_F + [(R_M-R_F)/\sigma^2_M]COV_{PM}$
  - The SECURITY MARKET LINE is based on CAPM and is written as:
    $R_{S\ or\ P} = R_F + \beta_{S\ or\ P}(R_M - R_F)$



- The CML and SML are similar, yet different concepts. The CML is the relationship between Required Returns on EFFICIENT Portfolios (R_P) and their Total Risk (σ_P). The SML is the relationship between the Expected Returns on INDIVIDUAL Securities or Portfolios ($R_{S\ or\ P}$) and their risk as measured by their Covariance with the Market Portfolio ($COV_{S\ or\ P,\ M}$) OR their Normalized risked relative to the Market as measured by their Betas ($\beta_{S\ or\ P}$). All Fairly priced assets and portfolios should lie on the SML, ONLY efficient portfolios lie on the CML
- The Linear relationship between the Expected or Required Return and Risk is called the CAPM. It is a Specific form of a general class of models called Risk Premium Models that relate return to risk

- **Theoretical Justification for the Indexing Strategy**
  - All points along the SML represent combinations of the Risk-free asset and the Market Portfolio (M) with the β combination being equal to the Percentage of Total funds invested in the Market Portfolio. When β = 1.00, 100% of the Assets will be invested in the Market Portfolio. When β = 0.25, 25% of the Assets will be invested in the Market Portfolio, and 75% in the Risk-free asset.



  - ALL Points along the SML represent more efficient portfolios than those that lie on the Efficient Frontier because the SML has a better Return/Risk Relation than the Efficient Frontier
  - ALL Points along the SML represent combinations of only 2 Portfolios: The Market (M) and the Risk-free asset (R_F). The β (risk) of the combination portfolio ALWAYS equals the percentage of the total funds invested in the market portfolio
  - Thus, Investors can optimize their return/risk ratio simply by:
    - Choosing an ACCEPTABLE Risk Level, measured by β
    - Investing that percentage of their total assets in the Market Portfolio, and the remainder in the Risk-free asset
  - Thus, the Optimal Portfolio need not require individual asset selection. A passive strategy of investing in the market portfolio is OPTIMAL. Individual Risk Constraints may be adhered to by simply investing that portion of total wealth in the market portfolio that corresponds to the investor's desired β (comfort) level. This concept is called the MUTUAL FUND THEORY and is the theoretical justification for using the passive equity strategy known as indexing.
  - Note: The SML depicts the relationship between Return & Risk such that:
    - Movement along the SML depicts how changes in the Risk of a Security (β) affects fair return
    - A changing slope of the SML ($R_M – R_F$) depicts a change in Investor Attitude Toward Risk.

- A Parallel Shift in the entire SML depicts a change in the nominal risk-free rate, either because of a change in the expected rate of inflation or a change in the real interest rate (due to changes in monetary of fiscal policies)

- **Practical Uses of the CAPM**
  - ***Controlling Portfolio Risk***

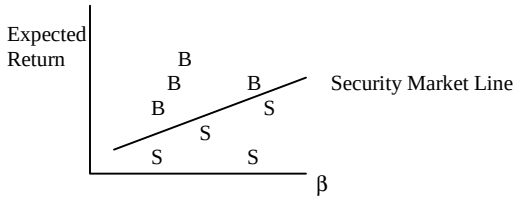
    For Example: Suppose the Risk Free rate is 5% and the Stock market could decline as much as 30%. An Investor does not want to Risk more than a 10% loss. What Portfolio β should the Investor Accept?

    $R_P = R_F + (R_M - R_F)\beta_P$

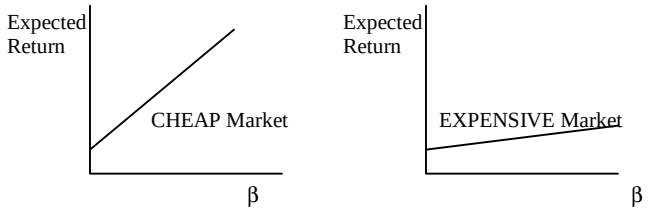
    $-10 = 5 + (-30 - 5)\beta_P$

    $\beta_P = .43$

    The Ideal β for the investor is .43 which means he should invest 43% of his wealth in the market portfolio and 57% in the Risk Free Asset.
  - ***Security Analysis***
    - It is possible to determine via conventional analysis (DDM) the Expected Return on Individual Stocks and relate these returns to the individual stock betas. A Regression of Expected Returns on Stock Betas produces a SML. Stocks which plot above the SML are those with above-average expected return given their β and thus attractive purchase candidates; stocks below that plot are Sell candidates
    - In a perfectly efficient market, all stocks and all efficient portfolios should plot on the SML.



  - ***Market Timing***
    - A Steep SML indicates that a large incremental return can be earned in the market by increasing risk by a small amount. Such a Market may be excessively Risk Averse and, ergo, Cheap. A Flat SML indicates that there is little incremental return in the market for taking risk, and ergo, the market is ignoring risk. Such a market may be overvalued.



  - ***Performance Measurement***
    - Modern Portfolio Theory leads to some interesting conclusions regarding portfolio performance objectives.
      - Outperforming the Market is NOT a Valid Performance Objective since to do so would require investing in a risky, high-beta portfolio. Such a portfolio would do badly in a bear market.
      - If the Market is Efficient, it is unrealistic to expect a portfolio manager to predict bull and bear markets well enough to shift the

portfolio betas, sufficiently, and at low enough costs to produce superior results through market timing
- Few managers using conventional stock selection techniques can be expected to select the portfolios that lie on the efficient frontier
- To outperform the market, risk has to be employed, either by leveraging the market portfolio or by investing in very risky, high beta assets. Most investors probably view such risks as unacceptable

- **Assumptions Behind CAPM**
  - Essential Conclusions of CAPM:
    - Return is Linearly Related to Systematic Risk
    - The Market does not Pay for Accepting UNSYSTEMATIC Risk, since such risk can be avoided by the simple process of diversification
    - β is a measure of Systematic Risk and that optimal portfolios may be constructed by varying the mix between a risk-free asset & the market portfolio (questionable due to modern studies)
  - Basic ASSUMPTIONS (in order for CAPM to work) --> 1-5 deal with Market Efficiency, 6-8 deal with CAPM
    - All investors Attempt to find an optimum portfolio on the Efficient Frontier so as to MAXIMIZE the UTILITY of their Wealth rather than to MAXIMIZE their WEALTH (itself). Investors are Risk Averse.
    - Information is FREELY & SIMULTANEOUSLY Available to ALL Investors. Their expectations regarding important economic variables are unbiased in accordance with the Economic Theory of RATIONAL EXPECTATIONS. (interest rates are Normally distributed around the anticipated interest rate level --> i.e., they overestimate as often as underestimate future inflation levels)
    - Investor Expectations are HOMOGENOUS (same as Risk Aversion Factor). All investors have the same expectations regarding the Expected Return and Risk of All Assets. Assumes the probability distribution of asset returns is normally distributed.
    - All Investors have an IDENTICAL TIME HORIZON. This is required in order to have a unique Risk-free rate (unless the yield curve is flat)
    - Capital Markets are in EQUILIBRIUM so that all assets are Properly priced with respect to their risks
    - Investors can BORROW (and Invest) at the RISK-FREE RATE (else the Market line becomes kinked (non-linear) for investor who want portfolio betas greater than 1.0)
    - There are NO TAXES, TRANSACTION COSTS, or SHORT SALE RESTRICTIONS.
    - Total Asset QUANTITY is FIXED and ALL ASSETS are Fully Marketable and Divisible. (means the liquidity of an asset can be ignored as an independent factor in determining the desirability of the asset)

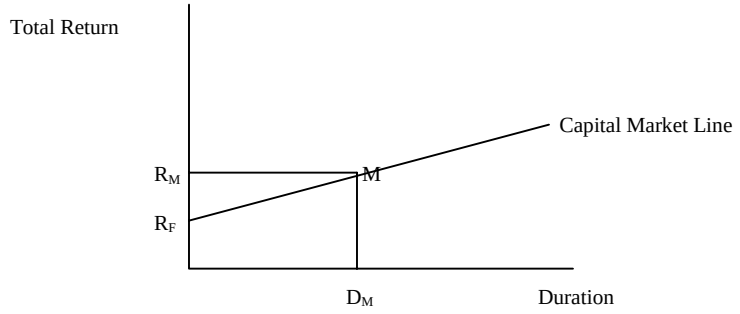
- **Problems with CAPM**
  - ***What is the Market Portfolio?***
    - The β of an asset is measured by regressing its returns on the returns of a market index; but what is the proper market portfolio index? Depending on which index is used (S&P 500, Wilshire 5000, Valueline), the Betas are significantly different. Thus, since the true market portfolio is unknown, one cannot determine the proper beta for an asset, and the SML cannot be determined. This leads to BENCHMARK ERROR since the CAPM valuation benchmark will mis-price securities & portfolios
  - ***What is the Risk-free Asset?***
    - The CAPM concludes that the market line on which all assets should plot in the return/risk plane should be linear, with the intercept equal to the risk-free rate and sloping so that it passes through the market return when beta equal one. But, empirical evidence shows that the actual market line has an intercept that is HIGHER than the risk-free rate, and whose slope is flatter than it theoretically should be.
    - Fisher Black has hypothesized that NO investment is really risk free as there is always some uncertainty about inflation and interest rates. Therefore, he proposes that the risk-free asset in CAPM be replaced with a PORTFOLIO whose β is ZERO.
  - ***Are Investment Returns Normally Distributed?***
    - If investment returns are SKEWED rather than being normally distributed, it is possible that low-beta stocks may appear undervalued, relative to CAPM, and high-beta stocks appear overvalued. This is what the empirical evidence shows
  - ***The Stability of β***
    - In order for CAPM to be useful, the β of an asset or portfolio must be stable or predictable. According to the empirical testing:
      - The Value of β is affected by the period of time over which it is measured (different β if measure over 5 years or 10 years). Since there is no reason to accept one measurement period over another, the validity of the β Value is brought into question
      - β changes when the interval of the measurement changes (daily, weekly, monthly, yearly, etc.) Using short intervals caused betas of large firms to be larger than the betas of small firms relative to those computed over longer periods. Thus, which is better?
      - β seems to be affected by the type of market model used to measure it.
        $R_S = \alpha + \beta R_M \neq (R_S - R_F) = \alpha + \beta(R_M - R_F)$
      - Betas measured by different firms are different due to their use of different methods, indexes, time intervals, time periods, etc. Studies have not been able to find significant correlations between the Betas published by different firms.
      - Betas do not seem to be stable over time. This makes them unpredictable. As the β is assumed to be constant in the CAPM, the model becomes useless when the β is a random variable. But

studies show Portfolio Betas are more stable than Betas of Individual Stocks. Plus, the Stability of β increases as the length of the period over which it is estimated increases

- The future Betas do not seem to be the same as Historical Betas. This makes CAPM impractical for making predictions
- Most attempts to predict the future beta of assets based on fundamentals have met with only modest success.

- ***β as a Predictor of Future Performance***
  - CAPM indicates that the ratio of excess return on an asset over the risk-free rate to the excess return on the market portfolio should be directly proportional to its beta. But studies show that small firms and firms with low P/E ratios tend to out-perform the market, even on a risk-adjusted basis. FAMA & FRENCH research found no statistical relationship between beta and the relative performance of the excess returns on stocks.
- Hence, many conclude that CAPM is not a good model upon which to make portfolio decisions, Thus there has been a search for an improved portfolio model.

- **"International Value & Growth Stock Returns" by Capaul, Rowley & Sharpe**
  - Based on a Study of Stocks selling at LOW Price/Book Value ratios (value stocks) and stocks selling at HIGH Price/Book Value ratios (Growth Stocks) over the 1981-1992 period in 6 different national markets.
  - Value Stocks outperform Growth Stocks on both ABSOLUTE & Risk-Adjusted Basis (Sharpe Ratio).
  - The difference in performance was statistically significant on a global basis, though not necessarily significant in each individual country studied separately.
  - The Superior Performance of the VALUE stocks was NOT related to the β of the stocks: usually, the Value stocks had lower Betas yet they produce superior returns
- **Application of Modern Portfolio Theory to Bonds**
  - If the bond market is efficient, then credit risk can be eliminated by Diversification. However, interest rate risk is analogous to Market Risk for Equities. For bonds, the level of interest rates is a proxy for the market.
  - Duration: Bonds = β:Stocks
  - One can construct SML for bonds like stocks by relating expected returns to Duration (Risk). In the US, Lehman Brothers Index is used as a proxy for the Bond Market Portfolio. The Risk free Rate is the T-Bill rate
  - The Duration of the Market Portfolio is NOT 1.0 (like β), it is an actual number, such as 7.27 years.



- CAPM relates risk to volatility of an asset in a market (beta for stocks, duration for bonds). The ARBITRAGE PRICING MODEL provides for the possibility of using several measures of RISK; For bonds, these include:
  - Risks associated with the general movement of interest rates (duration)
  - Uncertainties surrounding twists in the yield curve (IMMUNIZAION or STOCHASTIC Process Risk)
  - Credit Risk between Market Sectors (Macroeconomic Risk)
  - Individual Company Credit Risk (Specific Risk eliminate-able through Diversification)
- By altering exposure to these various risks, the portfolio manager alters both the overall risk and the expected return

- **Asset Allocation**
  - A portfolio is a collection of Assets. The purpose of construction portfolios using a variety of asset classes is to enhance their return/risk ratios through diversification
  - The asset allocation decision is vital. BRINSON, HOOD & BEEBOWER study found that 87% of the differential in portfolio performance can be explained by the differences in the weightings given to various asset classes
  - Steps needed to determine the Optimum Mix of Asset Classes in a Portfolio
    - Expected Return on Each Asset Class
    - Estimated Risk measured by the σ of the Rate of Return of Each Asset Class
    - Correlation between the Rates of Return of every pair of asset classes
    - Investment Objectives & Risk Constraints of the Investor
  - ***Estimating the Expected Rate of Return***
    - <u>Bonds</u>
      - The YTM available in the bond market is often deemed synonymous with the Expected Rate of Return of Bonds. This can be misleading. There are THREE Sources of Return on Bonds → COUPON Interest, Interest Earned on Re-invested Coupon income over the Bond's Holding Period, Change in PRICE of Bond
      - YTM is a good measure of the expected return for bonds ONLY if it is assumed that the re-investment rate applied to the coupon interest will be the same as this YTM. Instead, NEED to COMPUTE the HORIZON RETURN on Bonds over the Investor's Time Horizon, based upon assumptions regarding the future average reinvestment rate and the shape of the yield curve at the end of the holding period. Can try using Scenario Analysis and using probabilities to determine the EXPECTED Horizon Return
    - <u>Stocks</u>
      - *Historical Rate of Return* – rates earned in the past may be used as an estimate of future rates of return. This is not recommended.
      - *Dividend Discount Model* – Determine the IMPLIED Rate of Return on Stocks. This may be done for stocks as a general asset class. $r_{CE} = (D_{1\ S\&P} / P_{S\&P}) + g$

- *Security Market Line* – use DDM to calculate the expected return for a large number of representative individual stocks. These individual stock returns can be regressed against the betas of the respective stocks to determine the average relationship between expected return, and beta within the market as a whole.
- *Scenario Approach* – Can use in combination with either of the previous 2 methods if the parameters that comprise the model formulations are viewed as probability functions rather than point estimates

- ***Estimating Risk***
  - Usually use Historical Studies (though can use a Scenario Forecast)

RATE of RETURN 1926-1994

	Geometric Mean	**Arithmetic Mean**	**1-year σ**
Large Co. Stocks	10.2%	12.2%	20.3%
Small Co. Stocks	12.2	17.4	34.6
Long-term Corp. Bonds	5.4	5.7	8.4
Long-term Gov. Bonds	4.8	5.2	8.8
US T-Bills	3.7	3.7	3.3
CPI	3.1	3.2	4.6
Equity Risk Premium (stocks-bills)	6.5	8.5	20.3
Small Stock Premium (small stocks – stocks)	2.0	5.2	17.9
Default Premium (L/T Corp - L/T Gov.)	0.6	0.5	3.0
Horizon Premium (L/T Gov – Bills)	1.1	1.5	7.9

INFLATION ADJUSTED RETURNS

	Geometric Mean	**Arithmetic Mean**	**1-year σ**
Large Co. Stocks	6.9%	8.9%	20.5%
Small Co. Stocks	8.8	13.9	33.9
Long-term Corp. Bonds	2.2	2.7	9.8
Long-term Gov. Bonds	1.7	2.1	10.2
US T-Bills	0.5	0.6	4.2

  - The σ is the Measure of Risk for an Asset. This is the σ in the Rate of Return for a 1-year Holding Period. The estimated risk depends upon the Investment Time Horizon. To compute the risk over an N-Year Investment Time Horizon, use $\sigma_{Rn} = \sigma_{R1} / (n)^{.5}$. Ergo, if the average return on stocks is +/- 21.1% in any given year, over 10 years the risk would be $\sigma_{r\,10} = 21.1/(10)^{.5} = +/- 6.67\%$. However, this should NOT be interpreted to mean that the risk associated with the ENDING DOLLAR VALUE of a portfolio declines as the time horizon increases.

- ***Estimating Correlations***
  - Use a Correlation Matrix , which shows the correlation in the rates of returns between all pairs of asset classes. This is usually based on History; however, a Scenario Approach could be utilized

Serial & Cross-Correlations of Historical Returns between Asset Classes: 1926-1994

	Common Stock	Small Stocks	Corporate Bonds	Government Bonds	Treasury Bills	Inflation
Common Stocks	1.00					
Small Stocks	0.81	1.00				
Corp. Bonds	0.23	0.10	1.00			
Gov. Bonds	0.15	0.02	0.93	1.00		
T-Bills	-0.05	-0.10	0.21	0.24	1.00	
Inflation	-0.02	0.05	-0.15	-0.15	0.02	1.00
Serial Correlation	-0.01	0.09	0.18	0.08	0.27	0.64

Serial & Cross-Correlation of Inflation-Adjusted Historical Returns Between Asset Classes (1926-1994)

	Common Stock	Small Stocks	Corporate Bonds	Government Bonds	Treasury Bills	Inflation
Common Stocks	1.00					
Small Stocks	0.81	1.00				
Corp. Bonds	0.29	0.13	1.00			
Gov. Bonds	0.23	0.05	0.95	1.00		
T-Bills	0.10	-0.06	0.60	0.60	1.00	
Inflation	-0.22	-0.08	-0.58	-0.56	0.75	1.00
Serial Correlation	-0.02	0.06	0.27	0.15	0.66	0.64

- ***Determining the Expected Return & Risk of Portfolios***
  - The Basic Formulas for a 2 Asset Portfolio are

$$R_P = w_S R_S + w_B R_B$$
$$\sigma^2_P = w^2_S \sigma^2_S + w^2_B \sigma^2_B + 2 w_S w_B COV_{SB}$$
$$COV_{SB} = r_{SB} \sigma_S \sigma_B$$
$$\sigma_{Rn} = \sigma_{R1} / (n)^{.5}$$

  - The Risk *ƒ* indicates that a σ of a Portfolio's return depends not only on the standard deviations of the returns of the individual assets themselves, but also on how common factors affect them via the covariance of returns. If a common factor, like interest rates, affects all assets similarly, covariance rises and so will the portfolio risk

For Example: Assume the Following Facts for a Portfolio comprised of stocks & bonds:

	E(R)	σ (1-year)
Stocks	14%	20%
Bonds	8	6

$r_{SB} = 0.5 \rightarrow$ Correlation between the returns on stocks & bonds

Based upon this information, determine the Expected Return & Risk (σ) of various portfolios comprised of different mixes of these 2 asset classes. Show how the Risk of Various asset mixes would change as the investment horizon increases

Answer: Suppose a Portfolio is Constructed of 100% STOCKS & 0% BONDS.

$R_P = w_S R_S + w_B R_B = (1)(.14) + (0)(.08) = 14\%$

$\sigma^2_P = w^2_S \sigma^2_S + w^2_B \sigma^2_B + 2 w_S w_B r_{SB} \sigma_S \sigma_B = (1)^2(.2)^2 + (0)^2(.06)^2 + (2)(1)(0)(.5)(.2)(.06) = .04$

$\sigma_P = (.04)^{.5} = +/- 20\%$

If the Investment Horizon is 1 Year, the 68% Confidence Limits for the Expected Average per Year Return are

$R_P = E(R_P) +/- \sigma_P = 14\% +/- 20\%$

If the Investment Horizon is 5 years, the 68% Confidence Limits for the Expected Average per year Return are

$R_P = E(R_P) +/- [\sigma_{P1} / (n)^{.5}] = 14\% +/- [.20/(5)^{.5}] = 14\% +/- 8.9\%$

If the Investment Horizon is 10 Years, the 68% Confidence Limits for the Expected Average Per Year Return is

$R_P = E(R_P) +/- [\sigma_{P1} / (n)^{.5}] = 14\% +/- [.20/(10)^{.5}] = 14\% +/- 6.3\%$

Suppose the Portfolio is Constructed of 0% STOCKS and 100% Bonds:

$R_P = w_S R_S + w_B R_B = (0)(.14) + (1)(.08) = 8\%$

$\sigma^2_P = w^2_S\sigma^2_S + w^2_B\sigma^2_B + 2w_S w_B r_{SB}\sigma_S\sigma_B = (0)^2(.2)^2 + (1)^2(.06)^2 + (2)(0)(1)(.5)(.2)(.06) = .0036$

$\sigma_P = (.0036)^{.5} = +/- 6\%$

If the Investment Horizon is 1 Year, the 68% Confidence Limits for the Expected Average per year Return are

$R_P = E(R_P) +/- \sigma_P = 8\% +/- 6\%$

If the Investment Horizon is 5 Years, the 68% Confidence Limits for the Expected Average per year Returns are

$R_P = E(R_P) +/- [\sigma_{P1} / (n)^{.5}] = 8\% +/- [.06/(5)^{.5}] = 8\% +/- 2.7\%$

If the Investment Horizon is 10 Years, the 68% Confidence Limit for the Expected Average per year Return is

$R_P = E(R_P) +/- [\sigma_{P1} / (n)^{.5}] = 8\% +/- [.06/(10)^{.5}] = 8\% +/- 1.9\%$

Suppose the Portfolio is Constructed of 60% STOCKS and 40% Bonds:

$R_P = w_S R_S + w_B R_B = (.6)(.14) + (.4)(.08) = 11.6\%$

$\sigma^2_P = w^2_S\sigma^2_S + w^2_B\sigma^2_B + 2w_S w_B r_{SB}\sigma_S\sigma_B = (.6)^2(.2)^2 + (.4)^2(.06)^2 + (2)(.6)(.4)(.5)(.2)(.06) = .017856$

$\sigma_P = (.017856)^{.5} = +/- 13.4\%$

If the Investment Horizon is 1 Year, the 68% Confidence Limits for the Expected Average per year Return are

$R_P = E(R_P) +/- \sigma_P = 11.6\% +/- 13.4\%$

If the Investment Horizon is 5 Years, the 68% Confidence Limits for the Expected Average per year Returns are

$R_P = E(R_P) +/- [\sigma_{P1} / (n)^{.5}] = 11.6\% +/- [.134/(5)^{.5}] = 11.6\% +/- 6\%$

If the Investment Horizon is 10 Years, the 68% Confidence Limit for the Expected Average per year Return is

$R_P = E(R_P) +/- [\sigma_{P1} / (n)^{.5}] = 11.6\% +/- [.134/(10)^{.5}] = 11.6\% +/- 4.2\%$

These Calculations can be done for ALL possible Asset Mixes & Investment Time Horizons and Create the Following Table

Stocks	Bonds	E(R)	σ 1 Year	σ 5 Year	σ 10 Year
100%	0%	14.0%	20.0%	8.9%	6.3%
90	10	13.4	18.3	8.2	5.8
80	20	12.8	16.6	7.4	5.3
70	30	12.2	15.0	6.7	4.7
60	40	11.6	13.4	6.0	4.2
50	50	11.0	11.8	5.2	3.7
40	60	10.4	10.3	4.6	3.3
30	70	9.8	8.9	4.0	2.8
20	80	9.2	7.6	3.4	2.4
10	90	8.6	6.6	3.0	2.1
0	100	8.0	6.0	2.7	1.9

- ***Selecting the Optimal Mix***
  - Once the Expected Return & σ of Every Mix is Determined, the PROBABILITY Distribution depicting the possible results for each mix can be determined. This information can be presented to the investor in the form of a menu of choices. Based upon the investment objectives & constraints, the asset mix which produces the optimum return-risk tradeoff can be determined
  - The OPTIMAL Mix can be determined by using the INVESTOR INDIFFERENCE ANALYSIS. The optimal portfolio for a particular investor is one that maximizes the investor's utility. The Utility of a Portfolio (**U_P**) is defined as the Difference between its Expected Return (R_P) and the amount of risk aversion which it induces in the investor. The one-year risk of a portfolio is objectively measured by its VARIANCE (σ^2_{P1}). But the amount of disutility which this level of risk produces in the mind of the investor is quantified by a factor related to the Investor's RISK AVERSION (A).

    $U_P = R_P - ½[(A\sigma^2_{P1}) / n]$

For Example: A Client with a 5-year time horizon indicates he has a risk-aversion factor of 25. With a risk aversion factor of 35, the utility of Each Portfolio mix can be calculated using the formula above. The Optimal Portfolio is shown to be the 30% Stock, 70% Bond mix whose utility is 7.82%

Stocks	Bonds	E(R)	σ 1 Year	$U_P = R_P - ½ [(A \sigma^2_{P1}) / n]$
100%	0%	14.0%	20.0%	4.00%
90	10	13.4	18.3	5.00
80	20	12.8	16.6	5.91
70	30	12.2	15.0	6.58
60	40	11.6	13.4	7.11
50	50	11.0	11.8	7.52
40	60	10.4	10.3	7.75
30	70	9.8	8.9	7.82
20	80	9.2	7.6	7.76
10	90	8.6	6.6	7.51
0	100	8.0	6.0	7.10

- No Rational Investor will invest in any portfolio unless its utility exceeds the Risk Free Rate. Investor will not opt for risky portfolios unless their returns exceed the risk free rate by an amount that is sufficient to overcome the risk scaled by a factor related to his risk-aversion factor
- **Determining the Risk-Aversion Factor**
  - The Formula for the Risk-Aversion Factor is:

    $A = (R_R – R_F) / w_R\sigma^2_R$

    Where R_R = The Expected Return of the Risk Asset

    R_F = Risk-free Return

    σ^2_R = Variance of Possible returns on the Risky Asset
  - There are 3 Common Ways of Determining the Risk-Aversion Factor of an Investor
    - *Hypothetical Portfolio Construct*
      - Define 2 hypothetical assets; risky & risk-free. Construct a set of hypothetical portfolios containing different mixes of the 2. Allow the Investor to select the one which matches his goals. When the investor makes his selection, his risk-aversion factor can be determined from the formula for the risk-aversion factor given above. As this is a psychological characteristic, once determined, it can be assumed to be constant.
    - *Psychological Tests*
      - These can be given to the investor and will measure his risk-aversion factor
    - *Multiple Regression Models*
      - Most conclude that risk aversion decreases with income (above the poverty level), wealth, education, sex and age up through retirement. Women are more risk averse than men. Use a model and then the person's risk aversion factor can be determined with some certainty.

- ***Incorporating Other Investor Constraints***
  - In addition to the preceding quantitative analysis, will also need to consider other constraints.
    - LIQUIDITY → may either only consider asset classes that have appropriate liquidity when constructing potential portfolios OR use a Liquidity adjusted expected return in place of the usual expected return in the utility formula. This generally will adjust the return downward in an amount proportional to the price concession possible required to effectuate a quick sale.
    - INFLATION PROTECTION → deflate all expected returns and standard deviations by a price deflator, so that real returns and risks are used in the calculations used to determine the optimal asset mix
    - TAX CONSTRAINTS → calculate all returns and standard deviations on an after-tax basis
    - LEGAL CONSTRAINTS → eliminate from consideration all assets that are not of sufficient quality to be included in the investor's portfolio. If no short positions are permitted, all asset mix solutions requiring short sales are eliminated from consideration
  - *Who Should Make the Asset Allocation Decision?*
    - One → Make the Investment Manager responsible for determining the proper asset mix. But, the IM must act as a fiduciary for the client, understanding both the client's objectives/constraints as well as the risk/return relationships in the market
    - Two → IM act as capital markets expert and lay out the potential returns and risks for various asset mixes & then let the client make the ultimate decision
    - Three → IM plays no role in the asset mix process. IM stays with a certain strategy and then the client makes his own mix by allocating funds amongst different class managers
- ***Application to Pension Funds***
  - A pension fund can be viewed as a set of assets that will be used to Discharge a set of liabilities (PV of future pension obligations). The net difference between the two is the PENSION SURPLUS. The objective of pension fund management should be to optimize the utility of this surplus by the conventional utility maximization technique.

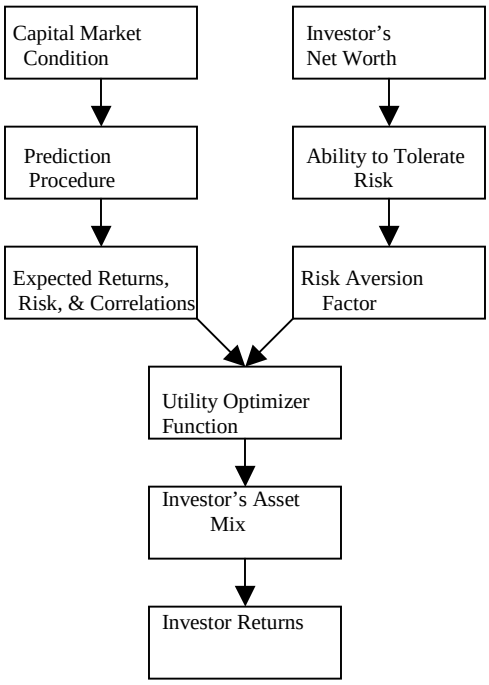
    $V_S = R_S - ½[(A\sigma^2_{S1}) / n]$

    $R_S = \Delta Assets - \Delta\ Liabilities / Initial\ Assets$
  - The Value of pension fund assets is easy to measure (Market Value); the Value of Pension Liabilities is more difficult: Either ABO or PBO.
  - ABO → sensitive to interest rates, as the FV of benefits are fixed, but their PV depends on the level of rates. When liabilities are valued in this way, the utility maximization procedure will tend to favor bonds. Try to match the duration of the fund assets with that of the ABO liability
  - PBO → value is sensitive to inflation. PBO tends to be more stable over time than an ABO. Also, as it assumes growth in benefits via future inflation, PBO value tends to be higher than ABO. Favor Equity

3. *The Theory of Portfolio Strategy*

- **An Integrated Approach to Portfolio Strategy**

  In general, one approaches asset mix decisions by looking at:



  The Left Side represents the condition of the Financial Markets. The Right side represents individual characteristics of the client/investor.

  Market expectations regarding risks & returns combine with the investor's risk aversion to produce an asset mix that optimizes the investors utility $U_P = R_P - ½A\sigma^2_P$

  Using conventional asset allocation techniques, one selects an asset mix which optimizes the investor's utility

  Once the mix is chosen, a fluid market produces certain returns and then there is a continuous feedback mechanism which impacts both the market returns and the investor's goals.

  As rebalancing a portfolio is expensive, an important strategic decision is made when selecting the Asset mix.

  - ***Strategic Asset Allocation***
    - The Integrated Approach is SELDOM used by money managers because it requires too many adjustments. Instead, one develops a set of expectations regarding the expected returns, standard deviation, and correlations. Then, using the standard method for maximizing investor utility, one determines the optimum asset mix for an investor with a given risk-aversion factor.
    - Unlike the Integrated Approach, the Strategic Asset Allocation approach does NOT alter the asset mix due to price fluctuations. Rather, once the strategy is chosen, it is kept via BUY & HOLD for long periods of time. It assumes the investor's risk-aversion factor remains constant and does not change with changes in his net worth. Also, it assumes constant returns, risks & correlations.

- BUY & HOLD → once an asset mix is chosen, assets purchased are held until a new assessment is made (quarterly or annually)
- CONSTANT MIX → the percentage invested in each asset class, once selected, is kept constant (short-term rebalancing due to different growths in asset classes)

- ***Tactical Asset Allocation***
  - Tactical Asset Allocation determines the optimal asset allocation mix using the conventional techniques. But, it is assumed that the investor's risk-aversion factor remains fixed for long periods of time and is not affected by incremental changes in net worth. And, as prices in the capital market change, there are changes in the expected returns, risks, and correlations of the different asset classes. Therefore, there will be short-term rebalancing
  - This strategy tends to be **value** oriented. When asset prices fall, their future expected return may rise, the forward looking risk may fall, and it may be more attractive for inclusion in the optimal portfolio. It is sort of a Contrarian type strategy wherein it is Buy Low – Sell High.
- ***Insured Asset Allocation***
  - The insured asset allocation strategy begins like the others. The optimal asset mix for an investor is determined. But, changes in the prices of assets do produce portfolio returns that cause the investor's net worth to change. These changes in net worth feed back to the change the investor's risk aversion. This strategy assumes that the investor's risk-aversion factor DECLINES in proportion to the spread between his net worth and some "Floor Level" → sort of like DYNAMIC HEDGING. As his wealth grows beyond the Floor Level, he becomes more willing to invest in risky assets. Thus, insured strategies are MOMENTUM Driven. Buy High, Sell Low.
    - CONSTANT PROPORTION Portfolio Insurance Strategy → A dynamic strategy in which the dollar amount invested in risky assets is related to the value of the portfolio, relative to the insured "floor

      $ Invested in Risky Assets = M (Portfolio Value – Floor Value)

      where M is a number greater than 1.0

- **Choosing A Strategy**
  - There are many generic asset allocation strategies. A key factor to determine the best strategy for an investor is the relationship between his risk aversion and that of society as a whole
  - Over the past 50 years, the spread between the return on the market portfolio and the risk-free rate has averaged about 4%, with a standard deviation of +/- 10%. This implies that the risk-aversion factor of society as a whole ($A_{Society}$) = 4.0

    $A_{Society} = (R_R - R_F) / w_R\sigma^2_R = [0.04 / (1)(.10)^2] = 4$
  - An Investor who is just as Risk Averse as the society should be willing to allocate his assets in the same manner as society does. Thus, the percentage of Total Assets that an investor should be willing to place in the market portfolio (w_M) should be inversely proportion to his risk-aversion factor ($A_{investor}$) relative to the

risk-aversion factor of society as a whole; the rest of his assets should be in the risk-free asset

$w_M = (A_{Society} / A_{Investor}) \rightarrow w_F = 1 - w_M$

- There is evidence that the risk-aversion factor of the average investor fluctuates inversely with the rise and fall of the value of the capital market itself. This is because most people are emotional. Implications for Portfolio Strategy →
  - If an investor has a risk-aversion factor that is always equal to society's, his optimal strategy is to buy the market portfolio and hold it. This means indexing each asset class in a proportion equal to society.
  - The Tactical asset allocation, value-driven contrarian strategy will be used by investors whose risk-aversion factors are NOT affected by fluctuations in their wealth. These stoic investors are not typical. As the rest of society becomes more risk averse, they will place more of their wealth in risky assets and reduce exposure to the risk-free asset.
  - The Insured Asset Allocation, momentum-based, trend following strategy will be used by investors whose risk-aversion factors rise and fall by an above average amount as the value of their portfolios fluctuate.

- **How Strategies Affect Capital Markets**
  - When market conditions change rapidly, the relative amount of funds being managed using various strategies can affect market behavior. For Example, in October 1987, $60-80 Billion was being managed by investors employing the portfolio insurance asset allocation strategy. As prices fell, this caused these managers to sell more stocks. This led to Tactical Asset managers to buy, but as only $15-20 was managed under this style, there were far more sellers than buyers. This strategic imbalance led to the swiftness of decline. Over time, Insurance Allocation lost favor and Tactical Asset Allocation gained favor leading to more balance and less wild swings in valuation.
  - This suggests that when a strategy becomes overly popular, it may affect the process it is designed to exploit and become ineffective.
  - Conclusion, (surprisingly) when value-oriented strategies are popular, it may be best to shift to an insured asset allocation strategy because the dominance of the tactical strategies will produce a stable environment which can best be exploited by trend following strategies; When momentum strategies are popular, it may best to shift to a tactical asset allocation strategy as the insured strategy imbalance will produce the volatile market environment which the tactical strategy can best exploit

- ***"Dynamic Strategies for Asset Allocation" by Perold & Sharpe***
  - Once an asset mix is chosen and a portfolio is constructed, the mix will change as the prices of the various assets fluctuate relative to each other. Then it becomes necessary to rebalance the portfolio. DYNAMIC STRATEGIES are explicit rules for performing asset mix rebalancing in response to relative changes in asset prices. There are FOUR Basic DYNAMIC Strategies.
  - ***Buy & Hold Strategies***
    - This STRATEGIC ASSET ALLOCATION investor initially chooses an asset mix and then no matter the relative prices of these assets, nothing is done to rebalance the portfolio
    - In general:
      - The Portfolio's Value will be LINEARLY Related to the performance of the risky asset with the slope of the relationship being equal to the initial percentage invested in the risky asset (Chart with X-axis as Price of Risky Diagram and Y-axis as value of portfolio)
      - The Value of the portfolio will never fall below the value of the initial investment in the risk-free asset
      - Upside Potential is Unlimited
      - The greater initial percentage invested in the risky asset, the better the performance will be when the risky asset outperforms the risk-free asset (and vice-versa)
  - ***Constant Mix Strategies***
    - Buy Low, Sell High – Concave Strategy
    - These strategies RESTORE the Asset mix back to its initial position whenever changes in the relative asset values cause this percentage to change. This restoration may be either strategic or tactical. If done simply to return to the previously calculated asset mix, it is STRATEGIC; if done because of momentum reasons, it is TACTICAL.
    - Such a strategy requires the purchase of risky assets if they fall in price relative to the riskless assets and the sale of risky assets if they rise in price relative to the riskless assets
    - The advantage of the Constant Mix, value-oriented strategy comes when price reversals take place. It is like dollar cost averaging where more risky securities are purchased at lower prices than higher prices causing the average cost of the securities to be less than the average price of the securities over time if prices fluctuate. So, it works best when the market is volatile; it will be inferior to the buy & hold strategy when the market is stable
  - ***Constant Proportion Insurance Strategies***
    - A constant proportion insurance strategy is one in which the dollars invested in the risky assets is determined by following the formula in which M is larger than 1.0

      $ Invested in Risky Assets = M(Portfolio Value – Floor Value)
    - This is an insured asset allocation, trend-following strategy The investor must select both the MULTIPLIER (M) and the FLOOR VALUE. The

floor grows at the risk-free rate and must initially be set below the initial value of the portfolio
    - Under this strategy, the portfolio will do at least as well as the floor value since no dollars will be invested in risky assets if the portfolio falls to the floor value. This is preferred by investors who have zero tolerance for risk if the portfolio falls to the floor. In a strong & stable market, this strategy does very well; but in flat, volatile markets, it does poorly.
    - The disadvantage of this strategy occurs if the prices of the risky assets fluctuate. Risky assets will be purchased at high prices only to be sold when prices fall.
- ***Option Based Portfolio Insurance***
    - This strategy begins by specifying an INVESTMENT HORIZON & a DESIRED FLOOR VALUE at that Investment horizon (then calculate it back to the Present Value).
    - Once a floor is chosen, its present value calculated, then the strategy is a SET of RULES designed to produce the same payoff at the horizon as would a portfolio of risk-free assets and call options on the risky asset.
- ***Concave & Convex Strategies***

Strategy	Rebalance Method	Payoff Diagram Shape
Buy & Hold	Nothing	Straight Line
Constant Mix	Buy Asset whose Price Falls Sell Asset whose price Rises	Concave
Constant Proportion Portfolio Insurance	Buy Asset whose Price Rises Sell Asset whose Price Falls	Convex
Option Based Portfolio	Buy Asset whose Price Rises Sell Asset whose Price Falls	Convex

    - Strategies that produce convex payoff diagrams represent the purchase of PORTFOLIO INSURANCE; strategies producing concave payoff diagrams represent the Sale of Portfolio Insurance
- ***Resetting Strategy Parameters***
    - The manner in which one resets strategic parameters can alter the performance of a strategy
- ***Strategy Selection***
    - No Single Asset mix is superior at all times.

- **Passive Asset Management**
- Strategic Theory relies on EFFICIENT MARKET CONCEPTS. These concepts suggest that portfolio's should consist of some weighting of asset classes invested in indexed ways. There are also INDEX-PLUS funds which are managed with the intention of outperforming an index while still matching the index's major risk constraints. This is a quasi-active, quasi-passive strategy.
- TRACKING ERROR is a problem with all indexing methods. It occurs when the performance of the portfolio varies from that of the index, which it is supposed to replicate. Sources of Tracking Error include:
    - Index has no TRANSACTION COST, but portfolios do
    - Portfolio may not PERFECTLY REPLICATE the composition of the index (statistical or sampling error)
    - Prices of securities used when valuing the index may not be the same as the prices used when valuing the portfolio due to bid/ask differences among dealers
    - Total Return depends upon re-investment rate assumptions built into the index, but it depends upon the actual reinvestment results of a real portfolio
  - ***Passive Strategies for Stocks***
    - The Classic Passive Management technique for the Equity portion of a portfolio is to use an index fund. But there are some problems with indexing:
      - Index funds CANNOT outperform the market. Funds have trading costs & other costs that the index does not have
      - The Index fund may have a β between 0.0 & 1.0 due to investing some wealth in the risk free asset. Cannot really get a higher than 1.0 β because one cannot borrow at the risk-free rate.
      - The S&P 500 index is not really the market portfolio nor is the T-Bill rate = risk-free rate.
  - ***Passive (Structured) Strategies for Bond Portfolios***
    - The Nature of the liabilities of a financial institution dictates the investment strategy of a bond manager. There are FOUR Basic Types of Liabilities Faced by Institutions
      - TYPE I $\rightarrow$ the future amount and timing of cash outlays of the institution are known (CDs, GICs)
      - TYPE II $\rightarrow$ the future amount, but not the timing of cash outlays are known (Life Insurance)
      - TYPE III $\rightarrow$ future cash outlay amount is uncertain, but the timing is known (Floating rate notes)
      - TYPE IV $\rightarrow$ both amount & timing of future cash outlay requirements are uncertain (Pension Fund)
    - In addition, LIQUIDITY may be a concern. Life insurance contracts have cash surrender values, property/casualty co. must meet payments when catastrophes occur, etc.

- In Bond Management, there are FIVE Passive-type Management techniques that may be Used (Buy & Hold, Indexing, Immunization, Dedication, Laddering)
  - Buy & Hold
    - Used by investor seeking income maximization over a desired time horizon. Usually a low-risk portfolio with predictable cash flows. Use only investment grade-bonds
  - Indexing
    - Requires a portfolio continually MATCH the Characteristics of the entire public market for bonds.
    - Easier to replicate a bond index than a stock index because the bond market is more homogenous and the relationships among bonds are more mathematically certain
    - Even if don't invest in a bond index, it is useful to have an index as a benchmark against which to measure performance.
    - The First Task for Indexing is to select the INDEX to replicate → factors used in this decision include
      - Investor's risk tolerance re: credit ratings
      - Investor's Return/Risk Ratio objective
      - Liability Stream of the Investor
      - Investment Constraints of the Investor
        - LEHMAN BROS. AGGREGATE INDEX → covers all publicly traded industrial, financial & utility bonds rated Baa or better with at least 1 year maturity & $1,000,000 of principal outstanding and a fixed coupon
        - MERRILL LYNCH DOMESTIC MKT INDEX → all publicly traded financial, utility, Yankee & transportation bonds with fixed coupons that are NOT convertible & rated Baa or better with at least $10,000,000 principal and 1 year maturity
    - In order to match these indexes, the portfolio must contain the same maturity, duration, quality, capitalization, coupon SIC, sinking fund, call feature, etc. as the index. As there will be a steady income stream, it is necessary to have a continual buying program of the right mix to keep the fund indexed
    - INDEXING as a Passive Bond Portfolio Management strategy has several ADVANTAGES
      - Performance should MIRROR the market
      - Management & Advisory fees are LOW
      - Cost of Investing should be Reduced with lower turnover & lower research costs

        - Investor can specify both the benchmark portfolio that will serve as the index and the amount of deviation to be allowed
        - With Efficient Markets, an Indexed portfolio strategy should maximize the expected return per unit of risk taken
    - INDEXING has several DISADVANTAGES
        - Index funds will do no better than average in terms of performance
        - The indexed portfolio is too rigid; ownership of certain bonds comprising the index is required, even when another bond may be more appropriate
        - Conventional Broad Bond market indexes do NOT include all types of bonds in the market (Zeros, Passthroughs, CMOS, Asset-backed, etc.)
        - No Immunization against interest rate risk or any other kind of risk when indexing is employed
        - No guarantee that a certain liability stream can be funded from the portfolio, only a guarantee to match the index
    - INDEXING METHODOLOGIES – unlike stock index funds, bond index funds cannot purchase all of the bonds in an index in the same proportion as the index itself because:
        - Most bond indexes contain 1,000s of bonds
        - Rebalancing is constantly required as certain bonds mature and coupon interest is reinvested
        - New issues are continually coming to market and being included in the index
        - Many bonds in the index are illiquid
    - It may be better to try to set up a bond portfolio whose characteristics closely match those of the Index. FOUR methodologies can do this
        - *SAMPLING*
            - Randomly select a few bonds from the index, but control the weightings so that duration, coupon, quality, sectors, etc. match the characteristics of the index being replicated. PROBLEM → Tracking Error
            - ADVANTAGES → Simplicity, non-indexed securities may be used, Flexible
            - DISADVANTAGES → Portfolio may not be Optimal, Parameters of the Portfolio may not MATCH the index, Sampling error may cause a mismatch between the issue & sector distribution of the benchmark portfolio relative to that of the true market

- *STRATIFIED SAMPLING (CELLULAR METHOD)*
    - Divide the major bond index into sub-sectors or cells based upon coupon, maturity, quality, duration, industry, sector, etc. Select individual securities that have the same characteristics by CELL as that of the index itself. An index fund is complete when all of the cells in the index have been replicated
    - ADVANTAGES → Simple, Flexible, can use securities not actually in the index
    - DISADVANTAGES → Difficult to construct (time), portfolio may not be optimal
- *OPTIMIZATION APPROACH*
    - Uses computers to search a database with a universe of securities to find a mix of bonds that produces the maximum EXPECTED RETURN while staying within the constraints of the money manger (such as using cellular characteristics)
    - ADVANTAGES → Systematically produces the optimal index, can easily rebalance as the parameters of the index fund change
    - DISADVANTAGES → cannot tilt portfolio in favor of certain bond characteristics due to the cellular constraints, databases may be incomplete or use untimely pricing, costly to rebalance because by re-optimizing, produce a huge amount of buy/sell orders
- *VARIANCE MINIMIZATION APPROACH*
    - Takes a database and finds a mix of bonds that will maximize Expected return while minimizing the difference between the portfolio and the index fund. More complex than linear programming used in Optimization approach.
    - ADVANTAGES → Use of variance-covariance matrixes reduces risk of selecting highly correlated bonds, measures the contribution made by each security to the overall ability to track the index and can thus tilt the portfolio towards the attractive characteristics while minimizing tracking error

- DISADVANTAGES → Presumes historical variance & correlations will continue indefinitely, databases may be incomplete and contain bad prices

- Immunization
  - Can be used to reduce Interest Rate Risk. Can guarantee a predetermined horizon return will be earned on a portfolio
  - There will still be some interest rate risk due to REINVESTMENT of COUPON INTEREST
  - To IMMUNIZE a bond or fixed-income portfolio against reinvestment rate risk, buy a bond or portfolio whose UNADJUSTED DURATION equals the time horizon of the investor (as the coupon & face value gain/loss will match each other)
  - FOUR Conditions are required to IMMUNIZE a Portfolio against Reinvestment Rate Risk
    - The Unadjusted Duration must EQUAL the investor's Time Horizon when there is a SINGLE Period Payout; in the case of a multi-period payout schedule, the unadjusted duration of the portfolio MUST equal the unadjusted duration of the stream of required future portfolio payouts
    - The CURRENT Value of the portfolio must at LEAST equal the present value of the required portfolio payouts
    - The MATURITY VARIANCE of the portfolio must Equal or only be slightly greater than the maturity variance of the required portfolio variance

      $\boxed{\text{Maturity Variance} = [\Sigma(t_i\text{-}D)^2 PV(CF_i) / \Sigma PV(CF_i)]}$

      D = unadjusted duration of portfolio (or payouts)

      t_i = time that each CF is received from portfolio assets (or required to be paid out)

      $PV(CF_i)$ = PV of each cash flow received from the portfolio assets (or required to be paid out)
    - The Distribution of the unadjusted durations of the assets in the portfolio must be wider than the distribution of the unadjusted durations of the required payouts.
  - The use of MACAULAY's DURATION to effectuate the immunization strategy gives rise to an instant problem. The formula used for the Macaulay Duration uses only ONE Discount Rate (YTM) when computing the present value of future cash flows. This assumes a flat yield curve. When the yield curve is NOT flat, the immunization is not perfect.
  - The Fact that an IMMUNIZATION may NOT completely protect the horizon return of a portfolio from changes in the

slope of the yield curve is called IMMUNIZATION RISK or STOCHASTIC PROCESS RISK. While this cannot be eliminated, it can be minimized by setting the MATURITY VARIANCE of the portfolio as closely as possible to that of the required payout stream

- EXAMPLES of IMMUNIZATION →
- SINGLE PERIOD IMMUNIZATION

For Example: an investor has a time horizon of 5 years. Several bond choices, each yielding 9 ½ % are available:

ISSUE	COUPON	MATURITY	DURATION
A	16%	20 years	5 Years
B	4%	8 years	5 years
C	0%	5 Years	5 Years
D	10%	5 Years	4 years

TO IMMUNIZE against reinvestment risk, the following observations can be made

i. Issue D is the worst choice because its duration does NOT MATCH the investor's time horizon
ii. Issue A is the 2nd worst choice because it has the worst maturity variance relative to the single-period time horizon of 5 years
iii. Issue B is the 2nd best choice because it has the proper duration and a distribution of funds close to that required because of its low volatility
iv. NOTE: this hierarchy of choices only looks at the interest rate factor. Relative returns should also be considered

- MULTI-PERIOD IMMUNIZATION (Duration Matching)

For Example: consider a pension fund with the following estimated payments required to pay future benefits (liability stream) at a time when interest rates are 10%

Year (t)	Required Payout Stream	PV of Payout Stream (10%)	%ΣPV	D = (PV)(t) / ΣPV	$(t-D)^2(PV)$
1	$100,000	$90,909	.1808	.1808	393,309
2	$130,000	107,438	.2137	.4274	125,316
3	$120,000	90,158	.1793	.5379	577
4	$150,000	102,452	.2038	.8152	86,715
5	$180,000	111,766	.2232	1.1160	412,014
		502,723		**3.08**	**1,017,931**

Duration = 3.08 years
Maturity Variance = 1,017,931 / 502,723 = 2.02 Years
PV = $502,723

Any Portfolio with a market value equal to or greater than $502,723 whose unadjusted duration is 3.08 years will be immunized against interest rate risk and should produce a horizon return of about 10%. Immunization risk will be minimized by imposing the additional constraint that the portfolio have a maturity variance as close to 2.02 years as possible (or slightly higher)

- REBALANCING THE PORTFOLIO
  - Immunization requires that the unadjusted duration & maturity variance of a portfolio be equal to the unadjusted duration and maturity variance of its payout stream. These equalities must exist at ALL Times during the investment period
  - As the duration & maturity variance of the portfolio drift away from those of the payout streams, it is necessary to rebalance the portfolio to restore the required equalities. But, daily rebalancing is costly
  - The preferred method of rebalancing is through financial futures (lower cost)

- ADVANTAGES of IMMUNIZATION
  - Immunization protects a portfolio against interest rate risk. Thus, it helps ensure that the value of a portfolio at the end of the investor's time horizon will equal a predetermined value
  - Though classified as a Passive strategy, immunization offers a great deal of flexibility that can be used to actively manage a portfolio to enhance returns.
  - An immunized portfolio can be used as a benchmark against which an actively managed portfolio's performance can be compared
- DISADVANTAGES of IMMUNIZATION
  - Cannot completely eliminate immunization risk and thus, cannot protect against a reshaping yield curve
  - The need for continual rebalancing creates logistical problems and increases the cost of managing (NOT a Set It & Forget It)
  - Does not protect against default, or other risks
  - If a bond in an immunized portfolio is called, goes into default, etc., major rebalancing is required

- Dedication
  - Dedicated portfolios are portfolios that will produce a stream of cash flows over their life that will match the cash flows required to meet a required payment stream. This is CASH-MATCHED DEDICATION. Duration-matched dedication is the same thing as multi-period immunization. *Immunization matches durations: Dedication matches Cash Flows*
  - The simplest form of cash-matched dedication is a series of zero coupon bonds that will provide the funds needed to meet a required payment stream. A series of Zero coupon bonds can be purchased to fund the future stream (benefit payments) of a pension fund

For Example:

Maturity	Payment	P_{Bond}	Yld	Cash Matched Bond Value
1	10,000	925.93	7.85	9,259.30
2	11,000	849.46	8.33	9,345.60
3	15,000	772.18	8.81	11,582.70
4	18,000	703.25	9.00	12,658.50
5	20,000	641.06	9.09	12,821.20
				55,067.30

  - Often zero coupon cash-matched dedicated portfolio is undesirable because it is inflexible. Once purchased, they must be held until maturity.
  - To Produce a dedicated portfolio, all that is required is to know the required payment stream and the cash flow characteristics and prices of a very large universe of bonds.

Then, use a computer program to develop a portfolio of bonds that can produce the required timing of cash flows within the confines of any other constraints

- ADVANTAGES of the DEDICATION STRATEGY
  - Reduces interest Rate risk since a known amount of cash sufficient to fund the required payment schedule will be generated with certainty
  - Cost Effective → essentially Set It & Forget It
- DISADVANTAGES of the DEDICATION STRATEGY
  - Inflexible.
  - Can be upset by bonds being called.
  - Can be upset by bonds going into default
  - Idle generated cash will have some reinvestment rate risk
- IMMUNIZATION v DEDICATION
  - Immunization is more flexible in bond selection and in the possibility of engaging in profitable swaps over the life of the investment horizon. When bond holding changes occur, duration matching can be re-established easily through futures contracts (more difficult to re-establish matching cash flows)
  - Immunization portfolios can produce Higher Yields since there is less necessity to invest in non-callable or high quality bonds
  - Dedicated portfolios NEED NOT be continually rebalanced and are thus cheaper

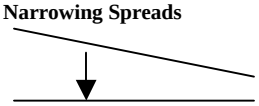
- <u>Laddered</u>
  - MATURITY LADDERING → portfolio consisting of equally spaced maturities to give some reinvestment rate protection
  - BARBELL MATURITIES → Use short & long-term maturities but no intermediate maturities. Appropriate when short terms rates are expected to rise, while long-term rates are expected to fall. Disadvantage since it produces reinvestment rate risk

- **Active Asset Management**
  - Unlike passive management, active management does not try to replicate the parameters of the market. The objective, instead, is to use special insights to generate above-market returns by selecting particular issues and weighting them in the portfolio in the most advantageous manner within the risk constraints of the investor. The objective is to generate UNSYSTEMATIC (α) Returns by accepting unsystematic risks
  - ***Active Strategies for Stocks***
    - SPECIALIZED MANAGEMENT $\rightarrow$ Place heavy emphasis on particular market sectors in which the manager has special insight
      - *Growth Stock Specialists* – accept both a high systematic risk (β) and high unsystematic risk to attempt to achieve a high unsystematic return (α)
      - *Undervalued Stock Specialists* – Look for low P/E stocks that are temporarily out of favor, or stocks whose value as determined by some method is higher than market prices
      - *Small Capitalization Stock Specialists* – attempt to obtain excess returns by employing special insights regarding small firms that are neglected by most analysts
      - *Industry Group Specialists* – become expert in specific industries in order to exploit that insight when appropriate to produce superior returns
    - ROTATIONAL MANAGEMENT
      - *Market Timers* – shift into the market or high β Stocks when the market appears to be in position to move upwards; and switch to cash or Low β stocks when ready to fall
      - *Group Rotators* – move into industries that are becoming attractive and out of industries that are losing favor. Try to rotate among sectors whose returns are not highly correlated (CONSUMER, CYCLICAL, GROWTH, COMMODITIES, INTEREST-RATE Sensitive). To reduce risk via diversification, all sectors may be held in a portfolio, but the weightings may be changed to reflect the investor's insights about the relative attractiveness of the groups
      - *Cluster Analysis* – develops homogenous groupings of similarly performing stocks. First start by deciding the variables to include as the objectives of the clusters and then regress against the market. Stocks with the same residual returns can be grouped in the same cluster.
    - INDIVIDUAL STOCK SELECTION
      - Fundamental or Technical Analysis (or both)

- ***Active Strategies for Bond Portfolios***
  - The Management of a Fixed-income portfolio consists of the following steps:
    - Set Investment Objectives
    - Establish an Investment Policy by (1) indicating the types of bonds to be included in the portfolio, (2) listing any constraints on the portfolio that must be taken into consideration such as regulation and tax consideration
    - Select a Portfolio Strategy
    - Select the Individual Securities
    - Measure and Evaluate Performance
  - Active Bond strategies involve structuring a portfolio to take advantage of the manager's expectations regarding changes in the general level of interest rates, the shape of the yield curve, changes in the yield spreads among bond market sectors, or changes in the yield of a particular bond to enhance returns. There are 5 Basic Active Bond Portfolio Strategies
  - INTEREST RATE ANTICIPATION STRATEGIES
    - Interest rate anticipation strategies attempt to take advantage of anticipated changes in the general level of interest rates, especially those that result in a parallel shift of the yield curve. The procedure is to lengthen the duration of a portfolio when interest rates are expected to fall, and shorten the duration when interest rates are expected to rise.
    - Though this may be rewarding, the ability to actually do it is questionable
  - YIELD CURVE STRATEGY
    - Reshapings of the Yield curve can affect the relative performance of various bonds.. The essence of yield curve strategies is to predict what the yield curve will look like at the end of a time horizon, and then attempt to optimize returns by buying bonds that should perform well as the interest rate changes from the current structure to the anticipated structure.
    - For a *Recession* (downward, steepening) → move into **intermediate** maturities
    - For a *Recovery* (upward, flattening) → move into either long or short maturities depending on which side will move the most in order to produce a flatter curve
    - For FLATTENING → general decline in rates. Rare, but move to longer maturities or use a barbell approach
    - (Upward, Steepening) rare → move to shorter maturities
    - Positive Butterfly → use intermediate securities
    - Negative Butterfly → rare, use longer term securities
  - YIELD SPREAD STRATEGIES
    - Intermarket Spread Swaps are used to reposition a portfolio to capitalize on expected changes in the spread between two sectors of the bond market. Spreads can change for several reasons →
      - Spread between high quality & low quality bonds NARROWS as business conditions improve & WIDENS when business conditions deteriorate.

- Spread between Callable & Non-callable bond yields tends to WIDEN when rates grow more volatile and narrow when volatility is reduced. (due to the fact the value of the imbedded call option rises as volatility increases)
- Spread between Callable & Non-callable bonds tends to Widen when rates are expected to drop meaning that the probability the bond will be called increases: the spread between them tends to narrow when rates are expected to rise as the probability of a call diminishes

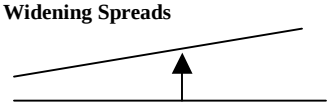
Narrowing Spreads



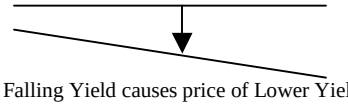
Falling Yield causes price of higher-yielding Bond to rise

Rising Yield causes price of Lower Yielding Bond to rise

Widening Spreads



Rising Yield causes price of higher yielding bond to fall



Falling Yield causes price of Lower Yielding Bond to Rise

- INDIVIDUAL SECURITY SELECTION STRATEGIES
  - Common Strategies centering around individual bond selection:
    - ID those issues whose yield is expected to change because their credit ratings will be changing, or because they are currently mispriced. Substitution Swaps are used to effectuate this strategy. Risks in this strategy include (credit rating assumed by analyst may be incorrect → Bonds with different convexities may not be mispriced, but rather just have a yield spread differential due to the cost of convexity)
    - In Mortgaged backed securities markets, it may be possible to find securities that are mispriced because the market is assuming a different pre-payment rate than the analyst believes is likely
- OPTION-ADJUSTED SPREAD BASED STRATEGIES
  - Portfolios can be positioned to take advantage of expected changes in the option-adjusted spreads between bonds with imbedded options and treasury issues. Once a strategy is discovered, it will become less effective when used by the public.

- ***"Constructing Fixed Income Portfolios" by Chris. P. Dialynas***
  - For fixed-income managers to use microeconomic forecasts effectively, it is necessary to form a link between an economic forecast and the interest rate outlook
    - Usually, fast growth and high inflation means higher rates: slow growth & low inflation means lower rates.
  - Next, the manager must be able to integrate the impacts of secular & cyclical forces

- Finally, he must be able to relate the economic scenario to the relative attractiveness of various bond sectors.
- The most important way a manager adds value is be setting a DURATION Strategy. Next, he must have a proper sector selection. Usually, individual bond selection is a trivial matter relative to duration & sector selection
- Volatility experienced by a portfolio depends upon duration, convexity, quality, and the distribution of YTM & Maturity in the portfolio.
- Expected changes in the shape of the yield curve exert powerful influences over the performance of various sectors. If believe there will be an easing of monetary policy, lower quality bonds may be more attractive as the improving economy should bring them improved quality ratings and better prices (lower yields)
- Must also consider the Volatility of rates. With volatile rates, callable bonds become less attractive
- International forecasts are important. If dollar is likely to fall, foreign bonds may become more attractive

- ***Active Management within Structured Strategies***
  - Passive Fixed-income portfolios may be actively managed because there is a wide variety of bonds having the same characteristics which may not be identically priced. Active restructuring of a passive portfolio should be considered whenever →
    - Cheaper bonds can be found that possess the same characteristics as the owned bonds
    - The Yield Curve changes shape, which may alter the mathematics of duration and the PV of cash flows
    - Changes occur in Yield Spreads between sectors of the market which may alter the characteristics of duration & PV Cash Flows
  - Examples of Active Management of Passive Bond Portfolios include:
    - *Cash Flow Swaps* – Replace current bonds with new ones in a DEDICATED portfolio as long as the new bonds have the same (or better) cash flow and quality characteristics as the owned bonds
    - *Re-optimization* – Change the portfolio whenever the re-running of a dedication or immunization program finds a new set of bonds that produces a better portfolio than the one owned
  - Those happened after bond prices change. It may be better to try to change the portfolio BEFORE prices change. Examples of this include:
    - Purchase a portfolio with the required characteristics in terms of OVERALL duration, maturity variance and cash flow weight the sector exposure toward those sectors expected to do best in the future
    - Segment an index fund into sectors and adjust sector weightings based on asset allocation techniques
    - Optimal passive portfolios require the portfolio meet certain criteria. This allows the manager to choose other criteria and actively manage that.

- Other portfolio management strategies enable active approaches to be employed under certain conditions with an automatic shift to a passive strategy under other conditions.
  - *Contingent Immunization*
    - A hybrid strategy in which a fixed-income portfolio is actively managed as long as its MARKET Value exceeds some Specified FLOOR VALUE; when the portfolio value drops to the floor level, the immunization strategy is Employed. Use the following Steps:
      - Choose a TARGET VALUE that a portfolio must achieve at the end of its time horizon.
      - The portfolio is actively managed as long as this target value (discounted to PV by immunizable return available) is less than the current value of the portfolio. Once Computed, this TARGET VALUE remains FIXED over the Rest of the Investment horizon

For Example: Assume an investor has $10,000,000 fixed-income portfolio which will be invested for a 5-year period. Over this investment horizon, it is necessary to earn a BOND EQUIVALENT AVERAGE RETURN of at least 4% per year. The current bond equivalent rate of return that can be earned on an immunized 5-year portfolio is 6.5% How should the portfolio be managed?

Answer: With a Bond Equivalent required return over the next five years of 4%, the target value at the end of its time horizon is

$TV = (10{,}000{,}000)(1.02)^{10} = \$12{,}189{,}944$

With immunizable returns currently yielding 6.5% (Bond Equivalent Basis) the PV of this target value discounted at this rate produces

FV = 12,189,944, I =6.5%/2 = 3.25 periodic, n = 2*5 years = 10 periods

PV = $8,853,217

As the value of the portfolio (10,000,000) is greater than the PV of the Target Price, there is no need to use a passive, conservative investment strategy. The portfolio may be actively managed by the manager in hopes of earning a return greater than 6.5%

One Year Later

The market value of the portfolio is $10,800,000. The immunizable return is 5.5%. Terminal date is 4 years away.

TV = FV = 12,189,944, I = 5.5/2 = 2.75, n =2*4 = 8

PV = $9,811, 763

The value is still greater than the PV of the target value. May still be actively managed

Two Years Later

The MV of the portfolio is $9,985,000. The immunizable return is 8%.

TV=FV=12,189,944, I = 8/2 = 4%, n =2*3 = 6 periods

PV = $9,633,890

The MV of the portfolio is still greater than the PV of TV. May still be actively managed

Three Years Later

MV of portfolio is $10,622,832. Immunizable return is 7%. 2 years left in horizon

TV=FV=12,189,944, I = 7/2 = 3.5%, n =2*2 = 4periods

PV = 10,622, 832

As the MV of the portfolio = PV of TV, the portfolio must be immunized in order to guarantee that the target value will be achieved

Here, the calculations were performed annually, usually they are performed daily.

  - *Horizon Matching*
    - This is a strategy that combines cash-matched DEDICATION with duration-matched IMMUNIZATION.
    - Divide the required payment stream into 2 parts. First, include all payments that must be made within a certain Time Horizon. Cash-matched dedication is used to fund these payments. An immunization strategy is used to fund

all the required payments beyond the time horizon funded with the dedicated strategy. Protects these long-term payments from reinvestment rate risk
    - Purpose of this strategy is to reduce the STOCHASTIC Process risk inherent in the immunized strategy. Stochastic Process risk occurs due to a reshaping of the yield curve. These reshaping most impact the first 3-5 years; thus a dedication strategy is used against this 3-5 year time horizon with immunization applied to that portion of the payment stream outside this 3-5 year risk period
  - *Contingent Dedication*
    - This strategy combines Contingent Immunization with cash-matched dedication. Active management is used as long as the value of the portfolio is large enough to fund a cash-matched dedicated floor portfolio that could meet a specified schedule of required cash outlays.
- CONTINUUM of FIXED INCOME STRATEGIES (Lowest → Highest Risk)
  - Cash-Matched Dedication using zero coupon, non-callable, treasury bonds
  - Cash-matched dedication using coupon bonds. Offers higher returns and more flexibility than the zero coupon dedicated strategy, but it introduces some reinvestment risk
  - Immunization, with immunization risk
  - Contingent Immunization, which enables higher returns to be earned due to the ability to employ active bond management
  - Pure Active Management, which is the most risky
  - If believe the market is efficient, prefer dedicated strategies to active management. Only use active management when believe that manager has unique insight allowing superior returns (on cost-adjusted basis)

4. *Monitoring & Rebalancing the Portfolio*

- Market Conditions, plus investor needs, circumstances & investment objectives change over time. When such changes occur, rebalancing portfolios is required so that asset allocations remain optimal. But, rebalancing is Costly
- The Rebalancing Decision involves tradeoffs. Failure to rebalance can mean that the asset mix drifts away from optimal. Plus, time can cause an investor's risk aversion factor and time horizon to change, changing the optimal portfolio. But, such monitoring can be costly. Costs include:
    - Research Expenses
    - Administration Costs
    - Commission Expenses
    - Cost associated with buying at asked quote and selling at bid quote
    - Psychological Costs when turnover increases
- The Rebalancing decision must trade these costs off against the costs of not trading, which include the opportunity cost of not owning an optimum portfolio and the cost of holding an asset mix that no longer meets the investor's needs. Rebalancing takes one of THREE forms →
    - Changing the ALLOCATION among CLASSES (stocks, bonds, cash) based upon STRATEGIC Decisions
    - Changing the INVESTMENT STYLE (Growth v. Value)
    - Changing the Individual Security Holdings within asset classes
- Must be aware of Changing Client Needs as well:
    - WEALTH → when a client becomes more wealthy, he may turn more Aggressive or more conservative. It is vital to know the psychology of the client
    - TIME Horizon → as it shortens, the ability to undertake risk declines
    - LIQUIDITY, TAXES, LAWS, UNIQUE Preferences
- Must be award of Changes in the Market
    - New Investment Alternatives → Innovative securities are continually being developed
    - Changing Risks
    - Major Market Trends (bullish v. bearish)
    - Central Bank Monetary Policy → risk free rates
    - Inflationary expectations
    - Profit Outlook
    - Yield Curve outlook
    - Changes in the Spreads between markets
- In light of these changes to both the CLIENT & the MARKET, the Manager must be aware of the COSTS of Rebalancing. The Real Cost of Transacting is the Difference between the Value of a portfolio after a trade and its value had the trade not taken place. This is not known with certainty.
- **Rebalancing Mechanics**
    - As asset prices change, asset mixes drift away from their optimal levels. To rebalance, can take either of two approaches
        - *Ad Hoc Rebalancing* → portfolio is rebalanced whenever the manager believes that it has become significantly sub-optimal, or when

expectations about upcoming expectations in the market change substantially.
    - *Disciplined Rebalancing* → done in a systematic way, like monthly, or when the asset mix drifts more than X%
    - Empirical evidence suggests that the DISCIPLINED approach works best. Like Market Timing, Ad Hoc Rebalancing appears ineffective
- **"Monitoring & Rebalancing the Portfolio" by Robert Arnott & Robert Lovell, Jr.**
  - ***Systematic Asset Allocation***
  - Systematic Asset Allocation is a Mechanical Scheme for Shifting the Asset Mix of a Portfolio based upon pre-defined market conditions. In theory →
    - Markets give explicit information as to the long-run expected returns on various asset classes (Yield on Money Markets = E(R) on Cash; YTM on Bonds – E(R) Fixed Assets; E(R) = Current Yld. + LT Real Econ. Growth + E(I))
    - Relative Expected Returns between asset classes reflect CONSENSUS Thinking. When spreads on returns between asset classes are unusually wide, it has been profitable to buy the asset with the highest return; when narrow, profitable to buy the asset with the lower return
    - E(R) provides clues to actual returns.
    - Authors performed a study where they shifted the asset mixes between stocks, bonds & cash according to the following set of rules
    - *Asset Allocation Ranges*
      - Stocks: 45-75% Bonds: 25-55% Cash: remainder
    - *Asset Mix Rules*
      - When the spread between Earnings Yield on Stocks and YTM on Bonds exceeds the Historical 24-month spread by more than 1 standard deviation, the stock holdings should be set at 75%. Else, 60% in Stocks
      - When the Spread between Bond Yields and Money Market yields exceeds the historical average 24-month spread by more than 1 standard deviation, hold 55% in bonds. If spread too narrow, less than 1 standard below average, hold 25% in bonds
    - *Results*
      - Rebalancing monthly via futures was done. Over the 1973-1988 period, this scheme would have outperformed the 60/40 buy & hold strategy by 392 Basis Points annually, and with less risk (excluding costs)
  - ***Stock Selection Screens***
    - Many services offer screens which select stocks. Shortcomings with these screens include:
      - Transactions costs of using screens are ignored
      - There is a BIAS toward small stocks
    - Using the JONES MODEL to evaluate the performance of a stock selection screen, the INFORMATION COEFFICIENT reflects the correlation between a stock's ranking in a screen in one period and its return in a subsequent period. (no study included in article)

- ***Are There Any Good Money Managers?***
  - Empirical evidence suggests that only ONE in FOUR money managers exceeds the median performance for 2 consecutive years; only 1 in 8 can do it for 3 consecutive years. This suggests STRONG FORM MARKET EFFICIENCY. But this is misleading. In fact, there are more excellent and horrible results than chance would suggest. Ergo, portfolio management does make a difference
  - Over the 1979-1988 period, analyzing the 25th & 75th percentile of managers, the gap between the 2 did not narrow → suggesting NON-RANDOMNESS meaning some managers stay high while other tend to stay low in their rankings.

- **"Using Information from Trading in Trading & Portfolio Management" by David J. Leinweber**
- Author studied the Trading cost associated with 13,000 trades executed by a pension fund. Trading costs were measured as the difference between the execution price of the order PLUS commissions LESS prices of securities at time investment decision was made. Results:
  - Trading Costs are IMPORTANT → Paper portfolios outperform real portfolios since they ignore trading costs. Between 1979-1991, Value Lines Paper portfolio produced an annualized return of 26.2% while the actual fund produced a return of only 16.1%
  - Small, easy trades were Disproportionately Expensive. Block traders produce better performance than the Loeb model predicts.
  - Management did not impact cost very much; contrary to the theory suggesting value trades should cost less than momentum-based trades
  - Some transaction costs are predictable within a reasonable degree of accuracy ($R^2 = 0.5$). Models incorporating a trading cost formula = X cents per share plus a percentage of the size of the order are misleading. Better to include reasons for trading, etc.
  - Skillful Execution reduces cost.
  - Patient trading reduces costs. Limit orders often keep costs down
  - Crossing & employing various trading venues can reduce costs. Can use ELECTRONIC Systems such as:
    - *ITG's Quantex System* – accessing several execution paths and to direct execution using market data and feedback from trades in progress
    - *First Boston's Lattice Trading* – performs ongoing matches internally and centralizes access to other markets
    - *Fidelity's Investor's Liquidity Network* – offers a matching system for orders to cross or execute against a stream of retail orders from Fidelity's correspondent brokers
    - *Instinet's Order Working System* – access to both the continuous Instinet market and the crossing networks, which cross orders after market closing hours
    - *Arizona Stock Exchange* – call auction market without broker participation

- **"Defining & Measuring Trading Costs" by Wayne H. Wagner**
- Most investors think that the cost of trading is the Commission paid to the broker. But, this is only part of the total trading cost. The cost of trading is really the difference between the price paid and the price that would have prevailed if the trade had not taken place. Thus, there are FOUR Components to Trading costs
    - *Commissions* – The cost of executing trades through markets
    - *Market Impact* – The difference between the price of the security at the time the order is placed with the broker & the actual execution price of the trade. This cost is a result of the trade itself; since the act of bidding for or offering shares cause prices to rise or fall. This is the Cost of LIQUIDITY
    - *Timing* – The cost of NOT executing all of the order at the same time, such as may occur if a limit order, rather than a market order is given. This is the cost of SEEKING LIQUIDITY
    - *Opportunity Cost* – Cost of not executing the trade because the price moves away from an acceptable level, the order is pulled, etc. This is the cost of LIQUIDITY FAILURE
- Market Liquidity is NOT a free good. Its cost is bounded by the value of the information on which an investor is acting. If the reason for the transaction is due to an impending item of news, market orders are placed, and the trade is executed rapidly; but the investor is at the mercy of the bid/ask spread. But, if the security is being purchased for more fundamental reasons that are already in the market, liquidity is not vital, a limit order may be placed, and the order filled according to the normal ebb & flow.
- The market environment impacts the market impact cost. In a "sky is falling" scenario, with many liquidity-seeking, sell at any price investors, liquidity becomes a premium.
- The investment STYLE of the manager relates to the costs of transactions
    - *VALUE Managers* are Bargain hunters. They tend to buy after a sell-off and do not buy based on emotion or rumor. Thus, they pay less for liquidity; instead, they may benefit by being suppliers of liquidity to over-eager buyers & sellers
    - *MOMENTUM Managers* peg their transactions to news or earnings announcements. Time is of the essence to this style and this need for liquidity exacts a cost. They are the natural counterparts to Value Managers. They have the highest costs while value managers have the lowest cost
    - *PASSIVE Managers* buy & sell in accordance with cash flows. They have moderate trading costs
- Consequences of this concept
    - PERFORMANCE is impacted by trading costs. This gives some advantage to the value strategy.
    - BEST EXECUTION is NOT finding the best price in the market at a particular time. Rather, it is the optimal outcome based on the style used by the manager.
    - Idea that Commission is the sole trading cost is dangerous. A higher commission cost may be valuable if it cots down on the liquidity-associated costs
    - Rushing to fill orders may be too costly to a value manager; failure to rush may be too costly to a momentum manager
    - Placing too large an order may add to opportunity costs.
    - Waiting for confirmation & waiting for ideas to be approved are costly if they change a value-based investment decision into a momentum-based trade

5. *Performance Measurement*

- **Basics**
- The primary purpose of Performance Measurement is to MONITOR how well a portfolio is doing compared to the goals that were set for it. Also, it is used to assess the value added by the portfolio manager. Finally, it can be used to compare portfolio managers
  - *Comparison with Peers*
    - Compare managers with similar investment styles to be compared against each other
    - BOND MANAGER STYLES →
      - Interest Rate Forecasters who attempt to change the duration of the portfolio based upon their interest rate projections
      - VALUE Buyers who do not necessarily attempt to predict rates, but find bonds that are relatively cheap
      - SPECIALISTS in particular market segments who use their expertise to outperform the normal spread
    - EQUITY MANAGER STYLES →
      - VALUE-Oriented managers who attempt to buy attractively priced stocks no matter what the general stock market conditions may be
      - EARNINGS GROWTH managers who tend to concentrate in growth stocks or stocks that have good earnings Momentum
      - MARKET TIMERS who buy a diversified portfolio of stocks when they believe the market is about to rise; and switch to cash when they feel the market will fall
      - SMALL CAP SPECIALISTS who find small emerging stocks that have a probability of developing into large, major firms
  - Since only compare against managers with similar styles, peer group comparisons have three Problems
    - How to Identify an appropriate universe of Styles
    - How to Place a manager in an appropriate style category.
    - How long to measure a manager's performance
  - *Comparison with "Normalized" Portfolio Benchmarks*
    - Measure against a benchmark not within group, but based on his own style. Find the manager's NORMAL (Benchmark) Portfolio. This normal portfolio represents a "paper" portfolio consisting of all the assets the manager could buy, weighted according to a long-term policy. Compare the benchmark to the actual results to determine the value added by the active management
  - *Comparison with Market Indexes*
    - May not always be appropriate
- **Calculating Portfolio Returns**
  - The Return earned on an investment during a single time period is called a HOLDING PERIOD YIELD → $r_P = (V_{P1}/V_{P0}) - 1$
  - There are THREE ways to measure the Average Annual Return over several periods
    - Dollar Weighted Return – The internal rate of return over an investment period using a discounted Cash Flow Calculation. It measures the actual

average annual return earned produced by the COMBINED effects of 2 Factors (1) the Performance of the Fund Manager & (2) Client decisions regarding adding or subtracting funds from the investment pool

- Time Weighted Return (Geometrically Computed) – This is the GEOMETRIC Mean of the Holding Period Returns earned during the holding period where the periods are defined as the time between EXTERNAL Cash Flows into or out of the portfolio. This calculation ELIMINATES the effect of client decisions on when to add or withdraw funds to or from the portfolio average annual return. It measures ONLY the return generated by the fund manager. It is considered to be the BEST measure of the ACTUAL (past) performance of the fund manager. It is REQUIRED by AIMR.
- Time Weighted Return (Arithmetically Computed) – This is the Simple Arithmetic average of the returns generated by a portfolio, excluding the effect of external cash flows that are initiated by the client. This is the ESTIMATE of the Expected return on a portfolio. Because this implies PROSPECTIVE performance rather than the actual historical performance of a fund manager, it is not an appropriate measure of the manager's past performance for performance presentation purposes.

For Example: A portfolio initially contains $1,000. The performance for the first quarter was +2%. At the end of the quarter, another $1,000 was added. The second quarter's performance was +3%. During the 3rd Quarter, performance was –1%. At the end of the 3rd quarter, $500 was withdrawn from the portfolio. During the 4th quarter, performance was +4%. In year 2, 1st quarter was –2%. During the 2nd quarter, performance was +3%. At the end of the quarter, another $1,000 was added. Third quarter was +1%, 4th quarter was –2%. Compute the rates of return for the 2-year period.

Dollar-Weighted Return

Steps: (1) Compute the Ending Value (2) Do an IRR calculation based solely upon cash flows and the Ending Value

The Ending Value of the Portfolio is:

$(1000)(1.02) = 1020+1000 = 2020$

$(2020)(1.03)(0.99) = 2060-500 =1560$

$(1560)(1.04)(.98)(1.03) = 1638+1000 = 2638$

$(2638)(1.01)(.98) = 2611$

Based upon the amount of cash contributed & withdrawn from the portfolio, and the timing of these cash flows, one can compute the dollar-weighted rate of return (r) as follows

$(1000)(1+r)^2 + (1000)(1+r)^{1.75} – (500)(1+r)^{1.25} + (1000)(1+r)^{.5} = 2,611$

$r = 0.75 \rightarrow .75*4 = 3\%$ per year (bond equivalent return)

Time-Weighted Return (GEOMETRIC METHOD) → Emphasized on Exam

Multiplying (1+quarterly returns) together produces (1+ 2year return)

$(1.02)(1.03)(.99)(1.04)(.98)(1.03)(1.01)(.98) = 1.08073$

The annual rate of return is

$(1+r_{Geometric})^2 = 1.08073$

$r_{Geometric} =(1.08073)^{.5} – 1 = 3.96\%$

This is the Best measure of the manager's contribution to the portfolio's past performance. It is required under AIMR Performance Presentation Standards. BY subtracting the Time-weighted return from the Dollar-weighted return, it is possible to see the extent to which the client's timing of contributions and withdrawals affect performance. In this case, the client harmed his return by 96 basis points owing to poor timing of additions & withdrawals.

Time-Weighted Return (ARTIHMATIC METHOD)

The Average Return per quarter is:

$r_{Arithmetic} = (.02+.03-.01+.04-.02+.03+.01-.02) / 8 = .01$

Annualizing this quarterly return produces an average of 4*.01 = 4% per year

This is a good measure of the EXPECTED FUTURE performance of the manager because the arithmetic mean is an unbiased estimate of expected values

- **Comparing Time-Weighted, Arithmetically Computed Returns with Time-weighted Geometrically Computed Returns**
  - The Time weighted, Arithmetically computed return (**r_A**) compounded over a given time horizon gives the best estimate for the ending value of a portfolio, whereas the time weighted geometrically computed return (**r_G**) is the best estimate of the future growth rate of the investment. To consider this (seemingly) paradoxical statement, consider the following example

    For Example: Suppose one starts with a $10,000 portfolio that is invested in a risky asset whose return has a 50% chance of rising 40% in a year and a 50% chance of falling 20% in a year. The expected value of the ending value of the portfolio (in 2 years) is:

    $E(V_{End}) = .25(19600) + .5(11200) + .25(6400) = \$12,100$

    This represents an Expected average annual rate of return of 10%

    $FV = PV\ (1+r)^2$

    $12,100 = 10,000(1+r)^2$

    $r = 10\%$

    Note: this same result can be obtained by simply computing the time-weighted arithmetically computed rate of return

    $r_A = (40 - 20)/2 = 10\%$

    The time-weighted geometrically compute rate of return produces a result of 5.83%

    $r_G = [(1+r_1)(1+r_2)]^{.5} - 1$

    $r_G = [(1+.4)(1-.2)]^{.5} - 1 = 5.83\%$

    $10,000 invested for 2 years at a rate of 5.83% will generate an ending value of $11,200

    $(10000)(1.0583)^2 = \$11,200$

    This is the MOST PROBABLE ending value of the portfolio, but it is NOT the Expected Ending Value.
  - The Time-weighted Arithmetically computed return provides the BEST way of determining the EXPECTED ENDING VALUE of a portfolio; yet the Time-weighted Geometrically computed return produces the Portfolio's Best estimate of the PROBABLE Ending VALUE.
  - Since compounding at different rates of return produces a skewed distribution of ending values, thus expected & most probably ending values are different.. The relationship between r_A & r_G is a *f* of the risk that is undertaken by the portfolio manager, as seen from the formula $r_A = r_G + \frac{1}{2}\sigma^2_R$
  - The Best Measure of Actual PAST Performance is the time-weighted, geometrically computed average return (r_G). It depends on only 2 Valuation points (V_O & V_{End}) and not upon the actual path. The time-weighted arithmetically computed average return (r_A) is Path dependent; it increases as the interim periodic returns become more volatile. Thus, if the arithmetically return (r_A) is used to measure a portfolio manager's performance, that performance could be enhanced by simply increasing the volatility of returns in each period. Using r_G cannot be improved by increasing volatility, thus r_G is used by AIMR.

- **Calculating Returns for a Single Period**
  - One problem in measuring average returns over several periods of time is determining the rate of return for a single period, such as a quarter or a month when contributions to or withdrawals from the portfolio have occurred at times other than the end of the period. In such a case, the DEITZ Method or the BAI Method can be used to estimate the return for the period
  - Dietz Method – assumes all contributions are made at mid-period.

    $r_P = (V_E - V_B - C) / (V_B + .5C)$

    For Example: a Portfolio has a value of $10,000 at the beginning of a month. During the month, $1,000 of additional funds were contributed to the portfolio by the investor. At the end of the month, the value of the portfolio was $12,050. According to the Dietz Method, the return on the portfolio is

    $r_P = (V_E - V_B - C) / (V_B + .5C)$

    $r_P = (12{,}050 - 10{,}000 - 1{,}000) / (10{,}000 + .5(1{,}000)) = 10\%$

    If the exact day that a contribution is made is known, the Dietz Method can be used to more precisely determine the periodic rate by using a day-weighted, or MODIFIED DIETZ METHOD

    $r_P = (V_E - V_B - C) / [\ V_B + \{(D_P - D_C)/D_P\}C_1 + \{(D_P - D_{C2})/D_P\}C_2 + \ldots$

    For Example: Suppose in the above example, the $1,000 contribution was made on the 10th day of a 30-day month. Can calculate more precisely the return.

    $r_P = (12{,}050 - 10{,}000 - 1{,}000) / [10{,}000 + (30-10/30)(1000) = 9.84\%$
  - BAI Method – a little different

    $V_E = V_B(1+r_P) + C_1(1+r_P)^{[(DP - DC1)/DP]} + C2(1+r_P)^{[(DP - DC2)/DP]} + \ldots$

    For Example: Suppose the previous example was solved using the BAI method.

    $12050 = 10000(1+r_P) + 1000(1+r_P)^{[(20-10)/30]}$

    using trial & error $\rightarrow r_P = 9.85\%$

    The Disadvantage of the BAI Method is the Need for the Trial & Error Method

    COULD Also use the DAILY Computation of returns, treating all contributions & withdrawals as if they occur at the beginning of the day The Annualized Returns would be the GEOMETRIC Average of 1 + Daily Returns for the entire year. While time consuming, this is accurate and urged by AIMR to reduce the need to make approximations regarding the timing of contributions & withdrawals

    $r_{Daily} = (V_{End\ of\ Day} / V_{Beginning\ of\ Day}) - 1$
- **Mutual Fund Performance**
  - Most mutual funds perform WORSE than a naïve strategy of Direct Investment in randomly selected securities or indexing. The primary reason for this seems to be related to costs associated with mutual funds (such as Transactions costs, management fees, SG&A Expenses, and sometimes, Loads). Plus, studies have found
    - Bond Funds tend to under-perform by 1% per year (re: direct investment in bonds). This corresponds to fund expenses of about 1% of assets per year
    - No-load funds out-perform load bonds
    - Low-turnover funds with less transaction costs out-perform high-turnover funds
    - Funds with low expense ratios out-perform funds with high expense ratios

        - Size of fund does not correlate to performance, ceteris paribus
    - When SURVIVOR bias is considered, the above results become magnified
    - Why, then, invest in Mutual Funds?
        - Mutual Funds provide substantial diversification that small investors otherwise cannot obtain
        - Mutual Funds perform record keeping functions making tax accounting easier
        - Mutual Funds offer specialization in areas individual investors might prefer (socially responsible funds, for example)

- **Performance Attribution Analysis**
    - Performance measurement may also be used to discover WHY a particular overall performance was achieved. Can be done in 2 ways:
        - Break the Return into Components based on Asset Allocation, Selectivity & Market Return
        - Break the Return into the Effects of Market Return, Policy Impact, Market Timing & Selection
    - *Measuring the Impact of the Market, Asset Allocation, & Selectivity*
        - Using the Below Example, see the comparison between the manager & the Market

	Stock Market Index		Managed Portfolio	
Sector	**Index Weight (w_M)**	**Sector Return (r_M)**	**Portfolio Weight (w_P)**	**Sector Return (r_P)**
Consumer	30%	15%	10%	18%
Technology	10%	20%	30%	25%
Cyclical	35%	30%	15%	20%
Energy	25%	-5%	45%	5%

        - Using this information, the Following Can be deduced →

Index Return (I) = $\Sigma w_M r_M$ = (.3)(.15) + (.1)(.20) + (.35)(.30) + (.25)(-.05) = 15.75%

Index & Allocation Return (II) = $\Sigma w_P r_M$ = (.1)(.15)+(.3)(.20)+(.15)(.30)+(.45)(-.05) = 9.75%

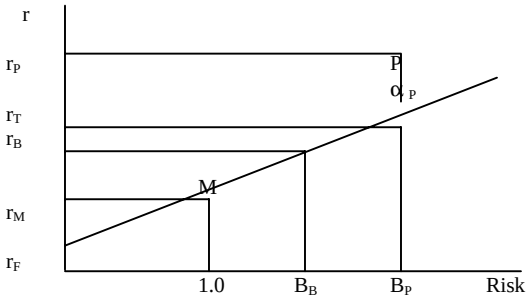
Policy & Selection Return (III) = $\Sigma w_M r_P$ = (.3)(.18)+(.1)(.25)+(.35)(.20)+(.25)(.05) = 16.15%

Portfolio Return (IV) = $\Sigma w_P r_P$ = (.1)(.18)+(.3)(.25)+(.15)(.20)+(.45)(.05) = 14.55%

        - The Effect of the Investment Manager's Strategy can be attributed to:
            - The MARKET → which is the Index Return
            - The ALLOCATION → among asset sectors
            - The Security SELECTIONS → made by Manager
            - The COMBINATION → of Asset Allocation & Security Selection
        - Given that, the manager's OVERALL Portfolio Return (IV) can be Attributed to 3 Factors
            - The MARKET RETURN (I)
            - The ALLOCATION among Sectors (II-I)
            - The Individual SECURITY Selection (IV-II)
        - Therefore, the Attribution Analysis leads to the Following Conclusions

Return Due to:	Calculation	Result	
Market Index	I		15.75%
Asset Allocation	(II-I)	9.75-15.75=	(6.00%)
Security Selection	(IV-II)	14.55-9.75=	4.80%
Manager's Return	IV		14.55
Manger's Contribution	(IV-I)	14.55-15.75=	(1.20%)

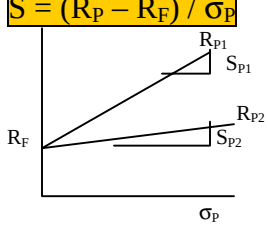
- *Measuring the Effect of the Market, Investment Policy, Market Timing & Security Selection on Total Performance*
  - The Return on a Portfolio can be broken down into its component parts by examining the placement of the portfolio in the return-beta plane, relative to the market line drawn for the measurement period



  - From the Illustration Above, the Component parts that comprise the portfolio's total return are:
    - MARKET Effect, r_M
    - BENCHMARK Effect, r_B-r_M
    - Market TIMING Effect, r_T-r_B
    - Stock SELECTION Effect, r_P-r_T

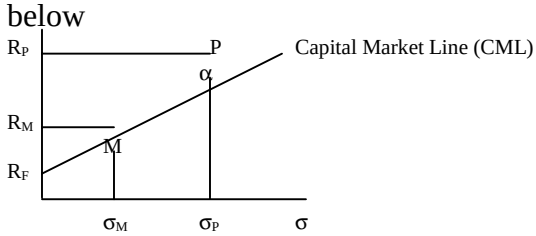
- **Measuring Risk-Adjusted Returns for Equity Portfolios**
- The Time-weighted Return Measures Performance WITHOUT Regard to Risks Taken. Since high returns may be earned by taking high risks, it is better to relate the return earned to the risk-taken. There are SIX generally recognized Methods of Measuring risk-adjusted Returns based on one-parameter Index Models:
  - ***The Sharpe Measure***
    - The Sharpe Measure is the Return Earned in EXCESS of the Risk-free rate on a Portfolio, relative to the portfolio's total risk (measured by the σ of Returns)

$$S = (R_P - R_F) / \sigma_P$$



    - The Sharpe Ratio is an appropriate measure of risk-adjusted performance for an overall portfolio. It can compare the performance of a portfolio to the capital market line, rather than to the security market line.

- ***Differential Return relative to Total Risk Taken***
  - The Capital Market Line can be used as the Standard Benchmark Against which performance is Measured, as shown in the figure below



  - Measures the α, which is a measure of its risk-adjusted performance

    $\alpha = R_P - R_T = R_P - [R_F + \{(R_M - R_F)/\sigma_M\}\sigma_P]$

- ***Treynor Measure***
  - The Treynor measure is similar to the Sharpe measure except that the RISK Criterion that is used is the β of the Portfolio. Because β is only meaningful for a well-diversified portfolio that has no unsystematic risk, and it is a measure of non-diversifiable, rather than Total Risk, it is less appealing than the Sharpe ratio as a general risk-adjusted measure of performance. But, it is Easy to compute since Portfolio Betas are easier to compute than Standard Deviations of portfolios. But, the relative rank of a stock's risk-adjusted return should be the same if one uses the Treynor ratio or Sharpe ratio if the portfolios are well-diversified: if they are not well-diversified, the Treynor ratio will tend to give the higher ranking to the least-diversified portfolio.
  - Whereas the Sharpe Ratio measures performance relative to the CML, the Treynor Ratio measures the portfolio's performance relative to the SML

    $T = (R_P - R_F) / \beta_P$

    The absolute risk-adjusted return is the Treynor Measure plus the risk free rate

    Risk-Adjusted Return $= [(R_P - R_F) / \beta_P] + R_F$
  - One Problem with the Treynor measure is that negative values are confusing. When a portfolio with a β of 1.3 produces a 2% return and the risk-free rate is 5%, its Treynor ratio is -.023. Such a result suggests inferior performance. But, if a portfolio has a negative beta, a negative Treynor ratio can indicate superior performance.
  - So, when a β of a Portfolio is NEGATIVE, it is BEST to use the JENSEN Measure to measure performance.

- ***Jensen Measure***
  - This measure is often used for BREAKING portfolio returns down into their component parts and for determining the α of the portfolio. But, it is not a good measure in its own right because it will only produce meaningful results if is used to compare 2 Portfolios which contain the same β
  - The Jensen Measure employs the Security Market Line to determine the EXPECTED Return of the Portfolio. The portfolio's α is the difference between the actual return and the return to be expected from CAPM
    $R_E = R_F + \beta_P(R_M - R_F)$
    $\alpha_P = R_P - R_E = R_P - [R_F + \beta_P(R_M - R_F)]$
  - The Jensen Measure is similar to the Treynor measure in that it calculates the Expected return on a portfolio, with respect ONLY to its Systematic Risk. Thus, it is a good measure of risk-adjusted return for ONLY well-diversified portfolios.
  - However, unlike Sharpe & Treynor, the Jensen measure requires the use of a different risk-free rate for each time interval of the measurement period.
- ***Portfolio R^2***
  - The Coefficient of Determination (R^2) between a Portfolio's Returns and the corresponding returns on the market index is a measure of how well the portfolio is diversified. The closer R^2=1.00, the better diversified is the portfolio
- ***The Fama Measure***
  - The Fama measure uses a Form of the CML to Decompose a portfolio's Total Returns into component parts.
  - Performance is usually measured by a Portfolio's EXCESS Return over the Risk Free Rate
    Overall Performance $(R_{Actual} - R_F)$
    = Return on Risk $(R_{Projected} - R_F)$
    + Gross Return on Selection $(R_{Actual} - R_{Projected})$
  - The Return on Risk can be subdivided into a return on the risk level that the client sets as a policy plus the return earned by the manager deviating from the client's policy (when the manager uses a portfolio whose risk equals the desired risk level of the client, there is NO manager risk)
    Return on Risk $(R_P - R_F)$
    = Return on Client's Policy Risk $(R_{\text{Client's Expected Return}} - R_F)$
    + Return on Manager's Risk $(R_{Projected} - R_{\text{Client's Expected Return}})$
  - The Gross Return on Stock Selection can be broken into sub-parts: A Diversification Component & a NET Selectivity Component

For Example: Given the Following Data, perform a Fama Analysis on Fund X. Assume the Client wanted a β of 1.10.

			FUND X PERFORMANCE			
Fund X Return	**Risk-free Rate**	**β**	**S&P500**	**σ**	**Fund X**	**R^2**
13.5%	5.0%	1.15	10.0%	20%	28%	.77

According to CAPM, Fund X's & Client's Required Returns should have Been

$R_{Projected} = (.05) + (1.15)(.10-.05) = 10.75\%$

$R_{Client\ Expected} = (.05) + (1.10)(.10-.05) = 10.50\%$

OVERALL Performance $\rightarrow (R_{Actual} - R_F)$	13.5% - 5.0% = 8.5%
Return on Risk $\rightarrow (R_{Projected} - R_F)$	10.75 – 5.0 = 5.75%
Return on Investor's Risk $\rightarrow (R_{Client's\ Expected} - R_F)$	10.5 – 5.0 = 5.50%
Return on Manager's Risk $\rightarrow (R_{Projected} - R_{Client's\ Expected})$	10.75 – 10.5 = 0.25%
Gross Selection Return $\rightarrow (R_{Actual} - R_{Projected})$	13.5 – 10.75 = 2.75%

The Fund's Return given its σ is:

$R_Q = R_F + [(R_M - R_F) / \sigma_M]\sigma_P$

$R_Q = (.05) + [(.1 - .05)/.2](.28) = 12\%$

Return Due to Diversification $(R_Q - R_P) = .12 - .1075 = 1.25\%$

Net Stock Selectivity Return = Gross Stock Selection Return – Diversification Return

= .0275 - .0125 = 1.50%

The Degree of Diversification in Fund X can be estimated from

$\sigma_P / \sigma_M = .28/.20 = 1.4$

$\beta_P = 1.15$

$R^2 = .77$

These indicators suggest that the portfolio is NOT completely diversified

- **Problems with Risk-Adjusted Measurements**
  - ***Randomness of α***
    - Most risk-adjusted performance measurement methods imply that the manager with the largest α (actual return – normal expected return) is best. But, this ignores the fact that a large α in any measurement period may be due to Chance. To differentiate a superior manager from an average one is a series of α measurements over time. Then, perform a statistical test to determine if they are Statistically SIGNIFICANT using t- & F-Tests. AIMR does not require risk-adjusted performance measures because of problems of the risk-adjusted method. Most managers are measured by Jensen (as in the following example)

For Example: A portfolio manager has produced the following Jensen Alphas over 5 years

Year	α
1	1.0
2	–2.5
3	4.2
4	1.0
5	–1.0

At the 5% level of significance, test the hypothesis that $\alpha = 0$

X	$(X - X_{avg})^2$
1.0	.2166
-2.5	9.2416
4.2	13.3956
1.0	.2166
-1.0	2.3716
2.70	25.4320

$X_{avg.}=0.54$ $S^2_X = (25.432/4) = 6.3580$ $S_X = (6.3580)^{.5} = 2.52151$

$S_{X\ Avg.} = [2.52151/(5)^{.5}] = 1.12765$

$t_{.05,\ 4} = 2.776$

$t= [(X_{avg} - X_0) / S_{X\ avg}] = (.54 - 0) / 1.12765 = .4788$

The α is NOT Significantly different from Zero because t < 2. 7776

To figure out how many years it would take to determine if an X_{Avg} of 0.54 and an S_X of 2.52 was significant for this positive α, it would take

$n = (t\text{-}stat_{level\ of\ significance})^2(S_X)^2 / (X_{Avg})^2 = (1.96)^2(2.52)^2 / (0.54)^2 = 83.66$ years

- ***Benchmark Error***
  - ROLL has pointed out that the widely used Jensen α risk-adjusted return performance measurement technique requires a SML or β Measurement, each of which uses a Market Index and a Risk-Free Rate. But, nobody knows exactly what they are, so the performances of these BENCHMARKS cannot be determined. Usually the T-Bill rate is proxied for the Risk-free rate and the S&P for the Market. But, these are not the True Market Portfolios as defined by CAPM. Thus, the market line used as the performance measurement standard may be wrong. Thus, ALL α measurements can be wrong in both MAGNITUED and DIRECTION
  - The Benchmark problem is even greater for Global portfolios.
  - Though the Theory of Risk-Adjusted Performance measurement using CAPM is sound, there are some practical difficulties with it. Perhaps the SHARPE Ratio is better for measuring the risk-adjusted performance as it does not require the use of a market portfolio (no β or σ_M in its calculation)
- ***Variability of Portfolio Means & Variances***
  - Risk-adjusted performance measures only work if the population's mean and variance can be presumed STABLE over time. When a manager changes the risk (and alters the return expectation), the homogeneity of the expected return variance changes and the standard statistical measures of multi-period risk-adjusted returns become useless.

For Example: Consider a portfolio manager who pursues a low-risk strategy in one year and a high-risk strategy the next. The Quarterly Excess Returns over the 2 year period are as follows:

Period		$R_P - R_E$
19X1		
Q	I	3%
	II	-1
	III	3
	IV	-1
19X2		
Q	I	27
	II	-9
	III	27
	IV	-9

Summary Statistics

Period	Avg. Excess R	σ	Sharpe Ratio
19X1	1%	2.0%	.50
19X2	9	18.0	.50
19X1-X2	5	13.4	.37

Note that the average Sharpe Ratio is the same in both year 1 & 2, but over both years, the Sharpe Ratio Drops. How can this be? The shift in riskiness produces the APPEARANCE of more overall risk than there actually is, resulting in a DOWNWARD Bias in the Sharpe Ratio.

  - One way to solve this is to use the TREYNOR measure instead of the SHARPE. Then, a measure of performance could be devised that examined the change in performance from period to period, in relation to the corresponding change in β.
- ***Inability to Leverage at the Risk-free Rate***
  - The Sharpe & Treynor Ratios use the Slope of a line drawn in the return/risk spectrum from the Risk-free rate to the return on a portfolio as the measure of the portfolio's risk-adjusted performance. But, this presumes an ability to borrow & invest funds at the same risk-free rate.

- **Measuring the Ability to Time the Stock Market**
  - Investment mangers attempt to Time the Market in 1 of 2 Ways
    - Vary the Asset mix in accordance with expectations about the relative performance of the asset classes
    - Vary the β of the Stock Portfolio in accordance with market expectations. When expect strong market, increase the β of portfolios, when expect weaker markets, decrease the β.
  - There are TWO ways to measure the degree of Success an investment manager has in timing Stock Markets Correctly
    - <u>Observe Deviations of β_P from normal long-term policy β and compare those deviations with performance of Market Index</u>
      - When Market Index exhibits above-average strength during periods when manager employs an above-average portfolio β, while the market index is weak when manger uses below-average β, the manager is a good market timer
      - If there is no correlation between above(below) average stock market performance and high(low) portfolio β choices by the manager, then the manager has no ability to time the market
      - If Market Index performs well while manger uses low β, and if market performs poorly while manager uses high β, he is a poor market timer
    - <u>Treynor-Mauzy Method</u>
      - Assumes that in a perfectly efficient market, portfolio returns should be related to returns generated by the market through CAPM $\rightarrow$ $\boxed{R_P = R_F + \beta_P(R_M - R_F)}$
      - Don't understand much of it, hope not on exam.

- **Benchmark Portfolios – Eliminating the Influence of Style from Investment Performance**
  - Traditional performance measurement techniques fail to distinguish between results that are produced by management decisions and results produced by manager's investment style.
  - As managers are often hired based on their style, it is unfair to evaluate the manger's performance against some standard of performance that is not comparable with that style. Thus, it is important to select an APPROPRIATE BENCHMARK for comparison
  - <u>*Characteristics of a Good Benchmark*</u>
    - Unambiguous $\rightarrow$ The names & weights of the securities in the portfolio should be clearly identified
    - Investable $\rightarrow$ A manager with a particular style should always be able to invest in the benchmark portfolio as an alternative to his own. Thus, the Benchmark should be a passive alternative to Active management for a particular style. It should be low-turnover with tradable positions (even number of shares)

- Measurable → Must be able to track the performance of the benchmark over time
- Appropriate → Securities in the benchmark should be the type that fit the investment manager's style and biases
- Reflective of Current Investment Opinions → Mangers should have access to current information on the assets included in the benchmark. The prices should be determined by the market, and not via appraisals
- Specified in Advance → Benchmark should be constructed prior to measuring the performance of a manager

▪ *Peer Group Ranking as a Benchmark of Performance*
- It is common to measure performance by determining where they fall relative to their peers.
- But, peer group ranking exhibits none of the characteristics of Good Benchmarking. They are ambiguous, unknowable in advance, un-investable, and un-specified.

▪ *Customized Benchmarks*
- Typical Benchmarks & Performance measurement techniques may be too general to apply to managers who are hired to use a specific investment style. But, the more traditional approaches fail to take into account the varying styles. Over time, styles move in & out of favor. Customized benchmarks enable style to be neutralized.
- Good customized benchmarks contain all the characteristics of a good benchmark, & will be designed to reflect the investment style (asset universe & strategy) of a manger whose performance is being measured.
- To Customize a Benchmark →
  - Identify the Manger's Style
  - Select Securities whose characteristics are compatible with the manager's style
  - Devise an appropriate weighting scheme for the securities, including an appropriate cash weighting
  - Review the benchmark portfolio occasionally and make appropriate modifications
  - Rebalance the weights on a periodic & appropriate basis

▪ *Implications of Increased Benchmark Portfolio Usage*
- Sponsors of Pension & Endowment Funds are likely to be impacted as benchmark portfolios become more commonly used as a performance measurement tool
  - Fund managers will be hired that can add value even while staying within a particular investment style or when specializing with a specific asset class
  - There will be less manager bashing as it will be easier to measure results that occur because of, not in spite of, a particular style of investing

        - Skillful manager will be rewarded for their security selection within a style and not because their style is in favor
        - Benchmarks will facilitate a better assessment of active manager skills & asset allocation

- **"Are Manager Universes Acceptable Performance Benchmarks?" by Bailey**
    - It is common to evaluate the performance of a money manager by comparing his performance to that of other money managers (v. median manager). The popularity of peer ranking is based on its naïve appeal (presume past can be extrapolated to future) and because data of this type is readily available and cheap
    - However, there are shortcomings to this
    - *Conceptual Shortcomings*
        - The Median Manager's portfolio is not unambiguous because it varies from time to time as the median manager changes from period to period
        - Impossible to invest in the median manager's portfolio because it is unknown at the start of the investment period
        - Impossible to track the performance of the median manager's portfolio since the median manager changes each period
        - Median manager for a group may not really match the risk constraints or objectives of other managers in the group
        - Median manager's portfolio may contain securities that are unknown by all managers in the group
        - Median manager's portfolio cannot be specified in advance of the measurement period
    - *Survivor Bias*
        - When a manager performs poorly, the client removes his assets from the manager's control. This results in an upward bias in manager outcomes (as mangers are removed from rankings)
    - *Failure to Pass Benchmark Quality Tests* – Valid Measures should →
        - Consist of all the actual portfolios managed by the manager, rather than just those selected portfolios the manager allows to be used in the benchmark
        - Percentage of portfolios held in particular securities by managers should exceed their percentage in the benchmark portfolio (else manager is merely indexing)
        - If the benchmark is used in place of the market portfolio as the performance target, the return/risk ratio of the benchmark portfolio's return should be higher than that of the market portfolio. If not, it is better to invest in the market
        - There should be high extra-market return correlation between the benchmark & managed portfolio. When a manager's style is out of favor, it should have no bearing on the manager's ability to add value to that style

- Median Benchmarks do not meet these tests. Most performance by median manager comparison studies gave no info. about client coverage, portfolio turnover, active positions, etc. Thus, it is invalid to evaluate a manager based upon his quartile performance relative to other managers.

- **"Mutual Fund Misclassification: Evidence Based on Style Analysis" by diBartolomeo & Witkowski**
  - There are SIX general Categories of Equity Mutual Fund Objectives:
    - Aggressive Growth
    - Growth
    - Growth-Income
    - Income
    - International
    - Small Capitalization
  - However, classification of a fund into one of these classes do not convey information about investment objectives, securities contained in the portfolio, or investment style
  - Misleading classification of mutual funds is a problem for investors.
  - Competition for fund among mutual funds is keen; plus, Morningstar rankings are used for marketing purposes. Thus, it is highly desirable to be considered 'superior' performing. This gives an incentive to misclassify. One way to outperform is to take on excess risk
  - Thus, investors should be cautious about accepting the classification a fund places on itself in the prospectus and how others classify it. It is best to examine the securities in the portfolio and track the record of the manager to determine the type of investments and the style used.
- **"Asset Allocation: Management Style & Performance Measurement" by Sharpe**
  - Essentially, how to construct a Benchmark
  - An Asset Factor model could be written so that the return on a portfolio is determined by →
    $R_P = [b_1R_1 + b_2R_2 + b_3R_3 + \ldots + b_nR_n] + e$
  - Each Factor Return (R_i) represents the return on an HOMOGENOUS asset class and the coefficients (b_i) are constrained between 0&1 (summing to 1). When this is done, the sum of the terms in the brackets will represent the portfolio return that is attributed to the style of the manager while the residual (e) will represent the return that is attributable to the manager's skill.
  - The author developed a 12-asset class factor model for performance measurement. Each factor could be used by an index.
    - T-Bills → Salomon Bros. 90-day Treasury Index
    - Intermediate Term Gov. Bonds → Lehman Bros. LT Gov. Bond Index (≤ 10 Years)
    - Long-Term Gov. Bonds → Lehman Bros. LT Gov. Bond Index (10+ Years)
    - Corp. Bonds → Lehman Bros. Corp. Bond Index

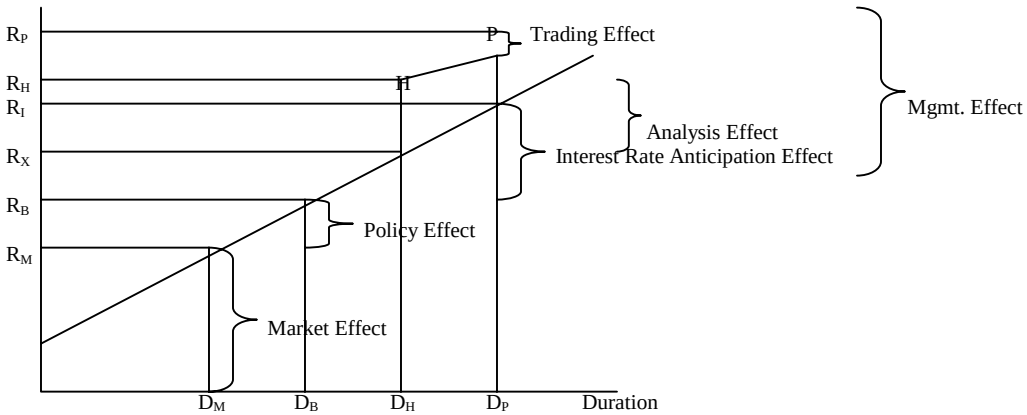
- Mortgages → Lehman Bros. Mortgaged-backed Securities Index
- Value Stocks → Sharpe/BARRA Value Stock Index
- Growth Stocks → Sharpe/BARRA Growth Stock Index
- Med.-Size Co. Stocks → Sharpe/BARRA Med. Cap. Stock Index
- Small Co. Stocks → Sharpe/BARRA Small Cap. Stock Index
- Foreign Bonds → Salomon Bros. Non-US Gov. Bond Index
- Euro. Stocks → FTA Euro-Pacific Ex Japan Index
- Japanese Stocks → FTA Japan Index

- Many of the differences in returns experienced by portfolios can be attributed to differences in exposures to the 12 asset classes. Variance in returns between those asset groups is greater than the variability within asset groups, suggesting that investment STYLE is a primary determinant of performance over any given period of time
- Using the above factor model, multiple regression analysis may be used to relate the returns of a given portfolio (R_P) to returns on each of the 12 asset classes. Regression coefficients (b_i) can be interpreted to represent the fund's historic exposure to the various asset classes.
- Once the style of a money manager has been determined (through regression) it is simple to determine the overall asset mix that will be obtained by placing funds with that manager.
- *Style Analysis and Performance Measurement*
    - A Good Benchmark portfolio to be used as a standard for measuring performance should be:
        - One the investor can invest in himself without using a money manager
        - One that is not easily beaten by attempting to select the right subset of securities that comprise it
        - One that can be replicated at low cost
        - One that can be identified before the fact
    - Style Analysis is a means of constructing benchmark portfolios that meet these requirements. To do it:
        - A regression constrained so that each regression coefficient was between 0&1 could be performed relating the fund's monthly returns to the monthly returns of the 12 indexes. This regression would define the style of the manager.
        - The resulting regression could then be used to predict what the return on the fund should have been in a month given the returns experienced by the 12 indexes. This is a measure of the return that was earned due to the investment style of the manager
        - The difference between the actual return & the predicted return (TRACKING ERROR) is a measure of how much value was added or lost by the manager due to security selection.
        - By repeating this process for several months, one may determine the amount the manager contributes to the style

by superior selection & whether or not this is statistically significant.

- Performing a test on several mutual funds, one finds that the AVERAGE TRACKING ERROR of all funds is -.89% per year. Funds, as a group, do not beat the market (since, in aggregate, they are the market). The negative tracking error is the cost of running the fund.

- **Measuring Risk-Adjusted Returns for Fixed-Income Portfolios**
- A measurement of both return & risk is required to obtain a risk-adjusted return measure. Bond returns are best measured by the horizon return earned on a portfolio over the measurement period. Bond risk is best measured by duration. By relating a bond portfolio's performance in the return-duration plane to a market line benchmark, it is possible to break a portfolio's total return into component parts.



- *MARKET EFFECT (R_M)* – The Return due to the Market
- *POLICY EFFECT ($R_B – R_M$)* – If the long-term benchmark portfolio is one with a duration, D_B which differs from the duration of the market portfolio, D_M, then the effect of this policy during the measurement period is to produce an incremental return equal to R_B - R_M
- *INTEREST RATE ANTICIPATION EFFECT – ($R_I – R_B$)* – Instead of keeping the duration of the portfolio at the long-term policy level, D_B, the portfolio manager changed it to D_P during the measurement period. This change, on average should have produced an incremental return equal to ($R_I – R_B$). This is the impact of the interest rate anticipation (raising duration above D_B in anticipation that rates would drop).
- *ANALYSIS EFFECT ($R_H – R_X$)* – This is the impact of bond selection. It is the difference between the actual return on a buy & hold portfolio at the beginning of the period (R_H) and the theoretical value of a buy & hold portfolio of the same Duration (D_H) measured off the Market Line (R_X).
- *TRADING EFFECT* – This is the residual return not accounted for elsewhere.

- The Manager contributes only to the last three of these effects. Thus, their sum is called the MANAGEMENT EFFICT
- There are TWO Drawbacks to this method of analysis →
  - It does NOT measure Credit Risk, Call Risk, Sinking Fund Risk, etc.
  - Macaulay's duration is a good risk measure only if the yield curve shifts are parallel: it is not a good risk measure if the shape of the yield curve changes (Stochastic Process Risk)

- *Decomposition Return Attribution Analysis*
  - In this analysis, the measurement begins by computing a MANAGEMENT DIFFERENTIAL, or the difference between the return that would be realized on the beginning-of-period portfolio if it were held unchanged over the measurement period, and that which would be realized on the market (index) portfolio. The differential is broken down into 4 components, shown below

Portfolio Type	Total Return	YTM	Interest Rate Effect	Sector/Quality Effect	Residual Effect
Theoretical Returns on Beginning Portfolio if Held Unchanged over Period	**0.94%**	2.14%	-3.84%	0.80%	1.84%
Return on Market Portfolio	**-1.25%**	2.06%	-4.13%	0.82%	0%
Management Differential	**2.19%**	0.08%	0.29%	-0.02%	1.84%

  - YTM Effect → The YTM on each portfolio at the beginning of the period
  - Interest Rate Effect → Basis point change in the Government Yield Curve that occurred during the measurement period * the duration of the portfolio
  - Sector/Quality Effect → Measure the % change in price of Aaa, Aa, A, Baa, etc, bond indexes that have occurred during the measurement period due to the changes that has occurred in their yield spread over treasuries during the same period. A weighted average of these percentages is then computed for the portfolio being measured and the market portfolio benchmark using the percentage of each portfolio that consists of Aaa, Aa, A, Baa, etch bonds as the weights. The procedure is repeated for other sectors (utilities, industrials, financials, governments, etc.) so that the JOINT EFFECT of these factors on yield spreads can be determined
  - Residual Effect → Total return of portfolio not accounted for by other effects. Measures the ability of the manager to select bonds.

- **AIMR Performance Presentation Standards**
  - **Purpose of AIMR Standards**
    - Given the need for a common, accepted set of guidelines to promote FAIR REPRESENTATION and FULL DISCLOSURE in presenting performance results, AIMR developed Performance Presentation Standards (AIMR – PPS). The Standards should be interpreted as the MINIMUM Standards of Ethical Principals for presenting Investment Performance. They have been designed to Meet FOUR Goals
      - *Achieve Greater Uniformity & Comparability among Performance Presentation Standards*
      - *Improve the Service offered to Investment Management Clients*
      - *Enhance the Professionalism of the Industry*
      - *Increase Self-Regulation*
    - Some Parts of AIMR-PPS are MANDATORY meaning they MUST be observed to claim compliance; some are RECOMMENDED, meaning they ought to be observed. AIMR recommends adopting both Mandatory & Recommended Standards

- AIMR-PPS are mainly to be used in PRESENTATION, rather than MEASUREMENT. Prefer adoption in Spirit rather than Strict Letter of the Code. Presenters have the responsibility to include disclosure containing material information not covered in the AIMR PPS.

- **Parties Affected by AIMR Performance Presentation Standards**
  - Affect those who present performance presentation and those who use it. ALL AIMR members, CFA Charterholders, & CFA Candidates are encouraged to inform their employers of AIMR-PPS and encourage their employers to voluntarily implement them.
  - Firm → To claim compliance with AIMR-PPS, the Standards MUST be observed on a FIRM-WIDE Basis and state how it is defining itself as a firm for compliance purposes. AIMR-PPS defines a firm as:
    - An Entity that is REGISTERED with the regulatory authorities as an Investment Firm
    - An AUTONOMOUS INVESTMENT Subsidiary or Division held out to the public as a Separate Entity (subsidiary may claim compliance for itself without the need of the parent to be in compliance)
    - All Assets managed for clients who have the same base currency
  - Total Firm Assets → Total firm assets include all Discretionary & Non-discretionary Assets. Total Firm Assets does NOT include the assets underlying overlay investment strategies unless the firm actually manages the underlying assets. Assets assigned to sub-advisors that are not part of the firm are not to be included in total firm assets unless the manager has discretion over the assets. Assets non based on a mark-to-market valuation (like GICs) can only be included in total firm assets and reported as being in compliance with the Standards if the assets are separately marked-to-market. Else, these assets are EXEMPT from AIMR-PPS and must be reported separately. All fee-paying accounts with investment discretion must be grouped into composites that have similar investment strategies or objectives. Compliance cannot be met on a per composite or per product basis, but can only be met on a firm-wide basis. ONLY Firms with INVESTMENT ASSETS UNDER MANAGEMENT that follow all required AIMR-PPS may claim compliance. Plan sponsors, consultants, and software vendor cannot make any claim of compliance unless they actually manage the assets. These groups can only ENDORSE the Standards and request investment management firms they employ be in compliance.
  - Historical Data Requirements → AIMR-PPS require that firms report a MINIMUM of 10 YEARS of Investment Performance (or since inception if less than 10 years) to claim compliance with the standards. For historical performance data computed for years prior to the EFFECTIVE Dates, there are 3 Options
    - Restate the prior historical performance numbers in accordance with the AIMR-PPS, thus bringing all performance data into compliance

- Restate historical performance in accordance with the RELAXED RETROACTIVE STANDARDS.
  - Valuation Periods may be as long as 1 year for Portfolios & composites
  - Accrual Accounting is NOT Required
- Use prior performance data as it was originally presented, disclose that the full record is NOT in compliance, identify the non-compliance periods, and explain how the non-compliance periods are out of compliance
- If a firm's records are lost or destroyed by extreme circumstances beyond the control of the manager, the firm may claim compliance from the time records are available to the present as long as the time period of the missing records is disclosed

▪ Claim of Compliance → To claim compliance, firms must meet ALL Composite, Calculation, Presentation & Disclosure requirements of AIMR-PPS. Compliance with the standards also requires adherence to all applicable laws & regulations. FULL Compliance is Required, cannot have partial compliance.

▪ May use the Compliance Statement only after every REASONABLE effort is made to ensure that the performance presentation is in compliance with the AIMR-PPS:
"name of firm has prepared & presented this report in compliance with the Performance Presentation Standards of the Association for Investment Management & Research (AIMR-PPS TM). AIMR has not been involved with the preparation or review of this Report."

▪ AIMR will take action against any firm that misuses the Compliance Statement, the "AIMR" or "AIMR-PPS" marks, or makes false claims of compliance with AIMR-PPS Standards.

o **General Mandatory Requirements** – Four Main Topics
  - Creation & Maintenance of Composites
  - Calculation of Returns
  - Presentation of Performance Results
  - Disclosures

▪ ***Creation & Maintenance of Composites***

- Composites are Groups of Portfolios or Assets that are Managed in a SIMILAR Way
  - All Fee-paying Discretionary Portfolios must be included in AT LEAST ONE composite defined by similar Strategy or Investment Objective
  - NEW Portfolios are not to be included in composites until they have been under management for one full MEASUREMENT PERIOD
  - Portfolios NO LONGER UNDER MANAGEMENT must still be included in historical composite results

- Portfolios may NOT be SWITCHED from one composite to another unless warranted by documented changes in client guidelines
- CONVERTIBLE Securities should be Treated as EQUITY instruments unless the firm & client decide otherwise. Convertible & other hybrid securities must be treated CONSISTENTLY Across & within composites
- ASSET-ONLY Returns must NOT be mixed with Asset-plus Cash Returns

- ***Calculation of Returns***
  - TOTAL RETURN must be used when calculating Investment Performance
  - TIME-WEIGHTED GEOMETRIC Rates of Return must be used for MULTI-PERIOD Return Calculations. Results that cover a period of less than 1 year must NOT be ANNUALIZED; results that cover a period of more than 1 year should be annualized.
  - ACCRUAL Accounting MUST be used for FIXED-INCOME and All Securities that accrue income. Accrued income must be included in both the denominator & numerator of rate of return calculations. Do not accrue unpaid dividends.
  - COMPOSITE Returns for Each Single Period must be ASSET-WEIGHTED using beginning of period weightings

$$R_C = [V_{A0}/(V_{A0}+V_{B0}+\ldots+V_{n0})](r_{A0}) + \ldots + [V_{n0}/(V_{A0}+V_{B0}+\ldots+V_{n0})](r_{n0})$$

For Example: Suppose a composite consists of 3 portfolios

Portfolio	$V_{Beginning}$	R_{Period}
A	14,000,000	8.0%
B	18,000,000	5.0%
C	8,000,000	17.0%

The Composite Return would be

$$R_C = (14/80)(.08) + (18/40)(.05) + (8/40)(.17) = 8.45\%$$

  - Returns from Cash & Cash Equivalents MUST be included in return calculations
  - Portfolios MUST be Valued at least QUARTERLY, and periodic returns must be geometrically linked (time-weighted multi-period returns)
  - Performance must be calculated after Subtracting TRADING EXPENSES (net of trading costs)
  - Return Results must be calculated both on an ACTUAL Basis & on a Restated ALL CASH basis for Portfolios where leverage has been used to purchase securities
  - All documents must be maintained that are necessary to demonstrate the calculation of performance or rate of return of all managed accounts
- ***Presentation of Performance Results***
  - A 10-year performance record must be presented (or since inception if less than 10 years)
  - Annual Returns for All years must be presented. Performance for periods of less than 1 year may not be annualized

- Composite Results may not be Restated following changes in a firm's organization
- Composites must ONLY consist of assets under management and my not link simulated or model portfolios with actual performance
- For composites with portfolios employing LEVERAGE; if the use of leverage is mandated by the client, performance must be presented on an ALL-CASH basis. If the use of leverage is discretionary, performance should be stated so as to include the effects of leverage and on a restated all-cash basis
- Performance of a past firm or affiliation may NOT be used to represent the historical record of a new firm entity or new affiliation.

- ***Disclosures***
  - Disclose the AVAILABILITY of a Complete List & Description of the firm's COMPOSITES
  - Disclose the Number of PORTFOLIOS and the AMOUNT of ASSETS in a Composite & the Percentage of the Firm's Total Assets the composite represents
  - Disclose the Definition of "FIRM" used to determine Total Assets
  - Disclose whether balanced portfolio segments are included in single-asset composites with an explanation of how cash has been allocated among asset segments
  - Disclose whether results are calculated Gross or net of Investment Management Fees, what the firm's fee schedule is, and the average weighted management fee if net results are used
  - Disclose whether there is a minimum Asset Size below which portfolios are excluded from a composite
  - Disclose σ of the Individual Composite Portfolio Returns around the Aggregate Compounded Return
  - Disclose whether Settlement-date or Trade-date valuation is used
  - Disclose the inclusion of any non-fee paying portfolios in composites and in the definition of total firm assets
  - Disclose the use and extent of leverage, including a description of the use, frequency and characteristics of any derivative product used
  - Disclose any material change in personnel responsible for investment management
  - Disclose the performance records prior to the applicable effective date (that are not recalculated to be in compliance), giving the time period that is not in compliance with AIMR-PPS, with a description of how the performance numbers are out of compliance.

- **General Recommended Procedures**
  - *Creation & Maintenance of Composites*
    - Balanced Portfolios should be Grouped by ALLOWABLE Range of Asset Mix
    - Accounts with SIGNIFICANT CASH FLOWS into or out of Portfolios should treat these cash flows as Temporary NEW ACCOUNTS
  - *Calculation of Returns*
    - Equal-weighted Composites should be calculated in addition to, but not instead of, asset-weighted composites
    - Accrual Accounting for dividends is Recommended, but not required
    - Accrual Accounting for fixed-income securities is strongly recommended for performance periods prior to the effective date of the Standards
    - Accrued Interest should be included in market value calculations in both the numerator & denominator for all periods
    - Portfolios should be valued on a DAILY basis, or whenever cash flows and market action combine to materially distort performance
    - Trade-date accounting should be used
  - *Presentation of Results*
    - Composite performance should be presented GROSS of investment management fees and Before Taxes (except for international withholding taxes)
    - Equal-weighted composite results should be presented as supplemental information
    - Any additional supplemental information the firm believes will be helpful ought to be included
  - *Disclosures*
    - Volatility of the Aggregate Composite Return
    - Benchmarks that parallel the Risk or Investment Style of the Composite
    - Differences in Portfolio Structure relative to the designated benchmarks
    - Cumulative Composite returns for All periods
    - Portfolio Size Range for each composite with the percentage of total assets managed in the same asset class the composite presents
  - *Verification*
  - The Standards Recommend that an INDEPENDENT Third Party verify the performance claims of the managers. 2 Levels of Verification are Performed
    - ***LEVEL I VERIFICATION*** –
      - AIMR-PPS requirement have been met on firm-wide basis
      - Each of the Firm's Discretionary fee-paying portfolios have been included in at least one composite and that the firm's

procedures for assigning portfolios to composites are reasonable and have been consistently applied
    - Firm's procedures for calculating total time-weighted returns, inclusion of past accounts, disclosures, and presentation results are in accordance with the standards
- ***LEVEL II VERIFICATION*** –
    - Level I Verification has been performed
    - Performance Results of Specific Composites have been calculated according to the Standards
    - Composites include only appropriate, discretionary, fee-paying portfolios and do not exclude portfolios meeting the same criteria of investment objective or strategy

- **Special Investment Situations**
    - ***Taxable Clients*** *(if firm chooses to report after-tax performance)*
        - *Mandatory Requirements*
            - Taxes must be RECOGNIZED in the same period as the Taxable Event occurred, not when taxes are paid
            - Taxes on Income and Realized Capital Gains must be subtracted from Results regardless of whether taxes are paid from assets outside the account or from account assets
            - The Maximum federal income tax rates appropriate to portfolios must be ASSUMED
            - The return for after-tax composites that hold both taxable & tax-exempt securities must be adjusted to an after-tax basis rather than Grossed up to a taxable equivalent
            - Calculation of after-tax returns for tax-exempt bonds must include amortization of accretion of premiums or discounts
            - For taxable portfolio composites, disclose the composite assets as a percentage of total assets in the taxable portfolios (including non-discretionary asset) managed according to the same strategy for the same type of client
            - Disclose the tax rate assumptions for performance results presented after taxes
            - Disclose client and manager average performance if adjustments are made for non-discretionary cash withdrawals
        - *Recommended Procedures*
            - Portfolios should be grouped by tax rate
            - Portfolios may be grouped by vintage year to include portfolios with similar amounts of unrealized capital gains in each composite
            - Use cash-basis accounting if required by applicable tax law
            - Adjust calculations for non-discretionary capital gains

- If available, calculate benchmark returns using the actual turnover in the benchmark index; else an approximation is OK
- If returns are presented pre-tax, the total rate of return for the composite should be presented without adjusting tax-exempt income to a pre-tax basis
- Composite presentation should include:
  - Beginning & Ending Market Values
  - Contributions & Withdrawals
  - Beginning & Ending Unrealized Cap Gains
  - Realized Short-term & long-term cap gains
  - Taxable income & tax-exempt income
  - Accounting convention used for treatment of realized cap gains
  - Method or source for computing after-tax benchmark returns if benchmark is shown

- ***International***
  - *Mandatory Requirements*
    - Sub-sectors of larger international composites may be used to create stand-alone composites ONLY if the sub-sectors are actually managed as separate entities with their own cash allocations & currency management
    - If stand-alone composite is formed using sub-sectors from multiple composites, the return must be presented with a list of the underlying composites from which the sub-sector was taken and the percentage the sub-sector represents from each composite
    - The benchmark for any currency overlay portfolio must be calculated in accordance with the mandate of the portfolio unless the benchmark is the currency return of a published benchmark
    - Disclose →
      - Whether Composites & benchmarks are presented gross or net of withholding taxes on dividends, interest & capital gains. State the assumed tax rate for the composite and the benchmark if numbers are presented net
      - If the composite is a sub-sector of a larger portfolio, disclose the percentage of the larger portfolio the sub-sector represents
      - Whether representative portfolios are used in the return of sub-sectors shown as supplemental information
      - For composites managed against specific benchmarks, disclose the percentage of the

composites invested in countries or regions not included in the benchmark
        - For returns that exclude the effect of currency, disclose whether the returns are presented in local currency with a statement that the local currency return does not account for interest rate differentials in forward currency exchange rates
- *Recommended Procedures*
    - Separate composites should be created for portfolios that allow currency hedging (unless the use of hedging is judged immaterial)
    - Separate composites should be created for portfolios that are managed against hedged benchmarks
    - A consistent source of exchange rate should be used
    - Returns should be calculated net of withholding taxes on dividends, interest, & cap gains
    - A currency overlay portfolio should be re-valued whenever the currency overlay manager is notified of changes in the underlying assets
    - For presentation of returns excluding currency, local currency returns should be calculated using spot rates and hedged returns should be calculated using forward rates
    - Disclose →
        - Range or Average Country weights of a composite that is managed against a specific benchmark
        - Inconsistencies in the treatment of exchange rates among portfolios within a composite
        - For presentation of return excluding the effect of currency, specify whether the return is the hedged return or the local return

- ***Venture & Private Placement***
    - *Mandatory Requirements*
        - All discretionary pooled funds and separately managed portfolios must be included in composites defined by vintage year (the year of fund formation & first takedown of capital)
        - General Partners
            - Cumulative Internal Rate of Return (IRR) earned by the limited partners, after deducting fees, expenses, & carrying interest of the principals of the fund (carry) must be presented since inception of the fund
            - IRR must be calculated based on cash-on-cash returns, plus residual value

        - Cumulative IRR since inception must be presented and return information must be presented in vintage-year format
        - Disclose:
            - Type of investment
            - Investment Strategy
            - Any changes in general partner since inception
    - <u>Intermediaries & Investment Advisors</u>
        - For separately managed accounts and commingled fund-of-fund structures, cumulative IRR must be presented since inception. IRR must be calculated less expenses and carry, but gross of investment advisory fees unless net of fees is required to meet applicable regulatory requirements
        - Calculation of IRR must be based on all appropriate cash flows into one IRR equation, as if from one investment
        - Separately managed accounts and commingled fund-of-funds structures must present IRR since inception. Inclusion of all discretionary pooled fund-of-funds and separately managed portfolios in composites must be defined by vintage year. The IRR for composite returns must be based on an aggregation of all the appropriate partnership cash flows into one IRR calculation
        - Disclose:
            - Number of portfolios and funds included in the vintage year composite
            - Composite Assets
            - Composite Assets in each vintage year as a percentage of the firm's total assets
            - Composite Assets in each vintage year as a percentage of total private equity assets
- *Recommended Procedures*
    - <u>General Partners</u>
        - Standard Industry Guidelines should be used for valuation
        - Valuation should be at cost or discount to comparables in the pubic market for buyout, mezzanine, distressed, or special situation investments
        - IRR should be calculated net of fees, expenses, carry, without public stocks discounted and assuming stock distributions were held
        - Disclose:

        - Gross IRR (pre-fees, expense & carry)
        - Multiple on Committed Capital net of fees & carry to the Ltd. Partners
        - Multiple on Invested Capital Gross of Fees & carry
        - Distribution multiple on paid-in capital net of fees to the limited partners
        - Residual multiple on paid-in capital net of fees and carry to the limited partners
    - Intermediaries & Investment Advisors
        - Net Cumulative IRR, after deduction of advisory fees should be calculated for separately managed accounts, managed accounts, and commingled fund-of-funds
        - Disclose the number & size of venture portfolios, expressed in terms of committed capital of discretionary & non-discretionary consulting clients

- ***Real Estate***
    - *Mandatory Requirements*
        - VALUED through an independent appraisal at lease ONCE every THREE years unless client agreement to a longer period. The appraisals must conduct a de novo appraisal, & not merely confirm one presented by another party
        - Valuations must be reviewed quarterly
        - Returns on Mortgages should be allocated as follows → Basic Cash Interest, Basic Accrued Interest, Contingent Interest, Return payable from operations is allocated to Income. Additional contingent interest and other sources of income that are deferred must be allocated to appreciation return
        - Returns from Income & Capital Appreciation must be presented in addition to total return
        - Disclose:
            - Absence of Independent Appraisals
            - Source of Valuation & Valuation Policy
            - Total Fee Structure & its relationship to asset valuation
            - Return formula & accounting policies for items such as CapEx, Tenant Improvements, Leasing Commissions
            - Cash Distribution & Retention Policy
            - Cash Distribution & Retention Policies regarding income earned at the investment level
            - Leverage Used

- Disclose if Returns:
  - Are based on Audited Operating Results
  - Exclude any investment expense that may be paid by investors
  - Include interest income from short-term cash investments or other related investments

- *Recommended Procedures*
  - Income earned at the investment level should be included in the calculation of income return
  - Equity ownership investment strategies should be presented separately
  - When presenting components of total return, it is preferred to recognize income at the investment level, rather than at the operating level

- ***Wrap-Fee Accounts***
- A Wrap Fee Account is an account with a contract where the client is charged a specific fee that is not based directly on transactions from the client's account; rather the fee is for investment advice and execution of transactions.
  - *Mandatory Requirements*
    - Wrap-fee performance must be shown net of all fees charged directly or indirectly to the account unless transaction expenses can be determined & deducted
    - When a wrap-fee composite includes portfolios that do not meet the wrap-fee definition, the firm must disclose the dollar amount of assets represented and the fee deducted for each year
  - *Recommended Procedures*
    - Wrap-fee portfolios should be grouped in separate composites from non-wrapped composites
    - Wrap-fee composites performance should be presented only to prospective wrap-fee clients
    - Performance should be reported before the fees in addition to net of fees

- **Details Related to the General Performance Presentations Standards**
  - **Composition of Composites**
    - Composites are GROUPS of Portfolios that are Managed with a SIMILAR STRATEGY, STYLE or INVESTMENT OBJECTIVE. The construction of multiple composites is required when the use of a single composite would be misleading. It is the responsibility of the firm to construct composites in a meaningful, representative manner. Relevant factors to distinguish & identify composites include -->
      - *Investment Management STYLE or STRATEGY*
      - *ASSET CLASSES*
      - *RISK Characteristics of Portfolios*
      - *The Degree of CONTROL firm has in implementing strategy*
      - *Characteristics of the CLIENT (tax status, cash flow, etc.)*
    - A firm must ensure its criteria for constructing composites is reasonable and that it is applied consistently. A single Branch office cannot claim compliance with the standards unless the entire firm is in compliance or the branch holds itself out as a separate entity (in which it is considered the firm)
  - **Discretionary v. Non-discretionary Portfolios**
    - To claim compliance, all DISCRETIONARY Accounts must be included in one or more composites. Portfolios are Non-discretionary ONLY if Client-imposed investment restrictions HINDER or PROHIBIT Application of the firm's intended investment strategy. Non-discretionary portfolios MUST not be included in the firm's discretionary composites
    - There is no universal definition of Discretionary v. Non-discretionary, ergo each firm must develop its own definition based on the general principal that a portfolio is non-discretionary if the portfolio has restriction s that interfere with the application of the firm's investment strategy. But, the firm must develop REASONABLE, WELL-DOCUMENTED procedures and follow them consistently. Performance of non-discretionary composites MAY be provided as supplemental information
  - **Minimum Portfolio Size**
    - Firms may set Size Limits to identify portfolios that the firm deems TOO SMALL to be representative of the firm's intended strategy and therefore not to be included in composite results. Firms exclude these portfolios ONLY if doing so has a NEGLIGIBLE impact on the firm's asset-weighted average return. 3 CRITERIA for establishing minimum portfolio size -->
      - Portfolios below the limit are UNABLE to implement the firm's Intended Strategy
      - Portfolios below the limit represent a small, immaterial percentage of assets to the firm
      - Firm does not accept any NEW accounts below the limit
    - Once minimum portfolio size has been establish, firm must disclose that information and apply the limit consistently

- **Multiple Asset Portfolios**
  - Multiple-asset portfolio = any portfolio that includes MORE than one asset class. Whenever the firm has discretion over changes from one asset class to another, the total return on the entire portfolio must be presented. Though not required, the performance of each asset class segment may be displayed in 1 of 2 ways
    - Supplemental info. to the performance of the total multiple-asset portfolio OR composite, in which case cash need not be allocated to the segments in calculating return
    - As a stand-alone portfolio in which case cash must be allocated to the segments in calculating the return
  - Balanced portfolios with different asset mixes should be grouped into separate composites defined by the percentages of each asset in the composite portfolio. Only balanced portfolios that the firm has discretion in determining the asset mix can be included in balanced composites. If firm has no discretion over asset mix, then the asset class segments, along with cash positions, must be included in composites of similar assets.
- **Calculation of Returns**
  - Return Calculations must relate the TOTAL RETURN of portfolios, including the income produced from dividend, interest, rent, etc. along with realized and unrealized capital gains/losses resulting from changes in the price of the assets in the portfolios. Returns from cash and cash equivalents must be included in its performance measure.
  - Interest Income must be calculated on an ACCRUAL Basis. Estimated accruals are acceptable, though exact accruals are preferred. Zeros have accrued income built into them, so must not count it twice.
  - The GEOMETRICALLY COMPUTED TIME-WEIGHTED Rate of Return MUST be used as the primary measure of performance. Daily valuations are recommended, but must be at least QUARTERLY
  - Portfolio REVALUATION is recommended whenever Cash Flows OR Market Action cause a Material Distortion of performance (≥ 10% MV).Daily valuations are recommended because distortions in performance from cash flows decrease when valuations are done more frequently
  - Pricing of assets MUST be based on a Reasonable estimate of their current value. Standardized pricing quotations may be used for frequently traded securities. For thinly traded securities, any reasonable method is acceptable so long as it is used consistently
  - Calculation of a portfolio's return for inclusion in a composite begins either at the start of the first full reporting period for which the portfolio is under management OR according to some reasonable guideline

- **Calculating Composite Performance**
  - Composite Return is intended to reflect the overall performance of the set of portfolios. Objective is to use a method that will give the same value as if the composite were treated as ONE master portfolio
    - Composite returns MUST be Calculated QUARTERLY (monthly is preferred)
    - TRADE-DATE Accounting is recommended, though settlement-date accounting is acceptable if disclosed
    - Performance is to be calculated AFTER TRADING & OTHER EXPENSES that the firm controls are subtracted. Fees that are commissions should be deducted from performance; custodial fees should be treated as a cash flow withdrawal
    - AIMR-PPS based on principle of ASSET-WEIGHTED Returns. Normally, portfolio & asset returns within a composite are weighted by the size of the portfolio or asset at the BEGINNING of the measurement period. Other acceptable methods for calculating asset-weighted returns are (1) Cash-flow-weighted returns and (2) aggregate return → combining composite's assets and cash flows as if composite portfolios were one. Equally-weighted composite results is recommended for supplementary disclosure, but not required
    - Performance results for any portfolio must include cash, cash equivalents.
- **Cash Allocation**
  - Ways of allocating cash to individual composites. Acceptable methods have the following traits:
    - Must be done on an EX ANTE basis (allocation decision must be made before the measurement period)
    - Allocation Method must be Reasonable & representative of how portfolios under management were actually constructed
    - Method should be documented to allow for auditing
  - Acceptable methods for allocating cash to individual composites include:
    - *Separate Portfolio Approach* → the manager examines all pure equity and pure fixed-income portfolios to determine what percentage of these portfolios are in cash. Equity composite would then be allocated a cash percentage equal to the cash allocation in equity portfolios (ditto fixed income)
    - *Multiple Cash Balances Approach* → manager determines the total cash as a percentage of all assets under management. This cash percentage would be allocated to the asset class composites in proportion to the percentage of assets that were in that class
    - *Allocation of Cash Returns Approach* → return on cash for all portfolios be determined for the period. Then the return on a composite is determined only for its non-cash components. A weighted-average of the non-cash return of a composite and cash

return is computed with the weights based upon asset mix of all classes at the start of the period

- Determination of the appropriate method for allocating cash returns is the responsibility of the firm, but once established, it must be applied consistently. Several ways of allocating cash returns:
  - *Pre-determined Cash Allocation Method* → manager sets a equity/bond/cash mix at start of measurement period. Return on cash is based upon return earned on cash during the period and its predetermined allocation in the composite at the start of period
  - *Target Asset Class Percentage Method* → target asset allocation is determined at start of period. Actual asset allocation for period is then determined. Return from cash during period is the return on cash for the period applied to the initial percentage allocated to cash plus the cash return for the period applied to the difference between actual & target mixes of non-cash assets

- **Treatment of Management Fees**
  - GROSS of FEES calculations are preferred, because a firm's fee schedule is usually scaled to the level of assets. It is more representative to present the results before fees are deducted and provide a fee schedule for the prospective client. But, when a net-of-fees calculation is used the firm MUST Include a fee schedule, disclose the calculation method used, and disclose the weighted-average fee to enable a prospective client to compute composite performance on a gross-of-fee basis
- **Disclosures of Composite Details**
  - A performance presentation should disclose the AVAILABILITY of a complete list & description of the firm's composites. Except on request, a firm need not individually list single portfolio composites. For single portfolio composites, it is acceptable to simply state on the firm's list of composites the number of such portfolios, the total assets represented by these portfolios, and the percentage of the firm's assets they represent. Also, the firm must include a brief description of the strategies that typify these single portfolio composites. Performance results of these single portfolio composites MUST be made available to prospective clients. Can use "Five or Fewer portfolios" rather than naming the exact number.
- **Portability of Performance Results**
  - AIMR-PPS performance is the result of the entire firm, rather than a single individual. Thus, it is NOT permissible to transfer performance results from one firm to another when a portfolio manager moves from firm to firm; nor is it permissible to link the performance generated by an individual portfolio manager at another firm with performance generated at the current firm. It is PERMISSIBLE, however, to show performance generated at another firm by a portfolio manager now employed at this firm as Supplementary information. If this is done, CREDIT must be given to the other firm for the performance generated when the individual manager worked there and this supplemental data may NOT be linked with that of the current firm

- When a firm is ACQUIRED by another firm, the Acquiring firm CAN show the performance results of the acquired firm as supplemental information but MAY NOT claim that past record as its own. Acquired accounts should be treated as NEW ACCOUNTS and placed in a composite called "ACQUISITION of FIRM" until the assets can be incorporated over time into existing composites that meet compliance requirements.
- But, when a firm is purchased for the SINGLE Purpose of bringing on Staff and Resources to Offer a Product SPECIFIC to the acquired firm (but new the acquiring firm) the records may be TRANSFERABLE for that Product.
- If the only change is in name or ownership, with all previous decision makers and client assets retained and static investment policies or strategies, then the performance history would remain the firm's

- **Composite Dispersion**
  - Composite Dispersion measures the Consistency of a firm's Composite Performance Results with respect to the individual portfolio returns within a composite. AIMR-PPS require that managers disclose the DISPERSION of portfolio returns within each composite. For an EQUAL-WEIGHTED Composite, the σ is appropriate. For an ASSET-WEIGHTED Composite, Reformulation of the σ to an asset-weighted dispersion measure is appropriate. Also, may use high-low portfolio return statistics.
    - *Standard Deviation* $\rightarrow$ Most widely accepted measure of dispersion within a composite with equal-weighted portfolios. σ of returns measures the riskiness of a portfolio relative to the average value of its return
    - *Asset-Weighted Standard Deviation* $\rightarrow$ Creates a dispersion measure that explains deviation away from the asset-weighted composite. Formulation begins with the calculation of an asset-weighted mean. The Asset-weighted standard deviation is a better measure for asset-weighted composite as it measures dispersion for the asset-weighted mean composite
    - *High-Low Range* $\rightarrow$ Simplest and easiest to understand measures of dispersion. But, not adequate as they are prone to extreme values that may skew the truth
    - *Quartile Dollar Dispersion* $\rightarrow$ May give best idea of dispersion
- **Risk Measures & Comparisons**
  - Risk should be understood as being multiple & uncertain in nature, duration & impact. No one statistic can consistently capture all the elements of risk in an asset class or style of management. AIMR-PPS RECOMMENDS that both TOTAL (absolute) and MARKET (relative) RISK be presented in conjunction with composite returns. Risk can be measured in several ways:
    - *Standard Deviation* of portfolio returns which measure the riskiness of a portfolio relative to the average value of its return

        - *Beta* which measures the riskiness of a well-diversified portfolio of all of an investor's assets
        - *Sharpe Ratio* which is a good risk-adjusted measure for all of an investor's assets
        - *Treynor Ratio* which is a good risk-adjusted measure when the investor's assets are partially invested with one money manager
    - <u>*Benchmark Comparison*</u> → Provide a relative measure for the riskiness of a strategy and to make risk/return comparisons. The designated benchmark must be consistently applied and must parallel the risk or investment style the client portfolio is expected to track
        - *Indexes* → S&P, etc. May be misleading as it may not represent the investment style of the manager. Plus, indexes do not take the effects of trading, administrative, and research costs into consideration
        - *Manager Universes* → Potential to match more closely with style than the indexes, but there may be problems as managers may use different reporting procedures and different standards for completeness & data accuracy
        - *Normal Portfolios* → Normalized portfolios may be constructed to reflect the style of a particular manager. But, they are difficult to construct and maintain & are usually not available from independent sources. Work best when used as a benchmark for a specific client rather than for composite strategy comparison.
- **Treatment of Leverage**
    - <u>*Creation & Maintenance of Composites*</u>
        - Portfolios using LEVERAGE may be included in the same composite with portfolios not using leverage so long as the strategies are the same (but for leverage). BUT when the manager has discretion for when or how much to leverage, then leverage becomes a distinct strategy & requires separate reporting
    - <u>*Calculation of Returns*</u>
        - To determine total firm assets & assets of individual composites or accounts:
            - If leverage is DISCRETIONARY to the manager via client mandate, the firm's assets & total assets used in composites should include ONLY the ACTUAL Cash amount under management. The Max. leverage permissible should be reported separately as an OVERLAY strategy; OR
            - If leverage is NON-Discretionary (required by client) the firm's assets and composite's assets should be increased to reflect the degree of required leverage
        - Any change in margin debt during the period must be treated as a CASH FLOW to the total assets because a change in margin debt occurs concurrently with a change in total assets

- *Presentation of Results*
  - When leverage is DISCRETIONARY, performance with the effects of leverage as well as performance on a restated, all-cash basis MUST be provided. If leverage is MANDATED by client, results are presented on an all-cash basis.
- *Disclosures*
  - Firms must disclose the use of leverage or derivatives in portfolios. A Description of the USE, FREQUENCY & CHARACTERISTICS of the derivatives products MUST be presented. The disclosure must be detailed enough so that the client can understand the pattern of returns and risks from the leveraged positions
- *Examples of Performance Presentation involving Leverage*
- There are TWO accepted definitions of Leverage in the Investment context. (1) ACCOUNTING → leverage results when total assets are greater than net-assets, i.e., when some part of the assets is financed by borrowing; (2) ECONOMIC → leverage results when supplementary investment actions are taken to generate returns from an unleveraged benchmark portfolio
- Example 1 Facts: Firm is given portfolio of $100,000,000 with Discretion to increase exposure to the market by buying S&P 500 Index Futures worth 50% of the underlying assets. The firm chooses to increase market exposure by 20%
  Treatment: As the firm has discretion to increase exposure, performance should reflect the firm's decisions. Performance presented must be on the underlying assets of $100,000,000. Plus, the ALL-CASH Return must be calculated on the leveraged base of $120,000,000 and must be provided as supplemental information. The firm would included $100,000,000 in total firm assets and report an additional $50,000,000 in a separate category of leveraged assets (though choose to leverage only $20,000,000)
- Example 2 Facts: Firm is given a portfolio of $100,000,000 with directions from the client to increase exposure to the market by buying S&P 500 Index Futures equal to 50% of the underlying assets
  Treatment: As the firm as NO-Discretion, the ALL-CASH Return must be calculated on a base of $150,000,000; this return may be included in the same composite with other unleveraged S&P 500 portfolios. Total firm assets include $150,000,000
- Example 3 Facts: Firm is given a portfolio of $1,000,000. Client borrows $250,000 from the broker against the portfolio
  Treatment: Performance is based on $1,000,000 and this amount is included in firm's total assets
- Example 4 Facts: firm is given a portfolio of $1,000,000 with Discretion to leverage the account via margin by 50%. The firm margins the account up to $1,250,000
  Treatment: Performance must be shown on a Leveraged basis, using $1,000,000 as the base. Plus, performance MUST be shown as supplemental information on an all-cash basis using $1,250,000 as the base. Total assets under management are $1,000,000 with an additional $500,000 of margined assets
- Example 5 Facts: Firm is given portfolio of $100,000,000 and instructed to overlay the portfolio with a tactical asset allocation strategy up to 50% of portfolio value
  Treatment: Leveraged return calculated on a base of $100,000,000 must be shown, with an all cash return on the amount of the underlying assets plus actual leveraged assets shown as supplemental information. The amount of assets included in total firm assets is $100,000,000. The additional $50,000,000 potential overlay assets is reported separately in an overlay assets category
- Example 6 Facts: Firm is contracted to overlay a $100,000,000 portfolio with a tactical asset allocation strategy equal to 50% of the underlying assets. The firm does not manage the underlying assets
  Treatment: Performance of the overlay strategy is based n $50,000,000, which should always be the actual amount invested in the strategy. No assets are included in total firm assets as the firm does not manage the underlying security. The $50,000,000 is reported in a separate overlay assets category.
- Example 7 Facts: A firm is given $5,000 to invest in securities on behalf of an account. The firm purchases $10,000 of stocks on margin. Interest on the margin account during the period is $250 and the value of the portfolio ends the period at $10,450.
  Treatment: Disclosure of the portfolio being Leveraged is REQUIRED and any additional information about the use of leverage must be thoroughly discussed. The All-cash and leveraged returns must be computed and disclosed;

$$r_{all\text{-}cash} = [(V_{End} + Interest) / V_{Begin}] - 1 = [(10450+250)/10000] - 1 = 7\%$$

$$r_{leveraged} = \{[V_{End} - Margin\ Debt] / [V_{Begin} - Margin\ Debt]\} - 1 = (10450-5000)/5000 = 9\%$$

- Example 8 Facts: Firm purchases $10,000,000 in an S&P Index fund and buys $10,000,000 in S&P 500 Index Futures for an account
  Treatment: Disclosure of the portfolio as being Leveraged is REQUIRED, with additional information about the use of futures & leverage discussed. Then, the All-cash return must be computed & disclosed
- Example 9 Facts: Firm has used an account's total assets of $5,000 to buy Call options on Stocks. This portfolio is NOT leveraged in an accounting sense, but it is leveraged in an economic sense.
  Treatment: The portfolio May or May not be considered leveraged. If considered leveraged, it could be argued that is already on an all-cash basis since no borrowing has occurred; the calls were purchased with cash. If there was any restatement, it should reflect the returns from a portfolio of the underlying stocks purchased for cash. The firm MUST disclose the strategy used, risk-return profile of strategy, and impact on portfolio return
- Example 10 Facts: Firm holds $8,000 in stocks on margin, and has sold $3,000 of stock index futures for an account with a net worth of $5,000. Portfolio IS leveraged in an accounting sense, but not in an economic sense.
  Treatment: Portfolio May or May not be considered leveraged. If leveraged, restatement to an all-cash basis could take two forms. First, restatement could remove the gain or loss on the short futures and then proceed as in example 7. Second, the restatement could remove the gain/loss on the futures and adjust the stock portfolio. Manager MUST disclose strategy used, risk-return profile, and impact on portfolio return. Disclosure of the portfolio strategy used is RECOMMENDED but not required.
- Example 11 Facts: Firm has sold short $1,000 in stocks and bough another $1,000 in stocks for a $5,000 account. Portfolio is leveraged in an accounting sense, but not in the economic sense
  Comment: Portfolio may not be leveraged according to the strict economic definition, but it is leveraged on the basis of other investment considerations. Portfolio return depends on the returns of the long v. short stocks.
  Recommendation: Disclosure of the portfolio strategy used is required a the portfolio may experience unusual levels of risk or return as a result of the strategy. Returns need not be restated to an all-cash basis a the strategy cannot be executed without the short sales, rendering the all-cash method meaningless
- Example 12 Facts: Firm A has 4 clients for which securities are traded. A prefers to have clients trade on margin due to increased leverage, but 2 clients do not permit trading on margin. Firm A has received $30,000 from each of the 2 clients who do not permit margin trading, and $15,000 from the clients who permit it. Firm A trades all accounts the same (same security purchase & sale). In first month, A produces $50 profit for each account. Firm B is a futures trader and accepts $800,000 from a client who deposits $200,000 on margin. Firm B has one other client who has deposited $800,000 cash in the account. In first month, B earns $5,000 profit for each
  Comment: Example illustrates situation in which a firm trades some accounts within a composite at different levels of leverage. IF strategies are the same, the portfolios are to be included in the same composite. To avoid performance distortion, firms must restate the leveraged returns to an all-cash basis. A must disclose that 2 accounts on margin and restate them to an all-cash basis. B requires that the returns be calculated on basis of amount of assets allocated to the firm for investment (as opposed to margin deposit). Without restatement, composite results are distorted due to the blended returns of portfolios trading at different levels of leverage.
  At end of month, A&B have earned the following returns on a blended basis:
  A: 200/90,000 = 0.22% B: 10,000/1,000,000 = 1.0%
  On an All-cash basis
  A: 200/120,000 = .17% B: 10,000/1,600,000 = 0.63%
  Recommendation: Firm A must disclose that it has 2 leveraged accounts. The all cash restatement must be computed and disclosed to avoid the reporting of blended returns. Firm B must disclose its strategy. Returns of the client who deposited only Margin need to be restated using amount of assets allocated to firm, which must be disclosed.
- Example 13 Facts: Firm is managing a market-neutral strategy using phantom cash→ aggregate amount of cash a client might have with multiple firms with responsibility for managing cash placed with one particular firm. Firm is allowed to leverage the cash position up to 250%
  Comment: Portfolio is NOT leveraged in an economic sense; but it is leveraged in some sense
  Recommendation: Firm must disclose the risk-return profile of the strategy and its potential impact on portfolio return. Need not restate to all-cash because it would be meaningless.

- **Treatment of International Portfolios**
  - ***Creation & Maintenance of Composites***
    - Firm that manages all its international portfolios similarly may have only one global composite. But, if a firm makes country-weighting decisions based on published indexes, portfolios managed against different indexes belong in separate composites as the country weightings are different
    - Portfolios that Hedge Currency Risk should NOT be included with portfolios that are not allowed to use currency hedging unless the effect of hedging is immaterial
    - Sub-sectors of larger international composites may be used to create stand-alone composites ONLY if the sub-sectors are actually

managed as separate entities with their own cash allocations & currency management
- Creation of Currency Overlay composites should be based on currency overlay portfolios with similar benchmarks & restrictions. A series of one portfolio composites is recommended when composites of multiple currency overlays do not provide meaningful information

- ***Calculation of Returns***
  - AIMR-PPS recommends calculation of portfolio returns NET of withholding taxes on dividends, interest, and cap. gains. Percentage of composites for which accrued cap. gains taxes on unrealized gains have not been subtracted should be disclosed
  - Consistent source of exchange rates should be used to translate foreign currency returns into reporting currency returns
  - Trade-date accounting is strongly recommended
  - Conversion of benchmark and portfolio into the base currency should be calculated using the same exchange rates. If not possible, firm should disclose any significant deviations. Exchange rate used to translate should be from the same source each measurement period
  - Currency overlay portfolios must be valued at least quarterly, though more frequent valuation is recommended.
- ***Presentation of Results***
  - For returns excluding the effect of currency, specify whether the return is hedged return or local return. It is recommended to show fully hedged returns back to client's home currency. But, if the return is in local currency, disclosure must be made that the local return does not account for interest rate differentials in the forward currency exchange rates
  - Total returns of the composite and benchmark must be shown on the same basis. Each composites return should be accompanied by any relevant information regarding restrictions
  - If stand-alone composite is formed using sub-sectors from multiple composites, its return must be presented with a list of the underlying composites from which the sub-sector was drawn, along with the percentage of each composite the sub-sector represents
- ***Disclosures***
  - Whether composite & benchmark returns are presented net of withholding taxes. If shown net of taxes, the assumed tax rate Must be disclosed
  - For composites managed against specific benchmarks, percentage of assets in the composite that are invested in countries or regions outside the benchmark must be disclosed. Recommend that the range or average country weights of the composites be disclosed

        - Results for sub-sector not treated as a separate entity may be presented ONLY as supplemental information.
- **Treatment of Real Estate Portfolios**
    - ***Creation & Maintenance of Composites***
        - All properties with discretionary fee-paying investors must be included in at least 1 composite. But, given the unique nature of individual real estate investments, composites containing single properties are often appropriate
    - ***Calculation of Returns***
        - Total Returns must be calculated including income and realized & unrealized capital appreciation. Components of total return must be separately disclosed. Investor level income is the preferred method of measuring returns, rather than operating level income
        - All income & expenses from real estate investment programs must be included in the return calculations
        - Returns earned on cash & other substitute assets must be included in the performance measures and presented on a consolidated basis
        - Change in valuation must be recognized in the reporting period that includes the effective date of the appraisal. For performance BEFORE DECEMBER 1993, either immediate recognition OR an allocation of changes in valuation is acceptable
        - Real estate mortgages with fixed or variable interest rates are considered fixed-income securities. Participation & Convertible mortgages are considered real estate investments for reporting purposes
    - ***Presentation of Results***
        - Equity ownership investment strategies should be presented separately. When presenting the components of total return, it is preferred to recognize income at the investment level. The concept of investment level is distinct from the operating or property level, and its returns may exclude some or all of the non-property investment income & expenses.
- **Treatment of Venture & Private Placement Portfolios**
    - ***Creation & Maintenance of Composites***
        - Fundamental requirement that all fee-paying portfolios over which the firm has full investment discretion be included in at least 1 composite does NOT apply to fund raisers. Each alternative investment partnership must be reported separately
        - Fund-on-fund firms that manage discretionary investments must be included in composites defined by vintage year
    - ***Calculation of Returns***
        - Though the time-weighted rate-of-return is the industry standard for comparing performance, it is not relevant in private equity. Recommend dollar-weighted rate of return.

- General Partners →
  - Vintage year is determined to be the year in which the fund's initial capital contribution occurred
  - Cumulative IRR net of fees, expenses & carry to the limited partner be presented since inception of fund.
  - Valuation should be either at cost or discount to comparables in the public market for buyout, mezzanine, distressed, or special situation investments
  - Standard Industry guidelines should be used for valuation
- Intermediaries & Investment Advisors→
  - For a Ltd. Partner or Investment advisor presenting the performance of separately managed accounts to existing clients, the date of the limited partners initial capital contribution determines the partnership's vintage year.

- **"AIMR's Performance Presentation Standards" by John Stokes**
  - In the past, certain performance presentation practices hindered the investors' ability to compare results among different managers and led to questions about the accuracy of the numbers themselves. Some of these practices included:
    - *Basing Performance Results only on "Representative" Accounts* → presenting only those accounts chosen by the manager, which lead to the practice of only including the best performing accounts
    - *Survivorship Bias* → presenting a performance history that excluded accounts whose poor performance led to their termination
    - *Using "Portable" Investment Results* → Presenting performance that was not the record of the firm reporting the results, but actually the performance of a portfolio manager generated when he worked at another firm
    - *Using Selected Time Periods* → presenting results only for time periods when the fund out-performed its benchmark
  - AIMR-PPS was developed to address these shortcomings and to satisfy the investment community's need for a common, acceptable set of standards for the calculation and presentation of investment firm performance results. There are 4 Basic Elements. (1) Construction & Maintenance of Composites, (2) Calculation of Returns, (3) Presentation of Investment Results, (4) Disclosure Requirements
    - ***Construction & Maintenance of Composites***
      - All fee-paying discretionary accounts must be included in one or more composites and the composites must be appropriately created
      - Selected Composites may not be presented as being in compliance unless all of the firm's qualifying portfolios have been accounted for in at least one composite
      - Firms may set minimum asset size, below which portfolios are excluded from a composite, but this must be rigidly followed
      - Terminated portfolios must be excluded from a composite for all periods after the last full reporting period they were in place, but included for all periods prior to termination

- ***Calculation of Return***
  - Firms must use the Geometrically computed time-weighted total rates of return that include both realized & unrealized gains, plus income (accrued for fixed income)
  - Composites must be weighted by the size of the assets in each portfolio included in the composite, using beginning of period weightings
  - Portfolios must be valued at least quarterly, and periodic returns must be geometrically linked
  - Performance must be calculated after the deduction of trading expenses
- ***Presentation of Investment Results***
  - A 10-year performance record (or since inception) must be presented; annual returns for all years must be presented
  - Composites must include only assets under management and may not link simulated portfolios with actual performance
- ***Disclosure*** – Firms must disclose →
  - Availability & a complete list & description of composites
  - Number, size & % of total assets each composite represents
  - Whether performance results are calculated net or gross of fees
  - If settlement date valuation or trade date valuation is used
  - Use & extent of leverage; plus a description of frequency & characteristics of any derivatives used
  - Measure of dispersion of individual portfolio returns around the aggregate composite return

- Important Issues regarding the Implementation of AIMR-PPS →
  - *Consultant Questionnaires often require managers to fill in quarterly performance charts. Plus, the questionnaires ask the manager to indicate whether or not the numbers presented have been prepared in accordance with AIMR-PPS.* A manager cannot calculate performance numbers ONLY for selected accounts or composites and claim compliance. A firm may not claim compliance unless compliance is firm-wide.
  - *Linking Performance results from a prior firm to a new firm*. Only if AIMR-PPS criteria for linking performance date are met (rare) may managers link their past performance with the on-going performance at the new firm. Else, performance data from prior firm work may only be included as supplemental information (as long as clearly identified as such and not linked to results at the new firm)
  - *A firm claiming compliance with AIMR-PPS wants to advertise its performance results for a composite that includes a mutual fund*. SEC no-action letter to AIMR allows investment managers to advertise Gross-of-Fee performance of composites that contain mutual funds. An advertisement must display both gross & net performance results with equal prominence and in a format designed to allow easy comparison of the gross and net of fee results. If the performance of one or more mutual funds is included in the composite, the ad MUST not id any specific fund.

- *What constitutes Gross-of-fee performance for a mutual fund?* Gross-of-fee performance for the mutual fund is the pure gross return, minus transaction costs. As management fees are negotiated and not related to a manager's ability to buy & sell securities, they should be added back to the performance on a gross-of-fee basis. Except for transaction costs & foreign withholding taxes, all other fees included in the income statement as expenses should be added back to the performance gross-of-fee return
- *Globalization of Performance Presentation Standards*. AIMR formed the Global Investment Performance Standards Committee (GIPS) to develop and implement a commonly accepted set of principles to ensure fair representation and full disclosure in the presentation of performance results to be distributed globally. GIPS will adopt most of AIMR-PPS.

- **Case I: G&C Investment**
  - ***Facts***

Gune & Cash Investment Management (G&C) is a mid-size firm that provides investment management service for retirement plans, endowment funds, corporations, individuals & trusts. As president & CEO of the firm, Jerry Cash has overall supervisory responsibility for the firm Heze Gune has direct supervisory responsibility for performance presentation materials and is the compliance officer.

In an effort to expand business, Cash & Gune hire May Steele. Steele had founded Super Asset Management in 1982 and built the firm by combining excellent returns and aggressive marketing. In addition to portfolio management at G&C, Steele was responsible for calculating performance & preparing presentations. For the 1st 3 years after Steele's arrival, G&C reported marked improved performance. All presentations & marketing materials to clients & prospects illustrated this improvement. Steele also stated on marketing materials that the performance presentation information complied with AIMR-PPS. G&C business grew substantially

Early in 1996, Steele & Gune made a presentation to the trustees of a fund. Kenneth U. Luze, CFA, was at the presentation. In the proposal was a page containing the following footnote,
"Rates of Return are calculated in accordance with AIMR standards. From 1983 to 1986, returns are in accordance with AIMR-PPS except that they are not size weighted. The composite includes accounts managed that were fully discretionary and more than $250,000 in value, gross of fees. Results from 1986 to 1993 are from a model portfolio. Performance data are historical and should not be indicative of future results."

Luze pointed out several discrepancies between the material and PPS, including the fact that although G&C was founded in 1985, the performance sheet cited performance results from 1982. Steele admitted that she adopted SAM performance numbers from 1982-1985 as the performance of G&C. Luze suggested that Gune & Cash become more familiar with PPS and revise their presentation if they want to continue claiming compliance

Gune asked Steele if all the firm's presentation materials contained similar errors. Steele assured Gune that it was an isolated incident and that all other marketing materials met the AIMR-PPS requirements. Gune was skeptical, but relied on Steele's assurance. The following month, Gune noticed the proposal contained the exact same performance material. Gune decided to investigate Steele's performance calculations and found that Steele had:

- Reported SAM's performance figures from 1983-1986 as G&C's without disclosing the source of the figures
- Derived Performance figures for certain categories of accounts by using hypothetical, rather than actual, data in the form of component weightings without disclosing this fact
- Based performance figures reported for the firm's composites on a select group of accounts, which varied from quarter to quarter

These practices resulted in the firm advertising to current & potential clients significantly better performance than the composites actually attained.

Gune reported his findings to Cash with a recommendation that the firm immediately terminate Steele's employment and distribute the correct performance information to all clients and potential clients. Cash did not want to do anything that could hurt business and believed Steele's assurances that the errors were isolated and would never happen again. Cash continued to give Steele discretion in creating performance reports, assuming Gune would keep him informed of any further misconduct.

Steele & Gune continued to hand out performance information claiming compliance with AIMR-PPS. Though Gune recognized the material was incorrect and grossly misleading, he said nothing. Gune believed he did all he could when he presented his findings to Cash.

G&C proposed anew to another client, represented by Luze. Luze saw the discrepancies between the material and the AIMR-PPS and could not believe G&C continued to claim compliance. This time, Luze forwarded both of G&C's proposals to AIMR & the SEC

- ***Violations***
  - Standard V(B), Performance Presentation, which requires members to ensure that performance is communicated to clients, or prospects in a fair, accurate, and complete manner. G&C contained false and material misrepresentations of performance numbers. SAM's performance cannot be transferred to G&C without disclosure. G&C also failed to disclose that its advertised performance was based only on selected accounts, and not entire composites. Since the select accounts varied, there is no meaningful comparison., Steele, as author, violated Standard V(B), but Gune & Cash are guilty by acquiescing in the false & misleading statements.
  - Members are not Required to Comply with AIMR-PPS; but the false claim of compliance is Also a violations of Standard V(B), Performance Presentation
  - Performance Sheet Presented by G&C violated PPS in several ways
    - Performance may not be presented as being "in complete compliance except"; Compliance with PPS means all mandated disclosures and requirements have been met.
    - Commission charges must be included in performance returns
    - Firm Composites must be calculated using actual assets under management; model results may be presented only as supplementary information and identified as model, not actual results
    - Presentation sheet must show the number of portfolios, list or state a list that is available of the composite assets or composites as a percentage of firm assets
  - Gune & Cash violated Standard III (E), Responsibility of Supervisors. Even when Gune was unaware that Steele was engaging in misconduct, he was responsible for Steele's actions. Gune failed to perform an adequate review of the materials developed by Steele and neglected to implement procedures to monitor Steele's activities. Once Luze pointed out these errors, Gune should have reported the matter to Cash ASAP. Gune failed to respond to indications of misconduct and improperly relied on assurances of the offender that the problem was isolated. Gune's responsibilities did not end with his report to Cash. Gune's duty was to continue appropriate supervisory action. If an AIMR member cannot discharge supervisory responsibilities due to absence, inadequacy, or both, of a compliance system or the refusal of a senior manager to adopt a compliance procedure or punish misconduct, the member should decline to accept supervisory responsibility until the firm adopts reasonable procedures which allow adequate supervision.
  - Though Cash delegated to Gune the supervisory responsibility, Cash failed in his supervisory responsibility because no compliance procedures existed to allow Gune to supervise Steele properly. Once Gune made Cash aware of the misconduct, Cash had a responsibility to investigate and determine whether other misconduct had gone unnoticed. Pending the investigation's conclusions, Cash should have increased supervision over Steele.
  - When Supervisors are aware of misconduct, they have a duty to define the responsibilities of who is to respond. That did not happen here.

- **Case II: Everleigh Asset Management (EAM)**
  - ***Facts***
    - EAM has created composites and calculated its performance results in accordance with AIMR-PPS. Using these results, EAM has prepared the performance presentation table shown below
    - LIST & DESCRIBE FOUR Items required by AIMR-PPS that have been omitted from the EAM performance presentation

10-Year Performance Presentation for EAM's Value & Fixed-Income Composites

Composite	Quarter (R)%	YTD (R)%	1-Yr Avg. Ann. (R)	3 Yr	5 Yr	10 Yr	Cum. Total R →1 Yr	3 Yr	5 Yr	10 Yr
Value Composite	13.67%	24.45%	24.45%	21.33%	20.23%	14.22%	24.45%	84.65%	159.57%	272.62%
Fixed-Income Composite	2.86%	6.85%	6.85%	6.67%	6.46%	7.76%	6.85%	22.61%	36.24%	115.17%

EAM has prepared & presented this report in compliance with AIMR-PPS. AIMR has not been involved with the preparation or review of this report.

Notes:

EAM Definition → EAM is the investment advisory subsidiary of CCS bank & trust. EAM has $45.9 million under management and has been in existence since 1970. The firm has been in compliance with

AIMR-PPS since 1/1/1993. There have been no material changes in personnel responsible for investment management in the past 10 years.
COMPOSITE Construction → EAM's Value Composite consists of all discretionary, fee-paying accounts with capital appreciation as their investment objective. These portfolios are primarily invested in equity securities EAM believes are undervalued in the marketplace. EAM's Fixed-Income Composite consists of all discretionary, fee-paying portfolios that invest in investment grade debt securities while maintaining an average maturity of 3-10 years. Balance portfolio segments are not included in single-asset composites. No non-fee-paying accounts are included in composites. A complete list & description of composites is available upon request.
RETURN CALCULATION → Results for the full historical period are time weighted using trade-date valuation. No leverage or derivatives are used in the portfolios contained in these composites.

- ***Violations***
  - The Number, Size and Percentage of Total Firm Assets contained in each composite must be disclosed. None of this is presented by EAM.
  - A measure of the Dispersion of individual portfolio returns around the aggregate composite return must be disclosed. EAM failed to do this
  - Annual Composite Returns for All years must be disclosed. They are not shown in the presentation.
  - It must be disclosed whether the composite returns are stated before or after management fees. While returns are reported in this disclosure, it says nothing about management fees.
  - It is not permissible to change the composition of composites unless there is a client-directed change in portfolio objective. According to the footnote, the fixed-income composite consists of fee-paying portfolios that invest in investment-grade securities as long as they maintain an average maturity of 3-10 years. If this means that any portfolio whose average maturity falls below 3 or rises above 10 years maturity for reasons not related to a client-directed change would be excluded from the composite, this would not be in compliance with AIMR-PPS
  - If the firm is in violation of AIMR-PPS for any of the above reasons, they cannot claim to be in compliance. Cannot claim partial compliance.

6. *Global Portfolio Management*

- US market represents only about 35% of the potential investment universe. Still, many investors ignore foreign investment due to:
  - Unfamiliarity with foreign firms, markets & cultures
  - Perceived Riskiness of foreign markets
  - Regulations may burden foreign investment
  - Perceive some foreign markets as inefficient & illiquid
  - Fear currency exchange rate volatility
  - Cost of international investing is higher than domestic investing
- But, as the financial markets become more globally integrated, international investing will increase. These fears will eventually ease
- ***Advantages of Global Investing***
  - Broader Spectrum of Securities from which to CHOOSE
  - HIGHER Prospective EXCESS Returns due to:
    - Emerging market economies have better rates or return than mature domestic markets
    - Foreign markets may be inefficient, and exploitable by professional investors
  - Reduction in risk can happen by incorporating foreign securities in a portfolio. There is low correlation between US & most foreign stock & bond markets. (NOTE: There is some regional correlation)

- ***Disadvantages of Global Investing***
  - Less Access to INFORMATION due to language barriers, different rules on financial reporting, and less research coverage (plus accounting difference make comparisons difficult)
  - LIQUIDITY is a problem where restricted trading exists
  - COUNTRY (Sovereign) Risk exists
    - Governmental Expropriation of foreign assets
    - Threat of nationalization of companies or industries
    - Government restrictions on capital flow
  - EXCHANGE RATE RISK → Investments in foreign securities contain 2 risks
    - Risk that security prices may decline in value, producing a capital loss measured in the local currency
    - Risk that foreign currency's exchange rate may fall producing a foreign exchange rate loss → $R_{\$} = (1+R_{fc})(1+R_{X\$/fc}) - 1$

      For Example: A US investor purchases a UK stock selling at ,5 when the pound is trading at $1.80. One year later the stock is sold for ,6, but the exchange rate shows $1.60 / ,. The Dollar Return on the Investment is as follows:

      $R_{,} = (6/5) - 1 = 20\%$ measured in ,

      $R_{X\$/,} = (\$1.60/,) / (\$1.80/,)\ ] - 1 = -11.1\%$ Exchange Loss

      $R_{\$} = (1+R_{,})(1+R_{X\$/,}) - 1 = (1.2)(.889) - 1 = 6.7\%$ in Dollars

      For Example: A US investor purchases Japanese bonds selling at –10,000,000 when the exchange rate is –110/$. One year later, the bonds are sold for –10,500,000, but the exchange rate is –108/$. What is the US Dollar Return?

      $R_{–} = (-10{,}500{,}000 / -10{,}000{,}000) - 1 = 5.0\%$

      $R_{X\$/–} = [(\$.00925926/–) / (\$.00909091/–)] - 1 = 1.85\%$

      $R_{\$} = (1+R_{–})(1+R_{X\$/–}) - 1 = (1.05)(1.0185) - 1 = 6.94\%$
    - But, currency risk can be ameliorated by:
      - <u>Diversification</u> → Global portfolios containing securities denominated in several currencies will usually have low correlations and thus there will be less risk.
      - <u>Hedging</u> → Currency risks can be hedged using futures
      - <u>Small Allocations</u> → Most international investing comprises less than 15% of a well-diversified portfolio, thus currency risk is relatively small.
  - RISKINESS → Foreign securities are viewed as more risky than domestic securities. This is because foreign markets are more volatile than US markets (often) and foreign markets may be less liquid, with less information, etc. But, due to the low correlations, a portfolio with 40 well-diversified global stocks has about ½ the volatility of a portfolio consisting of 40 well-diversified US stocks

- ***Hedging Currency Risk***
  - The Exchange Rate Risk can be hedged by selling the foreign currency in which an investment is denominated forward. If this is done, and the HEDGE IS LIFTED on SETTLEMENT DAY, the Expected Return on the foreign investment earned over the life of the Forward contract, measured in US Dollars is

    $R_{\$} = (1+R_{fc})[(1+r_{US})/(1+r_{fc})] - 1 =_{approx.} R_{fc} + r_{US} - r_{fc}$

    $R_{\$} \rightarrow$ E(R) on investment measured in US $

    $R_{fc} \rightarrow$ E(R) on investment measured in foreign currency

    $r_{US} \rightarrow$ periodic risk-free rate in US

    $r_{fc} \rightarrow$ periodic risk-free rate in foreign currency

    $[(1+r_{US})/(1+r_{fc})] - 1 \rightarrow$ Forward Premium currency futures contract measured in $/fc

    $=_{approx} r_{US} - r_{fc}$
  - Since there is usually a positive relation between the risk-free rate and the exchange rate, if $r_f > r_{US}$, it is likely that hedging the exchange rate will penalize the US dollar denominated return. Thus, there is a cost to hedging; it lowers the expected return, along with the risk.

    For Example: US investor purchases 50,000 share of French stock for fr5,000,000 when the franc is worth $0.20/fr and hedges the currency risk with a forward franc contract for 6 months. At the time, 6-month interest rates were 5.0% in the US and 6.0% in France. If the investor's shares are worth fr5,500,000 on Settlement day, what will the currency-hedged return be measured in US Dollars? Compare this with the return had a currency risk not been hedged, assuming the exchange rate remained unchanged.

    Answer:

    Hedged Return

    $R_{\$} = (1+R_{fr})[(1+r_{US})/(1+r_{fr})] - 1$

    $R_{\$} = (fr5{,}500{,}000/fr5{,}000{,}000)[(1+(.05)(.5))/(1+(.06)(.5)] - 1 = 9.466\%$

    Note: Forward PREMIUM on the Currency Contract is $[(1+(.05)(.5))/(1+(.06)(.5)] - 1 = -.4854\%$

    Unhedged Return

    $R_{\$} = (1+R_{fr})(1+R_{X\$/fr}) - 1$

    $R_{\$} = (fr5{,}500{,}000/fr5{,}000{,}000)(1+0) - 1 = 10\%$
  - Currency Hedges NEED not be held until Expiration, they can be lifted earlier. When lifted PRE-SETTLEMENT, the analysis of the hedged return is conducted by determining the profit that the investor obtains over the life of the hedge, measured in his own currency from each of 2 positions:
    - Long on Portfolio of Foreign Securities
    - Short on Position in Currency Futures Contracts
  - The COMBINED Domestic Currency denominated profits are then divided by the original domestic currency denominated investment in the portfolio of foreign securities to determine the return earned over the life of the hedge. Thus, the formula for determining currency-hedged US dollar returns from a US investor's portfolio in foreign securities, when the hedge is lifted before settlement is:

    $R_{\$\text{ -Currency Hedged Lifted Pre-Settlement}} = [(V_{Pf1}S_{\$/f1} - V_{Pf0}S_{\$/f0}) + (F_{\$/f0} - F_{\$/f1})V_{Pf0}] / (V_{Pf0}S_{\$/f0})$

    $V_{Pf} \rightarrow$ Value of the portfolio measured in the foreign currency (f)

    $S_{\$/f} \rightarrow$ Spot currency exchange rate stated in terms of $ per currency unit of f

    $F_{\$/f} \rightarrow$ Forward Currency Exchange rate state in terms of $ per currency unit of f

For Example: US investor has a fr5,000,000 portfolio of French stocks, which is hedged for 6 months against exchange rate risk via a short position in a 6-month forward franc futures contract. The following market conditions exist

	Hedge Initiated	3 Mos. post Hedge
Value of Portfolio (fr)	fr5,000,000	fr5,300,000
US interest rate	5.0%	5.2%
French Interest Rate	6.0%	6.5%
Spot Exchange Rate	fr1 = $0.2000	fr1 = $0.2050
Value of Futures Contract	$0.1990/fr	$0.2043/fr

If the investor lifts the currency hedge 3 months after initiating it, what will be the return on the hedged portfolio? Compare this to the return had not the portfolio been hedged.

Hedged Return (lifted pre-settlement) = $[V_{PF1}S_{\$/f1} - V_{Pf0}S_{\$/f0} + (F_{\$/f0} - F_{\$/f1})V_{Pf0}] / V_{Pf0}S_{Pf0}$
R = (fr5,300,000)($.2050/fr) – (fr5,000,000)($.2000/fr) + ($.1990/fr - $.2043/fr)(fr5,000,000) / (fr5,000,000)($.2000/fr)
R = 6%

Unhedged Return = $(1+R_f)(1+R_{X\$/f}) - 1$ = (fr5,300,000/fr5,000,000)($.2050/fr/ $.2000/fr) – 1 = 8.65%

- Empirical studies suggest that hedging the currency risk does NOT raise correlations between **stock** market returns of different countries significantly, compared to their correlations without hedging. However, hedging currency risk for **BONDS** raises correlations between bonds market returns.
- Timing Relationships Among Global Markets
  - No evidence has been found to suggest any systematic Lead/Lag relationships between Global Markets. But, significant world events occur at different times of the day when various markets are open & closed. In efficient markets, significant news that impacts one market when it is open should impact the opening prices of other markets that had been closed. Thus, there is no systematic way to take advantage of such events

- ***Determining Returns in a Global Portfolio Context***

	Exact Formula	**Approximate Formula**
Investing In Domestic Assets with No Currency Hedge	$R_{\$} = R_{US}$	$R_{\$} = R_{US}$
Investing in Foreign Assets with No Currency Hedge	$R_{\$} = (1+R_{fc})(1+R_{X\$/fc}) - 1$	$R_{\$} = R_{fc} + R_{X\$/fc}$
Investing in Foreign Assets with Currency Hedge	$R_{\$}=(1+R_{fc})[(1+r_{USp})/(1+r_{fp})]-1$	$R_{\$}=R_{fc}+r_{USp}-r_{fp}$
Investing in Domestic Assets with Reverse Currency Hedge	$R_{\$}=(1+R_{US})[(1+r_{fp})/(1+r_{USp})](1+R_{X\$/fc})-1$	$R_{\$}=R_{US}+r_{fp}-r_{USp}+R_{X\$/fc}$

Where:

R_{US} = total return on US assets during the period, which includes the current yield plus capital gain

For US Stocks, in an Efficient Market

$$R_{US} = (DIV_{US}+\Delta P_{US})/P_{US} = (DIV_{US}/P_{US}) + \beta_S R_{M\,US}$$

For US Bonds, in an Efficient Market

$$R_{US} = (I_{US}+\Delta P_{US})/P_{US} = (I_{US}/P_{US}) - D^*_B \Delta i_{US}$$

R_f = total return on Foreign assets in the period, including both the current yield and capital gains

For Foreign Stocks, in an Efficient Market

$$R_f = (DIV_f+\Delta P_f)/P_f = (DIV_f/P_f) + \beta_S R_{Mf}$$

For Foreign Bonds, in an Efficient Market

$$R_f = (I_f + \Delta P_f)/P_f = (I_f/P_f) - D^*_B \Delta i_f$$

**$R_{X\$/fc}$** = percent change in the SPOT Foreign Exchange rate measured in US$ per unit of foreign currency during the period as determined by the formula

$$R_{X\$/fc} = (\Delta S_{\$/fc} / S_{0\,\$/fc}) = (S_{1\,\$/fc} / S_{0\,\$/fc}) - 1$$

r_{US} = risk-free rate in US

r_f = risk-free rate in country f

- ***Market & Currency Return Interactions in Global Strategies***
  - In a global portfolio, returns that are earned in an investor's own currency will depend upon the interaction of market & currency factors which are quite complex. Study the Following Example.

Analysis of Global Strategies
Expected Return Scenarios

Data	I	II	III	IV
Return on US S&P (R_{US})	8%	11%	9%	15%
Return on France (R_f)	15%	12%	13%	10%
Return on Ex. Rate ($R_{X\ \$/fr}$)	-5%	3%	2%	-3%
Risk-Free Rate France (r_f)	6%	8%	3%	7%
Risk-Free Rate US (r_{US})	4%	5%	4%	5%
Strategies				
US S&P not Currency Hedged				
$R_\$ = R_{US}$	8%	11%	9%	15%
French Market Not Currency Hedged				
$R_\$ \cong R_f + R_{X\ \$/fr}$	10%	15%	15%	7%
French Market Hedged Francs into Dollars				
$R_\$ \cong R_f + r_{US} - r_f$	13%	9%	14%	8%
US S&P Hedge $ into Francs				
$R_\$ \cong R_{US} + r_f - r_{US} + R_{X\ \$/fr}$	5%	17%	10%	14%
Best Strategy				
Best Market (country)	France	US	France	US
Best Currency	US$	French fr	French fr	US$

  - With 2 Countries, & assuming there is NO Short Selling, there are 4 Possible Investment Strategies that can be followed.
    - *Investor could buy US Market with NO Currency Hedge* → Return from this strategy is simply that produced by the S&P 500 Index.
      $R_\$ = R_{US}$
    - *Investor could buy French Market with NO Currency Hedge* → Return to a US investor would be the return generated by the French market plus the amount the franc appreciated relative to the dollar over the investment period
      $R_\$ = (1+R_f)(1+R_{X\ \$/fr}) - 1 \cong R_f + R_{X\ \$/fr}$
    - *Investor could buy French Market with Currency HEDGE* → If hedged perfectly, the return would be
      $R_\$ = (1+R_f)[(1+r_{USp})/(1+r_{fp})] - 1 \cong R_f + r_{US\ p} - r_{fp}$
    - *Investor could buy US Market but reverse hedge dollars into francs* → US Dollar return would be
      $R_\$ = (1+R_{US})[(1+r_{fp})/(1+r_{USp})](1+R_{X\ \$/fr}) - 1 \cong R_{US} + r_{fp} - r_{USp} + R_{X\ \$/f}$
    - The optimal strategy is not necessarily so obvious before the exchange rate effect is considered. Intuition fails because there is a cost to hedging currency risks.
    - OPTIMAL Strategy needs to Select BEST COUNTRY & CURRENCY
    - The 2 decisions can be made Independently using the following calculations
      Best MARKET: $\text{MAX}\ [(1+R_i)/(1+r_{ip})] - 1 \cong \text{MAX}\ (R_i - r_{ip})$
      Best CURRENCY: $\text{MAX}\ [(1+r_{ip})(1+R_{X\ D/i}) - 1 \cong \text{MAX}\ (r_{ip} + R_{X\ D/i})$
      R_i → Expected return on investment in Country i measured in local currency
      r_{ip} → Periodic Risk-free rate in country i
      $R_{X\ D/i}$ → Expected %Δ in Exchange rate between currency of i and home currency of investor measured in domestic currency units per unit of i's currency

- Thus, the BEST MARKETS in which to invest are the ones whose expected excess returns over their own risk-free rates are large; the BEST CURRENCIES in which to invest are those whose risk-free rates, measured in the investor's own currency, are high.
  - If the best market is the US and best currency is $, buy US Market
  - If best market is Franc and best currency is fr, buy French Market
  - If best market is France & best currency is $, buy French market & hedge into $
  - If best market is US, & best currency is fr, buy US market & hedge into fr.
- Applied to the previous Example

MARKET DECISION ($R_i - r_i$)

	I	II	III	IV
Excess Return in US ($R_{US} - r_{US}$)	4%	6%	5%	10%
Excess Return in France ($R_f - r_f$)	9%	4%	10%	3%

CURRENCY DECISION ($r_i + R_{X\ \$/i}$)

	I	II	III	IV
US Risk-free Return in $ ($r_{US} + R_{X\ \$/\$}$)	4%	5%	4%	5%
French Risk-free Return in $ ($r_f + R_{X\ \$/fr}$)	1%	11%	5%	4%

BEST STRATEGY

	I		II		III		IV	
Best Market (Country)	France	9%	US	6%	France	10%	US	10%
Best Currency	US $	4%	French fr	11%	French fr	5%	US$	5%
Strategy	Buy France Hedge fr into $	13%	Buy US Hedge $ into fr	17%	Buy France Unhedged	15%	Buy US Unhedged	15%

NOTE: these simple to calculate results produce the same conclusions that were reached previously

If 3 or more markets are to be analyzed, the principles are the same, but the number of strategies become more numerous. For example, with 3 countries, there are 6 strategies. Plus, cross-hedging may be required.

- ***Performance Attribution Analysis in a Global Context***
  - Measuring the overall performance of a portfolio is not difficult. It is more difficult to break the performance down into several component parts so that the overall return can be ATTRIBUTED to certain specific factors
  - When GLOBAL portfolios are analyzed, performance measurement & attribution analysis can become complex as the performance is attributed not only to the way the assets were allocated among countries & selection of securities within those countries, but also due to currency exposure. When hedging is introduced, more complexity arises.
  - To study this, analyze the following example. The first table contains the needed data. The second table shows the conventional analysis (incorrect) and the third table shows the proper way to analyze performance for a global portfolio

Hypothetical Global Portfolio Data

Nation	Index Weight (W_I)	Index Return (R_I)	W_IR_I	Portfolio Weight (W_P)	Portfolio Return (R_P)	W_PR_P	Return on Exchange Rate ($R_{X\$/f}$)	$W_IR_{X\$/f}$	Local Return on Cash (r_f)	W_Ir_f	US Cash Return ($r_\$=r_f+R_{X\$/f}$)	$W_Ir_\$$	Non-cash Portfolio Weighting (W_C) +	Portfolio Cash (C_P) +	Hedge (H_P) +	= Currency Weight (W_C)
	<----------MARKET----------						<------Exchange Rate-------->			<----------Currency---------->						
Fra.	25%	7%	1.75	60	6.8	4.08	1.0	.25	5.0	1.25	6.0	1.5	60	0	-50	10%
Italy	25	10.5	2.625	10	12.25	1.225	-3.0	-.75	11.25	2.8125	8.25	2.0625	10	0	45	55
UK	25	9.5	2.375	10	10.5	1.050	-1.0	-.25	9.0	2.25	8.0	2.00	10	0	15	25
US	25	8.4	2.1	15	9	1.35	0	0	7.5	1.875	7.5	1.875	15	5	-10	10
Cash	0	7.5	0	5	8	.4	0	0	7.5	0	7.5	0	15	5	-10	10
Total	100		8.85	100		8.105		-.75		8.1875		7.4375	95	5	0	100

Total Index Return (in \$) = $\Sigma W_IR_I + \Sigma W_IR_X$ = 8.85 + (-.75) = 8.10%

Conventional Attribution Analysis (INCORRECT METHOD)

Nation	Market (country) Selection	Currency Selection	Security Selection	Total Contribution
	$(W_P - W_I)(R_I - \Sigma W_IR_I)$	$(W_C - W_I)(R_X - \Sigma W_IR_X)$	$W_P(R_P - R_I)$	
France	(.60 - .25)(.07 - .0885) = -.65%	(.10 - .25)(.01 + .0075) = -.26%	.60(.068-.07) = -.12%	-1.03%
Italy	(.10 - .25)(.105 - .0885) = -.25%	(.55 - .25)(-.03 + .0075) = -.68%	.10(.1225 - .105) = .18%	-.75%
UK	(.10 -.25)(.095-.0885) = -.10%	(.25-.25)(-.01+.0075) = 0%	.10(.105 -.095) = .10%	0%
US	(.15-.25)(.084-.0885) = .05%	(.10-.25)(0+.0075) = -.11%	.15(.09-.084) = .09%	.04%
Cash	(.05-0)(.075-.0885) = -.07%	(0-0)(0+.0075) = 0%	.05(.08-.075) = .03	-.04%
Unexplained	----	----	----	3.16%
	-1.01%	-1.05%	0.27%	1.37%

Market Selection
Portfolio: ΣW_PR_I = 7.84%
- Index: ΣW_IR_I = 8.85%
-1.01%

Currency Selection
Portfolio: ΣW_CR_X = -1.80%
- Index: ΣW_IR_X = -0.75%
-1.05%

Security Selection
Portfolio: ΣW_PR_P = 8.105%
- Index: ΣW_PR_I = 7.835%
0.27%

Unexplained
Σ Mkt + Sec. + Curr. Selection -1.79%
$\Sigma H_Pr_f \rightarrow$ unexplained 3.16%
Total Manager Effect 1.37%
Index Return (\$) $\Sigma W_IR_I + W_IR_X$ 8.10%
Total Return 9.47%

NOTE: The conventional attribution analysis is UNABLE to explain all of the portfolio's return. That is due to the fact that this model ASSUMES Market & Currency returns are PRODUCED JOINTLY and not SEPARATELY

Exact Attribution Analysis (CORRECT METHOD)

Nation	Market (country) Selection	Currency Selection	Security Selection	Total Contribution
	$(W_P - W_I)[(R_I - r_f) -(\Sigma W_IR_I - \Sigma W_Ir_f)]$	$(W_C - W_I)(r_\$ - \Sigma W_Ir_\$)$	$W_P[(R_P - r_f) - (R_I - r_f)]$	
France	(.60-.25)[(.07-.05) – (.0885-.081875) = .47%	(.10-.25)(.06-.074375) = .22%	.60[(.068-.05) – (.07 -.05) = -.12%	.56%
Italy	(.10-.25)[(.105-.1125) – (.0885-.081875) = .21%	(.55-.25)(.0825-.074375) = .25%	.1[(.1225-.1125) -(.105-.1125)]=.18%	.63%
UK	(.10-.25)[(.095-.09) – (.0885-.081875) = .02%	(.25-.25)(.08-.074375) = 0%	.1[(.105-.09)-(.095-.09)] = .10%	.12%
US	(.15-.25)[(.084-.075) – (.0885-.081875) = -.02%	(.10-.25)(.075-.074375) = -.01%	.15[(.09-.075)-(.084-.075)] = .09%	.06%
Cash	(.05-0)[(.075-.075) – (.0885-.081875) = -.03%	(0-0)(.075-.074375) = 0	.05[(.08-.075)-(.075-.075)] = .03%	0%
Unexplained	---	---	---	
	0.65%	0.45%	0.27%	1.37%

Market Selection
Portfolio: $\Sigma W_P(R_I - r_f)$ = 1.31%
- Index: $\Sigma W_I(R_I - r_f)$ = 0.66%
0.65%

Currency Selection
Portfolio: $\Sigma W_C(r_f + R_X)$ = 7.8875%
- Index: $\Sigma W_I(r_f + R_X)$ = 7.4375%
0.45%

Security Selection
Portfolio: $W_P(R_P - r_f)$ = 1.58%
- Index: $W_P(R_I - r_f)$ = 1.31%
0.27%

Σ Mkt + Sec. + Curr. Selection 1.37%
= (no unexplained)
Total Manager Effect 1.37%
Index Return (\$) $\Sigma W_IR_I + W_IR_X$ 8.10%
Total Return 9.47%

- ***Changing the Currency Risk with Futures Contracts***
  - Having explained currency risk can be hedged using futures contracts, follow the example to see how.

For Example: Assume a $20,000,000 portfolio has 30% exposure to the US $, 30% exposure to Canadian (Cd$) and 40% exposure to the British Pound (,). It is desired to alter the currency exposure of the portfolio to 30% US$, 45% Cd$, 25% ,. Given the following IMM currency futures quotes:

Currency	Quote	Value of One Contract
,	$1.80/,	25,000 Pounds
Cd$	$0.80/Cd$	100,000 Cd$

$N_F = (-HR/K_{Size})Q_{Hedge}$

1British Pound Contract measured in US$ → $1.80/, * ,25,000 = $45,000

1 Canadian Dollar K measured in US$ → $0.80/Cd$ * Cd$100,000 = $80,000

To achieve the desired currency exposure, the manager must increase Canadian Dollar Exposure by 15% (45%-30%) or $3,000,000 (15% of $20,000,000) and decrease exposure to the British pound by 15% or $3,000,000. This can be achieved by;

Buying 38 Canadian Dollar Futures contracts

$N_F = (-1/\$80,000)(-\$3,000,000) = 38$ Contracts

OR Selling 68 British Pound Futures Contracts

$N_F = (-1/\$845,000)(\$3,000,000) = -67$ Contracts

Benefits of Using Currency Futures to Alter Currency Exposure v. Purchasing/Selling Foreign Securities →

Transaction Costs are lower

Disruption of Portfolio is Minimized

No decisions are required on individual foreign securities

- ***Adjusting Country Exposure with Futures Contracts***
  - Futures contracts exist for most major national market indexes. These may be used to adjust the allocation of assets among countries without the need to physically buy & sell individual foreign securities.

For Example: Assume a $60,000,000 portfolio is 50% invested in the US and 50% invested in Japan. The Exchange rate is $0.0067/– so that the $30,000,000 Japanese investment is worth about –4.5 Billion. Suppose the manager wants to increase the US weight to 60%. This requires a decrease in the Japanese weighting from $30million to $24 million (40% of $60 million). This can be accomplished by increasing the exposure to US stocks by $6million and decreasing the exposure to Japanese stocks by an equal amount.

If the S&P is at 350 and the Nikkei is at – 40,000 ($K_{multiplier}$ for Nikkei is –500 per index point, desired change can be accomplished by:

Buying 34 S&P Futures → $Q/(K_{multiplier}*S)$ → {6,000,000/(500*350)}

Selling 45 Nikkei Futures → $Q/(K_{multiplier}*S)$

$6,000,000/$.0067/– = – 895,522,388

–895,522,388/(40,000*500) = 45 Contracts

- ***"National Risk in Global Fixed-Income Allocation" by Erb, Harvey & Viskanta***
- This study relates the credit ratings given to countries by bank credit rating staffs published twice yearly in the INSTITUTIONAL INVESTOR to a number of variables that are important in global bond selection & portfolio management. Summary of findings:
  - Weak Negative Relationship between the VOLATILITY of Bond returns in the international market (measured in local currency) and a country's credit rating (low credit ratings ≅ high volatility). BUT, when bond returns are measured in US dollars, the relationship becomes insignificant. This is because there is no relationship between the volatility of a currency and the credit rating of the country that issues it. When Bond returns are HEDGED against currency risk, the weak negative relationship between a nation's credit rating and its bond volatility (in US$) is re-established

  - Strong NEGATIVE Relationship between the RETURNS on Bonds (in local currency) and the credit rating of the country which issued the bonds. Persists even when the bond returns are converted into US$
  - Strong POSITIVE Correlation between the Return on a CURRENCY and the Credit rating of the issuing nation→ rising credit ratings are associated with stronger currencies
  - Strong NEGATIVE relationship between the rate of INFLATION in a country and its Credit Rating.
  - Forward Currency Exchange Rate Premiums over Spot Exchange rates (measured $/fc) seem Positively Correlated with country credit ratings.
- Thus, there seems to be an incentive to purchase bonds of countries with LOW Credit ratings as their returns are high, even when measured in US$. Plus, it is unwise to hedge the currency risk of this investment. Authors conducted a study. Results
  - (measured in Local Currency) the low credit-rated portfolios outperformed the high rated portfolios by 400 basis points with 40 basis points less volatility
  - (measured in US$) unhedged, low credit-rated portfolios outperformed the unhedged high rated portfolios by 120 basis points with 110 basis points less volatility
  - Currency-hedged low credit-rated portfolios outperformed the currency-hedged high credit-rated portfolios by 70 basis points but with 30 basis points of additional volatility
  - Duration of low credit-rated portfolios is less than the Duration of the high-rated portfolio. Thus, there may be a better return-risk from low-rated nations.
  - ACTIVE strategy of rotating from improved credit-rated to declining credit-rated countries out-performed passive buy & hold international portfolio.

- ***"International Bond Portfolio Management" by Steward & Lynch***
- International Bond managers face increased challenges relative to their domestic peers. Thus, it is even more vital to have a well-defined, disciplined approach to the investment process consisting of the following steps:

(1)Set Objectives (2) *Set Investment Guidelines* (3) *Develop a Portfolio Strategy* (4) *Construct a Portfolio* (5)*Monitor Risk & Evaluate Performance*

- **Setting Investment Objectives**
  - Investors seek one of four objectives from International Bond Portfolio Mgmt:
    - Higher TOTAL RETURN than could be obtained from domestic bonds alone
    - DIVERSIFICATION into foreign bonds that are not well correlated with domestic bond returns in order to REDUCE OVERALL Portfolio RISK
    - Higher CURRENT INCOME than obtainable domestically
    - Proper MATCHING of Assets with liabilities
- **Setting Investment Guidelines**
  - Guidelines should include:
    - Investor's Objectives
    - BENCHMARK that will be used to guide and measure performance. Benchmark selection is vital and should be undertaken very carefully.
      - Benchmark Currency position is important and need to decide whether to employ ACTIVE CURRENCY MANAGEMENT or PASSIVE CURRENCY Management. Active management requires the use of a Currency Overlay Manager who can adjust the currency mix to a more optimal mix, via futures. If Passive Strategy is used, currency risk can be either hedged or unhedged. Authors believe both or sub-optimal and should follow INTEGRATED Approach, in which bond & currency allocations are made simultaneously. Most research shows that Partially Hedged Currency Risk produces better return/risk ratios than either a fully hedged or unhedged approach. History suggests that hedging risk reduces return.
      - Usually, a 70% US 30% International Bond Portfolio (with Int'l bonds 50% hedged) produced the best results over 1985-1996.
      - WHETHER or NOT an international bond portfolio should be fully-hedged, partially-hedged, or un-hedged is still a controversial question that has not been answered by empirical studies. But, it is clear that investors should invest mainly in their own country with moderate diversification into international bonds
    - RISK Decisions must be made. Often make exposure limits in terms of trading blocs, rather than separate nations, due to intra-bloc correlation.
      - Dollar Bloc → US, Canada, Australia, New Zealand
      - Europe Core Bloc → Germany, Holland, France, Belgium
      - Europe Periphery Bloc → Italy, Spain, UK, Denmark, Sweden, Finland, & Portugal

        - Emerging Markets Bloc
        - Japan
        - Derivatives Restriction should also be included in the guidelines concerning risk
    - TIME HORIZON → shorter time horizons might encourage more short-term trading activity while longer-time horizons might suit investors seeking risk reduction
    - CUSTODIAL BANKS → handle the settlement & delivery of securities, FOREX transactions, collection of coupon interest, and maintenance of cash balances
- **Developing a Portfolio Strategy**
  - International bond managers face great complexity is determining which events will occur that will alter portfolio returns (beyond interest rate movements). At least 10-20 interest rates, currency decisions. Thus, managing an international bond portfolio is more like managing an equity portfolio than a fixed income bond portfolio. Thus, there are several different styles
    - *Trading Style* → technical & contrarian. High portfolio turnover. Try to take advantage of other manager mistakes
    - *Fundamentalist* → trade in line with economic conditions. Lower turnover as national economic cycles tend to last for months to years
    - *Black Box* → disciplined, computerized, quantitative approach to assess interest rate and currency outlooks in various countries. Along with the covariance of returns, used to determine the optimum allocation.
    - *Chartists* → technical analysts. Either trend (moving average or momentum) indicators (the trend is your friend) OR Counter-trend (Oscillator) approaches (what goes up must come down) attempting to determine interest rates and currency trends in various nations.
  - Most International Bond Fund managers use a variety or mix of these approaches rather than relying only on one. Authors recommend a disciplined, primarily FUNDAMENTALIST Approach. Try to follow a similar approach as Equity Maven Peter Lynch. This requires that portfolio be indexed to the selected benchmark position at MOST times. But, whenever managers believe there is a compelling reason to deviated from the pure indexed strategy, bets may be made in the form of overweighting in bonds that are expected to do great, and underweighting bonds that are expected to do poorly. Thus, though the portfolio is mainly indexed much of the time, the manager needs to outperform the market. There are several ways he can do this (while not deviating far from indexation)
    - *Bond Market Selection* → allocate more towards trading blocs where rates are expected to decline and reduce exposure in blocs where rates will be rising
    - *Currency Selection* → Manage the currency overlay so as to overweight the currency exposure toward those currencies that will rise more than the forward market expectations. To do this, need a way of forecasting rates.
        - Discount currencies (countries where interest rates are higher than the home currency of the investor) have a tendency to fall less than

is indicated by exchange rates in the forward market → Should unhedge these bonds
    - Overweighting a portfolio in currencies of countries with HIGH real interest rates has proven to be successful
    - Currencies tend to move in Trends. Thus, simple moving average technical approaches tend to work.
  - *Duration Management* → Can make changes in the duration of individual blocs based on predicted yield curve shifts while still maintaining an overall duration in the portfolio that is unchanged. Difficult to do internationally because of illiquidity, and swaps are underutilized.
  - *Sector Selection* → Many international fixed-income indexes contain only government bonds. As corporate bonds offer higher yields, it is possible to outperform by investing in corporates. But, in many nations, illiquidity concerns prevent this.
  - *Invest outside the Benchmark Markets* → If portfolio guidelines permit, managers can attempt to outperform their international benchmark by investing in bond markets that are expected to perform well, but which are not included in the international index used as the benchmark.
- A Fundamental Approach to International Bond Management
- Overall portfolio strategy consists of long-term strategic allocation decisions and a series of short-term tactical allocation adjustments to longer-term strategy. In analyzing fundamentals for the Strategic Decision, look to
  - *Outlook for the Business Cycle in Each Country* → rising economies tend to be associated with rising rates and fall economies with falling rates. Look at both GDP & POTENTIAL GDP (labor force growth rate, productivity, etc.) Countries growing faster than potential GDP should experience inflation, high rates, and weak currencies. Slower growth experiences disinflation, ,lower rates and stronger currencies. Inflationary expectations are associated with growth driven by CONSUMER or GOVERNMENT Sectors, whereas there is less inflationary pressure when growth is led by the INVESTMENT or EXPORT Sectors.
  - *Outlook for Inflation in Each Country* →Ceteris Paribus, high inflation leads to high rates and weak currencies. But, inflation per se is not as important in determining rates and currency movements as is the rate of inflation relative to market's expectations regarding it. UNANTICIPATED inflation is a primary cause of rising rates and weaker currencies. Sometimes, unanticipated inflation may strengthen a currency as the market will expect monetary policy to tighten, over the short-term. But over the longer-term, continuing inflation weakens the market's confidence in the monetary authority's ability to sufficiently tighten to arrest the erosion of value of a currency via loss in its purchasing power parity
  - *Outlook for MONETARY Policy in Each Country* → Ceteris Paribus, tight policy leads to rises in rates, while eased policy lowers rates in the short run. Expectations tend to count more than actualities. But, in longer-terms, tight policy can strangle an economy's growth.

- *Outlook for FISCAL Policy in Each Country* → Ceteris Paribus, in short-run, fiscal stimulus will tend to CROWD OUT investment spending and RAISE Rates. Its effect on currency is mixed in that in attracts capital, but imports also rise.
- *Outlook for DIRECTION of National Debt in Each Country* → When debt levels become high relative to GDP, interest rates rise. Bad for Bond prices. But, if high rates attract capital, currency rises. But, investors may fear debt trap.
- *Outlook for BALANCE of PAYMENTS in Each Country* → Capital flows are more volatile than trade flows. If study them, may be able to see long-term shifts.
- *Political Shifts within Each Nation* → Whether Socialist or Libertarian makes a difference

o It is not enough to study the 7 fundamental factors. Also need to look at the relative value of bond markets in each country and the technical conditions prevailing there.

- *Real Yields* → Real Yield = Nominal Yield – Expected Inflation. Real Yields can be compared across markets to determine where they are highest. If real yields in a country are unusually high (compared to its history) may indicate that the bond market is Unusually CHEAP and should be over-weighted; & vice versa
- *Technical Conditions* → Simple moving average and oscillators, inter alia, may be used
- *Market Sentiment* → Surveys are available regarding the outlook for rates in various countries and market expectations of currency levels. Surveys may be used as contrarian indicators.

- **Constructing a Portfolio**
- The Construction is complex & involves several steps. The first is to determine the EXPECTED return for bond investments in various countries. Plus, need to make country/currency selections designed to maximize the return.
- *Invest in Domestic Bonds* $R_\$ = R_{US}$
- *Invest Unhedged in foreign Bonds* $R_\$ = (R_{fc} - r_{fp}) + (r_{fp} + R_{X\ \$/fc})$
  $R_\$ = r_{USp} + (R_f - r_{fp}) + (R_{X\ \$/fc} - FP_{\$/fc})$
- *Invest Hedged in Foreign Bonds* $R_\$ = (R_f - r_{fp}) + (r_{USp})$
- *Invest Reverse-Hedged Domestic Bond* $R_\$ = (R_{US} - r_{USp}) + (r_{fp} + R_{X\ \$/fc})$
  $R_\$ = r_{USp} + (R_{US} - r_{USp}) + (R_{X\ \$/fc} - FP_{\$/fc})$
- *Invest Cross-Hedged Bond* $R_\$ = (R_f\text{-}r_{fp})+(r_{jp}+R_{X\ \$/j}) = r_{USp}+(R_f\text{-}f_{fp}) + (R_{X\$/j} - FP_{\$/fc})$
- *Proxy-Hedged Bond* $R_\$=(R_f\text{-}r_{fp})+(r_{fp}+R_{X\ \$/fc}) + [(r_{USp}\text{-}r_{jp})\text{-}R_{X\ \$/j}]$
  $R_\$= r_{USp}+(R_f\text{-}r_{fp})+[(R_{X\ \$/fc}\text{-}R_{X\ \$/j}) - FP_{j/fc}]$

  - Country Selection & Currency Selection may be done SEPARATELY rather than jointly
  - Certain Variables are KNOWN by the portfolio manager; the others must be ESTIMATED

- *To maximize the Return, the manager must take the Following Steps*
  - Observe all the RISK-FREE Rates in the world (r_{US}, r_f, & r_j)
  - Observe the Forward Premium in currency futures markets between the US dollar and the foreign currency (f) or proxy currencies that may have to be substituted for other currencies (j)
  - Estimate the EXPECTED RETURNS from currency movements between the US and other currencies, including any proxies that may need to be used as substitute hedges ($R_{X\ \$/fc}$ & $R_{X\ \$/j}$)
  - Run these facts and estimates through the equations to determine the best strategy.
    - BEST COUNTRY: $MAX(R_i - r_i)$
    - Best CURRENCY: $MAX\ (r_j + R_{X\ \$/j})$ or $MAX(R_{X\ \$/j} - FP_{\$/j})$
  - What is missing so far is an analysis of risk (just look to max. returns so far). To appraise risk in the international setting is complex since there are so many factors
    - Volatility of bond returns in each country, measured in local currency
    - Volatility of currency returns in each country, measured relative to $
    - Correlations between all various combinations of paired bond returns of all countries, measured in local currency
    - Correlations between the various exchange rate of paired currencies
  - To start a risk analysis, need data; can use historical, scenario or monte carlo.
  - USE THESE ESTIMATES of VOLATILITY & CORRELATION →RISK → along with the expected return analysis as inputs to a MEAN-VARIANCE Optimization Model.
  - Looking for Value in the International Bond Market
    - One way for a manager to discover the "CHEAPEST" bond markets is to search for those markets where the FORWARD RATES for LONG & INTERMEDIATE Bonds are MUCH HIGHER than the portfolio manager's EXPECTATION of how much interest rates will be rising in the future.
    - TO look for CHEAP CURRENCIES, the manager should look to those whose expected exchange returns ($R_{X\ \$/fc}$) will EXCEED the Forward Premiums ($FP_{\$/fc} = r_{USp} - r_{fp}$) in the foreign exchange forward market or futures markets by the widest margins
    - In most non-US Bond markets, only gov't bonds trade with SUFFICIENT LIQUIDITY to be utilized by investors. Plus, there are some maturities that are popular, and expensive. Using unpopular maturities may yield some cheaper bonds
    - TAXATION is critical. As income is taxed at a higher rate than capital gains, there will be a premium on lower coupon bonds. Thus, one could buy a cheaper higher coupon bond. Plus, coupon hopping occurs (sell the bond right before coupon, re-po right after payment). That will impact pricing.

- **Monitoring Risk & Evaluating Performance**
  - Most international bond portfolios are monitored by using a POSITION REPORT, which lists all of the bond positions in the portfolio broken down by country/trading bloc, indicating market & currency risk exposure in each country. Risk is measured using VARIANCE of RETURNS, DURATION, TRACKING ERROR and VALUE AT RISK (VAR) Analysis.
  - May also measure an international portfolio's risk in the DURATION WEIGHTED EXPOSURE → $DWE = [w_1D_1 + w_2D_2 + \ldots + w_nD_n] / D_{Benchmark}$
    - Problems with this Method include
      - Fails to capture effect of non-parallel shift in yield curve
      - As interest rate movements between countries are NOT perfectly correlated, duration weighted exposure will not exactly equate with interest rate risk
      - Differing Volatilities among markets means the contribution to duration from one market is not comparable to that of another.
  - CURRENCY RISKS are difficult to translate from country-by-country exposures to overall portfolio exposure because variation in exchange rate volatilities & correlations.
  - VAR attempts to measure all the risks. It does not assume returns are normally distributed. It can uncover risks that may not be apparent with other techniques.
  - TRACKING ERROR → useful as risk measure as it monitors how closely an international portfolio is tracking a chosen benchmark, and when start to get out of whack, manager can take quick steps to solve the problem
  - PERFORMANCE ATTRIBUTION → useful in monitoring the performance of a bond portfolio.

- ***"Strategies for International Trading" by Micioni***
  - INVESTMENT Risk can be reduced by international Diversification. But, international investing can be complex & costly. Reasons for the Cost include:
    - Commissions may be higher in some foreign markets
    - Clearing Costs tend to be high due to the need for international communications, language problems, & clearing bank fees
    - Custodial Costs are high due to the need to use networks of custodians & sub-custodians
    - Liquidity is LOW in some foreign markets causing wide bid/ask spreads
    - Settlement Techniques may be slow & cumbersome
    - Many emerging markets are INEFFICIENT
    - Difficult to find stock to borrow causing a lack of short selling & market inefficiencies
    - Many markets are insufficiently transparent to allow for good price/volume data
  - Improved technology & better international procedures are reducing these costs. But, to help reduce international trading costs, an INDEXED Approach using TRANSITION TRADING Techniques may be employed. Transition Trading is the Buying & Selling of Large Bundles of international securities (≅ program trading in US) allowing owner to re-allocate, cheaply, his exposure

- ***"Industry v. Country Correlations" by Rudd***
- To diversify away risk, must choose assets for a portfolio whose rates of return are not highly correlated. Author conducted a study using a multi-factor model. Conclude:
    - Economic Forces operating within a country, as well as global forces, have an impact on the stock market of individual countries. But, some markets are more heavily impacted by global forces, whereas other are relatively undisturbed by global forces.
    - Countries tend to be more important than industries. But, some industries are so global that they really have no single national impact, but are truly world-wide: such as banking, oil, precious metals, mining & forestry. Some industries are insulated against global influence & respond only to domestics: Food & Beverage, Health Care, business services
    - COUNTRY Factor is more important for Stocks in Emerging Markets than is the Global Factor. Ergo, emerging market stocks, as they are uncorrelated to globalism, are great for diversification
    - Mining, forestry, International oil, chemicals, machinery & banks behave similarly around the world (but insurance, heavy engineering, & household durable goods are local-dependent)

- ***"Forecasting International Equity Correlations" by Erb, Harvey & Viskanta***
- With more institutions investing globally and more economic cooperation among nations, it could by thought that correlations between rates of returns would be increasing. But, empirical evidence suggests that correlations among national markets have actually decreased recently.
- During BULL MARKETS, correlations between stock markets tend to decline (and rise during bear markets). So →
    - Diversification may reduce risks during Bull Markets, but during BEAR markets, there will be few benefits of diversification.
- Instead of relying on historical data, managers need to FORECAST correlations between markets. Can use regression models to predict the correlation between 2 national stock markets using the parameters (in a multi-variable model)
    - Recent Correlation between the markets
    - Dividend Yield in the Markets
    - Slope of the Yield Curve in both markets
- The model was weak in predicting the short term, but performed well over the long term, suggesting that correlations revert to mean over time.

- ***"Lessons for International Asset Allocation" by Odier & Solnik***
- International Diversification can increase the return/risk ratio of a portfolio by providing a wider access to investments, while at the same time, reducing risk through diversification.
- Low Correlations between Stock markets is due to 3 Factors:
    - Long-term interest rates are not highly correlated between countries
    - Currency movements are not highly correlated with bond returns in spite of bond theory
    - Currency risks are typically as large as interest rate risks

- These low correlations occur because monetary & fiscal policy are not synchronized globally.
- If investors want to invest globally, it is necessary to determine what should be the accepted global market portfolio in which to invest or use as a benchmark→
  - *EAFE* → Europe Australia Fare East; at one time, was predominant. But, some weighting problems, and it fails to include the US, ergo, it is more international & not global
  - *GDP-weighted Global Index* → Weight given to each country's national market index is based upon the country's GDP, relative to that of the sum of all GDPs of the world whose markets are in the index. But, still, currency translation problems
  - *GDP-weighted/Single Currency Index* → same as above, but measured in home currency, rather than local currency.
- Properties of a Good Benchmark
  - Widely Accepted in the Investment Community
  - Easy to engage in a low-cost passive strategy by constructing a portfolio of securities to replicate its performance
  - Justifiable on theoretical grounds (i.e., highly efficient)

- ***Investing in Emerging Markets***
  - Emerging Markets = nations that have undergone the economic, political, legal, and financial structural changes that begins transformation from under-developed to developed status.
  - Emergence Occurs when international investment capital begins to flow in significant size to a nation. It presumes sufficient legal, political, financial & economic infrastructure.
  - Characteristics of Emerging Markets
    - Political STABILITY has been largely achieved
    - Financial Markets are OPEN & Transparent (fair pricing)
    - Economic Policies conductive to growth are in place
    - Institutional Structures are in place (LEGAL guaranteeing contracts)
    - Clearly Defined Regulations are in place governing INVESTMENTS & Financial Markets (to ensure fair dealing practices)
    - TAX Regulations are FAIR & enforced fairly, without undue hardship, to foreign investors
    - Financial markets have achieved reasonable LIQUIDITY
    - Satisfactory Network of Financial Intermediaries (banks, brokers, custodians, accountants, research analysts, etc.)
    - Regulations permit reasonable free flow of capital within the country and between countries.
  - Benefits of Investing in Emerging Markets
    - Additional Investment Opportunities (the more opportunities, the greater the chance of finding one offering above-average returns)
    - Low Correlation of Returns between emerging market investments and investments from other emerging or developed markets. Suggests that emerging market is a separate asset class and can play a role as a diversifying agent. (though they have high σ themselves, lower risk)

- Problems & Constraints in Emerging Markets
  - High Volatility (extreme)
  - Potential periods of economic & political instability
  - Dramatic Currency Fluctuations
  - Illiquidity
  - High Transaction Costs
  - Rapid growth interspersed with periods of extreme volatility
  - Quick developing crises in economic, financial & political conditions
  - Limited access to reliable information about macro- & micro-economic conditions
- Emerging Equity Markets from a Historical Perspective
- Since emerging market investing is relatively new, there is not enough history for investors to draw firm conclusions about long-term secular and cyclical factors affecting emerging markets. As they are quite volatile, historical return analysis is dependent upon the time period selected for study

December 1975 – June 1995

Composite of:	Avg. Arithmetic (R)	σ	Compound Avg. (R)	Sharpe Index
Emerging Markets	1.15%	5.61%	0.99%	0.0945%
S&P 500	1.20%	4.25%	1.11%	13.65
Nasdaq	1.21%	5.26%	1.07%	11.22
T-Bills	0.62%	0.25%	0.62%	--
CPI	0.44%	0.33%	0.44%	--

- Impact of Currency Fluctuation on Emerging Market Returns
  - Investing in emerging markets exposes the investor to currency risk. For example, Brazil lost 10% per month against the dollar between 1975 & 1995.
  - To be meaningful, returns need to be measured in terms of the investor's home currency. Since most emerging currencies have lost value over the past 25 years, Returns measured in local currency will be much higher than returns measured in the Investor's Currency. Over 20 years, returns measured in local currencies were about 100 basis-points higher per month than returns measured in Dollars.
- Risks of Investing in Emerging Markets
  - Primary risk of investing in Emerging Markets is the Variability of Returns. Plus, emerging markets are quite inefficient and thus greater variability in returns is not always compensated by higher expected returns.
  -
- Constructing Portfolios Containing Emerging Market Investments
  - Some emerging markets create better returns in a diversified portfolio (Latin America & Asia) while others harmed performance (Africa & East Europe)
- Problems of Basing Conclusions on Historical Data
  - Most instruction for investing in Emerging Markets is based on historical data. But, markets change over time and risk/return characteristics also change. As the Emerging Market becomes more developed, its returns become more correlated with developed markets and thus, an investment in it loses its diversification attractiveness. However, the volatility still remains high, and thus the advantage of the investment loses more.

- Factors that Make Emerging Markets "Investable" for Foreign Investors
  - International Finance Corporation (IFC) established Investability Data in 1988, identifying securities deemed investable by the international community from its Emerging Markets Data Base. Main Criterion for determining investability was that foreigners NOT be restricted from buying & holding the security. Remaining criteria were not explicit: but includes Size, liquidity, & industry factors.
  - Since 1989, the Investable Index has consistently out-performed the Emerging Market Index.
- Investing in Emerging Markets via Closed-End Funds
  - For most investors, the only practical way to invest in Emerging Market Securities is through open- or closed-end funds. Open-end (mutual) funds have a Variable Number of Shares and investors purchase & redeem shares at the fund's NET ASSET VALUE. Closed-end funds have a fixed number of shares outstanding, and shares trade in the open market at a price determined by supply & demand.
  - Majority of Emerging Market Funds are Closed-ends trading on exchanges. As they invest in illiquid stocks, closed-ends are required.
  - Problem of Closed-end funds is that they may be more correlated with movements in the US Market than in the securities in which they invest, thus reducing the Diversification an investor seeks. Plus, most funds under-perform their country (or region) benchmark.
  - Thus, despite the theory of the benefits of investing in emerging markets, for now it remains an impractical method of increasing return and reducing risk.

- ***"Twenty Years of International Equity Investing" by Michaud, Bergstrom, Frashure & Wolahan***
  - Several issues are vital for international equity investors. Before investing globally, investors need to understand these issues; including the impact of diversification on portfolio risk/return.
  - Data supports the conclusion that international equity diversification can improve risk/return profile of portfolios. This is because of the increase in available securities increases the probability of finding an above-average one, plus inefficiencies create opportunities for expertise. Also, low correlations reduce the deviations in the portfolio.
  - Over the past 20 years, the opening up of additional equity markets has been a sign of progress. Plus, liquidity, training, transparency, and quality of data has improved.
  - Plus, improvements have allowed institutional investors to begin investing in international small-caps and emerging markets.
  - In the future, there will be larger, more accurate databases and advanced risk measurement and forecasting tools that can be used globally.
  - But, future expected returns will no longer be predicted via extrapolation. Plus, with globalization, correlation between markets may increase, reducing the ability to diversify away risk.

- In the past, much of the world was inefficient allowing anomalies to be exploited to create above-average returns. But, the world should become more efficient and these anomalies will no longer be available.

- ***"Where are the Gains from International Diversification?" by Sinquefield***
- Many US investors believe that international investing offers better returns than domestic investing alone. They also believe there is a low correlation between domestic and foreign markets. Thus, by international investing, they can improve the return/risk characteristics of a portfolio. The author believes this to be largely false (on national levels).
- But, if asset selection is based on VALUE and company size rather than nationality, market return/risk ratio can be improved.
- Buying foreign stocks with a low price:book (value) ratio and whose market cap. is low improves returns.

- ***Determining the Optimal Currency Hedge***
- Excess return/risk ratio of a portfolio can usually be improved if the portfolio includes both foreign & domestic securities (when not highly correlated). But, international investing brings currency exposure
  - *Effect of Hedging Currency Exposure on Global Portfolios*
    - OPTIMAL CURRENCY HEDGE can be defined as the amount of foreign currency exposure that should be hedged in order to minimize the portfolio risk for a given level of return. This can be determined by differentiating the variance equation and setting it equal to zero.
      $h_{f\ optimal} = (w_{domestic}/w_{foreign})(r_{d,X}\sigma_d/\sigma_{fc})+(r_{fc,X}\sigma_{f\$}/\sigma_X)$
    - Optimal Currency Hedge depends upon the correlation between foreign asset returns and the currency returns, both measured in terms of the domestic currency.
      - Currency Exposure has two effects
        - Increase risk due to the currency's standard deviation
        - Diversifies the returns, which reduces risk
      - Diversification reduces risk if the absolute correlation between the foreign asset return and the currency return is low. (if high, no diversification)
    - NEITHER a Completely Hedged nor a Completely Un-hedged currency exposure for a global portfolio is necessarily optimal. The optimal currency hedge depends upon the specific correlation structure among currencies & assets. To determine the optimal currency hedge, need to know:
      - E(R) for each asset
      - E(R) for each currency
      - σ for each asset & currency
      - Correlation ($r_{x,y}$) between every pair of asset returns
      - Correlation between every pair of currencies
      - Correlation between every currency & asset
      - Weighting of the assets in the portfolio

        - Do not conclude that the HIGHER the correlation, the more one should hedge (improper conclusion)
    - *Complication: Currency Returns are Not Randomly Distributed*
        - Statistical Analysis above is based on equations assuming currency returns are random variables. But, this is not correct (necessarily). Currency returns tend to be SERIALLY CORRELATED.
        - Reasons that currencies move in trends rather than random variables:
            - Governments detest erratic currencies because they feel it has a destabilizing effect on the economy. So, central banks tend to intervene when currencies become unstable.
            - Currency rates are NOT determined by supply & demand functions of currency traders: level of Exports & Imports play roles, and these are sticky variables.
        - The optimization model above presumes randomness. In light of this non-randomness of currency returns, its optimal predictions may be sub-optimal. Thus, require a far more complex model. And, since serial correlation exists, this can be exploited to produce higher returns.
    - *Nominal Hedging v. Real Hedging of Currency Risk*
        - When the investor wants to preserve purchasing power, it is better to measure asset & currency returns in real terms, after adjusting for inflation. The optimal currency hedge can then be determined as above, except it will consist of real, not nominal, currency & asset returns.

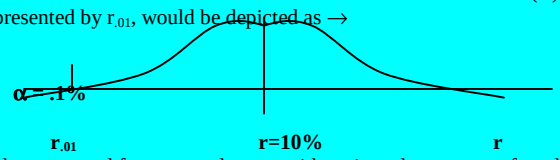
7. *Value at Risk (VAR) Analysis*

- ***Basics***
- RISK can be defined in terms of the probability of incurring a loss on an investment and the severity of what that loss may be.
- While Actual losses may be unpredictable, it is possible to estimate the probability & severity of losses if the probability distribution of all possible returns from the investment can be specified. Requires the manager to do the following
    - List all possible SCENARIOS and Events that could unfold over the holding period during which an investment risk is being assessed
    - Estimate the PROBABILITY of each scenario or even occurring during the period
    - Determine the VALUE of the Investment if such event occurs
- Thus, many sound judgments are required if this endeavor is to have any merit. But it is vital because only with such knowledge can:
    - Portfolio Manager understand the RISK inherent in their portfolios, so they can avoid exceeding acceptable risk limits
    - Top Management be able to manage the TOTAL RISK of their firms and prevent the firm from taking on so much risk that the viability of the firm be jeopardized
    - Regulators be certain that the capital requirements imposed on financial institutions be sufficient to cover the risks being taken
- 1988 Basle Capital Accord proposes that dealers set aside enough capital to cover three times their VAR as a means of guarding against market risk.. Suggest either an internal

method of computing VAR be used or adoption of the Bank For International Settlement standardized methodology be used

- ***Definition of Value at Risk (VAR)***
  - Value at risk is defined using Statistical Terminology. It is the MAX. potential Loss measured in currency units likely to be incurred on an investment or portfolio over a Specific Holding Period and Confidence Interval.
  - Put in form of question, "how much value would be lost over a period of one year if the actual return on an investment turns out to be the return that equals the lowest ONE Percentile of all possible returns, when they are arrayed from lowest to highest."

For Example: if the S&P 500 index returns are NORMALLY distributed with an E(R) of 10% and a σ of 20% per year, the lowest percentile, represented by $r_{.01}$, would be depicted as →



The Value of $r_{.01}$ can be computed from normal curve arithmetic and parameters found in a table of areas under a normal curve.

$Z_{.50-\alpha} = (r_\alpha - E(R)) / \sigma_R$

$Z_{.50-.01} = Z_{.49} = -2.325$ (from the normal curve table)

$-2.325 = (r_{.01} - 10\%) / 20\% = -36.5\%$

The lowest percentile return for an investment in the stock market for one year is a loss of 36.5%. If this happens, a $1,000,000 portfolio invested in an index fund would suffer a loss of $365,000. This is the Value at Risk(VAR) over one year.

$VAR = -r_\alpha V_P$

$VAR = -(-.365)($1,000,000)$

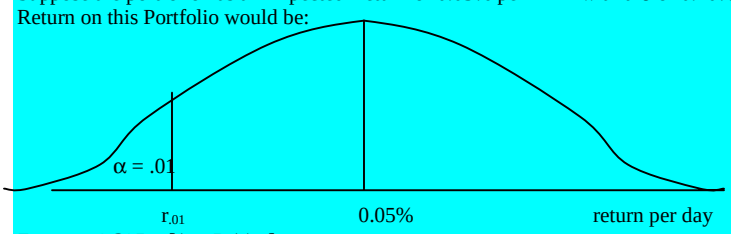
$VAR = $365,000$

  - VAR measures →
    - Can be measured in ANY CURRENCY Unit
    - Usually ASSUME an investment horizon equal to the amount of time it would take to liquidate portfolio positions or hedge an exposure. For trading desks, this is normally one day. For an investment manager, this could be a quarter or year. When comparing VARs between 2 portfolio, the time horizon must be the same in order to make the comparison valid
    - Choose α to be either the First or Fifth Percentile of Possible Returns (α is set to either .01 or .05 at the discretion of analyst)
  - If VAR is to be used as the BASIS for Setting Minimal Capital Requirements for Financial Institutions engaging in international finance & trading, the Methodology must be standardized. The proposed VAR Analysis (Standardized) should be performed in accordance with →
    - VAR Methodology employed by regulated firms should be validated by independent auditors
    - Data used as Inputs to the model must be closely controlled and deemed appropriate by the independent auditors
    - Risk management function be independent from the operating function of the firm
    - Model used to effectuate risk management
    - Senior Management oversee and be informed of the risk managing process
    - Investment time period be 2 Weeks
    - α set at 1%
    - Minimum Capital Requirements be set at 3 times firm's VAR

- Criticisms of the Standardized methodology:
  - 2-week holding period is too long for some volatile investments (especially derivatives)
  - 2-week holding period combined with 1% α tends to safeguard against events that might occur once every four years (this makes it difficult to validate a VAR model)
  - No Consensus on the best way perform VAR analysis, how it should be used, or how adapted to particular circumstances.

- ***VAR Methodologies → 5 Common Ways***
  - **Parametric (Statistical) Analysis (a.k.a. Variance-Covariance Model)**
  - Based upon the Following ASSUMPTIONS→
    - Investment Returns are NORMALLY Distributed
    - Investment Returns are SERIALLY INDEPENDENT
    - A ONE-DAY Investment Holding Period is the appropriate time period over which to measure VAR
    - Portfolio Return Distributions can be computed, using the Markowitz mean-variance approach, based on the Expected Returns and σ of individual asset comprising the portfolio, the correlations between all the paired combinations of assets, and the individual asset weightings in the portfolio

For Example: A portfolio contains 50 assets, each of which has a known expected return and σ of returns. Plus, the correlation matrix depicting all 1225 possible paired combinations and correlations is known. This, plus the weightings for the assets in the portfolio enable the analyst to determine the expected return and standard deviation of the portfolio. Once the Expected Return and σ of the PORTFOLIO is determined, the distribution of portfolio returns can be constructed. Suppose the portfolio has an Expected Return of 0.05% per DAY with a σ of 0.10% per DAY. The Lowest Percentile Return on this Portfolio would be:



$Z_{.50-.01} = -2.325 = [(r_{.01}-R_P)/\sigma_P]$
$-2.325 = (r_{.01} - .05) / .10$
$r_{.01} = -.1825\%$
$VAR_{Day} = -(-0.1825\%)(\$1{,}000{,}000) = \$1{,}825$ per day

If want to compute for a longer holding period (week) cannot just multiply by 5. Must go back and reconfigure the E(R) and σ Component before re-computing the VAR over a week.

  - STRENGTHS of this PARAMETRIC Method of VAR Analysis
    - σ & Correlations needed to perform the analysis for individual elementary components of assets are readily available from standard sources
    - VAR calculations are relatively easy to perform. Does not require significant computing power
    - No need to VALUE the individual assets in the portfolio; just need the Standard Deviations and the correlations
  - WEAKNESSES of this PARAMETRIC Method of VAR Analysis
    - Analyst must know the σ of returns on every elemental component of every asset in the portfolio, plus the correlation matrix for all elemental component parts. But, most of this information is based on historical data.

10 year average σ may not be appropriate in computing the daily VAR. Some try to use a moving average of past measures, but this makes the model sensitive to an arbitrarily chosen decay factor.

- Uses historical Correlations. But, during times of CRISIS, Correlations between Asset classes can Change Significantly. This means VAR may seriously underestimate the potential risk that exists in times of crisis
- As the number of assets or risk factors to which a portfolio is exposed increases, the number of terms in the portfolio variance equation increases geometrically. This means that large portfolios are difficult to calculate
- Assumes NORMAL Distribution. If not normally distributed, the model fails; require an advanced statistical technique to perform the calculations
- Risk characteristics of some assets may change with the economic conditions. PARAMETRIC Method of VAR can really only be used on portfolios containing assets with linear risks; if it contains Derivatives, the variance/covariance method is not very well-suited to compute risk.

- **Historical Analysis**
  - Most investment returns are NOT Normally Distributed. Rather they exhibit PLATYKURTOSIS (there tends to be a higher than normal probability of abnormally low or high returns) and SKEWNESS (return pattern tends to be asymmetrical). When distributions are NOT normal, the Parametric approach must be abandoned.
  - HISTORICAL approach is a simple solution to the non-normality problem
  - May look back 100 days and employ a histogram and find the daily return for the lowest return to correspond with the lowest percentile
  - STRENGTHS of HISTORIC Approach
    - Method is understandable and easily explained to clients and management who are not familiar with technical details of VAR
    - Unlike Parametric Approach, it does not require analyst to make any ASSUMPTIONS about how the prices of investments are determined. Thus, no valuations models are used nor is there a need to know the expected return on assets, their standard deviations, nor their correlation with other assets.
    - No need to assume Normal Distribution of returns
    - Serial Independence need NOT be assumed
  - WEAKNESSES of HISTORIC Approach
    - Assumes future distributions will mirror past distributions.
    - Requires the investment portfolio being analyzed not to have changed nor to propose change
    - Requires a Large database of historical return data that is costly to maintain
    - Does not permit SENSITIVITY TESTS
    - As Serial Independence is not assumed, it is not possible to convert Daily VARs to Weekly VARs

- **Historical Simulation Analysis**
  - Often, use assets whose historical performance is unknown due to an inactive market (for private placements) or because the asset is NEW. Can try to estimate performance by linking the new asset to an asset whose performance is known
  - STRENGTHS of HISTORICAL SIMULATION MODEL
    - Does not require the distribution of returns of assets or risk factors to be normal. Can be used to measure VAR of portfolios containing derivatives or assets with imbedded options
    - Does not require stability in σ or Correlation terms
  - WEAKNESSES of HISTORICAL SIMULATION Model
    - "Look-back" period may not be representative of the period for which the VAR is to be measured.
    - Requires the analyst to construct a valuation model that CORRECTLY links the probably performance of the asset being analyzed to the performance of the underlying factor whose past price history is well known. Not always easy to do.
- **Stochastic (Monte Carlo) Simulation Analysis**
  - Similar to historical simulation in that it requires the VAR analyst to develop valuation models for the individual assets that comprise a portfolio. These models specify the parameters that determine each asset's value. But, instead of basing the values of these parameters on historical price movements of known underlying factors, a computer is used to generate thousands of randomly selected values for the parameters in order to generate a simulated return distribution for individual asset returns. VAR analysis is then based on these simulated distributions

For Example: Suppose a VAR analyst is attempting to determine the 1-week VAR at the 5% probability level for a CALL OPTION on a highly volatile stock. From the Merton Option Pricing Model, the analyst knows the key parameters in valuing the option are

Price of Underlying Stock
Risk-free Rate
Strike Price on the Option
Dividend on underlying stock to be paid while option is alive
Volatility of the Underlying Stock
Time until Expiration

Only parameter in the model known for certain and specified in advance are the STRIKE PRICE and Time until Expiration. All other parameters are STOCHASTIC → they can take on any one of several values and there is uncertainty about their values during the time period. But, there is a limit to certain values that can be taken and there is a probability of those values. So, the analyst can define the probability distributions. So, the analyst might make some specifications for the Stochastic Variables on the Merton Model

1. *Price of the underlying stock one week hence may be described by a normal probability distribution of returns with a stated mean and standard deviation as determined by the analyst*
2. *Risk-free rate one week hence may also be described by a normal probability distribution with a stated expected value and standard deviation defined by the analyst*
3. *Dividend may be described by a skewed probability distribution (dividend more likely to be raised than cut)*
4. *Volatility of the underlying stock could be determined in conjunction with the price of the underlying stock, as noted above*
5. *Since Merton is an imperfect model, may also assume some distribution of model error with a mean of Zero and a standard deviation based on the analyst's experience*

These probability distributions are then put into a Monte Carlo computer program along with the Merton Model itself. The computer randomly selects values for the parameters. It computes the 5% lowest return.

- STRENGTHS of STOCHASTIC (Monte Carlo) Simulation Approach:
  - More FLEXIBLE than other methods of determining VAR as it enables the analyst to specify the valuation model and probability distributions of every stochastic parameter in the model. Also, it is more forward looking and not tied to historical data
  - Can be used to analyze NON-LINEAR as well as LINEAR risks. Can compare portfolios with derivatives to those without them
  - More likely to generate OUTLIER possibilities than would be included under historical approaches. This is vital since the outliers, which are often ignored, that are the primary cause of disasters that risk management want to avoid.
- WEAKNESSES of STOCAHSTIC (Monte Carlo) Simulation Approach:
  - The Ability to measure VAR accurately depends upon the ANALYST'S ability to develop adequate valuation models and to specify realistic probability distributions for the stochastic variables in those models.
  - More variables in the models mean more simulations
  - Often, alternative models can be used to determine the price of securities and the results of each model may differ. So, 2 firms with the same portfolios may compute very different VARs
  - Requires more computing power than other models. Also requires a large database of historical data that can be used as a reference by the analyst in composing models and parameters.

- **Stress Simulation Analysis**
  - Requires the manager to specify some WORST CASE scenario and determine how an investment would perform based upon the theoretical relationships believed to impact the value of the investment

For Example Suppose a $10,000,000 portfolio of stocks is invested in several securities whose weighted average $\beta = 1.2$. If the investment manager believes that the 1 percentile worst-case scenario is that the stock market falls 40% in 1 year, based upon CAPM, the annual VAR of the portfolio may be specified as $4,800,000

$$VAR_P = -\beta_P R_M V_P$$
$$VAR_P = -(1.2)(-40\%)($10,000,000)$$
$$VAR_P = $4,800,000$$

The Worst Case Scenario can be Determined in 1 of 2 Ways

a. Choose various values for one or more of the risk factors that impact the portfolio (as above)
b. Choose catastrophic events that have occurred in the past, and update to present (1929, 1987)

  - STRENGTHS of STRESS Simulation Analysis
    - Simple and Low Cost
    - Assumed abnormal market behavior and not wedded to past variances, correlations, normality, etc.
  - WEAKNESSES of STRESS Simulation Analysis
    - If portfolio's mix changes over time, VAR will change, even if worst-case remains unchanged.
    - If worst-case is changed from time to time, over different periods, the same portfolio will yield different VARs
    - The worst-case scenario is subjective. Analyst Bias occurs.
    - No good way to define the probability of the worst-case

- ***Problems Associated with VAR Analysis***
  - VAR looks only at the ABSOLUTE Dollar Risk in a portfolio, it does not measure the trade-off between risk & return. Thus, not useful in ranking various investment alternatives. (can only compare with portfolios which have the same expected return)
  - No one Single methodology for computing VAR. Allows lots of subjective judgment on the part of the analyst. Plus, no one methodology is clearly superior to another.
  - VAR is a statistical analysis that is most useful in capturing quantifiable market risk; it is less able to assess risks associated with qualified events.
  - VAR produced by the analyst depends upon the percentile chosen as 'worst case'. $\alpha = .01$ different from $\alpha = .05$
  - VAR is most useful in measuring short-term risks (1 day – 2 weeks) under normal circumstances. When market patterns deviate from their norms during true catastrophes, VAR usually significantly understates the riskiness.
  - Analysis requires actively traded assets with known price histories. For assets not traded in public markets, the use of appraisals may cause risk to be understated.
- ***Application of VAR for the Investment Manager***
  - *Using VAR to Construct More Efficient Portfolios*
    - VAR offers a framework for measuring and analyzing risk that can be applied consistently to a variety of assets. Thus a bond portfolio can be compared to an equity portfolio. Provides insight into the nature of and types of risks they may be taking. Thus, can help minimize negative surprises.
    - VAR allows managers to evaluate various asset allocation to determine the most efficient portfolios. Variance/Covariance VAR method is particularly useful in that it can alert a manager to those few fundamental risk factors that are crucial to obtaining an optimal risk/return ratio in a way that may not be so obvious using a conventional asset-oriented MPT analysis
    - Problem, though, is that VAR may be misunderstood by clients and senior management. Highly quantified results mesmerize clients who may place more faith in VAR than is warranted.
  - *Using VAR in Performance Measurement*
    - The Sharpe Ratio is the Standard measure of Risk-Adjusted Performance $\boxed{S = (R_P - R_F) / \sigma_P}$
    - It's tempting to substitute VAR for the standard deviation of portfolio returns as the measure of risk used to calculate the risk-adjusted portfolio. But, there are 2 drawbacks to this:
      - Sharpe ratios tend to be directly comparable among a group of investment managers as there is one consistent way of computing the standard deviation of portfolios. But, there is no Standard Method of computing VAR.
      - VAR is a measure of risk in the current portfolio while standard deviation of a portfolio is a measure of the Past portfolio volatility. Thus VAR is Ex Ante and σ is Ex Post. For VAR to substitute for σ it would have to be measured frequently and averaged over time.

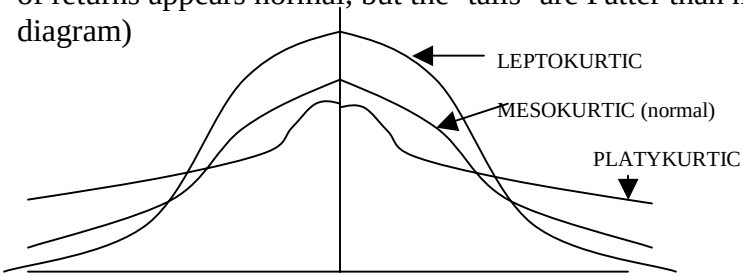
Since VAR is Ex Ante and Performance Measurement deals with the PAST, there is an inherent contradiction of purpose & tool.

- While VAR has drawbacks as a risk measure of risk-adjusted performance, it can be used to determine the relative risk the manager is taking compared to his peers. But, for VAR to be used in this way
  - The VAR calculations for the manager & peer group must be computed using the same methods & assumptions.
  - Composition of the portfolios of the members of the peer group must be known. But, most competitors are unwilling to disclose their compositions to their other competitors. Thus, it is unlike that one could obtain relevant comparable data.
- However, a manager could compare his VAR to a Benchmark's VAR over a specified time horizon.

- *VAR v. σ as Measure of Risk*
  - Traditional measure of asset and portfolio risk is the σ of the probability distribution of possible portfolio returns. While it has drawbacks, the standard deviation is a good measure of risk due to its simple calculation, implementation, and comparability between portfolios. But, the σ measures past risk which may be appropriate for Performance Measurement, it is not forward-looking. Thus, VAR as a forward looking measure of risk and can provide more meaningful information about the expected future portfolio risk.

- ***"Global Risk Management: Are We Missing the Point?" by Richard Bookstabler***
- VIP New Article; most likely will be on test. Critique of VAR
- Firms often perform global risk management at the Trading desk. Yet global risk management and trading desk management are 2 different things. If address global risk management using trading desk techniques, some important risk may be MISSED. Seven Reasons why Global Risk Managers should be careful
  - *Zero Exposure $\neq$ Zero Risk*
    - Trading Desks figure there is no risk when there is no exposure (i.e., if position is hedged, no risk). BUT
      - Hedging Models are Not Perfect; they are based on Assumptions about correlations, valuation, and other factors that may be false (especially securities with imbedded options). If hedge is not perfect and the quantity of asset hedged is large, there can be a large risk exposure when the model predicts no exposure
      - If the SIZE of the inventory of assets is large, Risks can be large even if they are theoretically hedged as some risks may not have been considered, or even if considered, could not be hedged (clearing problems, sudden collapse of liquidity, undetected ambiguity in legal document, etc.) $\rightarrow$ *Non-Quantifiable Risks*
      - Spread & Arbitrage-related Strategies are more subject to these types of risk as they usually require very large positions to be taken in order to extract relatively low profits. Large positions bring more of these types of Risks (LONG-TERM CAPITAL)

- *Market Returns are not always Normally Distributed*
  - Most Statistically based measures of risk, like the variance-covariance model of VAR, are based on the assumption that returns on assets are normally distributed. But, there is evidence that real-world returns are NOT normally distributed. Rather, they are PLATYKURTIC (distribution of returns appears normal, but the 'tails' are Fatter than normal—see diagram)



  - Implication → Once in a while, OUTLIER events occur that produce ABNORMALLY large losses (or gains). Thus, the probability of a large, catastrophic loss is greater than the normal curve indicates. Using a Normal distribution for statistical tests will underestimate the risk; ESPECIALLY the risk of a HORRIBLE CATASTROPHIC Loss
- *Correlations between Markets Increase Dramatically during Crisis*
  - Diversification reduces risk when the correlation between market returns is less than perfect. But, correlations change over time and using the historical correlations in a VAR model may not be appropriate. Plus, in times of market chaos, correlations rise significantly. Thus, normal historic correlations are virtually useless in calculating the true risk inherent in a portfolio during times of crises. May try to use *SCENARIO ANALYSIS* to try to figure out what may happen to the portfolio in cataclysms.
- *When it Really matters, Diversification does not Reduce Risk*
  - Since correlations increase during turbulence, Diversification does NOT reduce the risk when crises occur. Though diversification is fine for reducing risk in average times, it is not a safe way to reduce risk in times of market disruptions
- *Normal Risk Measures may not detect potentially Catastrophic Non-linear Risks*
  - Many derivative instruments have non-linear risk characteristics. Under normal circumstances, they fluctuate moderately as market events change by small amounts. But, during unusual conditions, volatility becomes much larger than expected.
- *Catastrophic Risks are NOT Complex*
  - These risks go undetected because the analyst fails to ask a simple question, not because it is so difficult to measure. Must question the assumptions in the model and try to analyze what would happen in a catastrophic situation (not if things continue in their 100 day trend). To ask the right questions, need →
    - Open Trading information to allow non-traders review

        - Allow non-traders (& traders) incentives to critically analyze the trading activities
        - Managers should not defer to traders in performance of risk-analysis. They should be active in measuring risk-analysis themselves.
    - *Most Important Risks are not always Easily Recognized*
        - Most of the very large losses suffered by firms have not been because a recognized risk was not analyzed; rather they occur because an analyzable risk was not recognized. Thus, must detect where potential risks may lie.

- ***"Behavioral Risk: Anecdotes & Disturbing Evidence" by Arnold S. Wood***
    - Most Theories in Finance & Economics ASSUME that individuals make RATIONAL Choices. In efficient markets, opinions of investment professionals are assumed to be unbiased estimates of future results (equal probability of being right or wrong). But, investment professionals under-perform the market most of the time.
    - Based on this, investment decision makers Rely more on COGNITIVE INSTINCT (perceptions of reality) than on Rationality
    - Must recognize that false perceptions distort reasoning & learn to overcome it. (rely more on math & less on greed/fear). Major Cognitive Influences which distort rationality are:
        - Over-Confidence
            - Relying on forecasts leads one to fall victim to the CALIBRATION PARADIGM of FORECAST INACCURACY, meaning that the more confidence placed in a forecast, the greater chance that the confidence is misplaced. Plus, more often rely on the SOURCE of the opinion than the opinion itself. (rely more on presentation-form than on the rationality of the presentation)
        - Decision Framing
            - Most theories assume people seek to maximize utility. PROSPECT theory is a challenge to this argument. It states that HOW a person views a situation has more to do with what decision he will make than any rational utility maximization argument
            - For example: rather have an 80% chance of losing $4,000 or 100% chance of losing $3,000? 92% chose first option (even though it has a higher expected loss)
            - People seem to be risk takers in negative situations while being risk-averse in positive situations.
            - For example: take 80% chance of earning $4,000 or 100% chance of earning $3,000? 80% chose second option, though first has higher expected return.
            - This, combined with the way individuals frame a decision could lead to IRRATIONAL Decisions.

- Agency Friction
  - People behave differently when managing their own, as opposed to another's, money. In agency, tend to be more conservative
    - Fear Regretting a decisions (more conservative)
    - Since up for review every quarter, opt for safer, low-returns over possible larger-returns
    - To outperform markets, need to take unconventional & controversial chances. But, doing this leads to loss of confidence from clients (in the short-run) despite the probability of generating larger-returns in the short run.

- ***"The Psychology of Risk" by Amos Tversky***
- Classic Analysis of decision making under risk ASSUMES (1) Asset Integration (asset X is preferred over asset Y if portfolio with X is preferred to portfolio with Y); (2) Risk Aversion (where expected returns are equal, people prefer assets with smaller variance to those with larger return variances); (3) Rational Expectations (people are unbiased forecasters and correctly asses information, on average)
- Behavioral Research casts doubts on these assumptions. Decisions are actually influenced by COGNITIVE Illusions. People often seek risk, segregate outcomes and have biased expectations.
  - *Risk-Acceptance v. Loss Aversion*
  - There is a difference between Risk & Loss Aversion.

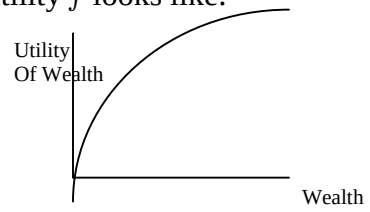
    For Example: Investment A: Sure $85,000 profit. Investment B: 85% chance of making $100,000, 15% chance of making 0. The Expected Returns are identical, but most people choose A → this is Risk Aversion; taking a sure thing over a gamble.
    Investment A: Sure Loss of $85,000. Investment B: 85% chance of losing $100,000; 15% chance of losing nothing. The Expected Losses are the Same, but most people choose B → this is Loss Aversion (Risk Seeking) where the probability of a loss is large, people prefer the gamble to the sure thing.
  - Studies show Risk Aversion Holds when LARGE GAINS are at stake, but Risk SEEKING holds when Large Losses are probable. When probabilities are low, reverse occurs
  - THREE Characteristics of how human value functions operate
    - People Think in terms of Gains & Losses 1 investment at a time rather than the ultimate ending value (wealth)
    - There is a law of diminishing gains & losses. People get the most pleasure with the first $100 gain, and thereafter derive less pleasure; People are most upset with the first $100 loss, and thereafter every loss causes less pain.
    - People are more upset by losses than satisfied by gains.
  - The major motive is NOT aversion to uncertainty (risk aversion) it is an Aversion to LOSS → people prefer gambling to Losing
    - Reference Dependency
    - Which is better: having $60,000 for sure, or an even shot at either $75,000 or $50,000? People's responses depend on their reference point. If people already have $60,000 they prefer the certainty because the choice is then either maintain the status quo v. gaining $15,000 or losing $10,000. Here, Loss Aversion prevails. But, if they start with $75,000, they prefer the gamble because the certain choice brings a $15,000 loss. Reference point

is crucial in decision making: Alternatives are not evaluated in terms of final outcomes; they are evaluated in terms of gains/losses relative to the status-quo of the reference point

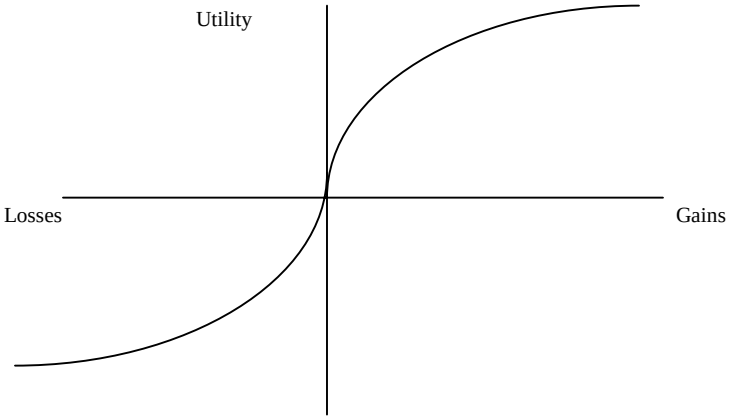
- *Asset Segregation v. Integration*

  For Example; Choose between: (A) sure gain of $240 or (B) 25% chance of $1,000. most people choose A (Risk Aversion). Choose between: (C) sure loss of $750 or (D) 75% chance of losing $1,000. Most choose D (Risk Seeking). Most people choose (A) & (D) (nobody chose (B) & (C)). Aggregating the results
  A & D → 25% chance of gaining $240 75% chance of losing $760
  B & C → 25% chance of gaining $ 250 75% chance of losing $750.
  B&C are better than A&D (-500 v. –510) yet most choose A&D. This shows inferior portfolios are chosen if the decision are segregated, rather than integrated. Combo of Risk-seeking in the domain of losses and risk-aversion in domain of gains can lead to incorrect decisions

  - People tend to evaluate alternative choices one at a time. This leads to MENTAL ACCOUNTING. If the price of a single security falls, they prefer to sell another security that has already risen in value rather than sell the loser. People fail to believe there is a loss until the single stock account is closed. Leads to a tendency to allow losses to run and take gains quickly, the exact opposite of a good trading technique.
- *Biased Expectations v. Rational Expectations*
  - Contrary to rational expectations theory, people's beliefs and the probability they assign to possible outcomes are neither accurate nor unbiased. The major source of bias is over-confidence. Excessive confidence causes people to trade excessively and exacerbates volatility in the markets. Leads to 'herd instinct' and the effectiveness of 'contrarian' investing
- *Implications of Research → Investor Utility Functions*
- Traditional theory suggests that investors are risk averse, haters of uncertainty so their utility *f* looks like:



- Authors claim that people are (1) LOSS AVERSE, (2) MENTAL ACCOUNTANTS –wealth does not matter as much as the size of each bet, (3) Risk Averse to gains, but Risk-Seeker for losses. Thus, their utility *f* is:



- ***"Disentangling Equity Return Regularities" by Jacobs & Levy, CFA***
- Many anomalies have been discovered that question the concept of Market Efficiency
  - *Value-Based Regularities*
    - Effects such as P/E effect and dividend yield effect where low P/E ratios tend to outperform the market and high yields (& zero yields) tend to outperform the market on a risk-adjusted basis
  - *Earnings Expectations-based Regularities*
    - Firms whose earnings estimates have been REVISED Upwards outperform the market and firms whose Earnings Estimates have been Revised Downward under-perform the market.
    - Earnings SURPRISE Effect where stocks whose reported earnings are better or worse than expected perform better or worse than the market
    - Earnings TORPEDO Effect where analysts tend to be overly optimistic in forecasting the earnings of successful firms and overly pessimistic in estimating the earnings of unsuccessful firms
    - LATE Reporting firms tend to report bad results
  - *Price-Based Regularities*
    - Low-priced stocks tend to outperform the market on a risk-adjusted basis
    - Small Cap, illiquid, and under-researched firms tend to outperform the market on a risk-adjusted basis
    - PRICE REVERSAL Effect where if one stock in a group performs differently in a day than other stocks in the group, it will tend to catch up with the group by the next day
    - RELATIVE Strength tends to work in an intermediate-term time frame
    - Stocks tend to Reverse in LONG Cycles. Big losers in a 3-5 year period tend to be largest gainers in the next 3-5 year period
    - Stocks depressed by Tax Selling rebound after tax selling is over
  - *Calendar-Based Regularities*
    - MONDAY Effect where stocks tend to do poorly on Mondays
    - First 2 weeks of the month tend to be better than last 2 weeks
    - January Effect where stocks tend to do best in January (especially smaller firms)
- Some of these anomalies are related. Authors researched some anomalies. Found →
  - Low P/E, small size, neglected stocks to better than high P/E, large, well-researched stocks
  - Stocks performing well in 1 month unrelated to a positive news announcement tend to perform poorly in the next month (95% of the time)
  - Returns do not seem to be consistently correlated with a stock's β. (Casts doubt on CAPM theory)
  - January Effect & Dividend Yield effect appear to be tax related
  - Auto-correlations were found in stock price returns which leads to a questioning of the efficient market hypothesis
  - Relative strength works well in bull markets

- Conclusions from Research:
  - Strength & Consistency of earnings surprise factors contradict the semi-strong form of the Random Walk Hypotheses
  - Weak-form efficiency is contradicted by the relative strength & price reversal results
  - CAPM & Arbitrage Pricing Theory cannot explain most anomalies which have been discovered
- Anomalies should persist because:
  - They have long, historic track records
  - Investor psychology and institutional rigidities that produce them should continue
  - Emerging theories help explain why they exist
- Strategies recommended by Research:
  - Place Investment Bets on Strong & Persistent Anomalies
  - Investment decisions can be based on time-series models.
  - Invest on the basis of macroeconomic models

- ***"Economic Foundations of Capital Market Returns" by Singer & Terhaar***
- New Article This year which was placed by AIMR in Econ (though more Portfolio theory here)
- The first step in the Investment Management Process is to DEFINE the Return/Risk Spectrum for the investor. The relationship between return & risk existing at any point in time is defined by the Capital Market Line. This can be defined by a single factor model, such as CAPM. In order to define the Capital Market Line or Security Market Line, the Risk-free rate and the expected return and risk of the market portfolio must be known
- Traditionally, the Market portfolio has been viewed as a major stock market index of a nation, such as the S&P 500. But, a stock market index is too restrictive to serve as a benchmark representing the market portfolio of investors as a group, because it is comprised only of large-cap stocks. Instead, need to determine a GLOBAL Capital Market Index, consisting of all asset classes in which the investors invest and allocated in the same proportion as the world's wealth is invested. Once the Global Market Portfolio is determined, the CAPM can be applied to it to determine the relationship between return & risk.
- One of the conclusions that a strict interpretation of CAPM reaches is that optimal portfolios are combinations of a risk-free asset and a capital market indexed portfolio. Depending on the risk-aversion factor of the investor, and the β of the market portfolio, a certain percentage of wealth will be invested in the market portfolio and the rest in the risk-free asset.
- But, if CAPM and its indexing implication is rejected, actively managed portfolios could be constructed in an attempt to outperform the results expected using CAPM. But, CAPM remains the benchmark against which performance is likely to be measured
- As soon as the investor chooses the level of risk he desires (desired β of portfolio) the manager is charged with the responsibility of managing the client's portfolio in order to earn a return that is commensurate with taking the stated amount of risk. Manager must inform the client of the Expected return relative to the amount of risk taken. Reasons for informing clients of return/risk tradeoffs $\rightarrow$

- Prevents clients from holding the manager to a set of unrealistic performance expectations. (survey results show that clients expect returns of 34% per year over 1997-2007)
- Once the client's risk tolerance is known, knowledge of the Capital Market Line can be used by the investment manager to determine the goal return that the investment strategy should seek to achieve.
- It can be a benchmark against which actual performance can be compared

- In order to be able to communicate to clients what rate of return should be expected for the level of risk, the investment manager must be able to define the global capital market line as it exists at any point in time. Usually, they use historical returns as predictions of future returns. But return/risk profiles change over time. Managers should know that future returns may not be the same as past returns.
- Historical returns are often used because investors have no theoretical framework for making future return predictions. This article attempt to provide a method for predicting future returns.
- *Framework of Analysis*
- The Aggregate Return on a Portfolio that is Indexed to a Domestic Capital Market (R_M) consists of Three Components
  - The Real Risk Free Rate → $R_{F\text{-real}}$
  - An Inflation Premium → $R_{Infl.}$
  - A Capital Market Risk Premium → R_{CMRP}

  $$\boxed{R_M = R_{F\text{-real}} + R_{Infl.} + R_{CMRP}}$$

  Traditionally, it has been assumed that the inflation risk premium equals the expected rate of inflation

  $$\boxed{R_{Infl.} = E(Infl.)}$$

  Furthermore, the nominal risk-free rate is assumed to be the real risk-free rate plus the expected rate of inflation. Thus, the expected rate of return on the capital market portfolio is often stated to be the sum of the nominal risk-free rate plus the market risk premium

  $$\boxed{R_M = R_F + R_{CMRP}}$$

  Thus, the premium for risk paid by the market is the difference between the expected return on the market & the nominal risk free rate

  $$\boxed{R_{CMRP} = R_{CM} - R_F}$$

  The Expected Return on any efficient portfolio can be determined by CAPM

  $$\boxed{R_P = R_F + \beta_P(R_{CM} - R_F)}$$

  However, the β of the Portfolio is

  $$\boxed{\beta_P = r_{P,CM}(\sigma_P\sigma_{CM}/ \sigma^2_{CM}) = r_{P,CM}(\sigma_P/\sigma_{CM})}$$

  Therefore, the expected return on any asset class or portfolio (R_P) in an efficient market must be:

  $$\boxed{R_P = R_F + r_{P,CM}[(R_{CM} - R_F) / \sigma_{CM}](\sigma_P)}$$

  The term $[(R_{CM} - R_F)/\sigma_{CM}]$ is the Sharpe Ratio of the Capital Market Portfolio (S_{CM}). It can be viewed as the price that the capital market pays for taking the normal amount of capital market risk.

This model states that the return/risk relationship existing in the capital market is:

$R_P = \alpha + \beta\sigma_P$

R_P is the expected return on an asset class or portfolio given a stated level of risk

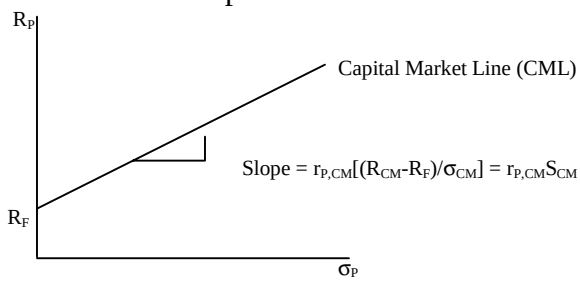
α is the nominal risk free rate (R_F)

β is $r_{P,CM}[(R_{CM} - R_F) / \sigma_{CM}]$

Furthermore, CAPM suggests that the return on any portfolio should equal the nominal risk-free rate plus the correlation between the rate of returns on the portfolio and the capital market index times the Sharpe Ratio of the Capital Market

$R_P = R_F + r_{P,CM}S_{CM}\sigma_P$

The Sharpe Ratio of the market can be viewed as the price paid for taking the normal risk associated with holding a portfolio of asset classes and the correlation coefficient can be viewed as a scaler that may dampen this return earned for taking market risk, depending upon how close the returns from the asset classes or portfolios correlate with the returns of the capital market as a whole.

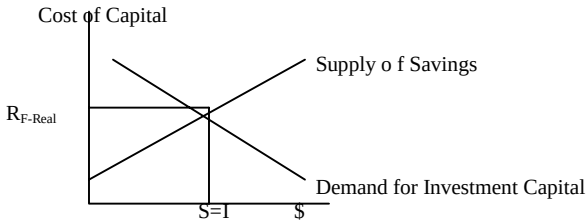


This Capital Market Line model is the framework for determining the relationship between the expected return and risk in a global capital market.

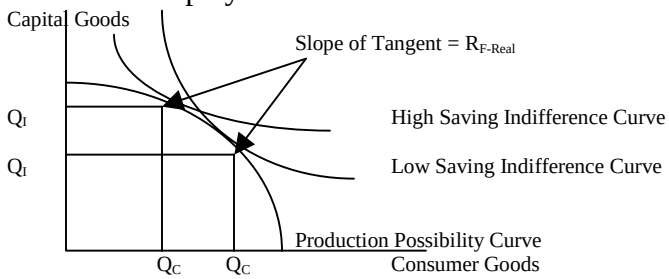
The Author's model for constructing the capital market line assumes that the correlation between a portfolio's return and the market's return ($r_{P,CM}$), the standard deviation, or risk of a portfolio's return (σ_P) and the standard deviation of the market's return (σ_{CM}) are constants that can be determined empirically by measuring them over an historical period. Returns may change over time, but the volatility of asset classes and their correlation with other asset classes are inherent characteristics of the asset classes themselves that remain constant over the long run. Therefore, the only variables that are assumed capable of under-going secular change are the Risk-free rate (R_F) and the Sharpe Ratio of the Capital Market. Once defined, the Capital Market Line can be used by investment managers to estimate.

- Market Return that can be earned in Safest Investments (R_F)
- Return reasonably expected in the future by taking a risk equal to that of investing in the capital market on an indexed basis
- Amount of incremental return expected by taking some additional risk
- Return expected for any given level of risk taken (σ_P)

- *Determinants of the Real Risk-Free Rate*
  - The REAL Risk-free rate is the PURE Time Value of Money when future cash flows are certain and there is no inflation. For any society, this return is determined by the supply of savings and the demand for investment capital, as illustrated below:



  - The Supply of savings is determined by how much the people of a society are willing to defer spending their income on current consumption in order to have future consumption. The tradeoff between future & current consumption can be illustrated by a set of INDIFFERENCE CURVES. Steeper Slopes show a preference for Current Consumptions, and Flatter Slopes show a preference for Future Consumption (saving)
  - A PRIMARY Determinant for the SLOPE of an Indifference Curve is the Age Distribution of the Population. Younger or Older populations are more oriented toward Consumption, middle-aged populations are oriented to Savings
  - The Demand for Investment Capital depends upon a country's Marginal Efficiency of Capital. This can be illustrated by examining the Production Possibility Curves .The farther from origin, the greater is the society's ability to produce goods. Production depends upon the SIZE of the Labor Force, & the Productivity of that Labor Force. Plus, education, technology, & existing capital/labor ratio all play roles.



  - The mix of capital/consumer goods is determined by the intersection of the society's indifference curve with the marginal rate of production.
  - Conclusions:
    - The REAL Risk-free interest rate of a society is the variable that enables the supply of savings to equal the demand for capital, thereby ensuring that all of the society's savings will be invested in a way enabling the total productive capacity of the nation be developed to produce the optimal mix of capital & consumer goods
    - The More Willing a Society is to SAVE, the LOWER the Risk-free rate, ceteris paribus. The more the Society wants to SPEND, the higher the Real Risk-free rate will be, ceteris paribus. These propensities to save are influenced by: AGE of society & Cultural Attitude toward saving

        - The Greater the productivity of the society, the steeper will be its production possibility curve and the higher the Real Risk-free rate will be. The less productive a society, the flatter its production possibility curve and the lower its real risk-free rate.
        - When Most of the Society's Income is devoted to Consumption, the REAL Risk-free rate will tend to be high.
    - HENCE, the CAUSES of changes in the Real Risk-free rate will be SHIFTS in demographic & productivity trends, as well as cultural attitudes toward savings.
- *Determinants of the Inflation Premium*
- The Nominal Risk-free rate equals the Real Risk-free rate plus the Inflation Premium. The inflation premium is just an estimate of what the rate of inflation will be over the investor's time horizon. The predominant economic theory of inflation is the QUANTITY THEORY of MONEY

  $\boxed{Mv = PQ}$

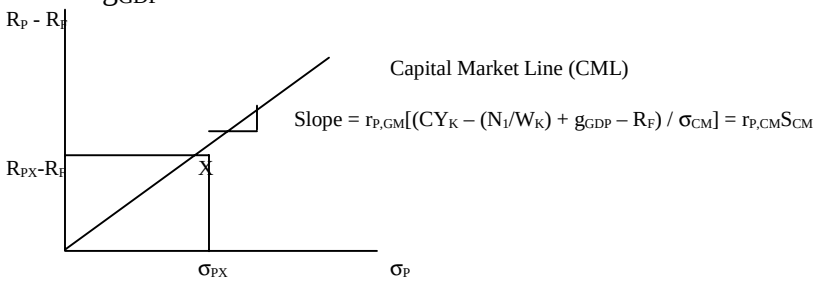
  M is the Money Supply
  v is the Velocity of Money
  P is the Price Level
  Q is the Quantity of Real Economic Output
- This theory hypothesizes that the velocity (v) of money is relatively CONSTANT in the long run while the ability to produce real output (Q) is a *f* of real factors like the growth rate of the labor force, growth rate in hours worked per year, and growth rate of productivity. Thus, the MAIN determinant of Inflation in the long-run is an ⇑ ratio of Money Supply to Real Output. This is determined by monetary policy. But, the ratio of money supply to the production of real goods is difficult to determine because:
    - It is difficult to MEASURE the Money Supply (M). In theory, the money supply is the available supply of the medium of exchange because it is the medium of exchange that is used to buy goods & services. But, in the modern world, the medium of exchange is more than just cash, it includes money markets, etc. Both Currency & Money markets can be stores of wealth and mediums of exchange; thus, the ratio of each used as a medium of exchange is complex to determine. Since the theoretical Money Supply (as a medium of exchange) cannot be determined, the Quantity Theory of Money is relatively useless!
    - Even if M could be measured, a change in M will produce a similar change in inflation ONLY if the quantity theory of money's assertion that the velocity of money is constant in the long run is true. However, over the long run, velocity is NOT constant.
- Due to these problems, ALTERNATIVE measures of inflation have been hypothesized. But still, the authors suggest using the Quantity Theory of Money is used in the analysis. But, rather than being purely quantitative, use a more qualitative approach. Look at the key players formulating monetary policy and whether they tend to be expanding or contracting.
    - If the policy is shaped by an independent body in a democracy, then they will tend to fight inflation. If, on the other hand, they are not independent, they will use monetary policy to boost employment and hence inflation is likely.
    - Plus, if the central banks monetize government debts, the potential for inflation is higher.

- Sophistication of the public is also important. For a sophisticated public, monetary authorities would know that using monetary policy for growing out of a recession would be used by the public to make decisions and thus would create inflation & be useless. If unsophisticated, they would be fooled by a monetary illusion.

- *Determining the Sharpe Ratio of the Capital Market Portfolio (Price market pays for taking risk)*
- The nominal risk-free rate simply reflects the nominal time value of money in a world with certainty. The Sharpe ratio of the Capital Market Portfolio is the price that the market pays for taking a normal amount of risk in an uncertain world.
- The Capital Market's Sharpe Ratio is the market risk premium divided by the σ of the capital market's return, measured as the historical volatility of a portfolio that is indexed to the capital market portfolio

$$\text{Sharpe Ratio}_{CM} = R_{CMRP} / \sigma_{CM} = [CY_K - (N1/W_K) + g_{GDP} - R_F] / \sigma_{CM}$$

K is the weighted average of all investments in the market
$N1/W_K$ is trendline value of next year's net issuance of NEW financial Assets (N1) as a percentage of society's current wealth (W_K)
g_{GDP} is the Growth Rate of the Gross Domestic Product

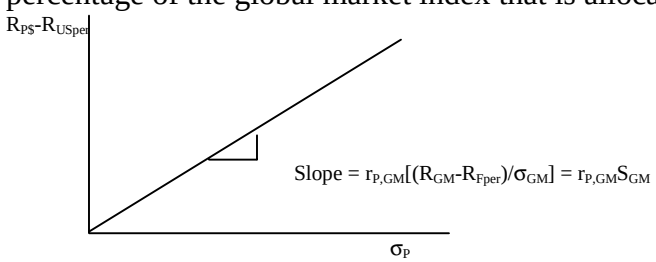


- Based on this theory, several observations can be made
  - A high NOMINAL Risk-free rate can raise the expected, forward-looking return on portfolios. But beware: There is an INVERSE relationship between interest rates and asset prices. Thus, a risking risk-free interest rate will depress returns from a backward-looking perspective but raise them from a forward-looking perspective. Once rates are high, forward-looking returns may be higher than before because asset prices are now depressed. This is borne out by evidence, during the 80's & 90's as boomers saved, and rates dropped, security prices soared. Thus, the 1982-1998 returns will not continue over the next 10-20 years.
  - If new securities will be issued at a faster pace than in the past, a larger portion of the current yield investors will be receiving will have to be plowed back into the market to offset dilution in the cash flow per security. This lowers investor spendable cash flow and dampens future returns. During the 80's & 90's, M&As caused number of shares to decline. This boosted share prices. Plus, the issuance of new shares has fallen. And the Sharpe ratio has fallen with lowered return for taking risk (due to rising financial asset prices)
  - Acceleration in future growth could enhance future return prospects.

- *Transforming Domestic CAPM to Global CAPM*
- When global investing is permitted, analysis must address several issues
  - For US investor, Risk-free asset is assumed to be the 90-day US T-Bill. But, in a global market, it is better to use the 90-day Eurodollar deposit as the risk-free asset.
  - For US investor, inflation can be measured using US CPI. But, globally, inflation varies across countries. Tough to measure the global rate of inflation. Authors try to circumvent problem by ASSUMING that PPP will hold in the long-run. Currency Exchange rates & Product Prices will adjust due to international trading arbitrages to bring about the purchasing power parity. While not realistic, it is a necessary assumption to keep the model simple.
  - The Risk-free rate to a US investor is the 90-day T-Bill rate. But, in a global CAPM, it is difficult to measure the Global Risk-free rate. If it is assumed that PPP holds in the long run, the real risk-free rate is the same everywhere. Under this condition, the global (multi-currency) CAPM becomes

    $$R_{\text{Risk Premium – P\$}} = r_{P,GM}[(R_{GM} - R_{Fper.})/\sigma_{GM}]\sigma_P = r_{P,GM}S_{GM}\sigma_p$$

    $R_{GM} - R_{Fper}$ is the Weighted average of the difference between every asset in the global capital market index's return and the risk-free rate of the country in which the asset is domiciled, with the weights being the percentage of the global market index that is allocated to the asset



  - In order to determine the forward-looking expected return/risk trade-off, as illustrated above, all that is required is knowledge of:
    - The Correlation of asset class or portfolio returns with the global capital market index
    - The Sharpe ratio of the Global market (S_{GM}), which essentially should be the same as the Sharpe ratio in the domestic market in the long run if global markets are fully integrated
  - From this, a manager can determine the global market risk premium that should be earned on a portfolio with a given level of risk (σ_P).
- *Assets Qualified for Inclusion on the Capital Asset Market Line*
  - Model above is the global capital market line for society's REAL Assets. Which financial assets are claims on these REAL Assets of society?
    - Corporate Debt & Equities are claims on capital assets and thus fall on the global capital market line.
    - Mortgages represent a claim on real estate and thus fall on GCML
    - Government Debt Does NOT represent a claim on capital assets or real estate; rather it is a claim on a government "IOU". But, since this will be financed by taxation on the working public (human capital) it falls on the Global CML
    - Derivatives are NOT claims on real assets and are not on GCML

- *Global Asset Integration v. Segmentation*
- In order for all capital assets to fall on the GCML, all asset prices must be INTEGRATED into a global market framework. Assets not traded within an integrated global framework are priced off the GCML (segmented model). Cross-holdings also leads to some double counting if assets and thus some bias in the GCML
- *Deriving Capital Market Returns for the Late 1990s*
- Authors used their model to develop estimates for returns on global asset classes and country/regional portfolios in the foreseeable future (written in 1997). Results:
  - Real Risk-free Rate
    - Real Risk-free rate will be determined by demographic, cultural & productivity trends.
    - *Demographics*: decline in ratio of savers to consumers as youth (emerging market) & aged (developed market) grow in size. Rising real global risk-free rate in the early 21st century
    - *Cultural Factors*: as developing nations, with propensity to save, become integrated in the global economy and increase the propensity to spend, the real risk-free rate should fall.
    - *Productivity*: should grow as new technology expands around the world. But, as emerging nations are only a small part of the global economy, these gains in productivity should be marginal. Thus, little impact on real risk-free rate
    - Over past 25 years, real 90-day Eurodeposit rate has averaged 2.7%. This rate is expected to fall into the next century to 2.0% (though the authors offer little quantifiable evidence of this)
  - Inflation Premium
  - Should remain low (using Qualitative arguments) →
    - Velocity of money in US has stabilized at a long-run growth rate of zero.
    - Most central banks can really only control the monetary base. As the world becomes more sophisticated, expectations will be formed in accordance with the rational expectations theory. Thus, it is doubtful employment and growth will be influenced by monetary policy.
    - Capital & Currency markets deal harshly with nations allowing their monetary policies to grow erratic or inflationary. That gives additional incentives to central bankers to concentrate efforts on fighting inflation
    - Central Banks are coordinating their activities more. This further integrates global markets.
  - Ergo, global inflation will remain slightly below 3.0% in the foreseeable future.
  - Global Real Economic Growth Rate
  - Authors expect real growth rate of global economy to be 4.0% per year for the next 25 years. (little reasoning behind this conclusion).
  - Current Yield on the Global Capital Market
  - To calculate the current yield on the global capital market portfolio, authors performed the following analysis:
    - Calculate the NOMINAL current yield on stock, bond & money markets of each nation represented in the global capital market index, measured in each nation's currency. Then subtract the long-run rate of inflation of each

nation from these nominal yields to obtain real current yields. Then add global long-run inflationary expectations to bring them back to a nominal basis, but based on a converging global rate of inflation.

- Weighted-average nominal current yields for each nation was calculated as follows.

  $CY_{country} = w_{cash}CY_{cash} + w_{bonds}CY_{bonds} + w_{stocks}CY_{stocks}$

- Current Yield on the global market portfolio was calculated as a weighted average of these country averages, with weights being proportional to the size of each nation's capital market in the global portfolio

  $CY_{GM} = w_1CY_1 + w_2CY_2 + \ldots + w_nCY_n$

- This analysis indicated that the CY on the Global Market Portfolio in 1997 was 4.9%

- Net New Issuance of Financial Assets
  - The net income produced for investors from the global market portfolio is its current yield, less the amount investors must re-invest in order to prevent a dilution of their position due to the issuance of new issues. Authors estimate that the net new issuance of stock in each country is:

  %ΔNew Stock Issuance = %ΔEquity Market Capitalization - %ΔMarket Index

  - They estimate the percentage of new bond issuance as:

  %ΔNew Bond Issuance = %ΔGross Government Debt * (Total Debt / Gov. Debt)

  - The net new issuance of each country's market was computed by the weighted average of the new issuance of stock & bonds with weights proportional to the amount of wealth invested in each. The global net new issuance is the weighted average of the net new issuances in every country. Authors found this to be 4.8%
- Global Capital Market Risk
  - In order to compute the Sharpe ratio for the global market, it is necessary to determine the σ of the Global Market Portfolio. Authors did this by measuring the 5-year rolling Standard Deviations of a global capital market index over the 1972-1996 period. It was discovered that the annualized σ of the Global Capital Market Index was stable at about 7%
- Sharpe Ratio of Global Capital Market
  - The Sharpe Ratio of the global capital market is the price that the market pays for taking a risk equal to that of the market as a whole. It can be calculated in REAL terms as follows:

    $S_{GM(real)} = [(R_{GM(real)} - R_{F(real)})/\sigma_{GM}]$

    $S_{GM(real)} = [(CY_{GM} - (N_1/W_K) + g_{GDP(real\ global)} - R_{F(real)}) / \sigma_{GM}]$

    $S_{GM(real)} = (4.9\% - 4.8\% + 4.0\% - 2.0\%) / 7\% = 0.30$

  - When the Global market portfolio's Sharpe Ratio is calculated in NOMINAL terms, the same result is produced

    $S_{GM(nominal)} = (R_{GM} - R_F) / \sigma_{GM}$

    $S_{GM(nominal)} = [CY_{GM} - (N_1/W_K) + g_{GDP\ (real\ global)} + E(Infl.)_{GGDP} - (R_{F(real)} + E(Infl)_{GGDP})] / \sigma_{GM}$

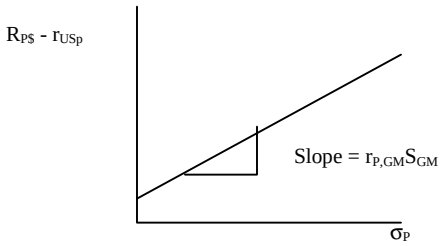
    $S_{GM(nominal)} = [4.9\%-4.8\%+4.0\%+3.0\%-(2.0\%+3.0\%)] / 7.0\% = 0.30$

  - Thus, the analysis may be done in either real or nominal terms. As inflation is difficult to predict, it is often easier to perform in real terms.

- *Determining the Expected Market Risk Premium for Individual Portfolios*
- The model developed to measure the return/risk relationship for global market portfolios from a US investor's viewpoint is:

  $R_{P\$} - r_{USp} = r_{P,GM}[(R_{GM} - R_F)/\sigma_{GM}]\sigma_P$

  $R_{P\$} - r_{USp} = r_{P,GM}S_{GM}\sigma_p$
- It is graphed as follows



- The measurement may be done in real or nominal terms with respect to the RISK-FREE Rates (r_{USp} v. R_F) and the returns on assets ($R_{\$P}$ and R_{GM}) as long as consistency is used throughout the model.
- The LONG-RUN Expected Return on any asset, measured in US$, is based on:
  - Periodic risk-free rate in US for time-horizon of Investor
  - Historical Correlation between the asset's return and the return on the global capital market index ($r_{P,GM}$)
  - Sharpe Ratio of the Global Capital Market (S_{GM}) calculated by previous fundamental analysis (=0.30)
  - Historical σ of the Asset measured in its local currency (σ_P)

For Example: Assume a US investor wants to determine the expected returns on the following portfolios given the data:

Portfolio (P)	$r_{P,GM}$	σ_P
US Bonds	.60	6.0%
US Stocks	.85	16%
European Bonds	.60	5.0%
European Stocks	.67	18%
Asian Bonds	.55	2.8%
Asian Stocks	.60	20%
Emerging Mkt. Bonds	.40	25%
Emerging Mkt. Stocks	.30	60%

If the Sharpe Ratio for the Global Capital Market Index is 0.30 and the risk-free rate in the US is 5%, calculate the expected return, measured in US$ for all portfolios, assuming they fall on the Global Capital Market Line

Answer: The Basic Formula to use is as follows:

$R_P = r_{USp} + r_{P,GM}S_{GM}\sigma_P$

As the risk free rate is stated in nominal terms, the following US dollar denominated returns will also be in nominal terms.

$R_{US\ Bonds} = 5.0\% + (.60)(.3)(6.0\%) = 6.08\%$
$R_{US\ Stocks} = 5.0\% + (.85)(.3)16\%) = 9.08\%$
$R_{Euro\ Bonds} = 5.0\% + (.60)(.3)(5.0\%) = 5.9\%$
$R_{Euro\ Stocks} = 5.0\% + (.67)(.3)(18\%) = 8.62\%$
$R_{Asian\ Bonds} = 5.0\% + (.55)(.3)(2.8\%) = 5.46\%$
$R_{Asian\ Stocks} = 5.0\% + (.60)(.3)(20\%) = 8.60\%$
$R_{Em.\ Mkt.\ Bonds} = 5.0\% + (.40)(.3)(25\%) = 8.0\%$
$R_{Em.\ Mkt.\ Stocks} = 5.0\% + (.30)(.3)(60\%) = 10.4\%$