Chapter – II

Review of Literature
CHAPTER – II
REVIEW OF LITERATURE
PORTFOLIO MANAGEMENT

INTRODUCTION

Etymological Dissertation of the words in all the Languages illustrating Idealisms, Concepts, Ideas, Policies, Philosophies, Ideas, Policies, Philosophies, Principles, the Mindset and the behavioral patterns of men and women would definitely elucidate the chronological, geographical and the cultural emergencies, Necessities and the Crises they originated from and the purpose and objectives they originated for their usage and prevalence in technical and common parlance throughout the history stand a proof of how useful and successful they have been in literary analyses and in communication in practical life situations.

An important step in research is to review the related literature which will help to bring out clearly the real condition and contribution ones the study. Knowledge is a fast growing one. It gets doubled in a very short time. Many scholars, researches and writers go on adding knowledge through their knowledge, studies and writings. One who is not fully conversant with this has little chance of making a worthwhile contribution. Therefore a researcher first has to scan the available literature relating to his field of study.

The art and science of making decisions about investment mix and policy, matching investments to objectives, asset allocation for individuals and institutions, and balancing risk against Performance. Portfolio management is all about strengths, weaknesses, opportunities and threats in the choice of debt vs. equity, domestic vs. international, growth vs. safety, and many other tradeoffs encountered in the attempt to maximize return at a given appetite for risk.

In the case of Mutual and Exchange-traded Funds (ETFs), there are two forms of portfolio management: passive and active. Passive management simply tracks a market index, commonly referred to as indexing or index investing. Active management involves a single manager, co-managers, or a team of managers who attempt to beat the market return by actively managing a fund's portfolio through investment decisions based on
research and decisions on individual holdings. Closed-end funds are generally actively managed. (www.investopedia.com).

We dream of beating the market and being super investors and spend an inordinate amount of time and resources in our endeavors.

Here, we present the argument that to be successful with any investment strategy, we have to begin with an investment philosophy that is consistent at its core and which matches not only the markets we choose to invest in but also our individual characteristics. In other words, the key to success in investing may lie not in knowing what makes successful but in finding out more about us. If we own more than one security, we have an investment portfolio. Build the portfolio by buying additional stocks, bonds, mutual funds or other investments. The goal is to increase the value of portfolios by selecting investments that we believe would go up in price.

Portfolio management is an art and also a science. It is a dynamic decision making process, one that is continuous and systematic but also which requires a great deal of judgment. The objective of this class is to blend theory and practice to achieve a consistent portfolio management process.

This dynamic process is designed to be applied in a comprehensive and logical fashion to a variety of objectives and constraints in an increasingly more volatile and global capital markets. (www.mbaknol.com).

PORTFOLIO MANAGEMENT

Portfolio Management is used to select a portfolio of new product development projects to achieve the following goals:

1. Maximize the profitability or value of the portfolio
2. Provide balance
3. Support the strategy of the enterprise

Portfolio Management is the responsibility of the senior management team of an organization or business unit. This team, which might be called the Product Committee, meets regularly to manage the product pipeline and make decisions about the product portfolio. Often, this is the same group that conducts the stage-gate reviews in the organization.
A logical starting point is to create a product strategy - markets, customers, products, strategy approach, competitive emphasis, and so on. The second step is to understand the budget or resources available to balance the portfolio against. Third, each project must be assessed for profitability (rewards), investment requirements (resources), risks, and other appropriate factors.

The weightage of the goals in making decisions about products varies from company to company. But organizations must balance these goals: risk vs. profitability, new products vs. improvements, strategy fit vs. reward, market vs. product line, long-term vs. short-term. Several types of techniques have been used to support the portfolio management process:

1. Heuristic models
2. Scoring techniques
3. Visual or mapping techniques

The earliest Portfolio Management techniques optimized projects’ profitability or financial returns using heuristic or mathematical models. However, this approach paid little attention to balance or aligning the portfolio to the organization's strategy. Scoring techniques weight and score criteria to take into account investment requirements, profitability, risk and strategic alignment. The shortcoming with this approach can be an overemphasis on financial measures and an inability to optimize the mix of projects. Mapping techniques use graphical presentation to visualize a portfolio's balance. These are typically presented in the form of a two-dimensional graph that shows the trade-off's or balance between two factors such as risks vs. profitability, marketplace fit vs. product line coverage, financial return vs. probability of success, and so on.(www.npd-solutions.com). A portfolio is a list of securities. Since it is rarely desirable to invest the entire funds of an individual or an institution in a single security, it is essential that every security be viewed in a portfolio context. A portfolio comprises of different types of securities and assets. As the investors acquire different sets of assets of financial nature, such as gold, silver, real estate, buildings, insurance policies, post office certificates, NSC and so on. They are making a provision for future. The risk of each of such investments is to be understood in advance. Normally the average householder keeps most of his income in cash or bank deposits and assumes that they are safe and least risky. Little does he
realize that they also carry a risk with them – the fear of loss or actual loss or theft and loss of real value of these assets through price rise or inflation in the economy? It should understood that Cash carries no interest or income and bank deposits carry a nominal rate of 4 Per cent on savings deposits, no interest on current account and a maximum of 9 Per Cent on term deposits of one year.

The liquidity on fixed deposits is limited as one has to wait for the date to maturity or take loan on such amount but at a loss of income due to penal interest. Generally risk averters invest only in banks, Post office and UTI and Mutual funds. Gold, silver real estate and chit funds are the other avenues of investment for average Householder, of middle and lower income groups. If the investor desired to have a real rate of return which is substantially higher than the inflation rate he has to invest in relatively more risky areas of investment like shares and debenture of companies or bonds of Government and semi-Government agencies or deposits with companies and firms.

Investment in Chit funds, Company deposits, and in private limited companies has the highest risk. But the basic principle is that the higher the risk, the higher is the return and the investor should have a clear perception of the elements of risk and return when he makes investments. Risk Return analysis is thus essential for the investment and portfolio management. Risk was defined as the standard deviation around the expected return. In effect we equated risk of security with the variability of its return. More dispersion or variability about expected return of a security meant the security was riskier than one with less dispersion. Diversification of one’s holdings is intended to reduce risk in an economy in which every return is subject to some degree of uncertainty. Even the value of cash suffers from the inroads of inflation and money value.

Most investors hope that if they hold several assets, even if one goes bad, the others provide some hedge out from an extreme loss. (www.mbaknol.com).

**TYPES OF PORTFOLIOS**

Stock investors constantly hear the wisdom of diversification. The concept is to simply not to put all of your eggs in one basket, which in turn helps mitigate the chance of risk, and generally leads to better performance or return on investment. Diversifying your hard-earned dollars does make sense, but there are different ways of diversifying,
and different portfolio types. We look at the following portfolio types and suggest how to get started building them: aggressive, defensive, income, speculative and hybrid. It is important to understand that building a portfolio will require research and some effort. Having said that, let's have a peek over our portfolios to gain a better understanding of each and get started.

**THE PATIENT PORTFOLIO**

This type invests in well-known stocks. Most of them pay dividends and are investors to buy and hold for long periods. Perhaps forever! The vast majority of the stocks in this portfolio represent classic growth companies, those that can be expected to deliver higher earnings on a regular basis regardless of economic conditions. (www.greekshares.com).

**THE AGGRESSIVE PORTFOLIO**

This portfolio invests in "expensive stocks" (in terms of such measurements as price-earnings ratios) that offer big rewards but also carry big risks. This portfolio "collects" stocks of rapidly growing companies of all sizes, that over the next few years are expected to deliver rapid annual earnings growth, because many of these stocks are on the less-established side, this portfolio is the likely to experience big turnovers over time, as winners and losers become apparent. (www.greekshares.com). An aggressive portfolio or basket of stocks includes those stocks with high risk/high reward proposition. Stocks in the category typically have a high beta, or sensitivity to the overall market. Higher beta stocks experience larger fluctuations relative to the overall market on a consistent basis.

If you have an individual stock having a beta of 2.0, it will typically move twice as much in either direction to the overall market - hence, the high-risk, high-reward description. Most aggressive stocks (and therefore companies) are in the early stages of growth, and have a unique value proposition. Building an aggressive portfolio requires an investor who is willing to seek out such companies, because most of these names, with a few exceptions, are not going to be common household companies but looking online for companies with earnings growth that is rapidly accelerating, and have not been discovered by Wall Street. The most common sectors to scrutinize would be technology, but many other firms in various sectors that are pursuing an aggressive growth strategy.
can be considered. As you might have gathered, risk management becomes very important when building and maintaining an aggressive portfolio. Keeping losses to a minimum and taking profit are keys to success in this type of portfolio. (www.investopedia.com).

THE CONSERVATIVE PORTFOLIO

They choose stocks with an eye on yield, as well as earnings growth and a steady dividend history. Whichever strategy or type you will use, managing successful portfolios are a bit like cultivating gardens! Although the fruits of one's labor do not appear immediately, it is essential to maintain discipline and vigilance while focusing on the eventual harvest.

Discipline and vigilance must always characterize your management style. Stick to a core strategy with a low-risk profile, reflecting a more disciplined, value-oriented and diversified approach. When markets rise many investors feel comfortable just to be participating. But when markets start gyrating investors start taking more critical looks at their portfolios. On several occasions, stock prices will experience substantial increases or severe declines.

Amidst these ups and downs, follow your strategy and as a refuge, concentrate mostly on dividend paying stocks and attractively priced companies that are poised for positive change. Sweating over your portfolio? We can beat the indexes and funds.

There are three ways to win. They are
1. Rational Analysis,
2. Crystal Ball and
3. Inside Information.

But we'd better leave the last two methods to fortune tellers and spies! We should always focus on rational financial analysis with fundamental screening and charting. (www.greekshares.com).

THE DEFENSIVE PORTFOLIO

Defensive stocks do not usually carry a high beta, and usually are fairly isolated from broad market movements. Cyclical stocks, on the other hand, are those that are most sensitive to the underlying economic "business cycle." For example, during recessionary times, companies that make the "basics" tend to do better than those that are focused on
fads or luxuries. Despite how bad the economy is, companies that make products essential to everyday life will survive. Think of the essentials in your everyday life, and then find the companies that make these consumer staple products.

The opportunity of buying cyclical stocks is that they offer an extra level of protection against detrimental events. Just listen to the business stations and you will hear portfolios managers talking about "drugs," "defense" and "tobacco."

These really are just baskets of stocks that these managers are recommending based upon where the business cycle is and where they think it is going. However, the products and services of these companies are in constant demand. A defensive portfolio is prudent for most investors.

A lot of these companies offer a dividend as well which helps minimize downside capital losses. (Find out how these securities can protect you from a market bust. Check out Guard Your Portfolio with Defensive Stocks.)

THE INCOME PORTFOLIO

An income portfolio focuses on making money through dividends or other types of distributions to stakeholders. These companies are somewhat like the safe defensive stocks but should offer higher yields.

An income portfolio should generate positive cash flow. Real estate investment trusts (REITs) and master limited partnerships (MLP) are excellent sources of income producing investments. These companies return a great majority of their profits back to shareholders in exchange for favorable tax status. REITs are an easy way to invest in real estate without the hassles of owning real property: vacancy issues, repairs and the other types of issues a landlord faces when trying to rent property. Keep in mind, however, that these stocks are also subject to the economic climate. REITs are groups of stocks that take a beating during an economic downturn, as building and buying activity dries up.

An Income portfolio is a perfect complement to most people's paycheck or other retirement income. Investors should be on the lookout for stocks that have fallen out of favor and have still maintained a high dividend policy. These are the companies that can not only supplement income but also provide capital gains. Utilities and other slow growth industries are an ideal place to start your search. (Find out how this "first love"
still holds its bloom as it ages. To learn more, read Dividends Still Look Good After All These Years.)

THE SPECULATIVE PORTFOLIO

A speculative portfolio is the closest to a pure gamble. A speculative portfolio presents more risk than any others discussed here. Finance gurus suggest that a maximum of 10 Per Cent of one's investable assets be used to fund a speculative portfolio. Speculative "plays" could be Initial Public Offerings (IPOs) or stocks that are rumored to be takeover targets.

Technology or healthcare firms that are in the process of researching a breakthrough product, or a junior oil company which is about to release its initial production results, would fall into this category.

Another classic speculative play is to make an investment decision based upon a rumor that the company is subject to a takeover. One could argue that the widespread popularity of leveraged ETFs in today's markets represent speculation.

Again, these types of investments are alluring: picking the right one could lead to huge profits in a short amount of time. Speculation may be the one portfolio that, if done correctly, requires the most homework. Speculative stocks are typically trades, and not your classic "buy and hold" investment.

THE HYBRID PORTFOLIO

Building a hybrid type of portfolio means venturing into other investments, such as bonds, commodities, real estate and even art. Basically, there is a lot of flexibility in the hybrid portfolio approach. Traditionally, this type of portfolio would contain blue chip stocks and some high grade government or corporate bonds. REITs and MLPs may also be an investable theme for the balanced portfolio. A common fixed income investment strategy approach advocates buying bonds with various maturity dates, and is essentially a diversification approach within the bond asset class itself. Basically, a hybrid portfolio would include a mix of stocks and bonds in a relatively fixed allocation proportions. This type of approach offers diversification benefits across multiple asset classes as equities and fixed income securities tend to have a negative correlation with one another. (www.investopedia.com).
Most portfolios are hybrids of the three types of portfolios listed above. Rarely will you find a portfolio that is strictly used for assessment, development or showcase purposes.

Occasionally, you may come across showcase portfolios that do not show evidence of self-reflection, rubrics for assessment or feedback, however, as Helen Barrett, an expert in the field of e-portfolios, would say "a portfolio without standards, goals and/or reflection is just a fancy resume, not an electronic portfolio." Self-reflection is an important component of electronic portfolio development.

If you do not require participants to self-reflect on the artifacts they add to the portfolio, they will not gain from the rich learning experience that e-portfolio development can provide (www.academic.regis.edu).

THE DOCUMENTATION PORTFOLIO

This type is also known as the "working" portfolio. Specifically, this approach involves a collection of work over time showing growth and improvement reflecting students' learning of identified outcomes.

The documentation portfolio can include everything from brainstorming activities to drafts to finished products.

The collection becomes meaningful when specific items are selected out to focus on particular educational experiences or goals. It can include the best and weakest of student work.

THE PROCESS PORTFOLIO

This approach documents all facets or phases of the learning process. They are particularly useful in documenting students' overall learning process. It can show how students integrate specific knowledge or skills and progress towards both basic and advanced mastery. Additionally, the process portfolio inevitably emphasizes students' reflection upon their learning process, including the use of reflective journals, think logs, and related forms of meta-cognitive processing.

THE SHOWCASE PORTFOLIO

This type of portfolio is best used for summative evaluation of students' mastery of key curriculum outcomes. It should include students' very best work, determined
through a combination of student and teacher selection. Only completed work should be included.

In addition, this type of portfolio is especially compatible with audio-visual artifact development, including photographs, videotapes, and electronic records of students' completed work.

The showcase portfolio should also include written analysis and reflections by the student upon the decision-making process used to determine which works are included. (www.pgcps.org).

THE DEVELOPMENTAL PORTFOLIOS

Their represent the advancement and development of student skills over a period of time. Developmental portfolios are considered works-in-progress and include both self-assessment and reflection/feedback elements. The primary purpose is to provide communication between students and faculty.

THE ASSESSMENT PORTFOLIOS

They denote student competence and skill for well-defined areas. These may be end-of-course or program assessments primarily for evaluating student performance. The primary purpose is to evaluate student competency as defined by program standards and outcomes.(www.mbaknol.com).

PORTFOLIO INVESTMENT

Portfolio investment is investment made by investors who are not particularly interested in involvement in the management of a company. The term is often used in the context of foreign investment in a country, which can often be fairly neatly divided between:

1. Portfolio investors (who buy debt instruments and listed shares)
2. Direct investors (who set up operations in a country).

Of course the division is not always that neat: a foreign investor who launches a takeover of a domestic company may be buying listed securities to do so, but is not a portfolio investor.

Fund managers do sometimes intervene in the management of a company, but any active involvement is short lived: their most common intervention is to change the composition of the board of directors, with the changed board then left to manage the
company. Fund managers can therefore almost always be assumed to be portfolio investors. Private equity funds are an important exception. They usually buy with shares the intention of taking control of a company. (http://moneyterms.co.uk)

PORTFOLIO INVESTORS

A common perception is that portfolio investing is purely equity-driven. Although equities can certainly play a part, portfolio investors understand that a well-rounded portfolio contains a variety of investments in different asset classes.

PROFILE OF A PORTFOLIO INVESTOR

Portfolio investors are typically financially stable and have a steady income but:

1. Are in the accumulation stage of their financial lives
2. May be paying down a home mortgage
3. May be saving for their children's education
4. May be saving to buy a cottage or other secondary property

Retirement is a consideration, and they may start to prepare for this stage of their lives, but it is not something that will happen in the near future. Portfolio investors have the ability to invest and understand the value of investing now to achieve their short- and long-term financial goals.

For portfolio investors, a well-diversified portfolio and a structured financial plan are the keys to their investment success. They are usually self-reliant and prefer to self-direct or may retain an advisor for part of their investments and manage the balance themselves.

These investors want to ensure that they have all the tools and resources at their disposal so that their portfolios are well prepared to reflect any economic improvements or weather any downturns.

BENEFITS WE OFFER TO A PORTFOLIO INVESTOR

Calculators

Assess how much you need to attain your short- and long-term financial goals with our many calculators.

Fund Builder

Take advantage of the convenience of systematic investing with a regular investment plan. We will automatically transfer a specific amount from your CIBC bank
account at the frequency you choose to your CIBC Investor's Edge account, as a cash deposit or to purchase mutual funds.

**Share Builder**

You can arrange it so that the dividends you receive on eligible Canadian and U.S. stocks are automatically reinvested in additional, whole shares of the same stock. You'll pay no commissions or processing fees. (Your dividend payment must be sufficient to buy at least one share.)

**Asset Allocation Tool**

Find the asset mix that best suits your risk tolerance, investment objectives, and investing time horizon, and learn how your portfolio compares to your suggested asset allocation profile.

**Education Centre**

Broaden your knowledge about investments and strategies that can help you build a stronger portfolio.

**Portfolio Tracker**

Allows you to save multiple lists of equity, option, and mutual fund symbols for tracking of various statistics and information about these holdings.

(http://www.investorsedge.cibc.com)

**10 RULES FOR A PROFITABLE INVESTMENT PORTFOLIO**

Asset allocation - the way you divide your capital among different investment options - accounts for more than 90 per cent of your portfolio's overall return. Which is why it’s so very important to get the asset allocation right in your investment portfolio?

**The Portfolio's the thing**

Get used to the fact that, at any one time, a few parts of your portfolio will be doing terribly. Over a long enough time period, each and every component will have had a bad year or two. This is normal asset-class behavior and cannot be avoided. So, focus on the performance of the portfolio as a whole, not the individual parts.

**In asset allocation, job one is to pick an appropriate stock / bond mix**

This is determined primarily by your risk tolerance. Do not bite off more risk than you can chew - a classic beginner's mistake.
Calmly and coolly planning for a market downturn is quite different from actually living through one, in the same way that crashing a flight simulator is different from crashing a real airplane. Time horizon is also important. Do not invest any money in stocks that you will need in less than five years, and do not invest more than half unless you will not need the money for at least a decade.

**Allocate your stocks widely among many different asset classes**

Your biggest exposure should be to the broad domestic stock market. Use small stocks, foreign stocks, and real estate investment trusts (REITs) in smaller amounts.

**It makes a difference where you put things**

Some asset classes, such as large foreign and domestic stocks, and domestic small stocks, are available in tax-efficient vehicles; put these in your taxable accounts. Other asset classes, particularly value stocks, REITs, and junk bonds, are highly tax-inefficient. Put these only in your tax-sheltered retirement accounts.

**Don't rebalance your portfolio too often**

The benefit of rebalancing back to your policy allocation is that it forces you to sell high and buy low. Asset classes tend to trend up or down for up to a few years. Give this process a chance to work; you should not rebalance more often than once per year.

These rules apply to tax-sheltered accounts. In taxable accounts, rebalance only with outflows, inflows, and mandatory distributions; here, the rebalancing benefit is usually outweighed by the tax consequences.

**The recent past is out to get you**

Human beings tend to be most impressed with what has happened in the past several years and wrongly assume that it will continue forever. It never does.

The fact that large U.S. growth stocks performed extremely well in the late 1990s does not make it more likely that this will continue; in fact, it makes it slightly less likely. The performance of different kinds of stocks and bonds is best evaluated only over the long haul.

**If you want to be entertained, take up sky diving**

Investors like to have fashionable portfolios, invested in the era's most exciting technologies. Resist the temptation. There is an inverse correlation between an
investment's entertainment value and its expected return; IPOs, on average, have low returns, and boring stocks tend to reward the most.

**An asset allocation that maximizes your chances of getting rich also maximizes your chances of becoming poor**

Your best chance of making yourself fabulously wealthy through investing is to buy a few small stocks with good growth possibilities; you just might find the next. Of course, it is far more likely that you will lose most of your money this way. On the other hand, although you cannot achieve extremely high returns with a diversified portfolio, it is the best way to avoid a retirement diet of cat food.

**There is nothing new in investing**

Knowledge of financial history is the most potent weapon in the investor's armamentarium. Since the dawn of stock broking in the seventeenth century, every generation has experienced its own version of tech bust. The recent dot-com catastrophe was just one more act in finance's longest running comedy.

Be able to say to yourself, 'I've seen this movie before, and I think I know how it ends.' The only thing that's new is the history you haven't read.

**A portfolio of 15 to 30 stocks does not provide adequate diversification**

The myth that it does results from a misinterpretation of modern financial theory. While it is true that a 30-stock portfolio has no more short-term volatility than the market, there is more to risk than day-to-day fluctuations.

The real risk is not that short-term volatility will be too high, but that long-term return will be too low. The only way of minimizing this risk is to own thousands of stocks in many nations. Or a few index funds (http://www.rediff.com/money)

**Modern Portfolio Theory**

Portfolio analysis redirects here. For theorems about the mean-variance efficient frontier, see Mutual fund separation theorem. For non-mean-variance portfolio analysis, see Marginal conditional stochastic dominance.

**Modern Portfolio Theory (MPT)**

Modern Portfolio Theory is a theory of investment which attempts to maximize portfolio expected return for a given amount of portfolio risk, or equivalently minimize risk for a given level of expected return, by carefully choosing the proportions of various
assets. Although MPT is widely used in practice in the financial industry and several of its creators won a Nobel memorial prize (Harry M. Markowitz, 1991) for the theory, in recent years the basic assumptions of MPT have been widely challenged by fields such as behavioral economics.

MPT is a mathematical formulation of the concept of diversification in investing, with the aim of selecting a collection of investment assets that has collectively lower risk than any individual asset. That this is possible can be seen intuitively because different types of assets often change in value in opposite ways. For example, as prices in the stock market tend to move independently from prices in the bond market, a collection of both types of assets can therefore have lower overall risk than either individually. But diversification lowers risk even if assets' returns are not negatively correlated—indeed, even if they are positively correlated. (Andrei Shleifer, 2000)

More technically, MPT models an asset's return as a normally distributed function (or more generally as an elliptically distributed random variable), defines risk as the standard deviation of return, and models a portfolio as a weighted combination of assets so that the return of a portfolio is the weighted combination of the assets' returns.

By combining different assets whose returns are not perfectly positively correlated, MPT seeks to reduce the total variance of the portfolio return. MPT also assumes that investors are rational and markets are efficient. (Koponen, Timothy M, 2003)

MPT was developed in the 1950s through the early 1970s and was considered an important advance in the mathematical modeling of finance. Since then, many theoretical and practical criticisms have been leveled against it.

These include the fact that financial returns do not follow a Gaussian distribution or indeed any symmetric distribution, and that correlations between asset classes are not fixed but can vary depending on external events (especially in crises). Further, there is growing evidence that investors are not rational and markets are not efficient. (Andrei Shleifer, 2000).

Portfolio Investment Process

The ultimate aim of the portfolio manager is to reduce the risk and increase the return to the investor in order to reach the investment objectives of an investor. The
The manager must be aware of the investment process. The process of portfolio management involves many logical steps like portfolio planning, portfolio implementation and monitoring. The portfolio investment process applies to different situations. Portfolio is owned by different individuals and organizations with different requirements. Investors should buy when prices are very low and sell when prices rise to levels higher than their normal fluctuation. Portfolio investment process is an important step to meet the needs and convenience of investors. The portfolio investment process involves the following steps:

1. Planning of portfolio,
2. Implementation of portfolio plan and

**The Portfolio Investment Process**

**Planning:**
1. Investor’s situation
2. Market Condition
3. Speculative policies
4. Strategic asset allocation

**Implementation:**
1. Rebalance Strategic Asset Allocation
2. Tactical Asset Allocation
3. Security Selection

**Monitoring:**
1. Evaluate Statement of Investment Policy
2. Evaluate Investment Performance

Source: http://www.mbaknol.com/investment-management/portfolio-investment-process/
1. PLANNING OF PORTFOLIO

Planning is the most important element in a proper portfolio management. The success of the portfolio management will depend upon careful planning. While making the plan, due consideration will be given to the investor's financial capability and current capital market situation.

After taking into consideration a set of investment and speculative policies will be prepared in the written form. It is called as statement of investment policy. The document must contain

i. The portfolio objective,
ii. Applicable strategies and
iii. Investment and speculative constraints.

The planning document must clearly define the asset allocation. It means an optimal combination of various assets in an efficient market. The portfolio manager must keep in mind the difference between basic pure investment portfolio and actual portfolio returns. The statement of investment policy may contain these elements. The portfolio planning comprises the following situation for its better performance:

INVESTOR CONDITIONS

The first question which must be answered is this – “What is the purpose of the security portfolio?” While this question might seem obvious, it is too often overlooked, giving way instead to the excitement of selecting the securities which are to be held.

Understanding the purpose for trading in financial securities will help to:

i. define the expected portfolio liquidation,
ii. aid in determining an acceptable level or risk and
iii. Indicate whether future consumption (liability needs) are to be paid in nominal or real money, and so on.

For example: A 60 year old woman with small to moderate saving probably

i. has a short investment horizon,
ii. can accept little investment risk and
iii. Needs protection against short term inflation.

In contrast, a young couple investing for retirement in 30 years has

i. a very long investment horizon,
ii. an ability to accept moderate to large investment risk because they can
diversify over time and

iii. A need for protection against long-term inflation.

This suggests that the 60 year old woman should invest solely in low-default risk
money market securities. The young couple could invest in many other asset classes for
diversification and accept greater investment risks.

In short, knowing the eventual purpose of the portfolio investment makes it possible to begin sketching out appropriate investment / speculative policies.

MARKET CONDITION

The portfolio owner must know the latest developments in the market. He may be
in a position to assess the potential of future return on various capital market instruments.
The investors’ expectation may be two types, long term expectations and short term
expectations. The most important investment decision in portfolio construction is asset
allocation. Asset allocation means the investment in different financial instruments at a
percentage in portfolio. Some investment strategies are static. The portfolio requires
changes according to investor’s needs and knowledge. Continuous changes in portfolio
lead to higher operating cost. Generally the potential volatility of equity and debt market
is 2 to 3 years. The other type of rebalancing strategy focuses on the level of prices of a
given financial asset.

SPECULATIVE POLICIES

The portfolio owner may accept the speculative strategies in order to reach his
goals of earning to maximum extent. If no speculative strategies are used the
management of the portfolio is relatively easy. Speculative strategies may be categorized
as asset allocation timing decision or security selection decision. Small investors can do
by purchasing mutual funds which are indexed to a stock. Organization with large capital
can employ investment management firms to make their speculative trading decisions.

STRATEGIC ASSET ALLOCATION

The most important investment decision which the owner of a portfolio must
make is the portfolio asset allocation. Asset allocation refers to the percentage invested in
various security classes. Security classes are simply the type of securities:

i. Money Market Investment,
ii. Fixed Income obligations,
iii. Equity Shares,
iv. Real Estate Investment and
v. International securities.

Strategic asset allocation represents the asset allocation which would be optimal for the investor if all security prices trade at their long-term equilibrium values that is, if the markets are efficiency priced.

2. IMPLEMENTATION OF PORTFOLIO PLAN

In the implementation stage, three decisions to be made, if the percentage holdings of various assets classes are currently different from the desired holdings as in the SIP.

REBALANCE STRATEGIC ASSET ALLOCATION

The portfolio should be rebalanced to the desired SAA (Strategic Asset Allocation). If the statement of investment policy requires a pure investment strategy, this is the only thing, which is done in the implementation stage. However, many portfolio owners engage in speculative transaction in the belief that such transactions will generate excess risk-adjusted returns. Such speculative transactions are usually classified as “timing” or “selection” decisions. Timing decisions over or under weight various assets classes, industries, or economic sectors form the strategic asset allocation. Such timing decision deals with securities within a given asset class, industry group, or economic sector and attempts to determine which securities should be over or under-weighted.

TACTICAL ASSET ALLOCATION

If one believes that the price levels of certain asset classes, industry, or economic sectors are temporarily too high or too low, actual portfolio holdings should depart from the asset mix called for in the strategic asset allocation. Such timing decision is referred to as tactical asset allocation. As noted, TAA decisions could be made across aggregate asset classes, industry classifications (steel, food), or various broad economic sectors (basic manufacturing, interest-sensitive, consumer durables).

Traditionally, most tactical asset allocation has involved timing across aggregate asset classes.
For example, if equity prices are believed to be too high, one would reduce the portfolio equity allocation and increase allocation to, say, risk-free securities. If one is indeed successful at tactical asset allocation, the abnormal returns, which would be earned, are certainly exciting.

SECURITY SELECTION

The third type of active speculation involves the selection of securities within a given asset class, industry, or economic sector. The strategic asset allocation policy would call for broad diversification through an indexed holding of virtually all securities in the asset in the class.

For example, if the total market value of HPS Corporation share currently represents 1Per Cent of all issued equity capital, than 1Per Cent of the investor’s portfolio allocated to equity would be held in HPS corporation shares. The only reason to overweight or underweight particular securities in the strategic asset allocation would be to offset risks the investors face in other assets and liabilities outside the marketable security portfolio. Security selection, however, actively overweight and underweight holding of particular securities in the belief that they are temporarily mispriced.

3. MONITORING THE PERFORMANCE OF PORTFOLIO

Portfolio monitoring is a continuous and ongoing assessment of present portfolio and the portfolio manger shall incorporate the latest development which occurred in capital market. The portfolio manager should take into consideration of investor’s preferences, capital market condition and expectations.

Monitoring the portfolio is up-grading activity in asset composition to take the advantage of economic, industry and market conditions. The market conditions are depending upon the Government policy. Any change in Government policy would reflect the stock market, which in turn affects the portfolio. The continuous revision of a portfolio depends upon the following factors:

i. Change in Government policy.
ii. Shifting from one industry to other
iii. Shifting from one company scrip to company scrip.
iv. Shifting from one financial instrument to another.
v. The half yearly / yearly results of the corporate sector
Risk reduction is an important factor in portfolio. It will be achieved by a diversification of the portfolio, changes in market prices may have necessitated in asset composition. The composition has to be changed to maximize the returns to reach the goals of investor (www.mbaknol.com).

**PORTFOLIO CONSTRUCTION**

Portfolio construction can be simply viewed as a matter of selecting securities to include in a portfolio and then determining the appropriate weighting: proportional representation of the securities in the portfolio.

The Markowitz model indicates that the proper goal of portfolio construction should be to generate a portfolio that provides the highest return at a given level of risk. A portfolio having this characteristic is known as an efficient portfolio and has generally been accepted as the paradigm of optimal portfolio construction.

In addition, the Markowitz model provides and explicit and disciplined process, known as optimization, for constructing portfolios that attain the goal of being efficient. This optimization process has found extensive application by major plan sponsors as they attempt to determine the best mix of major asset classes for the portfolio. This process is known as asset allocation and is practicable because the number of major asset classes to be considered is by nature limited.

When the universe of securities under consideration expands beyond such a limited number, the Markowitz optimization process is impractical, and alternative approaches, which we describe in the next two chapters, need to be employed.

Since the Markowitz model provides the underlying concepts for efficient portfolio construction as well as the foundation for other aspects of portfolio analysis, we devote a considerable portion of this chapter to describing the Markowitz model. In this regard, we cover the concepts of efficient portfolios and diversification, which are basic to portfolio construction.

We also describe the basic inputs needed to implement the Markowitz efficient portfolio construction process, as well as the impact that variations in these inputs can have on the resulting risk-return characteristics of the portfolio. We then go on to illustrate how the Markowitz process can be applied in practice by describing its use in generating an asset allocation.
PORTFOLIO CONSTRUCTION PROCESS

The portfolio construction process can be broadly characterized as comprising the following phases. First, the universe of securities eligible for selection needs to be defined. For most plan sponsors the focus has been on the major asset classes of common stocks, bonds, and money market instruments. More recently, these investors have been incorporating international stocks and nondollar bonds to provide a global perspective; some have included real estate and venture capital to further broaden the scope of investing.

Although the number of asset classes to consider remains limited, the number of securities within these various classes can be quite substantial. For example, managers of common stocks would generally have at least 200 securities in their universe, with the average somewhere around 400 to 500, and some at 1000 or more.

Investors also need to develop expectation with regard to the return potential, as well as the risk exposure, of individual securities and broad asset classes. Furthermore, it is important that these estimates be explicitly stated as to facilitate a comparison of the attractiveness of the securities and asset classes across the universe. The worth of the resulting portfolio for investing will depend heavily on the quality of these estimated security inputs.

The third phase of the process, the actual optimization, entails a selection of individual securities and a proper weighting of these in the portfolio. In blending securities together to form the desired composite, it is necessary not only to consider the risk-return characteristics of each of the securities but also to evaluate how these are likely to interact overtime.

As noted, the Markowitz model provides both the conceptual framework and analytical tools for determining the optimal portfolio in a disciplined and objective way. (James L. Farrell, 2006).

APPROACHES IN PORTFOLIO CONSTRUCTION

There are basically two approaches in the construction of portfolio of securities.

1. Traditional Approach
2. Modern Approach
1. TRADITIONAL APPROACH

In this Approach, investors need in terms of income and capital appreciation is evaluated and appropriate securities are selected to meet the needs of investor. The common practice in traditional approach is to evaluate entire financial plan of individual. It deals with mainly two major decisions.

a. Determining the objectives of the portfolio.

b. Selection of securities to be included in the portfolio.

The above two decisions involve six steps to be followed:

i. Analysis of constraints of investor.

ii. Formulation of objectives.

iii. Then based on these objectives, selection of securities.

iv. Study of risk & return of security.

v. Assigning of weights to securities like Bonds, Stocks, Debentures.

vi. Diversification.

This can be explained with help of flow chart as given below.

**STEPS IN TRADITIONAL APPROACH**

2. MODERN APPROACH

It involves construction of portfolio so as to maximize the expected return for a given level of risk. It views Portfolio Management in terms of expected return and the risk associated with obtaining the expected return. Statistical analysis is used for measurement of risk and Mathematical programming for selection of Assets in portfolio in efficient manner.

Harry M. Markowitz is credited with developing this first modern portfolio model. An ‘Efficient Portfolio’ is one which is expected to yield the highest return for a given level of risk or lowest risk for a given level of return. (Inderpal sing, et al, 2007).

PORTFOLIO MANAGEMENT

It is a process of encompassing many activities of investment in assets and securities. The portfolio management includes planning, supervision, timing, rationalism and conservatism in the selection of securities to meet investor’s objectives. It is the process of selecting a list of securities that will provide the investor with a maximum yield constant with the risk he wishes to assume.

The portfolio management is growing rapidly serving broad array of investors – both individual and institutional – with investment portfolio ranging in asset size from few thousands to crores of rupees. Despite growing importance, the subject of portfolio and investment management is new in the country and is largely misunderstood. In most cases, portfolio management has been practiced as a investment management counseling in which the investor has been advised to seek assets that would grow in value and or provide income.

Portfolio management is concerned with efficient management of investment in securities. An investment is defined as the current commitment of funds for a period of time in order to derive a future flow of funds that will compensate the investing unit for the

1. time the funds are committed,
2. expected rate of inflation and
3. Uncertainty involved in the future flow of funds.

The portfolio management deals with the process of selection of securities from the number of opportunities available with different expected returns and carrying
different levels of risk and the selection of securities is made with a view to provide the investors with the maximum yield for a given level of risk or ensure minimize risk for a given level of return.

Investors invest their funds in a portfolio expecting to get a good return consistent with the risk that he has to bear. The return realized from the portfolio has to be measured and the performance of the portfolio has to be evaluated.

It is evident that rational investment activity involves creation of an investment portfolio. Portfolio management comprises all the processes involved in the creation and maintenance of an investment portfolio.

It deals specially with security analysis, portfolio analysis, portfolio selection, portfolio revision and portfolio evaluation. Portfolio management makes use of analytical techniques of analysis and conceptual theories regarding rational allocation of funds. Portfolio management is a complex process, which tries to make investment activity more rewarding and less risky.

**APPLICATION TO PORTFOLIO MANAGEMENT**

Portfolio Management involves time element and time horizon. The present value of future return/cash flows by discounting is useful for share valuation and bond valuation. The investment strategy in portfolio construction should have a time horizon; say 3 to 5 years to produce the desired results of say 20-30Per Cent return per annum.

Besides portfolio management should also take into account tax benefits and investment incentives. As the returns are taken by investor’s net of tax payments, and there is always an element of inflation, returns net of taxation and inflation are more relevant to taxpaying investors. These are called net real rates of returns, which should be more than other returns. They should encompass risk free return plus a reasonable risk premium, depending upon the risk taken, on the instruments/assets invested. (www.mbaknol.com).

**APPROACHES OF INVESTMENT PORTFOLIO MANAGEMENT**

Different investors follow different approaches when they deal with investments. Four basic approaches are illustrated below, but there could be numerous variations.
1. The Holy-Cow Approach

These investors typically buy but never sell. He treats his scrips like holy cows, which are never to be sold for slaughter. If you can consistently find and then confine yourself to buying only prized bulls, this holy cow approaches may pay well in the long run.

2. The Pig-Farmer Approach

The pig-farmer on the other hand, knows that pigs are meant for slaughter. Similarly, an investor adopting this approach buys and sells shares as fast as pigs are grown and slaughtered. Pigs become pork and equity hard cash.

3. The Rice-Miller Approach

The rice miller buys paddy feverishly in the market during the season, then mills, hoards and sells the rice slowly over an extended period depending on price movements. His success lies in his skills in buying and selling, and his financial capacity to hold stocks.

Similarly, an investor following this approach grabs the share at the right price, takes a position, holds on to it, and liquidates slowly.

4. The Woolen-Trader Approach

The woolen-trader buys woolen ever a period of time but sells them quickly during the season. His success also lies in his skill in buying and selling, and his ability to hold stocks. An investor following this strategy over a period of time but sells quickly and quits. (www.mbaknol.com).

<table>
<thead>
<tr>
<th>Investment Approach</th>
<th>Key Strategy</th>
<th>Choice of Stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Holy cow</td>
<td>Buy and hold</td>
<td>Growth stocks and blue chips with a successful track record.</td>
</tr>
<tr>
<td>The Pig farmer</td>
<td>Buy and sell promptly</td>
<td>Cyclical stocks, Companies with special situations like take-over, change of management and so on.</td>
</tr>
<tr>
<td>The Rice miller</td>
<td>Buy swiftly and sell slowly</td>
<td>Stock which are likely to benefit by imminent, favorable government policies, like liberalization, decontrol and so on.</td>
</tr>
<tr>
<td>The Woolen trader</td>
<td>Buy slowly and sell swiftly</td>
<td>Stocks in special situations like a turn around.</td>
</tr>
</tbody>
</table>

To succeed in portfolio management you must consciously follow a path which suits you best; otherwise you may end up with below-average returns. For an investor in growth stocks, the most suitable investment approach, obviously, is the holy cow approach. You identify good growth stocks, buy them, and hold them for a long-term. Do not get flustered and switch strategy mid-way. The objective of portfolio management is to invest in securities in such a way that one maximizes one’s returns and minimizes risks in order to achieve one’s investment objectives. A good portfolio should have multiple objectives and achieve a sound balance among them. Any one objective should not be given undue importance at the cost of others. (Inderpal sing et al, 2007).

ROLE OF PORTFOLIO MANAGEMENT

In the beginning of the nineties India embarked on a programme of economic liberalization and globalization. This reform process has made the Indian capital markets active. The Indian stock markets are steadily moving towards capital efficiency, with rapid computerization, increasing market transparency, better infrastructure, better customer service, closer integration and higher volumes. Large institutional investors with their diversified portfolios dominate the markets. A large number of mutual funds have been set up in the country since 1987. With this development, investment securities have gained considerable momentum. Along with the spread of securities investment among ordinary investors, the acceptance of quantitative techniques by the investment community changed the investment scenario in India. Professional portfolio management, backed by competent research, began to be practiced by mutual funds, investment consultants and big brokers.

The Securities and Exchange Board of India, the stock market regulatory body in India, is supervising the whole process with a view to making portfolio management a responsible professional service to be rendered by experts in the field. With the advent of computers the whole process of portfolio management has become quite easy. The computer can absorb large volumes of data, perform the computations accurately and quickly give out the result in a desired form. The trend towards liberalization and globalization of the economy has promoted free flow capital across international borders.

Portfolios now include not only domestic securities but also foreign securities. Diversification has become international. Another significant development in the field of
portfolio management is the introduction of derivatives securities such as options and futures.

The trading in derivative securities, their valuation and so on. Has broadened the scope of portfolio management. Portfolio management is a dynamic concept, having systematic approach that helps it to achieve efficiency in investment.

**ELEMENTS OF PORTFOLIO MANAGEMENT**

Portfolio management is an on-going process involving the following basic tasks

1. Identification of the investor’s objectives, constraints and preferences, which will help formulate the investment policy.

2. Strategies are to be developed and implemented in tune with the investment policy formulated. This will help the selection of asset classes and securities in each class depending upon their risk-return attributes.

3. Review and monitoring of the performance of the portfolio by continuous overview of the market conditions, companies performance and investor’s circumstances.

4. Finally, the evaluation of the portfolio for the results to compare with the targets and needed adjustments have to be made in the portfolio to the emerging conditions and to make up for any shortfall in achievement vis-à-vis targets.

The collection of data on the investor’s preferences, objectives, and so on., is the foundation of portfolio management. This gives an idea of channels of investment in terms of asset classes to be selected and securities to be chosen based upon the liquidity requirements, time horizon, taxes, asset preferences of investors, and so on. These are the building blocks for the construction of a portfolio. According to these objectives and constraints, the investment policy can be formulated. The policy will lay down the weights to be given to different asset classes of investment such as equity share, preference shares, debentures, company deposits, and so on., and the proportion of funds to be invested in each class and selection of assets and securities in each class are made on this basis. The next stage is to formulate the investment strategy for a time horizon for income and capital appreciation and for a level of risk tolerance. The investment strategies developed by the portfolio managers have to be correlated with their expectation of the capital market and the individual sectors of industry. Then a particular combination of assets is chosen on the basis of investment strategy and manager’s expectations of the market.  (www.managementparadise.com).
FUNCTIONS OF PORTFOLIO MANAGEMENT

The basic purpose of portfolio management is to maximize yield and minimize risk. Every investor is risk averse. In order to diversify the risk by investing into various securities following functions are required to be performed.

The functions undertaken by the portfolio management are as follows:

1. To frame the investment strategy and select an investment mix to achieve the desired investment objective;
2. To provide a balanced portfolio which not only can hedge against the inflation but can also optimize returns with the associated degree of risk?
3. To make timely buying and selling of securities;
4. To maximize the after-tax return by investing in various taxes saving investment instruments. (www.scribd.com).

OBJECTIVES OF PORTFOLIO MANAGEMENT

The objective of portfolio management is to invest in securities in such a way that one maximizes one’s returns and minimizes risk in order to achieve one’s investment objective. The specific objectives of Portfolio Management are as follows:

1. Safety of Investment

   It is priority consideration while making investment. Other considerations like income, growth and so on. Come into picture only after safety on one’s investment is assured. Investment safety means minimization of risks. There is no such thing as Zero-risk investment. But one should minimize the overall risk or bring into an acceptable level by developing a balanced and efficient portfolio.

2. Stable Current Returns

   Once the safety of investment is assured, the Portfolio should yield steady current incomes. The current income means dividend or interest. The current income at least should match opportunity cost of funds of investor.

3. Appreciation of Value of Capital

   A good portfolio should appreciate in value in order to protect the investor from any erosion in purchasing power due to inflation. Therefore while selecting securities, some securities in portfolio, should be such that they appreciate in real value after adjusting for inflation.
4. Marketability

A good portfolio must consist of investment which can be marketed without difficulty. If there are too many utilized shares or inactive share in one’s portfolio, he will face problem in liquidating or encasing them, or in switching from one investment to other. It is therefore practical to invest in companies listed on major stock exchanges and is actively traded.

5. Tax Planning

Tax is an important variable in total investment planning. Therefore a good portfolio should enable its owner to enjoy a favorable tax shelter. The portfolio should be developed, considering, not only income tax, but also capital gains tax. (Inderpal sing, et al 2007).

SCOPE OF PORTFOLIO MANAGEMENT

Portfolio management is a continuous process. It is a dynamic activity. The following are the basic operations of a portfolio management:

1. Monitoring the performance of portfolio by incorporating the latest market conditions.
2. Identification of the investor’s objective, constraints and preferences.
3. Making an evaluation of portfolio income (comparison with targets and achievements).
4. Making revision in the portfolio.
5. Implementation of strategies in tune with the investment objectives.

(Types of mbaknol.com).

TYPES OF PORTFOLIO MANAGEMENT

Portfolio management can be broadly divided into

1. Active portfolio management
2. Passive portfolio management

1. Active portfolio management

Portfolio managers (either independent advisors or managers tied to financial management firms) are constantly involved in the active management of portfolios. They aim at earning more than the average market return on the chosen investments. Market research is undertaken to formulate investment strategies. Active portfolio management
strategy involves purchasing undervalued securities or selling securities that are overvalued. The success of an investment portfolio depends on the skills of a portfolio manager and the accuracy of market research.

2. Passive portfolio management

This process is limited to selecting securities that track a particular index. It includes formulating an investment plan. As part of portfolio building, Decisions regarding asset classes and the proportional allocation of funds to them need to be finalized. This is followed by keeping records and rebalancing the portfolio when needed. (www.economywatch.com).

PHASES OF PORTFOLIO MANAGEMENT

Portfolio Management is a process comprising of large number of activities aimed at maximizing investor’s return, with minimum possible risk. It comprises of five phases. They are


PHASES OF PORTFOLIO MANAGEMENT

1. SECURITY ANALYSIS

The different types of securities are available to an investor for investment. In stock exchange of the country the shares of 7000 companies are listed. Traditionally, the securities were classified into ownership such as equity shares, preference share, and debt as debenture bonds and so on. Recently companies to raise funds for their projects are issuing a number of new securities with innovative feature.

Convertible debenture, discount bonds, Zero coupon bonds, Flexi bond, floating rate bond, and so on are some of these new securities From these huge group of securities the investors has to choose those securities, which he considers worthwhile to be included in his investment portfolio. So for this detailed security analysis is most important.

The aim of security analysis is to find out intrinsic value of a security. The basic value is also called the real value of a security is the true economic worth of a financial asset. The real value of the security indicates whether the present market price is overpriced or under priced in order to make a right investment decision. The actual price of the security is considered to be a function of a set of anticipated capitalization rate. Price changes, as anticipation risk and return change, which in turn change as a result of latest information. Security analysis refers to analyzing the securities from the point of view of the scrip prices, return and risks. The analysis will help in understanding the behaviour of security prices in the market for investment decision making. If it is an analysis of securities and referred to as a macro analysis of the behaviour of the market. Security analysis entails in arriving at investment decisions after collection and analysis of the requisite relevant information. To find out basic value of a security “the potential price of that security and the future stream of cash flows are to be forecast and then discounted back to the present value.”

The basic value of the security is to be compared with the current market price and a decision may be taken for buying or selling the security. If the basic value is lower than the market price, then the security is in the overbought position, hence it is to be sold.

On the other hand, if the basic value is higher than the market price the security’s worth is not fully recognized by the market and it is in under bought position, hence it is to be purchased to gain profit in future. There are mainly three alternative approaches to
security analysis, namely fundamental analysis, technical analysis and efficient market theory.

**FUNDAMENTAL ANALYSIS**

The fundamental analysis allows selection of securities of different sectors of the economy that appear to offer profitable opportunities. The security analysis will help to establish what type of investment should be undertaken among various alternatives i.e. real estate, bonds, debentures, equity shares, fixed deposit, gold, jewellery and so on. Neither all industries grow at the same rate nor do all companies.

The growth rates of a company depend basically on its ability to satisfy human desires through production of goods or performance is important to analyze nation economy. It is very important to predict the course of national economy because economic activity substantially affects corporate profits, investors’ attitudes, expectations and ultimately security price.

According to this approach, the share price of a company is determined by these fundamental factors. The fundamental works out and compares this intrinsic value of a security based on its fundamental; then compares this intrinsic value, the share is said to be overpriced and vice versa. The mispricing security provides an opportunity to the investor to those securities, which are under priced and sell those securities, which are overpriced. It is believed that the market will correct notable cases of mispricing in future. The prices of undervalued shares will increase and those of overvalued will decline. Fundamental analysis helps to identify fundamentally strong companies whose shares are worthy to be included in the investor’s portfolio.

**TECHNICAL ANALYSIS**

The technical analysis is the study of market action for the purpose of forecasting future price trends. The term market action includes the three principal sources of information available to the technician – *price, value, and interest.*

Technical Analysis can be frequently used to supplement the fundamental analysis. It discards the fundamental approach to intrinsic value. Changes in price movements represent shifts in supply and demand position.

Technical Analysis is useful in timing a buy or sells order. The technical analysis does not claim 100Per Cent of success in predictions.
It helps to improve the knowledge of the probability of price behaviour and provides for investment. The current market price is compared with the future predicted price to determine the extent of mispricing. Technical analysis is an approach, which concentrates on price movements and ignores the fundamentals of the shares. (www.mbaknol.com).

**FUNDAMENTAL ANALYSIS VS. TECHNICAL ANALYSIS**

Technical analysis and fundamental analysis are the two main schools of thought in the financial markets. As we've mentioned, technical analysis looks at the price movement of a security and uses this data to predict its future price movements. Fundamental analysis, on the other hand, looks at economic factors, known as fundamentals. Let's get into the details of how these two approaches differ, the criticism against technical analysis and how technical and fundamental analysis can be used together to analyze securities.

**The Differences**

**CHARTS VS. FINANCIAL STATEMENTS**

At the most basic level, a technical analyst approaches a security from the charts, while a fundamental analyst starts with the financial statements. By looking at the balance sheet, cash flow statement and income statement, a fundamental analyst tries to determine a company's value.

In financial terms, an analyst attempts to measure a company's intrinsic value. In this approach, investment decisions are fairly easy to make - if the price of a stock trades below its intrinsic value, it's a good investment.

Although this is an oversimplification (fundamental analysis goes beyond just the financial statements) for the purposes of this tutorial, this simple tenet holds true. Technical traders, on the other hand, believe there is no reason to analyze a company's fundamentals because these are all accounted for in the stock price. Technicians believe that all the information they need about a stock can be found in its charts.

**TIME HORIZON**

Fundamental analysis takes a relatively long-term approach to analyzing the market compared to technical analysis. While technical analysis can be used on a
timeframe of weeks, days or even minutes, fundamental analysis often looks at data over a number of years.

The different timeframes that these two approaches use is a result of the nature of the investing style to which they each adhere.

It can take a long time for a company's value to be reflected in the market, so when a fundamental analyst estimates intrinsic value, a gain is not realized until the stock market price rises to its "correct" value. This type of investing is called value investing and assumes that the short-term market is wrong, but that the price of a particular stock will correct itself over the long run. This "long run" can represent a timeframe of as long as several years, in some cases.

Furthermore, the numbers that a fundamentalist analyzes are only released over long periods of time. Financial statements are filed quarterly and changes in earnings per share don't emerge on a daily basis like price and volume information. Also remember that fundamentals are the actual characteristics of a business. New management can't implement sweeping changes overnight and it takes time to create new products, marketing campaigns, supply chains, and so on.

Part of the reason that fundamental analysts use a long-term timeframe, therefore, is because the data they use to analyze a stock is generated much more slowly than the price and volume data used by technical analysts.

TRADING VERSUS INVESTING

Not only is technical analysis more short term in nature than fundamental analysis, but the goals of a purchase (or sale) of a stock are usually different for each approach. In general, technical analysis is used for a trade, whereas fundamental analysis is used to make an investment.

Investors buy assets they believe can increase in value, while traders buy assets they believe they can sell to somebody else at a greater price. The line between a trade and an investment can be blurry, but it does characterize a difference between the two schools.

THE CRITICS

Some critics see technical analysis as a form of black magic. Don't be surprised to see them question the validity of the discipline to the point where they mock its
supporters. In fact, technical analysis has only recently begun to enjoy some mainstream credibility. While most analysts on Wall Street focus on the fundamental side, just about any major brokerage now employs technical analysts as well.

Much of the criticism of technical analysis has its roots in academic theory - specifically the efficient market hypothesis (EMH).

This theory says that the market price is always the correct one - any past trading information is already reflected in the price of the stock and, therefore, any analysis to find undervalued securities is useless.

There are three versions of EMH. In the first, called weak form efficiency, all past price information is already included in the current price. According to weak form efficiency, technical analysis can't predict future movements because all past information has already been accounted for and, therefore, analyzing the stock past price movements will provide no insight into its future movements.

In the second, semi-strong form efficiency, fundamental analysis is also claimed to be of little use in finding investment opportunities. The third is strong form efficiency, which states that all information in the market is accounted for in a stock's price and neither technical nor fundamental analysis can provide investors with an edge. The vast majority of academics believe in at least the weak version of EMH, therefore, from their point of view, if technical analysis works, market efficiency will be called into question. There is no right answer as to who is correct.

There are arguments to be made on both sides and, therefore, it's up to you to do the homework and determine your own philosophy.

Can They Co-Exist?

Although technical analysis and fundamental analysis are seen by many as polar opposites - the oil and water of investing - many market participants have experienced great success by combining the two. For example, some fundamental analysts use technical analysis techniques to figure out the best time to enter into an undervalued security. Oftentimes, this situation occurs when the security is severely oversold. By timing entry into a security, the gains on the investment can be greatly improved. Alternatively, some technical traders might look at fundamentals to add strength to a technical signal. For example, if a sell signal is given through technical patterns and
indicators, a technical trader might look to reaffirm his or her decision by looking at some key fundamental data.

Oftentimes, having both the fundamentals and technical’s on your side can provide the best-case scenario for a trade.

While mixing some of the components of technical and fundamental analysis is not well received by the most devoted groups in each school, there are certainly benefits to at least understanding both schools of thought. (www.investopedia.com).

**Efficient Market Hypothesis/Theory**

A more recent approach to security analysis is the efficient market hypothesis/theory. According to this school of thought, the financial market is efficient in pricing securities. The efficient market hypothesis holds that market prices instantaneously and fully reflect all relevant available information. It means that the market prices of securities will always equal its intrinsic value. As a result, fundamental analysis, which tries to identify undervalued or overvalued securities, is said to be a useless exercise.

Efficient market hypothesis is direct repudiation of both fundamental analysis and technical analysis. An investor can’t consistently earn abnormal return by undertaking fundamental analysis or technical analysis. According to efficient market hypothesis it is possible for an investor to earn normal return by randomly choosing securities of a given risk level. (www.mbaknol.com).

2. PORTFOLIO ANALYSIS

The main aim of portfolio analysis is to give a caution direction to the risk and return of an investor on portfolio. Individual securities have risk return characteristics of their own. Therefore, portfolio analysis indicates the future risk and return in holding of different individual instruments. The portfolio analysis has been highly successful in tracing the efficient portfolio. Portfolio analysis considers the determination of future risk and return in holding various blends of individual securities. An investor can sometime reduce portfolio risk by adding another security with greater individual risk than any other security in the portfolio. Portfolio analysis is mainly depending on Risk and Return of the portfolio. The expected return of a portfolio should depend on the expected return of each of the security contained in the portfolio.
The amount invested in each security is most important. The portfolio’s expected holding period value relative is simply a weighted average of the expected value relative of its component securities.

Using current market value as weights, the expected return of a portfolio is simply a weighted average of the expected return of the securities comprising that portfolio. The weights are equal to the proportion of total funds invested in each security. Traditional security analyses recognize the key importance of risk and return to the investor. However, direct recognition of risk and return in portfolio analysis seems very much a “seat-of-the-pants” process in the traditional approaches, which rely heavily upon intuition and insight.

The result of these rather subjective approaches to portfolio analysis has, no doubt, been highly successful in many instances. The problem is that the methods employed do not readily lend themselves to analysis by others.

Most traditional method recognizes return as some dividend receipt and price appreciations over a forward period. But the return for individual securities is not always over the same common holding period nor are the rates of return necessarily time adjusted. An analyst may well estimate future earnings and P/E to derive future price. He will surely estimate the dividend. But he may not discount the value to determine the acceptability of the return in relation to the investor’s requirements.

A portfolio is a group of securities held together as investment. Investments invest their funds in a portfolio of securities rather than in a single security because they are risk averse. By constructing a portfolio, investors attempt to spread risk by not putting all their eggs into one basket. Thus diversification of one’s holding is intended to reduce risk in investment. Most investors thus tend to invest in a group of securities rather than a single security. Such a group of securities held together as an investment is what is known as a portfolio. The process of creating such a portfolio is called diversification. It is an attempt to spread and minimize the risk in investment. This is sought to be achieved by holding different types of securities across different industry groups (www.mbaknol.com).
A. DIVERSIFICATION

Diversification is a familiar term to most investors. In the most general sense, it can be summed up with this phrase: "Don’t put all of your eggs in one basket." While that sentiment certainly captures the essence of the issue, it provides little guidance on the practical implications of the role diversification plays in an investor's portfolio and offers no insight into how a diversified portfolio is actually created. (www.investopedia.com).

Meaning and Definition

Diversification means "not putting all your eggs in one basket." Diversifying is like protecting your money. Investors diversify by spreading their investments across a variety of investment types and industry types. So if one company or industry falters, investors do not lose all of their money. (www.medstudent.ucla.edu).

"An investment technique intended to minimize risk by utilizing a wide variety of investments within a portfolio.

In a diversified portfolio, a decline in the value of one investment, for example, should be offset by the strength of other investments" (www.finance-lib.com).

Forms of Diversification

(i) Simple Diversification,
(ii) Over Diversification and
(iii) Efficient Diversification.

(i) Simple Diversification

It involves a random selection of portfolio construction. The common man could make better returns by making a random diversification of investments. It is the process of altering the mix ratio of different components of a portfolio. The simple diversification can reduce unsystematic risk.

The research studies on portfolio found that 10 to 15 securities in a portfolio will bring sufficient amount of returns. Further, this concept reveals that the prediction should be based on a scientific method.

(ii) Over Diversification

Investors have the freedom to choose many investment alternatives to achieve the desired profit on his portfolio. However, the investor shall have a great knowledge regarding a large number of financial assets spreading different sectors, industries,
companies. The investors also are more careful about the liquidity of each investment, return, tax liability, the performance of the company and so on. Investors find problems to handle the large number of investments. It involves more transaction cost and more money will be spent in managing over diversification.

If any investor involves in over diversification, there may be a chance either to get higher return or exposure to more risk. All the problems involved in this process may result in inadequate return on the portfolio.

(iii) Efficient Diversification

Efficient diversification means a combination of low risk involved securities and high risk instruments. The combination will only be finalized after considering the expected return from an individual security and it does inter relationship with other components in a portfolio. The securities shall have to be evaluated and thus diversification to be restricted to some extent. Efficient diversification assures the better return at an accepted level of risk.

IMPORTANCE OF DIVERSIFICATION

If you invest in a single security, your return will depend solely on that security; if that security flops, your entire return will be severely affected. Clearly, held by itself, the single security is highly risky. If you add nine other unrelated securities to that single security portfolio, the possible outcome changes-if that security flops, your entire return won’t be as badly hurt.

By diversifying your investments, you have substantially reduced the risk of the single security. However, that security return will be the same whether held in isolation or in a portfolio.

Diversification substantially reduces your risk with little impact on potential returns. The key involves investing in categories or securities that are dissimilar: Their returns are affected by different factors and they face different kinds of risks. Diversification should occur at all levels of investing. Diversification among the major asset categories-stocks, fixed-income and money market investments-can help reduce market risk, inflation risk and liquidity risk, since these categories are affected by different market and economic factors.
Diversification within the major asset categories—for instance, among the various kinds of stocks (international or domestic, for instance) or fixed-income products—can help further reduce market and inflation risk. (www.mbaknol.com).

THE PROCESS OF DIVERSIFICATION OF INVESTMENT PORTFOLIO

The process of diversification has various phases involving investment into various classes of assets like equity, preference shares, money market instruments like commercial paper, inter-corporate investments, deposits and so on. Within each class of assets, there is further possibility of diversification into various industries, different companies and so on. The proportion of funds invested into various classes of assets, instruments, industries and companies would depend upon the objectives of investor, under portfolio management and his asset preferences, income and asset requirements. A portfolio with the objective of regular income would invest a proportion of funds in bonds, debentures and fixed deposits. For such investment, duration of the life of the bond/debenture, quality of the asset as judged by the credit rating and the expected yield are the relevant variables.

Bond market is not well developed in India but debentures, partly or fully convertible into equity are in good demand both from individuals and mutual funds.

The portfolio manager has to use his analytical power and discretion to choose the right debentures with the required duration, yield and quality. The duration and immunization of expected inflows of funds to the required quantum of funds have to be well planned by the portfolio manager.

Research and high degree of analytical power in investment management and bond portfolio management are necessary. The bond investment are thus equally challenging as equities investment and more so in respect of money market instruments. All these facts bring out clearly the needed analytical powers and expertise of portfolio manager. (www.mbaknol.com).

PORTFOLIO DIVERSIFICATION AND RISK MANAGEMENT

Portfolio diversification can be a valuable stock investing concept for every investor whose ultimate goal is to maximize profit and minimize risk. The principle of maximizing profits and minimizing risks is so simple, yet its practice is seemingly an impossible task. While the best investment advice abounds throughout investment circles,
any wise and mature approach to investing is the same. Your best protection against risk is portfolio diversification; investing in multiple investment options instead of choosing to place all of your investments in only one area.

You can, for example, use the stability of cash investments like CDs and money market funds to diversify your portfolio and offset the liability of stocks, futures, options and stock or bond mutual funds. Picking stocks of riskier small growth companies while also investing in the traditional blue chips, which are the stocks of large, well-established companies allows for a structured stability that will translate to the bottom line of an investor’s portfolio. In other words, when the return is down in one area, it’s usually balanced by a positive performance in another. In the simplest terms, portfolio diversification is an excellent hedge against stock volatility and the ups and downs of investing.

As with any stock trading plan, it is imperative to evaluate assets and realign the investment mix from time to time.

For example, as the value of a stock increases, it consumes a larger percentage of the total, thus affecting the total diversification of the portfolio. In an effort to maintain a healthy balance, it may be necessary to decrease the holding in that particular stock and increase in a different area, such as bond or cash holdings. Such decisions require not only experience but the benefit of a method such as candlestick chart analysis.

In all likelihood, a well-diversified portfolio will contain most, or all, of the following: stocks, bonds, mutual funds, cash equivalents like Treasury bills or money funds, as well as other types of investments. Being able to diversify over a broad range of investment options can help minimize many of the dramatic ups and downs in investing.

It has been shown through research that, over extended periods of time, investors are actually able to reduce the level of stock volatility in their portfolios (by diversifying) without sacrificing much in the way of profit at the bottom line. Establishing a well diversified portfolio is crucial, and it is dependent on available assets, money management, risk tolerance, and long term investing goals. Simply stated, asset allocation is diversifying an investment portfolio among various categories, also known as asset classes. A typical allocation, for example, would put 60 Per Cent of the available capital
in stocks, 30 Per Cent in bonds, and the other 10 Per Cent in cash (www.candlestickforum.com).

**BENEFITS OF DIVERSIFICATION**

When investing for some future goal, one of the most basic investment principles is that of adopting a proper asset allocation. This really is just a fancy way of saying "diversify".

The idea of diversification might not seem all that worthwhile for many investors. It could seem like a make-work project (now they have more things they have to monitor) or it could seem like additional risk (now conservative investors are stuck with higher risk assets in their portfolio).

However, the truth is that once people understand the most basic benefits of diversifying their investments, they quickly see just how powerful the practice can be (notwithstanding the fact that it becomes a common sense practice as well). Here are two of the biggest and most powerful benefits of diversifying your portfolio:

1. **Spread of Risk**

   By diversifying your portfolio, yes you are adding more assets to it. That could mean spreading out a bond portfolio to include short-term and long-term maturities, government and corporate issues, and so on. It can also mean moving some assets out of the bond portfolio and incorporating an equity position into the overall investment portfolio. Regardless of what diversification means, whether it is intra-asset class or inter-class, you are essentially spreading the risk among different assets.

   This means that if asset A fails you, assets B, C, D, and so on. Might be able to retain or improve value after all. Spread of risk, therefore, is a fundamental practice that investors can employ to reduce potential losses in their portfolio.

2. **Multiple Sources of Income**

   As in the case above, suppose everything moves along its regular pace. Asset A, B, C, D, and so on show no signs of risk, but since they are all performing, the investor now gets to enjoy the benefit of different sources of income. Some of that income might come from interest, some from capital appreciation, some from dividends, and so on. A different source of income is important, particularly for longer-term investments where income may be sporadic in some asset classes, such as dividend-paying securities and
capital appreciation. By enjoying different sources of income, investors are better positioned to be able to continue leading the lifestyle they have chosen.

These two very basic and fundamental benefits truly highlight the importance of knowing and sticking to your asset allocation. And this reality is only heightened during periods of market instability which, like a car whose engine seizes, means it is too late to fix the problem (www.ezinearticles.com).

**TIPS FOR DIVERSIFYING YOUR PORTFOLIO**

With the luxury of hindsight, we can sit back and critique the gyrations and reactions of the markets as they began to stumble after the '90s, and again in 2007. Diversification is not a new concept. We should remember that investing is an art form, not a knee-jerk reaction, so the time to practice disciplined investing with a diversified portfolio is before diversification becomes a necessity. By the time an average investor "reacts" to the market, 80 Per Cent of the damage is done.

Here, more than most places, a good offence is your best defence and in general, a well-diversified portfolio combined with an investment horizon of three to five years can weather most storms. Here are some diversification tips:

1. **Spread the Wealth**

   Equities are wonderful, but don’t put all of your investment in one stock or one sector. Create your own virtual mutual fund by investing in a handful of companies you know, trust, and perhaps even use in your day-to-day life.

   People will argue that investing in what you know will leave the average investor too heavily retail-oriented, but knowing a company or using its goods and services can be a healthy and wholesome approach to this sector.

2. **Consider Index or Bond Funds**

   Consider adding index funds or fixed-income funds to the mix. Investing in securities that track various indexes makes a wonderful long-term diversification investment for your portfolio. By adding some fixed-income solutions, you are further hedging your portfolio against market volatility and uncertainty.

3. **Keep Building**

   Add to your investments on a regular basis. Lump-sum investing may be a sucker's bet. If you have $10,000 to invest, use Rupee-cost averaging. This approach is
used to smooth out the peaks and valleys created by market volatility: you invest money on a regular basis into a specified portfolio of stocks or funds.

4. Know When to Get Out

Buying and holding and Rupee-cost averaging are sound strategies, but just because you have your investments on autopilot does not mean you should ignore the forces at work. Stay current with your investment and remain in tune with overall market conditions. Know what is happening to the companies you invest in.

5. Keep a Watchful Eye on Commissions

If you are not the trading type, understand what you are getting for the fees you are paying. Some firms charge a monthly fee, while others charge transactional fees. Be cognizant of what you are paying and what you are getting for it. Remember, the cheapest choice is not always the best.

Investing can (and should) be fun. It can be educational, informative and rewarding. By taking a disciplined approach and using diversification, buy-and-hold and Rupee-cost-averaging strategies, you may find investing rewarding - even in the worst of times (www.investopedia.com).

RISK AND RETURN IN PORTFOLIO INVESTMENTS

There are different motives for investment. The most prominent among all is to earn a return on investment. However, selecting investments on the basis of return is not enough.

The fact is that most investors invest their funds in more than one security suggest that there are other factors, besides return, and they must be considered. The investors not only like return but also dislike risk. So, what is required is:

1. Clear understanding of what risk and return are,
2. What creates them, and
3. How can they be measured?

RETURN

The return is the basic motivating force and the principal reward in the investment process. The return may be defined in terms of

(i) Realized return, i.e., the return which has been earned, and
(ii) Expected return, i.e., the return which the investor anticipates to earn over some future investment period.

The expected return is a predicted or estimated return and may or may not occur. The realized returns in the past allow an investor to estimate cash inflows in terms of dividends, interest, bonus, capital gains, and so on, available to the holder of the investment. The return can be measured as the total gain or loss to the holder over a given period of time and may be defined as a percentage return on the initial amount invested. With reference to investment in equity shares, return consists of the dividends and the capital gain or loss at the time of sale of these shares. (www.mbaknol.com).

The typical objective of investment is to make current income from the investment in the form of dividends and interest income. Suitable securities are those whose prices are relatively stable but still pay reasonable dividends or interest, such as blue chip companies. The investment should earn reasonable and expected return on the investments. Before the selection of investment the investor should keep in mind that certain investment likes, Bank deposits, Public deposits, Debenture, Bonds, and so on will carry fixed rate of return payable periodically.

On investments made in shares of companies, the periodical payments are not assured but it may ensure higher returns from fixed income securities. But these instruments carry higher risk than fixed income instruments (www.mbaknol.com).

**A 10-Step Process of Improving Portfolio Returns**

Step 1 : Adopt a long-term investment approach (future dividend flows), rather than momentum (short-term price change).

Step 2 : Cap annual turnover of portfolios at 30 Per Cent.

Step 3 : Understand that all tools now used to manage risk and return are based on the discredited theory of efficient markets.

Step 4 : Adopt a stable benchmark such as growth of GDP plus a risk premium (www.seekingalpha.com).

Step 5 : Don’t Pay Performance Fees

Step 6 : Do Not Engage in Alternative Investments – Hedge Funds, Private Equity, and Commodities

Step 7 : Insist on Total Transparency of Agents’ Strategies (www.seekingalpha.com).
Step 8: Everything in the portfolio should be traded on a public exchange.

Step 9: Secure full transparency of banking service costs incurred by companies you invest in.

Step 10: Provide full disclosure of compliance with these policies. (www.seekingalpha.com).

CONSTRAINTS OF PORTFOLIO REVISION

Portfolio revision involving purchase and sale of securities gives rise to certain problem which acts as constraints in portfolio revision, from those constraints (Limitations) some may be as following:

1. STATUTORY STIPULATIONS

Investment companies and mutual funds manage the largest portfolios in every country. These institutional investors are normally governed by certain statutory stipulations regarding their investment activity. These stipulations often act as constraints in timely portfolio revision.

2. TRANSACTION COST

Buying and selling of securities involve transaction costs such as commission and brokerage. Frequent buying and selling of securities for portfolio revision may push up transaction cost thereby reducing the gains from portfolio revision. Hence, the transaction costs involved in portfolio revision may act as a constraint to timely revision of portfolio.

3. INTRINSIC DIFFICULTY

Portfolio revision is a difficult and time-consuming exercise. The methodology to be followed for portfolio revision is also not clearly established. Different approaches may be adopted for the purpose. The difficulty of carrying out portfolio revision itself may act as a restriction to portfolio revision.

4. TAXES

Tax is payable on the capital gains arising from sale of securities. Usually, long-term capital gains are taxed at a lower than short-term capital gains. To qualify as long-term capital gain, a security must be held by an investor for a period not less than 12 months before sale.

Frequent sales of securities in the course of periodic portfolio revision of adjustment will result in short-term capital gains which would be taxed at a higher rate...
compared to long-term capital gains. The higher tax on short-term capital gains may act as a constraint to frequent portfolios. (http://www.mbaknol.com).

5. PERFORMANCE EVALUATION

Many investors mistakenly base the success of their portfolios on returns alone. Few consider the risk that they took to achieve those returns. Since the 1960s, investors have known how to quantify and measure risk with the variability of returns, but no single measure actually looked at both risk and return together. Today, we have many sets of performance measurement tools to assist us with our portfolio evaluations. (http://www.investopedia.com).

Portfolio evaluating refers to the evaluation of the performance of the portfolio. It is essentially the process of comparing the return earned on a portfolio with the return earned on one or more other portfolio or on a benchmark portfolio. Portfolio evaluation essentially comprises of two functions, performance measurement and performance evaluation. Performance measurement is an accounting function which measures the return earned on a portfolio during the holding period or investment period. Performance evaluation, on the other hand, address such issues as whether the performance was superior or inferior, whether the performance was due to skill or luck and so on.

The ability of the investor depends upon the absorption of latest developments which occurred in the market. The ability of expectations if any, we must able to cope up with the wind immediately.

Investment analysts continuously monitor and evaluate the result of the portfolio performance. The expert portfolio constructer shall show superior performance over the market and other factors. The performance also depends upon the timing of investments and superior investment analyst’s capabilities for selection. The evolution of portfolio always followed by revision and reconstruction. The investor will have to assess the extent to which the objectives are achieved.

For evaluation of portfolio, the investor shall keep in mind the secured average returns, average or below average as compared to the market situation. Selection of proper securities is the first requirement. The evaluation of a portfolio performance can be made based on the following methods:

a. Sharpe’s Measure,
b. Treynor’s Measure and

Methods of Portfolio Performance Evaluation

Portfolio evaluation has evolved dramatically over the last two decades. The acceptance of modern portfolio theory has changed the evaluation process from crude return calculation to rather detailed explorations of risk and return and the sources of each. The evaluation of portfolio performance is essentially concerned with comparing the return earned on some portfolio with the return earned on one or more other portfolios. It is important that the portfolios chosen for comparison are truly comparable. Broadly speaking, there are three widely used and universally recognized methods of portfolio performance evaluation. These are:

a. Sharpe’s Return to Variability,
b. Treynor’s Return to Volatility and

A. SHARPE’ MEASURE

The objective of modern portfolio theory is maximization of return or minimization of risk. In this context the research studies have tried to evolve a composite index to measure risk based return.

The credit for evaluating the systematic, unsystematic and residual risk goes to Sharpe, Treynor and Jensen. Sharpe measure total risk by calculating standard deviation. The method adopted by Sharpe is to rank all portfolios on the basis of evaluation measure.

Reward is in the numerator as risk premium. Total risk is in the denominator as standard deviation of its return. We will get a measure of portfolio’s total risk and variability of return in relation to the risk premium.

The measure of a portfolio can be done by the following formula:

$$SI = \frac{(Rt - Rf)}{\sigma_f}$$

Where, $SI =$ Sharpe’s Index
$Rt =$ Average return on portfolio
$Rf =$ Risk free return
$\sigma_f =$ Standard deviation of the portfolio return.
B. TREYNOR’S MEASURE

The Treynor’s measure related a portfolio’s excess return to non-diversifiable or systematic risk. The Treynor’s measure employs beta. The Treynor based his formula on the concept of characteristic line. It is the risk measure of standard deviation, namely the total risk of the portfolio is replaced by beta.

The equation can be presented as follow:

\[ T_n = \frac{(R_n - R_f)}{\beta_m} \]

Where,

- \( T_n \) = Treynor’s measure of performance
- \( R_n \) = Return on the portfolio
- \( R_f \) = Risk free rate of return
- \( \beta_m \) = Beta of the portfolio (A measure of systematic risk)

C. JENSEN’S MEASURE

Jensen attempts to construct a measure of absolute performance on a risk adjusted basis. This measure is based on CAPM model. It measures the portfolio manager’s predictive ability to achieve higher return than expected for the accepted riskiness. The ability to earn returns through successful prediction of security prices on a standard measurement.

The Jensen measure of the performance of portfolio can be calculated by applying the following formula:

\[ J_p = R_p - [R_f + \beta_p (R_m - R_f)] \]

Where,

- \( J_p \) = Jenson’s measure for portfolio,
- \( R_p \) = portfolio return,
- \( R_f \) = risk free return, and
- \( \beta_p \) = beta coefficient of the portfolio. (http://www.mbaknol.com).

CRITERIA FOR EVALUATION OF PORTFOLIO

Portfolio managers and investors who manage their own portfolios continuously monitor and review the performance of the portfolio. The evaluation of each portfolio, followed by revision and reconstruction are all steps in the portfolio Management.

Managers and Analysts wish to know how they performed in their investment strategies in terms of return per unit of risk, both in absolute terms and relative terms.
relative to overall market performance. They have to assess the extent to which the objectives aimed at are being achieved say in terms of income, capital appreciation, risk and returns, and so on.

In this context, evaluation has to take into account whether the portfolio secured above average returns, average or below average, as compared to the market return. The ability to diversify with a view to reducing and even eliminate all unsystematic risk and expertise in managing the systematic risk related to the market buy use of appropriate risk measured, namely, Betas. Selection of proper securities is thus the first requirement.

Superior timing and superior stock selection may result in above average return. Diversification in terms of Markowitz model or Sharpe’s Single Index Model will reduce the market related risk and maximize the returns for a given level of risk.

Market returns being related positively to risk, evaluation has to take into account:

1. Rate of returns, or excess return over risk free rate.
2. Level of Risk both Systematic (Beta) and Unsystematic and residual risks through proper diversification.

Under the Traditional theory, the evaluation is only in terms of the rate of return, particularly in comparison with other assets of the same risk class. The theory of Markowitz and Modern Portfolio Theory have opened up the avenue for selecting and evaluation the portfolios on the basis of risk adjusted return.

Modern portfolio theory has postulated that the portfolio selection and evaluation should be on the basis of both Risk and Return and the objective should be to optimize the return for a given level of risk or to minimize the risk for a given level of return. Due to uneven fluctuations of returns and high degree of fluctuations of returns and high degree of variability of returns, risk adjusted returns become the basis for evaluation.

This is possible due to later developments involving the quantification of risk by the statistical measures of S.D., variance and covariance of returns of securities in a portfolio.

There was no composite index, which measures both return and risks under the Traditional Theory. In Modern Portfolio Theory it became necessary to develop some composite measures of both return and risk in portfolio performance, as the objective now is maximization of return and minimization of risk.
Because of the trade-off between them, simple maximization of returns or single goal of minimization or risk will be defeating the objectives of Modern Portfolio Management. It was in this context that later researches have tried to evolve a composite index to measure risk based returns taking into account the different components of risk, viz., systematic, unsystematic and residual risk. The credit for evolving these criteria goes to Sharpe, Treynor and Jensen measures of portfolio. (Avadhani V.A. (2007).

APPLICATION OF EVALUATION TECHNIQUES

The answers generated using these performance measures are only as good as the data input. Therefore, it is necessary to be careful in computing the rates of return and take proper account of all inflows and outflows. More important, it is necessary to use judgments in the evaluation process. The above mentioned techniques and methods of evaluating investment performance apply to institutional investors as well as to individual investors.

As individual we all know that one of the ways to improve ourselves is to review the past, to see where we made mistakes, and where we can improve. As far as investment is concerned, we should review the past results with respect to the following:

1. DEGREE OF RISK ASSUMED

Is the portfolio properly diversified, or is it under diversified or overly diversified? Do the investor use margin? If so, is it too much? Many individuals’ accounts are wiped out because of margin calls and priced sales of securities in recession.

2. SELECTION OF INDIVIDUAL SECURITIES

Does the investor have the ability to select undervalued issues? This can be determined by comparing the percentage gain of the weekly purchased issues with the market performance. If the percentage gain exceeds the market index, it shows that the buyer has made good selections. If one has done this consistently, it shows skill in selecting undervalued issues.

3. CYCLICAL AND MARKET TIMING

Does the investor try to adjust the portfolio into aggressive, neutral, or defensive positions on the basis of anticipating the market savings? If so, is the investor successful? On what basis – technical or fundamental factors – does he formulate his anticipation of
market savings? What improvements can be made? Or would it seem that he should better invest his earning elsewhere?

4. RISK-ADJUSTED RETURN

The investor should compute

1. Annual rates of return on the portfolio;
2. The level of risk assumed in terms of beta of the portfolio or variability or returns and
3. The risk-adjusted returns.

Then, the investor should compare the risk adjusted returns with those experienced by the market index, the average stock funds and balanced mutual funds, and so on. An evaluation of a portfolio managed should be done a number of times over different market environments before a final judgment is reached. An evaluation of the portfolio performance by the investors along the lines suggested, if done consistently once every year, should reveal weaknesses and strengths, and provide measures to improve overall ability in managing the investment programmers. (Bhalla V.K., 2004).

Portfolio performance measures should be a key aspect of the investment decision process. These tools provide the necessary information for investors to assess how effectively their money has been invested (or may be invested). Remember, portfolio returns are only part of the story. Without evaluating risk-adjusted returns, an investor cannot possibly see the whole investment picture, which may inadvertently lead to clouded investment decision. (http://www.investopedia.com).

The process of portfolio management involves conducting a SWOT analysis to decide

a. which assets to buy
b. the quantity of each asset to be purchased
c. the timing of their purchase
d. which assets to divest

Factors Influencing the Process of Portfolio Management

Portfolio management should begin with the setting of investing objectives. While one investor may aim for rapid growth, another may be seeking safe investments.
Accordingly, one can choose between debt instruments (such as bonds) and equities (stocks). In addition, derivatives (such as options and futures contracts) are can also help diversify the portfolio.

Other factors that affect the process of portfolio management are:

a. circumstances of the portfolio owner
b. performance measurement (including expected return and risk associated with it)
c. changing economic conditions
d. preference of the area of investment (domestic or international)

Financial institutions conduct their own investment analysis. Individual investor may hire their services to achieve financial goals. (http://www.economywatch.com).

BASICS OF PORTFOLIO MANAGEMENT IN INDIA

In India, Portfolio Management is still in its infancy. Barring a few Indian banks, and foreign banks and UTI, no other agency had professional portfolio management until 1987. After the setting up of public sector mutual funds, since 1987, professional portfolio management, backed by competent research staff became the order of the day.

After the success of the mutual funds in portfolio management, a number of brokers and Investment consultants some of whom are professionally qualified have become portfolio managers. They have managed the funds of the client on both discretionary and non-discretionary basis. It was found that many of them, including mutual funds have guaranteed a minimum return or capital appreciation and adopted all kinds of incentives that are now prohibited by SEBI.

The recent CBI probe into the operations of many market dealers has revealed the unscrupulous practices by banks, dealers and brokers in their portfolio operations. The SEBI has then imposed stricter rules, which included their registration, a code of conduct and minimum infrastructure, experience and expertise and so on. it is no longer possible for any unemployed youth, or retired person or self-styled consultant to engage in portfolio management without the SEBI’s license. The guidelines of SEBI are in the direction of making portfolio management a responsible professional service to be rendered by the experts in the field.
DIFFERENCE BETWEEN PORTFOLIO MANAGEMENT SERVICES (PMS) AND MUTUAL FUNDS

The concept of Portfolio Management Services and Mutual Funds remains the same, collecting money from investors, pooling them and investing the funds in various securities. There are some differences between them described as follows:

In the case of portfolio management, the target investors are high net-worth investors, while in the case of mutual funds the target investors include the retail investors.

In case of portfolio management, the investments of each investor are managed separately, while in the case of MFs the funds collected under a scheme are pooled and the returns are distributed in the same proportion, in which the investors/ unit holders make the investments.

The investments in portfolio management are managed taking the risk profile of individuals into account. In mutual fund, the risk is pooled depending on the objective of a scheme.

In case of portfolio management, the investors are offered the advantage of personalized service to try to meet each individual client’s investment objectives separately while in case of mutual funds investors are not offered any such advantage of personalized services.

MANAGEMENT OF INVESTMENT PORTFOLIOS

Investment Management or Portfolio Management deals with the manner in which investors analyze, select and evaluate investments in terms of their risks and expected returns. It is both an art and a science. The art aspect derives from the notion that some investors, by whatever means, have the ability to consistently pick up investments that outperform other investments on a risk/expected-return basis. Although many techniques have been developed to assist investors in the selection of investments, the concept of market efficiency maintains that for most investors, the ability to consistently select high-return/low risk investments may be difficult to do. An efficient market is one where prices reflect a given body of information.

In such a situation, one investment should not persistently dominate another in terms of risk and expected return. In other words, markets are said to be efficient if there is a free flow of information and market absorbs this information quickly.
James Lorie has defined the efficient security market as, “the ability of the capital market to function, so that the prices of securities react rapidly to new information. Such efficiency will produce prices that are appropriate in terms of current knowledge, and investors will be less likely to make unwise investments.”

This brings to the science aspect of portfolio/investment management. If markets are reasonably efficient in a risk/expected-return sense, investor’s objective should be to choose their preferred levels of risk and expected return and to diversify as easily as possible to meet their investment goal. As a consequence, portfolio management has become very analytical. Various techniques are today available which enable investors to identify the diversified portfolio that has the highest expected return at their preferred level of risk.

SEBI GUIDELINES TO PORTFOLIO MANAGEMENT

SEBI has issued detailed guidelines for portfolio management services. The guidelines have been made to protect the interest of investors. The salient features of these guidelines are:

1. The nature of portfolio management service shall be investment consultant.
2. The portfolio manager shall not guarantee any return to his client.
3. Client’s funds will be kept in a separate bank account.
4. The portfolio manager shall act as trustee of client’s funds.
5. The portfolio manager can invest in money or capital market.
6. Purchase and sale of securities will be at a prevailing market price.

POWERS OF SEBI

The Securities and Exchange Board of India has the following powers to control and manage the portfolio managers:

1. The portfolio manager shall submit to SEBI such reports, returns and documents as may be prescribed.
2. SEBI may investigate the affairs of a portfolio manager such as inspection of books of accounts, records, and so on.,
3. SEBI has full authority in the event of violation of any provision to suspend or cancel the license.
4. No exemptions will be given under any circumstances to portfolio manager.(http://www.managementparadise.com).
After the overall all study about each and every aspect of this topic it shows that portfolio management is a dynamic and flexible concept which involves regular and systematic analysis, proper management, judgment, and actions and also that the service which was not so popular earlier as other services has become a booming sector as on today and is yet to gain more importance and popularity in future as people are slowly and steadily coming to know about this concept and its importance.

It also helps both an individual the investor and FII to manage their portfolio by expert portfolio managers. It protects the investor’s portfolio of funds very crucially. Portfolio management service is very important and effective investment tool as on today for managing investible funds with a surety to secure it. As and how development is done every sector will gain its place in this world of investment.

REVIEW OF PREVIOUS STUDIES

In this chapter an attempt has been made to briefly review the work already undertaken and methodology employed in this study. A brief review of select studies has been presented as follows.

Eiteman W.J., C.C. Dice, and D.K. Eiteman, studied the performance of several stocks in 1965. The stock price indices are similar in that they attempted to measure the average price level for their respective population of stocks.

Cohen K.J. and Fitch B.P. Studied the average investment performance of some selected indices in 1966.

King (1966) studied this problem and concluded that the market index accounted for about 50 per cent of the volatility of stock returns over time. An additional 10 per cent could be attributed, he thought, to industry classification.

Kalman J. Cohen and Jerry A. Pogue (1967) in their paper “An Empirical Evaluation of Alternative Portfolio-Selection Models”, evaluated the ex ante and ex post performances of single period portfolio-selection models-based upon “Markowitz Formulation” of Harry M Markowitz. They found that the performance of the multi-index models was not superior to that of single –index portfolio. According to them, all the index models were similar in that they related the return of any security as a linear function of some index. However, if a wider class of securities is considered, it is felt that the multi-index formulation would tend to dominate in inter –industry, as well as intra- industry comparisons.
Anand & Murugaiah V (1967) in their article entitled “Analysis of Components of Investment Performance – An Empirical Study of Mutual Funds in India” attempt to examine the components and sources of investment performance in order to attribute it to specific activities of Indian fund managers. It also attempts to identify a part of observed return which is due to the ability to pick up the best securities at given level of risk. For this purpose, Fama’s methodology is adopted here. The empirical results reported here reveal the fact that the mutual funds were not able to compensate the investors for the additional risk that they have taken by investing in the mutual funds. The study concludes that the influence of market factor was more severe during negative performance of the funds while the impact selectivity skills of fund managers was more than the other factors on the fund performance in times of generating positive return by the funds. (http://papers.ssrn.com)

Gohen and Pogue (1967) also looked at the by using Markowitz portfolio model. They found some evidence to support King’s study, but there were severe statistical problems with their work.

Michael Jenson’s (1968) in his article entitled “Mutual fund performance in the period 1945-1964” studied 115 funds over a period spanning from 1945 to 1964, confirmed the efficient market hypothesis.

His analysis has shown that the performance of expense-adjusted fund returns was markedly lower than those randomly chosen portfolios of a similar risk category. These results were in line with the findings of Treynor (1965) and Sharpe (1966).

Performance of professionally managed funds also was not any better than the performance of risk-adjusted index portfolio, which also indicated that managers of these funds did not appear to possess private information. Thus, the results of the early studies prevailed as general conclusion in the erstwhile literature.

Bluume (1971) employed two typical methods for ranking the betas to test for stability. Portfolios with only one security remained in the same risk class 62 per cent of the time. This means that 38 per cent of stocks changed risk class.

Larger portfolios were more apt to remain in the same risk rankings; only 3 percent of these portfolios changed rank between the two periods. Bluume also observed that share in the portfolios moved in a direction opposite to that of market.
Jacob (1971) found that betas generated using the market model depended on three factors: the historical period over which the beta is estimated, the average market return during the period of study, the average market return during the period of study, whether the investor actually used the market model as a method for estimating betas. According to him, the length of time over which we calculate beta is important. The measurement period must be long enough to allow statistically sample, but not so long as to include information that does not reflect the relationships likely to persist into future what is the effect of different holding-period choices.

Lerner (1972) looked especially at this question, he calculated betas for number of stocks by using the market model (simple linear regression), with monthly intervals. The betas change significantly as the holding period lengthens. He also observed similar results for other firms.

Michael A. Simkowitz and Dennis E. Logue (1973), in their paper, “The Interdependent Structure of Security Returns”, reformulated the traditional CAPM models, a system of simultaneous equations in which returns on similar securities were treated as endogenous variables and the pertinent financial data for particular firms and a market factor were treated as exogenous variables. A robust test of CAPM model assumption, which asserts that all the interdependencies among security returns are accounted for solely by the relationship between a single security and a common market index, was also conducted.

The paper also examined the relationship of security returns and corporate operating date to determine the extent to which the beta of the CAPM model is simply a summery, surrogate measure for them.

Meyer (1973) observed that if the amount of variance explained by the market varied from one period to next, then betas would not be stationary from one period to another. His portfolio beta was quite stable.

Friend, Westerfield, and Granito (1978) formulated a test that attempts to use different indices. They first used a stock index alone, and then added a bond index, and finally a joint stock-bond index. They observed that the regression coefficient will not be similar regardless of the index use. The intercepts were not the same and they were not close to any of the normally quoted risk free rates for the period. To provide some perspective on
their intercepts, the average Treasury bill rate for the same period was five-fold higher than the estimation.

For two regressions, both used to corporate bond index alone, the coefficient of determination showed that the index and the asset’s return were virtually unrelated. The joint stock and bond index, however, showed a higher coefficient of determination than that of the stock index alone. The residual errors should not have improved the results. Therefore, they concluded that the choice of index can have very important consequences.

Industry related factors do affect returns and that adding the industry factors could enhance the beta power. However, for an industry index to provide additional information there must be effects that are semi systematic, that affect all companies in an industry to greater or lesser degree.

Alexander and Chervany (1980) found that their results were not in conflict- beta was stable in more diversification portfolio. In addition, they found that most of improvement in beta stability occurred by the point where there were ten securities in the portfolio. Bey (1983) used a sophisticated statistical approach to look at the stability of betas of public utility and industrial stocks. He observed that ordinary-least squares (OLS) betas change quite dramatically from period to period- they were not stable. Sherman Cheung Clarence C. Y. Kwan (1988), in this paper, “Optimal Portfolio Selection of Bonds and Stocks”, offered an alternative approach to bond portfolio management from the traditional immunization approach.

By using the general Multi-index Model to characterize the variance-covariance structure of security returns, both Duration Theory and Modern Equilibrium Theories of the term structure were incorporates in the analysis. In addition, a simplified selection procedure based on Single-index Model was derived.

Francis (1989) observed that the market indices (like BSE Sensex) are more scientific than market averages (like RBI Index) due to three reasons,

1. the indices have base years to facilitate comparisons,
2. the indices can employ some meaningful weighting system if it is appropriate and
3. the index is usually given in more useful units of measures than the average of an index is.
Adequacy of index in generating inputs for the selection of efficient set has been studied over the years. Some attempts have been made to create broader indices, in part, simply to test the results of using such indices.

Different betas for different industry may simply mean that companies in the same industry operate in similar products with the same or similar means of production. Such companies could be affected in similar ways by macroeconomic events.

The article titled “Performance Analysis with Indian Stock Market Returns” done by Madhusoodanan T.P (1996) analyzed the Indian stock market returns, form optimal portfolio and then test their performance for the following quarter, half year and a year.

They also tested the volatility of these portfolio formulation modules in practice and check how it works Vis–a-Vis the other bench marks of market indices. From the result, the study found that an active portfolio strategy could be worse than a passive strategy and there were no any significant differences in the returns.

A study on "Evaluate the operations of Mutual Funds" by Nalini Parva Tripathy (March 1996), examines the importance and growth of mutual funds and evaluate the operations of mutual funds and suggests some measures to make it a successful scheme in India.

Sahadevan and Thiripalraju, in their research paper titled “Mutual Funds – Data Interpretations And Analysis” (1997), analyzed the performance of private sector funds they compiled and analyzed the monthly average return and standard deviation of 10-selected private sector funds.

The investigation reveals that in terms of the rate of return, 5 funds viz., Alliance 95, ICICI Power, Kothari Prima, Kothari Pioneer Blue Chip and Morgan Stanley Growth Fund out performed the market, during the period of comparison. The analysis also shows that, by and large, performance of a fund is not closely associated with its size.

Jayadev (1998) in his analytical study “The Performance of Mutual Funds” analyzed 44 schemes of mutual funds during the period of 1994-95 and compared Jensen’s measure and Sharpe’s differential returns of the schemes. The author stated that there was high difference between the two measures and concluded that lack of diversification was the reason for the declining trend in performance.

The study has examined the performance in terms of fund diversification and consistency of performance. The paper concludes that mutual fund industry’s portfolio diversification has performed well. But it supported the consistency of performance.

Amitabh Gupta (2000) studied a paper entitled “Investment Performance of Indian Mutual Fund: An empirical Study” to evaluate the performance of Mutual Fund Schemes in the frame work of risk and return. The study period ranges for 5 years from April 1\textsuperscript{st}, 1994 to March 31\textsuperscript{st}, 1999 by using six performance measures. The empirical results of this study reported the mixed performance of sample schemes during the study period. There was no conclusive evidence available which warrants the investors to accept that their performance was superior to the relevant benchmarks.

The article titled with “Portfolio Construction by Volatility Forecasts: Does the Covariance Structure Matter?” Done by Momtchil Pojarliev and Wolfgang Polasek (2001),explained the performance of a global minimum variance portfolio in dependence of the structure of the covariance matrix and the type of strategies based on unvaried and multivariate GARCH modules for a portfolio consisting of the north America, Europe and the pacific region.

They found that variance forecasts are more important than covariance forecast and the multivariate volatility models yield better results than unvaried volatility models.

The dissertation entitled, ‘On the Investment Performance of Value and Growth Stocks in the Kuwaiti Stock Exchange’, by Al-logani & Mattar, (2001), the conclusion pointed out that the portfolios were made of high stock multipliers (growth stocks). It also concluded that the Kuwaiti Stock Exchange is inefficient and that realizing extraordinary returns is possible.

Turan and Bodla, in the paper “Performance Appraisal of Mutual funds” (2001) examined the growth of mutual funds in India in terms of resource mobilization, promotion of various types of schemes and NAV based risk and return. The study reveals that mutual
The fund industry has registered a sharp rise in terms of resource mobilization during the period 1990-1991 to 1997-1998.

Morey Matthew and Hrishikesh, in their paper named “Estimation Risk in Mutual Fund Ratings: The Case of Morningstar” (May 17, 2001) examined estimation risk in the well-known Morningstar mutual fund star rating system. As a result, investors can be somewhat less confident that the ratings of young funds are truly what they are estimated to be.

Narasimham and Vijayalakshmi (2001) in their article “Evaluating the Performance of The Mutual Funds In India” focused on the investment strategies followed by the mutual fund companies. They analyzed the performance of 76 mutual fund schemes of around 25 asset management companies (AMC’s) mutual funds. The study examined the impact of change from large portfolio to thin portfolio.

They found out that there was a general shift in the investment strategy of diversified portfolio and optimizing the risk return of investment in predictive winners of the period.

Wokian and Shmmary, (2002), ‘On the Financial Performance and the Company Value; a Study on Kuwaiti Industrial Companies’, concluded that industrial companies’ prices were not related to their accounting statements that describe their annual performance. This conclusion shows that investors in the Kuwaiti Stock Exchange do not relate the company performance to its stock price in the market. Financial ratios, which are good parameters of the performance, were also used to measure the performance of such companies. Studies related to the subject of this study are limited.

Ramesh Chander (2002) in his article named “An Evaluation of Portfolio Performance, Examined Portfolio Performance- Components across Fund Characteristics” identified sources and components of investment performance attributed subsequently to the different activities of fund managers. On the whole, the study has produced evidence supporting superior performance of close end growth funds sponsors by the private sectors.

Narayan Rao.S (2002) in his article entitled “Performance Evaluation of Indian Mutual Funds in a Bear Market” examined the performance through relative performance index, risk-return analysis, Treynor’s ratio, Sharpe’s Ratio, Sharpe’s measure, Jensen’s measure, and Fama’s measure. The results of performance measures suggest that most of the mutual fund schemes in the sample were able to satisfy investor’s expectations by giving
excess returns over expected returns based on both premium for systematic risk and total risk.

An article title with “Constructing an Optimal Portfolio Using Sharpe Single Index Model” Done by Debasish Dutt (2003). Made an attempt to construct an optimal portfolio by applying Sharpe’s single index model of capital asset pricing.

Taking BSE 100 as market index and considering daily indices for the period from October 2002 to April 2003 the proposed method formulates a unique cut off point and selects stocks having excess of their expected return over risk-free rate of return surpassing this cut off point. It is found that, all the stocks expected turn out to be bank stocks (http://www.icwai.org).

The article entitled with “Return Forecasts and Optimal Portfolio construction: A Quintile Regression Approach” is done by Lingjie Ma And Larry Pohlman (2003) explored the full distributional impact of factors on returns of securities, and found that effects vary substantially across quintiles of returns. It also found that under mild conditions, the methods used in this study provide more accurate forecasts and potentially more value-added portfolios than the classical conditional mean method. (http://papers.ssrn.com)


For this purpose the researcher used tools like mean-variance optimization algorithm and multi-factor models risk analysis, it is found that the risk models enable portfolio managers to manage portfolio risk through factor exposure and each factor’s risk contribution to portfolio’s total risk. (www.wpi.edu).

An article entitled “Portfolio Performance in Relation to Risk and Return and Effect of Diversification: a test of market efficiency” Done by Rakesh Kumar And Raj S Dhankar (2005) examined the possibility of diversification effect on portfolio risk which is the composite of market and non market risk. The study results found that the relationship between portfolio risk and return are very high, moderate and low in the analysis of monthly, weekly and daily risk – return analysis respectively. (http://www.britannica.com).

A study done by Soumya Guha Deb, Ashok Banerjee , B. B. Chakrabarti (2005), entitled “Performance of Indian Equity Mutual Funds vis-à-vis their Style Benchmarks”,
analyzed the relative performance of the fund with respect to their style benchmark. The data used in this study covers the period from January 2000 to June 2005 and it considers the monthly return data of Indian Equity Mutual Fund and their relevant benchmarks, over the study period. The results of this study show that the funds have not been able to beat their style benchmarks on the average. (http://papers.ssrn.com).

Muthappan. P.K. and Damodharan. E (2006) in their paper entitled “Risk - Adjusted Performance Evaluation of Indian Mutual Fund Schemes” analyzed the performance of Indian Mutual fund Schemes in the concept of risk and return, for the period of five years from April 1st, 1995 to March 31st, 2000. The study used Sharpe ratio, Treynor ratio, Jensen measure, Sharpe differential return measure and Fama’s components of performance to evaluate the performance of Mutual Fund schemes. The study results supported the risk and return of Mutual Fund schemes are not in conformity with their investment objectives. The sample schemes are not found to be adequately diversified and the funds are able to earn higher returns due to selectivity. The proper balance between selectivity and diversification is also not maintained. Thus it is observed that the Indian Mutual Funds are properly diversified.

Sondhi and Jain (2006), in their study entitled “Can Growth Stocks be identified for Investment? - A Study of Equity Selectivity Abilities of Fund Managers in India”, examined the returns and excess returns (called Jensen’s alpha) of all equity mutual funds in the sample which have been in operation for more than three years.

Lingjie Ma and Larry Pohlman (2007), in their “Return Forecasts and Optimal Portfolio Construction: A Quantile Regression Approach”, say that in finance there is growing interest in Quantile regression with the particular focus on value at risk and copula models. In this paper, we first present a general interpretation of Quantile regression in the context of financial markets.

We then explore the full distributional impact of factors on returns of securities, and find that factor effects vary substantially across quantiles of returns. Utilizing distributional information from quantile regression models, we propose two general methods for return forecasting and portfolio construction. We show that under mild conditions these new methods provide more accurate forecasts and potentially higher value-added portfolios than the classical conditional mean method. (http://www.uic.edu)
Bilbao A., Arenas M., Rodríguez M.V. and Antomil J. (2007), in their paper, “On constructing expert Betas for single-index model”, proposed a methodology approach of an extension of Sharpes Single Index model called Sharpes Model with Expert betas”. This extension was carried out through the construction of betas obtained from both statistical and imprecise expert estimations.

Jeff Grover and Angeline M. Lavin (2007) in this paper, “Modern Portfolio Optimization: a Practical Approach Using an Excel Solver Single-Index Model”, presented a practical solution to the strategic asset allocation problem that investor face when attempting to construct an optimal portfolio from a given set of available stocks. The optimization model, developed in excel uses the Capital asset pricing Model(CAPM) principles to determine security (fund) valuation and Sharpe ratio to identify an optimal or efficient combination of the available stock (funds).

Pablo Roger’s (2007), ‘Comparative Study of CAPM, Fama and French Model and Reward Beta Approach in the Brazilian Market’ tests and compares three alternative models for the prediction of the expected returns in the Brazilian stock market:

1) the Sharpe-Litner-Mossin version of the CAPM; 2) the Fama and French Three-Factor model; 3) and the Reward Beta Model, presented by Bornholt (2007).

The two-step test methodology for general balance models was used as empirical procedure: the first step consists of determining the parameters of the models based on time series regressions, and in the second step the estimated parameters are used as explanatory variables in cross section regressions.

The tests were conducted on portfolios, in accordance with the Fama and French’s (1993) and Bornholt’s (2007) methodology, and applied in two sub-samples of stocks with available data in the São Paulo Stock Exchange (BOVESPA): the ex-ante sample comprises the period from July 1995 to June 2001 and the ex-post sample the period from July 2001 to June 2006. (http://www.anpad.org).

Deepak Agarwal (2007) in his article entitled “Measuring Performance of Indian Mutual Funds” analyzed the Indian Mutual Fund Industry pricing mechanism with empirical studies on its valuation. It also analyzed data at both the fund - managers and fund – investor’s levels for the period of 17 years from 1991 to 2007 and Standard Deviation, Correlation analysis and Co-efficient of Determination were used. The study results
supported that the performance affected savings and investment habits of the people, at another side the confidence and loyalty of the fund-manager and rewards affects the performance of the Mutual Fund industry in India. (http://papers.ssrn.com).

Karen Benson, Philip Gray, Egon Kalotay, Judy Qiu (2008), in their paper, “Portfolio Construction and Performance Measurement when Returns are Non-Normal”, explored the potential usefulness of nonparametric approach to portfolio construction and performance measurement.

The portfolio performance index (PPI) is based on the nation that investors associate risk with the failure to achieve a target return. Karen proposed that portfolio construction and performance measurement be approached by calculating the decay rate in the probability that a given portfolio will under perform its designated benchmark. By comparing the PPI and Sharpe Ratio metrics, this paper presented preliminary evidence of the economic significance of non-normality’s in Australian equity returns, and documented the impact of it on portfolio construction and performance evaluation practice.

Tamal Datta Chaudhuri (April 2008) in his paper “A Structural Approach to Stock Market Return, Risk-Free Rate and Capital Asset Pricing Model (CAPM)”. He developed a structural model, which shows interdependent relationship between risk free rate and stock market returns.

It gives new macroeconomics structural features which shape the price movement in stock exchange. He used a Granger test and a Sims test to prove the interdependence of two variables. He suggested that instead using of exogenous values of stock market returns and risk free rate, one should use estimated values of these variable forms reduced from equation of Capital Asset Pricing Model (CAPM). He tested and proved with the data of individual companies.

According to Amaresh Das (November 2008), ‘Risk Perception, Behavior and Optimizing Models’ the paper explores issues raised by a Bayesian decision framework, focusing specifically on analysis of worker risk perception and behavior. Although the behavior is broadly consistent with a Bayesian learning framework, the behavioral decisions may not always coincide with other optimizing behavior of cognitive psychology. The above literature provides an overview of different valuation models associated with the valuation of optimal portfolio stock along with some empirical studies.
An attempt has been made in this study to evaluate the impact of optimal portfolio stock taking the models used in the above studies. But several studies made earlier on this subject cover restricted number of particular companies. Hence this study aims at covering group of companies. (http://www.eurojournals.com)

The study entitled, ‘Testing the Capital Asset Pricing Model (CAPM): The Case of the Emerging Greek Securities Market ’ by Grigoris Michailidis (2008) discusses the article examines the Capital Asset Pricing Model (CAPM) for the Greek stock market using weekly stock returns from 100 companies listed on the Athens stock exchange for the period of January 1998 to December 2002. In order to diversify away the firm-specific part of returns thereby enhancing the precision of the beta estimates, the securities were grouped into portfolios. The findings of this article are not supportive of the basic statement that higher risk (beta) is associated with higher levels of return.

The model does explain, however, excess returns and thus lends support to the linear structure of the CAPM equation. The CAPM’s prediction for the intercept is that it should equal zero and the slope should equal the excess returns on the market portfolio. The results of the study refute the above hypothesis and offer evidence against the CAPM.

The tests conducted to examine the nonlinearity of the relationship between return and betas support the hypothesis that the expected return-beta relationship is linear. (http://www.eurojournals.com)

Hong Wu’s (2008), ‘International Asset Pricing Models: A Forecasting Evaluation’ assesses the ability of several international asset pricing models in forecasting the cross-sectional variation in expected returns. With national market portfolios, only the International CAPM with exchange risk can pass the test and performs the best.

However, my empirical work suggests that the hypothesis of zero pricing errors can be rejected for any specification when the country value-minus-growth portfolios are taken to be the test assets. To reach this conclusion, the Fama-MacBeth two-pass regression approach is used, with Shanken corrected standard errors. (http://www.eurojournals.com)

Ayhan Kapusuzoğlu’s (2008), ‘The Impact of Alpha, Beta, and Correlation Coefficients on the Processes of Stock-Selection and Portfolio formation by the Investors’ is an Empirical Analysis on the Turkey Istanbul Stock Exchange (ISE)This study aims at revealing the impact of systematic/non-systematic risk factors which affect the processes of
stock-selection and portfolio formation by the investors and occupy a crucial place in the CAPM model, as well as the nature and power of the relationship between the stocks. Covering the period between 01.06.2004-01.06.2007, the study uses as data the closing prices of 30 publicly-traded firms in the ISE (Istanbul Stock Exchange) National-100 Index, as well the daily index closing values. Analyzing the data for 754 trading days, the study calculates the alpha, beta, and correlation coefficients and describes their effects and the way they should be evaluated by investors. (http://www.eurojournals.com/)

The paper entitled, ‘Simple Techniques for Determining the Optimal Portfolio Investment bank stock in Amman Stock Exchange’ by Ghazi F. Momani (2008) shows that the study is to gain knowledge of the fact that the stock of commercial banks in Jordan eligible to be included in the optimal portfolio or not.

In addition, the relation of the location of these banks in the optimal portfolio and its variables which are the share turnover ratio, the earning per share dividend, the payout ratio, and the price earnings ratio by using simple regression analysis. Also, examinations were conducted on banking sector because of the high prices of stocks of this sector in Amman’s stock market and the increase in trade of these stocks in the stock exchange compared to other sectors.

The result of this research was that the Arab bank was the only bank to be included in the optimal portfolio and is the largest bank in Jordan with respect to capital volume and number of branches inside and outside of Jordan. As for the rest of the banks, they were not eligible to be included in the optimal portfolio, but very close to be included. (http://www.eurojournals.com/)

The article entitled with “Portfolio Construction with Down Side Risk” Is Done By Harald Lohre Thorsten Neuman and Thomas Winterfeldt (2009). Optimized portfolios with respect to various measures of downside risk in an empirical out of sample setting. The study found that these optimizations are successful for most of the investigated measures by assuming perfect foresight of expected returns. (http://papers.ssm.com)

An article entitled “Equity Portfolio Construction and Selection Using Multi objective Mathematical Programming Model” done by Panagioties Xidonas, George Mavrotes, John Psarras, (2009) developed a multi objective mixed integer programming model for equity
portfolio construction and selection. It is developed to generate the pereto optimal portfolios using E – constraint method applied in Athens stock exchange. The study results found the fact that the proposed methodology is capable of helping the investors to select the portfolio that satisfies as much as possible and makes it a very powerful decision support.

The article with title “The Process of Stock Portfolio Construction With Respect To the Relationship between Index, Return and Risk, Evidence from Turkey” done by Ayhan Kapusuzoğlu And Semra Karacaer (2004) constructed portfolios equal to and higher than Istanbul stock exchange national 100 index employing the quadratic programming model in order to demonstrate the effects of the relationship between the elements of index, return and risk on the overall process of portfolio construction by the investors. The study concluded with that the risk levels increased to the index return; and that the portfolios with high risk levels had also higher returns.

Nateson. C, and Arun Rajesh. B (2010) in their article titled with “Optimal Portfolio Construction Using Single Index Model.” attempted to construct optimal portfolio by applying share single index model of capital asset pricing. Eight stocks have been selected for constructing an optimal portfolio from nifty and six stocks have been selected from nifty junior. From the analysis, the study found that the portfolio provides the rationale for forming that an optimal portfolio of the securities instead of buying only a single security.
RISK TOLERANCE

MEANING

The degree of uncertainty that an investor can handle in regard to a negative change in the value of his or her portfolio. An investor's risk tolerance varies according to age, income requirements, financial goals, and so on. For example, a 70-year-old retired widow will generally have a lower risk tolerance than a single 30-year-old executive, who generally has a longer time frame to make up for any losses she may incur on her portfolio. (www.investopedia.com)

An investor's ability to handle declines in the value of his/her portfolio. (www.investorwords.com)

Risk tolerance is the extent to which you as an investor are comfortable with the risk of losing money on an investment. If you're unwilling to take the chance that an investment that might drop in price, you have little or no risk tolerance. (www.financial-dictionary.thefreedictionary.com)

On the other hand, if you're willing to take some risk by making investments that fluctuate in value, you have greater risk tolerance. The probable consequence of limiting investment risk is that you are vulnerable to inflation risk, or loss of buying power. (www.financial-dictionary.thefreedictionary.com)

The extent to wish an investor is willing to accept more risk in exchange for the possibility of a higher return.

An investor with a high risk tolerance is likely to invest in securities, such as stocks in startup companies, and is willing to accept the possibility that the value of his/her portfolio will decline, at least in the short-term. An investor with a low risk tolerance, on the other hand, tends to invest predominantly in stable stocks and/or highly-graded bonds. One's risk tolerance is subjective and may vary according to age, needs, goals, and even personal dispositions. See also: eat well, sleep well. (www.financial-dictionary.thefreedictionary.com)

An investor's ability or willingness to accept declines in the prices of investments while waiting for them to increase in value. (www.financial-dictionary.thefreedictionary.com)

Risk tolerance is the willingness of some person or some organization to accept or avoid risk.
In any group of people there are gamblers or risk takers and there are non-gamblers or risk avoiders. People who have a low willingness to accept risks and the consequences of risks are called risk avoiders. Those people who are willing to take risks are called risk takers.

It is important to know that people and organizations have differing risk tolerances. Some customers do not want to risk the delivery of the project they are paying for by taking a chance on something new.

Other customers will welcome the opportunity if the danger is not too great. For example, if we were manufacturing a product like some of the products that are advertised on late-night television, we would probably have a relatively high risk tolerance for the product’s failure. This is because the product is priced very low and is not going to put anyone’s life in danger. Customers buying very low priced items can expect them to have a shorter useful life than the advertising indicates. If customers want a product that will last longer, they buy an item that is built better and is probably more expensive.

This ability to choose is related to risk tolerance. In the mind of the consumer there is a tolerance for risk, which is expressed in his or her willingness to spend money.

A consumer who is interested in having a highly reliable product that will last a long time is willing to pay more to get these features. Another consumer who is not willing to pay more to get a better product will be more accepting of the risk that the product will fail.

If we draw increasing impact and increasing probability on an x and y axis, we can draw the locus of all points of equal severity as a line on the graph in risk tolerance.

Acceptable risks are any risks that are below and to the left of this locus of points of equal severity. Unacceptable risks are those risks that have a severity above and to the right of this severity line.

If we shift the severity line up and to the right, as in risk tolerance: gamblers, we are describing a person or an organization that is more of a risk taker. That is, the severity of the risks that one is willing to take is higher than before we shifted the line, and the person or organization shown is more of a gambler.
If, on the other hand, we shift the line down and to the left, as in risk tolerance: avoiders, we are describing a person or organization that is less of a risk taker.

That is to say that the severity of the risks that a person or organization is willing to take is less than before we shifted the line. In the classes we teach, we often perform the experiment of telling the students that we are willing to bet money on the roll of a single die, a cube with a number one through six on each side. (that’s half of a pair of dice to you non-gamblers.)

In the bet we say that if the die comes up with a one or a two, we win. If the die comes up with a three, four, five, or six they win. The question is, "who would be willing to play for a penny?" nearly everyone stays in the game at this point. Then the stakes are raised to one dollar, and some of the people no longer want to play. As the stakes are raised higher and higher, more people drop out of the game. Eventually, unless there is a really hard-core gambler, everyone drops out of the game because the stakes are too high.

Even though the odds are very favorable, four chances out of six to win, when the bet is high enough, people will not play because the pain of losing is too great even when there are favorable odds.

This is a great example of risk tolerance. Individuals and companies do the same thing with threats and opportunities. In risk tolerance we are concerned with people’s personal values and views as well as the company’s values and views.

We may be dealing with a high-flying company that is willing to take many chances, but the individual who is representing the company may not be willing to stake his career on the risk you are suggesting. On the other hand, we do not want to be misled by the salesperson that is optimistic about everything until the sale is made. Risk tolerance is somewhat describable in monetary terms. Our risk tolerance is how much we are willing to lose if the risk happens.

In the case of a product that is sold to a consumer, the cost of the failure of the product might be the cost of the repair or replacement of the product if it fails. In the situation where someone’s life is in danger, these decisions become much more important. The tolerance for a risk that is life threatening is very high indeed. This is because we cannot put a monetary value on human life. (www.adeak.com)
Risk tolerance is the willingness of some person or some organization to accept or avoid risk. In any group of people there are gamblers or risk takers and there are no gamblers or risk avoiders.

People who have a low willingness to accept risks and the consequences of risks are called risk avoiders. Those people who are willing to take risks are called risk takers. It is important to know that people and organizations have differing risk tolerances. Some customers do not want to risk the delivery of the project they are paying for by taking a chance on something new. Other customers will welcome the opportunity if the danger is not too great. For example, if we were manufacturing a product like some of the products that are advertised on late-night television, we would probably have a relatively high risk tolerance for the product’s failure. This is because the product is priced very low and is not going to put anyone’s life in danger. Customers buying very low priced items can expect them to have a shorter useful life than the advertising indicates. If customers want a product that will last longer, they buy an item that is built better and is probably more expensive.

This ability to choose is related to risk tolerance. In the mind of the consumer there is a tolerance for risk, which is expressed in his or her willingness to spend money. A consumer who is interested in having a highly reliable product that will last a long time is willing to pay more to get these features. Another consumer who is not willing to pay more to get a better product will be more accepting of the risk that the product will fail.

If we draw increasing impact and increasing probability on an X and Y axis, we can draw the locus of all points of equal severity as a line on the graph in

![Risk Tolerance Diagram](Source: www.pmtips.net/defining-risk-management-part-5-risk-tolerance)
Acceptable risks are any risks that are below and to the left of this locus of points of equal severity. Unacceptable risks are those risks that have a severity above and to the right of this severity line.

If we shift the severity line up and to the right, as in Figure 2, we are describing a person or an organization that is more of a risk taker. That is, the severity of the risks that one is willing to take is higher than before we shifted the line, and the person or organization shown is more of a gambler.

![Risk Tolerance: Gamblers](source)

**RISK TOLERANCE: GAMBLERS**


If, on the other hand, we shift the line down and to the left, as in Figure 3, we are describing a person or organization that is less of a risk taker. That is to say that the severity of the risks that a person or organization is willing to take is less than before we shifted the line.

![Risk Tolerance: Avoiders](source)

**RISK TOLERANCE: AVOIDERS**

In the classes we teach, we often perform the experiment of telling the students that we are willing to bet money on the roll of a single die, a cube with a number one through six on each side. (That’s half of a pair of dice to you no gamblers.)

In the bet we say that if the die comes up with a one or a two, we win. If the die comes up with a three, four, five, or six they win. The question is, “Who would be willing to play for a penny?” Nearly everyone stays in the game at this point.

Then the stakes are raised to one dollar, and some of the people no longer want to play. As the stakes are raised higher and higher, more people drop out of the game. Eventually, unless there is a really hard-core gambler, everyone drops out of the game because the stakes are too high.

Even though the odds are very favorable, four chances out of six to win, when the bet is high enough, people will not play because the pain of losing is too great even when there are favorable odds. This is a great example of risk tolerance. Individuals and companies do the same thing with threats and opportunities.

In risk tolerance we are concerned with people’s personal values and views as well as the company’s values and views. We may be dealing with a high-flying company that is willing to take many chances, but the individual who is representing the company may not be willing to stake his career on the risk you are suggesting. On the other hand, we do not want to be misled by the salesperson that is optimistic about everything until the sale is made.

Risk tolerance is somewhat describable in monetary terms. Our risk tolerance is how much we are willing to lose if the risk happens. In the case of a product that is sold to a consumer, the cost of the failure of the product might be the cost of the repair or replacement of the product if it fails. In the situation where someone’s life is in danger, these decisions become much more important.

The tolerance for a risk that is life-threatening is very high indeed. This is because we cannot put a monetary value on human life. (www.pmtips.net/defining-risk-management-part-5-risk-tolerance)

According to Droms (1988), MacCrimmon and Wehrung (1986), Roszkowski (1995), there are few, if any, generally recognized measures or instruments designed to ascertain someone’s financial risk tolerance or preference.
According to Roszkowski et al. “most existing devices appear to have been created by various financial planning concerns for their local ‘in-house’ use or are adaptations of techniques that were meant for use in scientific studies no one measure has yet emerged as the standard by which the others can be evaluated” (Roszkowski et al., 1993, p. 230).

The need for a widely accepted and commonly used instrument is as great today as any time in the past. Without such an instrument financial service providers and researchers have been forced to use other assessment techniques that may not adequately measure the underlying construct of financial risk tolerance.

Furthermore, according to risk-tolerance researchers (e.g., Droms, 1988) and financial planning practitioners (e.g., Opiela, 1996), the lack of a widely accepted risk-assessment instrument has been an ongoing problem slowing the pace of research in the area of financial management within the larger context of personal financial planning and investment management.

The development of a financial risk tolerance assessment instrument, and, based upon this framework, propose a financial risk-tolerance assessment instrument with corresponding reliability and validity estimates. The concepts presented in this paper are offered with the hope of moving the financial service profession closer to the ultimate development and adoption of a standardized financial risk-tolerance assessment instrument.

DEFINITION OF FINANCIAL RISK TOLERANCE

The following definitions were used for the purposes of this study:

Investor Risk Tolerance In this research, investor risk tolerance (the dependent variable) referred to the maximum amount of investment risk someone was comfortable taking (Schaefer, 1978). Risk tolerance induces an order relation on risk evaluation. Schaefer described the relation this way: “two persons may very well agree on the riskiness of a set of gambles, but may nevertheless prefer different gambles, rank-ordering them differently according to their personal tolerance. This is not to say that people should agree on riskiness of options”.

In general, one can expect individuals with low risk tolerance to act differently with regard to risk than individuals with a high risk tolerance.
Someone with a high level of risk tolerance would be expected to “accept a higher exposure to risk in the sense of taking sole responsibility, acting with less information, and requiring less control than would” someone with a low level of risk tolerance (MacCrimmon & Wehrung, 1986).

Individuals with low levels of risk tolerance generally: (a) require lower chances of a loss, (b) choose not to operate in unfamiliar situations, (c) tolerate less uncertainty, and (d) require more information about the performance of an investment (MacCrimmon & Wehrung, 1985). In summary, high risk-tolerance individuals accept volatile events, while low risk-tolerance individuals require certainty.

Issues involving risk are often difficult to distinguish and misunderstood by those making vital decisions for firms and projects. Risk is not tangible or visible, therefore, managers’ risk perceptions in a particular project varies by risk characteristics and project’s internal and external environment.

Therefore, it is important to first define “risk” and “risk tolerance” as it relates to project management in a technology-driven organization. (March and Shapira, 1987) observe that according to classical decision theory, risk is generally understood to be the distribution of possible outcomes, their likelihood, and their subjective values. In project management, this definition can be applied to time, cost, performance, and many other influential factors in any project that impact these three concerns. However, project managers, firms, and stakeholders rarely share the very same view or opinion of what the possible outcomes are for a project, much less their likelihood.

(Kahneman and Tversky, 1979) and (Tversky and Kahneman 1992) suggest that the reference points that people use to evaluate risky prospects affect risk-taking. In this respect, risk tolerance is a subjective notion in the absence of clear and uniform communication and tools for risk analysis. Risk tolerance is still a developing area of research because of its human dynamics. (Pratt, 1964), Arrow (1965), and Ross (1981) possessed a far too simple conception of risk tolerance: to put it simply, individual decision-makers are risk averse. In fact, a person does not necessarily choose to be compensated for variability in outcomes. Many other circumstances shape attitudes toward risk, and thus risk tolerance is a complex topic demanding a more complex
definition. Taking big risks can be beneficial to a firm that is able to accept them because it enables opportunity.

For this reason, risk must be defined as including the probability of both good and bad outcomes. It is in this context that we analyze risk tolerance correctly and understand some managers’ inclination for risk-taking.

(Wilemon and Cicero, 1970) point to two categories of “risk” which pertains to project managers and concerns them most. These are project risk and professional risk. Project risk applies to the uncertainties for a project manager in achieving a project’s goals in terms of time, cost, and performance.

These risks are the main subject of risk management as they apply to project management. Professional risk deals with a project manager’s uncertainties with respect to future job advancement and reward. This type of risk receives less attention, but it can potentially drive a project manager’s decisions and cause those decisions not to be in line with defined risk tolerance levels.

The following demographic definitions are provided in order to clarify why these characteristics continue to be considered by many investment managers and some researchers to be effective in differentiating among levels of investor risk tolerance, and why they were used as components within the background analysis stage in the empirical model.

DETERMINING RISK AND THE RISK PYRAMID

You might be familiar with the risk-reward concept, which states that the higher the risk of a particular investment, the higher the possible return. But, many investors do not understand how to determine the level of risk their individual portfolios should bear. This article provides a general framework that any investor can use to assess his or her personal level of risk and how this level relates to different investments.

RISK-REWARD CONCEPT

This is a general concept underlying anything by which a return can be expected. Anytime you invest money into something there is a risk, whether large or small, that you might not get your money back.

In turn, you expect a return, which compensates you for bearing this risk. In theory the higher the risk, the more you should receive for holding the investment and the
lower the risk, the less you should receive. For investment securities, we can create a chart with the different types of securities and their associated risk/reward profile.

![Risk Profile Chart](http://www.investopedia.com/articles/basics/03/050203.asp)

Although this chart is by no means scientific, it provides a guideline that investors can use when picking different investments. Located on the upper portion of this chart are investments that offer investors a higher potential for above-average returns, but this potential comes with a higher risk of below-average returns. On the lower portion are much safer investments, but these investments having a lower potential for high returns.

**DETERMINING YOUR RISK PREFERENCE**

With so many different types of investments to choose from, how does an investor determine how much risk he or she can handle? Every individual is different, and it's hard to create a steadfast model applicable to everyone, but here are two important things you should consider when deciding how much risk to take:

**TIME HORIZON**

Before you make any investment, you should always determine the amount of time you have to keep your money invested. If you have \$20,000 to invest today but need it in one year for a down payment on a new house, investing the money in higher-risk stocks is not the best strategy. The riskier an investment is, the greater its volatility or price fluctuations, so if your time horizon is relatively short, and you may be forced to sell your securities at a significant a loss.

With a longer time horizon, investors have more time to recoup any possible losses and are therefore theoretically more tolerant of higher risks. For example, if that \$20,000 is meant for a lakeside cottage that you are planning to buy in ten years, you
can invest the money into higher-risk stocks because there is be more time available to recover any losses and less likelihood of being forced to sell out of the position too early.

**BANKROLL**

Determining the amount of money you can stand to lose is another important factor of figuring out your risk tolerance. This might not be the most optimistic method of investing; however, it is the most realistic. By investing only money that you can afford to lose or afford to have tied up for some period of time, you won't be pressured to sell off any investments because of panic or liquidity issues.

The more money you have, the more risk you are able to take and vice versa. Compare, for instance, a person who has a net worth of $50,000 to another person who has a net worth of $5,000,000. If both invest $25,000 of their net worth into securities, the person with the lower net worth will be more affected by a decline than the person with the higher net worth. Furthermore, if the investors face a liquidity issue and require cash immediately, the first investor will have to sell off the investment while the second investor can use his or her other funds.

**INVESTMENT RISK PYRAMID**

After deciding on how much risk is acceptable in your portfolio by acknowledging your time horizon and bankroll, you can use the risk pyramid approach for balancing your assets.

(Source: http://www.investopedia.com/articles/basics/03/050203.asp)
This pyramid can be thought of as an asset allocation tool those investors can use to diversify their portfolio investments according to the risk profile of each security. The pyramid, representing the investor's portfolio, has three distinct tiers:

**BASE OF THE PYRAMID**

The foundation of the pyramid represents the strongest portion, which supports everything above it. This area should be comprised of investments that are low in risk and have foreseeable returns. It is the largest area and composes the bulk of your assets.

**MIDDLE PORTION**

This area should be made up of medium-risk investments that offer a stable return while still allowing for capital appreciation. Although more risky than the assets creating the base, these investments should still be relatively safe.

**SUMMIT**

Reserved specifically for high-risk investments, this is the smallest area of the pyramid (portfolio) and should be made up of money you can lose without any serious repercussions. Furthermore, money in the summit should be fairly disposable so that you don't have to sell prematurely in instances where there are capital losses.

**PERSONALIZING THE PYRAMID**

Not all investors are created equally. While others prefer less risk, some investors prefer even more risk than others who have a larger net worth. This diversity leads to the beauty of the investment pyramid. Those who want more risk in their portfolios can increase the size of the summit by decreasing the other two sections, and those wanting less risk can increase the size of the base. The pyramid representing your portfolio should be customized to your risk preference.

It is important for investors to understand the idea of risk and how it applies to them. Making informed investment decisions entails not only researching individual securities but also understanding your own finances and risk profile. To get an estimate of the securities suitable for certain levels of risk tolerance and to maximize returns, investors should have an idea of how much time and money they have to invest and the returns they are looking for. (www.investopedia.com)
HEURISTIC ESTIMATES OF RISK TOLERANCE

Heuristic, ("find" or "discover") refers to experience-based techniques for problem solving, learning, and discovery. Heuristic methods are used to speed up the process of finding a satisfactory solution, where an exhaustive search is impractical.

Examples of this method include using a "rule of thumb", an educated guess, an intuitive judgment, or common sense. In more precise terms, heuristics are strategies using readily accessible, though loosely applicable, information to control problem solving in human beings and machines. (Pearl, Judea, 1983).

Heuristic Judgment is the technique that uses demographics, socio-economic and sometimes even attitudinal factors to predict the investor’s financial risk tolerance. Obviously, using this technique requires a proof of an acceptable correlation between these variables and financial risk tolerance. That is why some research has been specifically designed to address this issue.

These studies, which have specifically investigated the relationship between financial risk tolerance and socio-economic, demographic or psychological variables, had mainly used regression models. In most of them the dependent variable is the total score of a subjective assessment instrument (Faff et al). In some others, the dependent variable is an objective measure of financial risk tolerance, such as the ratio of risky assets to total wealth, (Schooley, Worden, 1996).

Other findings of the correlation between demographics, socio-economic and attitudinal factors and financial risk tolerance are the by-products of research with different purposes. Here we mention some of these variables and their corresponding literature.

GENDER

Gender (i.e., male or female) was considered an important investor risk-tolerance classification factor because more men than women tend to fit the personality trait called “thrill seeker” or “sensation seeker” (Roszkowski et al., 1993).

There also is a “prevalent belief in our culture that men should, and do, take greater risks than women” (Slovic, 1966, p. 169), which has generated a consensus among investment managers that gender is an effective differentiating and classifying factor.
AGE

Investment managers use this input as a measure of the time remaining until a client’s financial assets are needed to meet goals and objectives. In addition to being used as a proxy for time, investment managers also use age as a measure of someone’s ability to recoup financial losses.

It is widely assumed that older individuals have less time to recover losses than do younger individuals, and as such, older individuals will have lower risk tolerances.

MARITAL STATUS

Investment managers consider marital status (i.e., married, never married, divorced, separated, and widowed) an effective factor in distinguishing among levels of investor risk tolerance for two reasons. First, it is assumed that single individuals have less to lose by accepting greater risk compared to married individuals who often have responsibilities for themselves and dependents.

Second, it is assumed that married individuals are more susceptible to social risk, which is defined as the potential loss of esteem in the eyes of colleagues and peers, if an investment choice leads to increased risk of loss (Roszkowski et al., 1993).

OCCUPATION

As defined in this research, occupation refers to the principal activity in which someone engages for pay. Examples include the following: manual labor, physician, manager, educator, and administrative personnel.

Some investment managers have concluded that higher ranking occupational status (e.g., business executive, attorney, and so on.) can be used as a classification factor related to higher levels of investor risk tolerance (Roszkowski et al., 1993).

SELF-EMPLOYMENT

Respondents were defined as being self-employed if their incomes came directly from their own business, trade, or profession rather than through salaries or wages from an employer. Investment managers have assumed that self-employment status automatically leads to higher levels of risk taking, and that, other things being equal, self-employed individuals will typically choose riskier investments and accept increased investment volatility as compared to people who work for others on a straight salary (MacCrimmon & Wehrung, 1986).
INCOME

According to (MacCrimmon and Wehrung, 1986), upper income persons (i.e., individuals with incomes greater than $70,000 per year from all sources and before taxes) and millionaires (i.e., individuals who derive a portion of their income from assets valued at more than $1 million) tend to take greater risks than individuals with lower incomes.

Investment managers have concluded that increasing income levels are associated with access to more immediate resources (O’Neill, 1996), leading some to conclude that increased levels of income lead to increased levels of risk tolerance.

RACE

According to researchers such as Zhong and Xiao (1995) and Sung and Hanna (1996a), different cultural values, preferences, and tastes may affect the risk tolerance of Whites and non-Whites. There is general consensus among personal finance researchers that Whites have higher investor risk tolerances than non-Whites.

Reasons for this include: (a) non-Whites may not have the same exposure to banks and other financial institutions as Whites, (b) minority groups may be exposed to non-traditional investment opportunities, (c) many non-White cultures tend to be oriented towards the past or present rather than oriented towards future returns (Zhong & Xiao), and (d) Whites, in general, may possess greater confidence in their analytical and decision making skills (MacCrimmon & Wehrung, 1986).

EDUCATION

It is argued by some that increased levels of education (i.e., formal attained academic training) allows someone to assess risk and benefits more carefully than someone with less education. Higher education has been found to encourage risk taking (MacCrimmon & Wehrung, 1986), and as such, investment managers assume that increased levels of education are associated with increased levels of risk tolerance.

HISTORICAL CONTEXT

The study of investor risk tolerance is not new. Individual risk tolerance has been of interest to investors and academics for hundreds of years. According to (Bernstein 1996), the modern conception of risk “is rooted in the Hindu-Arabic numbering system that reached the West seven to eight hundred years ago”. (Bernstein 1996) stated that the “serious study of risk began during the Renaissance, when people broke loose from the
constraints of the past and subjected long held beliefs to open challenge”. The first serious attempt to measure objective risk arose when Chevalier de Mere, using a question developed by Luca Paccioli (the person who developed double-entry bookkeeping), challenged Blaise Pascal to solve the following puzzle: how does one divide the stakes of an unfinished game of chance between two players when one of them is ahead.

Collaborating with Pierre de Fermat, Pascal was able to solve the problem, and in turn, discover the basic laws of probability, or what Bernstein called the mathematical heart of the concept of risk.

The use of probabilities was primarily the domain of gamblers until the early 1700s. By 1725 the English government was using probabilities to determine life expectancies, and private entrepreneurs were using probability techniques to place marine insurance. By 1730 Abraham de Maoivre had discovered the concept of standard deviation and the bell curve.

Even more important to the subject of risk tolerances was the conceptualization of marginal utility and loss aversion by Daniel Bernoulli in 1738 (Bernstein, 1996). Bernoulli found that the satisfaction resulting from a small increase in wealth was inversely proportionate to the quantity of goods already possessed. Bernoulli concluded that as individuals increased their wealth, they required greater guaranteed returns in order to risk more wealth, and in general, people tended to prefer less risk to more. As Bernstein stated, “Bernoulli’s statement stood as the dominant paradigm of rational behavior for the next 250 years and laid the groundwork for modern principles of investment management”.

Risk tolerance research did not re-emerge as a subject of importance until the 1900s, and as pointed out, most research attempts to understand investor risk tolerance have occurred recently. Only a handful of research endeavors to understand risk-taking propensities were conducted prior to the 1950s. Two notable studies prior to the 1950s were undertaken by (Keynes 1921) and (Knight 1921). Up until this time economists accepted Bernoulli’s logic basis of risk-taking propensity without question. Little additional research was conducted between the Great Depression and the end of World War II, with the notable exception of (Keynes 1937) publication of *The General Theory*. 
The lack of risk-tolerance research was primarily due to the fact that economists were preoccupied with social and political problems, and not interested in advancing research of interest to investors, because it was commonly assumed that the Great Depression was a result of excesses in the investment markets.

It was not until the late 1940s, near the end of World War II, that economists turned their attention to exploring Bernoulli’s original logic based explanation of risk-taking propensities.

(Friedman and Savage 1948) were the first to challenge the standard utility function assumption by showing that most people do not have a constant risk tolerance throughout the entire domain of wealth. Friedman and Savage postulated a utility function with both risk taking and risk avoiding segments.

Concurrently, the study of risk-taking propensities also was taking place outside the realm of economics. The earliest work on the recognition of risk was concentrated in the area of consumer behavior (MacCrimmon and Wehrung, 1984).

Researchers in the fields of finance (e.g., Cohn, Lewellen, Lease, & Schlarbaum, 1975; Markowitz, 1959; Siegel & Hoban, 1982), business (e.g., Fitzpatrick, 1983), natural hazards (e.g., Kunreuther, 1979), and natural situations (e.g., Newman, 1972; Slovic, Fischhoff, & Lichtenstein, 1978) also have given attention to measuring risky situations and surveying perceived individual risks.

During the late 1950s and early 1960s, a major advancement in the study of choice in risky situations was advanced by (Wallach and Kogan 1959; 1961). These researchers developed the widely used Choice Dilemmas Questionnaire to measure risk tolerance in everyday life situations. The original questionnaire required that subjects advise other individuals regarding 12 choices with two outcomes: a sure gain or a sure loss. An example of these questions included the following: “Mr. A, an electrical engineer, has the choice of sticking with his present job at a modest, though adequate, salary or of moving on to another job offering more money but no long term security. Please advise Mr. A by deciding what probability of success would be sufficient to warrant choosing the risky alternative” (Wallach & Kogan, 1959). These types of choice dilemmas were commonly used to measure risk-taking propensities until the mid-1970s. Behavioral economists and psychologists supported the use of choice dilemmas, while
economists advocated the use of utility functions. After the mid-1970s both approaches came under increased attack for lack of validity and reliability due to the one dimensional nature of these types of risk assessments.

The lack of consistency between and among distinctive choice dilemma questionnaires administered by different researchers was revealed as far back as 1962 by Slovic who concluded that choice dilemma measures lacked sufficient validity and reliability to be of much predictive use.

Slovic came to this conclusion after examining all forms of the choice dilemma instrument, including dot estimation tests, word meanings tests for category width, life experiences inventories, multiple choice exams, recreational activity measures, job preference inventories, gambling assessments, and peer ratings.

(Kogan and Wallach, 1964), the creators of the Choice Dilemmas Questionnaire, also found no evidence of general risk propensity across situations.

Later researchers concluded that these findings were partially attributable to the one dimensional type questions used in the instruments which required respondents to state how risk averse or tolerant they perceived themselves to be. (MacCrimmon and Wehrung, 1986) concluded that one dimensional questions (e.g., “how risk tolerant are you?”) measure only a small part of the multidimensional nature of risk, and that most people overestimate their risk preferences when answering these type of questions. MacCrimmon and Wehrung also concluded that “there is no particular reason to believe that a person who takes risks in one area of life is necessarily willing to take risks in all areas”.

During the time choice dilemmas were being used extensively, the use of utility functions continued as a favorite method for measuring individual risk tolerances; however, more recent studies conducted by (Kahneman and Tversky, 1979) and others shed doubt on economists’ claims that risk-taking propensities and preferences could be represented and understood within a utility function environment. “The magnitudes of potential loss and gain amounts, their chances of occurrence, and the exposure to potential loss contribute to the degree of threat (versus opportunity) in a risky situation” found that people were consistently more willing to take risks when certain losses were
anticipated than when certain gains were anticipated. “As the chance, size, or exposure to potential losses (including opportunity costs) increases, the degree of threat increases. Increases in the magnitude, chance, or exposure to potential gains increase the ‘opportunity’ aspect” (MacCrimmon & Wehrung, 1986, p. 182). Additional research since the mid-1970s has substantiated the hypothesis that individuals, in general, exhibit risk-taking preferences for losses and risk avoidance preferences for gains (Statman, 1995; Tversky & Kahneman, 1981).

These results suggest that reliability problems might be associated with risk-tolerance utility functions, because utility functions tend not to be generalizable when choices are framed both positively and negatively with identical payoff structures.

In summary, the use of choice dilemmas and utility functions, as procedures to measure investor risk tolerance may be inadequate and inappropriate.

It has been recommended that, instead of relying on choice dilemmas and utility function, investment managers and researchers should attempt to measure investor risk tolerance in a direct, multidimensional, manner (MacCrimmon & Wehrung, 1986; Okun, 1976; Okun, Stock, & Ceuvorst, 1980; Slovic, 1962; Statman, 1995).

DEMOGRAPHICS RELATED TO RISK TOLERANCE

The empirical study of investor risk tolerance in relation to demographics is limited. Further, according to (MacCrimmon and Wehrung, 1986), “much of the past research on risk has focused on how people perceive risks as well as rules for choice in risky situations. Little of this work has been concerned with the people who must make risky decisions”. Additionally, much of the previous research has tended to use unrealistic settings and events far removed from actual risks faced by investors. Another criticism of previous research (especially experimental studies) is that students, rather than individuals more likely to face actual investment risks, have been used as subjects (Okun, 1976; Okun et al., 1980). (MacCrimmon and Wehrung, 1986) provided the seminal literature and research review concerning risk-tolerance studies from the period 1928 through the early 1980s.

They found that empirical findings relating to risk tolerance and age, nationality, number of dependents, gender, race, wealth, income, and occupation were contradictory over the four decade span of review. Again, contradictory findings were found to be the
result of researchers failing to take into account the multidimensionality of risk and the subjectivity of risk tolerances. Additionally, validity and reliability problems associated with studies using utility theory as a theoretical basis, as explored by Prospect Theory researchers (e.g., Tversky & Kahneman, 1981), placed serious doubts on the veracity of research findings, conclusions, and implications of work done prior to 1974. The remainder of this literature review examines research associated with the demographics as outlined in the introduction.

Previous research findings are presented in the following order: (a) those research endeavors that found a relationship between demographics and risk tolerance, (b) those that did not find a relationship, and (c) those research studies with inconclusive findings. A brief description of each study’s objective and methodology is provided at the first primary point of reference and omitted thereafter in order to reduce redundancy.

**GENDER DIFFERENCES AND FINANCIAL RISK TOLERANCE**

A number of studies have looked at gender differences in business decision-making and risk. However, there is no consensus on the size of gender differences or the fact that there are any differences at all. The general psychology literature dated before 1980 contains many primary and meta-analytical studies of gender differences in social, sexual and motor behavior, attitudes, cognitive ability, decision making, and personality traits (see Eagly, 1995 for an extensive review). The literature suggests that women are more cautious, less confident, less aggressive, easier to persuade, and have inferior leadership and problem solving abilities when making decisions concerning risk compared to men.

(Johnson and Powell, 1994) argue that these research findings were instrumental in establishing a dominant view that substantial gender trait differences exist in nature, and in the outcomes of management decision involving risk. However, a re-examination of these studies and the more recent evidence on gender differences suggest that there are no significant differences in management decision making values or styles (Chaganti, 1986; Powell, 1990), and that there are more similarities than differences in personality of male and female entrepreneurs (Birley, 1989; Sexton and Bowman-Upton, 1990). Males and females are found to be equally capable of performing in terms of achieving desired outcomes from decision making under risk (Hudgens and Fatkin, 1985;
Hollander, 1992). However, the one gender difference that is persistently found in both the general and business specific literature is a lower preference for risk amongst females. Examples of such findings in business specific literature include (Grable 2000; Masters 1989; Sung and Hanna, 1996; Bajtelsmit and Bernasek, 1996).

Further, Johnson and Powell (1994) examined betting behaviour in the general population and an investment decision amongst a sample of management students. They found a lower preference for risk amongst women, but only in the general population.

(Powell and Ansic, 1997) examined whether the gender differences in risk propensity and strategy in financial decision-making are due to context factors such as familiarity and framing, costs or ambiguity rather than a general trait. They derived their pool of subjects from a business school to ensure that any gender differences found were not associated with non-specialist populations.

They concluded that females are less risk seeking irrespective of contextual factors, and that females adopt different strategies in financial decision environments compared to males, but that these strategies have no significant impact on their ability to perform.

**AGE, FINANCIAL SITUATION, MARITAL STATUS, LEVEL OF EDUCATION AND FINANCIAL RISK TOLERANCE**

Risk studies on age differences indicate that older people are more risk adverse and are less likely to engage in risky behaviours or make risky decisions (Brown 1990; Bakshi and Chen 1994; Grable 2000). Practitioners and researchers have long believed that age was negatively related to risk tolerance (e.g. Palsson 1996; Brown 1990; Morin and Suarez 1983; Wallach and Kogan 1961), however recent studies suggest that this assumption is not necessarily true conducted a regression analysis of a number of demographic and socio-economic factors to test the strengths of these factors in predicting financial risk tolerance. Age was not a significant predictor of financial risk tolerance when all other factors were held constant. They found that education, financial knowledge, income, home ownership, the number of dependants; financial solvency and ethical background were significant predictor variables of financial risk tolerance. The most significant effects were education level, financial knowledge and income, all of which have positive relationships with financial risk tolerance.
It was also interesting to note that (Grable and Joo, 1999) found gender and marital status are not significant in predicting financial risk tolerance. This is inconsistent with studies that associate high risk tolerance with males (Sung and Hanna 1996); and being single (Baker and Haslem 1974).

Nevertheless, the results suggest that the importance of demographic and socio-economic characteristics previously thought as important predictors of financial risk tolerance may diminish when all other factors are accounted for.

(Grable and Joo 1999, 2000) asserted that in order to differentiate among levels of risk tolerance more effectively, a rigorous and systematic investigation of demographic, socio-economic, attitudinal and psychological factors should take place.

There are also other researchers that have associated income and assets as predictors of financial risk tolerance (Cicchetti and Dubin, 1994). It was found those individuals with higher incomes and net assets tend to have greater financial risk tolerances. The strength of these factors and how they influence financial risk tolerance has yet to be investigated.

**GENDER AND RISK TOLERANCE**

According to (Slovic, 1966), a “prevalent belief in our culture is that men should, and do, take greater risks than women”. This assumption has been confirmed by other researchers (Higbee & Lafferty, 1972). (Blume, 1978), when reporting the results of a unique national study of New York Stock Exchange (NYSE) investors that employed a combination of descriptive and multivariate statistics, indicated that men who own and invest in equities avoided risk less than women with similar characteristics. This finding was affirmed by (Coet and McDermott, 1979) who studied the effects of gender, type of instruction, and group composition on general risk-taking behavior using an experimental method with 200 college students, and by (Rubin and Paul, 1979) who designed an experimental study to examine systematic risk taking by gender over the life cycle as part of a larger model of risk-tolerance behavior. Rubin and Paul found that males consistently demonstrated greater risk-taking behaviors than did females.

The assumption that men generally prefer more risk than women when investing continues to receive credence in publications like *Money*. For example, (Belsky,
Kobliner, & Walmac, 1993) concluded that men and women differ about money and related risk tolerances.

Although not grounded in original empirical research, the Money article was based on research findings from sociology, psychology, and other social science studies. During the 1990s researchers continued to conclude that men were more willing to take financial risks than were women.

(Hawley and Fujii, 1993-1994), (Sung and Hanna, 1996b), and (Xiao and Noring, 1994) each used a version of the Survey of Consumer Finances (SCF) to obtain data for regression type analyses (e.g., Ordinary Least Squares, logit, probit, and to bit), where willingness to take financial risks was defined as the dependent variable, and gender (among a number of other variables) was operationalized as an independent variable.

These researchers concluded that men were more willing than women to take financial risks. (Bajtelsmit and Bernasek,1996), in reporting findings from a survey of literature, concluded that women invest their pensions more conservatively than men, and that, in general, women are less risk tolerant than men. (Lytton and Grable,1997) analyzed gender differences in financial attitudes from a random sample of 592 tax payers from a mid-Atlantic state; they found that males expressed more confidence in their financial situation(s) and higher risk-taking propensities in relation to financial management strategies than women.

As indicated above, there is evidence to suggest that a relationship exists between gender and investor risk tolerance, with men tending to take more risks than women. Furthermore, it is commonly accepted that gender can be used effectively to classify individuals into investor risk tolerance categories; however, researchers have not reached consensus on this point. There are, however, a number of empirical studies which indicate that there are no differences between men and women in relation to risk tolerances.

(Blum, 1976) used a random sample of 90 male and 91 female professionals and business people, clerical workers, semi-skilled to skilled personnel, housewives, and retired individuals from the New York City area to explore gender differences in risk taking.
Blum asked respondents to assume that they had received a sum of money equal to one year’s income, with the stipulation that the money must be invested rather than spent, and that they must choose one of four investments. Fourteen judges were used to rank the four investments in terms of riskiness.

Based on the judges’ estimates, Blum analyzed means and standard deviations of responses. He concluded that the difference between men and women was not statistically significant.

(McInish, 1982), who conducted a random sample survey of 3,000 investors, arrived at similar conclusion. McInish measured specific personality characteristics and locus of control in relation to portfolio risk as measured by beta. Using a form of multiple regressions, he found that gender was not a significant factor in explaining risk tolerances.

Using t-tests, ANOVA, and regression analysis to analyze data from a random sample of 480 investors, (Masters, 1989) also found no difference in investor risk tolerances by gender. (Schooley and Worden, 1996) and (Haliassos and Bertaut, 1995), using data from the 1989 and 1983 SCF respectively (each employing a form of regression analysis), concluded that gender did not appear to influence stockholding. Furthermore, (Fitzsimmons and Wakita, 1993) found no difference in male and female family financial managers’ expectations of future financial condition using survey data from a random sample of 2,510 household financial managers drawn from rural counties in eight states.

Most recently, (Palsson, 1996) employed a logit regression to determine if risk tolerance varied with household characteristics. She used Swedish cross-sectional data based on 1985 tax returns from more than 7,000 households to conclude that risk tolerance did not systematically change according to gender.

Schooley and Worden offered evidence indicating that a relationship between gender and risk tolerance may be nothing more than myth. Not all studies have been as conclusive as those just mentioned. (Baker and Haslem, 1974), using data gathered by means of a mail questionnaire of 851 active customers of five brokerage firms in the Washington, D.C. area, found conflicting gender based results.
They concluded that gender plays a significant role in determining an investor’s desire for dividend yield and price stability (with women preferring these attributes), but no relationship between gender and expected price appreciation. (Bonoma and Schlenker, 1978) obtained equally perplexing results from their study.

Bonoma and Schlenker constructed a series of experiments where 30 male and 35 female psychology students were instructed on the use of simple subjective probability and utility scales.

The students were asked to actively role-play a decision maker in seven general risky situations.

Bonoma and Schlenker found that both men and women acted in similar manners when faced with risky choices. Their findings indicated that risk tolerance is not only multidimensional, but may be sub-dimensional as well. Specifically, when investigating investor risk tolerances it was determined that investigators should provide respondents with a multitude of investment situations which require risk-taking choices.

Unfortunately, most prior research has failed to do this (Okun, 1976), and the record has not improved in the 20 years since Okun conducted his research. Thus, while it is commonly accepted that males are more risk tolerant than females, this conclusion is not a consensus view held by researchers.

AGE AND RISK TOLERANCE

Wallach and (Kogan, 1961) are generally considered to be the first researchers to study the relationship between risk tolerance and age. Their early experimental research used choice dilemmas which indicated that older individuals were less risk tolerant than younger individuals. This finding was responsible for creating an increased research interest on this topic which leads to a multitude of other research projects.

In 1966 Botwinick investigated cautiousness in relation to age, sex, and education in the context of 24 “life situations” (including several ‘investing’ type questions) using (Wallach and Kogan’, 1961) experimental choice-dilemma test as a basis of investigation. Based on experiments with 90 volunteer older adults and 111 young adults enrolled in psychology courses at Duke University, he found that older subjects were more cautious in their decisions than younger adult subjects.
Wallach and Kogan’s choice dilemma test has been the subject of numerous other investigations. For example, (Vroom and Pahl, 1971) administered a choice dilemmas test to 1,484 managers from over 200 companies, and concluded that older subjects showed a significant negative relationship to risk taking and the value placed upon risk.

During the early 1970s researchers turned their attention from testing the relationship between age and risk tolerance away from choice dilemmas to survey methods, other experimental designs, and objective measures (i.e., deducing risk tolerance from assets owned by individuals).

(Bossons, 1973) used estimates based on data collected in the 1963 SCF to conclude that younger individuals were more risk tolerant than older persons.

In 1974, Lease, Lewellen, and Schlarbaum used results from a survey of brokerage firm clientele (N = 1,000) and also concluded that age was inversely related to risk tolerance.

(Okun and DiVesta, 1976) obtained similar results from an experiment utilizing 48 younger and older males who were asked to participate in a vocabulary task involving varying degrees of risk under neutral, supportive, and challenging instructions.

During this time other researchers, using both survey sampling methods and experimental designs, observed that older adults were more cautious than younger adults (Baker & Haslem, 1974).

The use of more sophisticated statistical methods and a renewed research interest in lifecycle analysis marked a changing point in age/risk-tolerance research in the 1980s. (McInish, 1982), using data from a random sample of 3,000 investors, found (using regression analysis) significant negative age coefficients in his analysis of personality characteristics and risk tolerances.

(Morin and Suarez, 1983), using data from the 1970 SCF for Canada, attempted to add empirical evidence to the effect of wealth on risk aversion through the life cycle by concluding that risk tolerance decreases uniformly with age. Risk-tolerance researchers continued to explore age relationships using survey methods, life-cycle effects, and objective measures in the 1990s.

Researchers such as (Brown, 1990), using economic theoretical modeling with macroeconomic data such as Treasury Bill rates, stock and bond market variances, and
state contingent values, found that portfolio composition tended to be age dependent. (Dahlback, 1991), using cross sectional data from a survey of 443 unmarried Swedish citizens between 22 and 64 years of age, employed bivariate correlation analysis to determine that older individuals were more likely to avoid risk than younger persons.

Similar results were obtained by (Hawley and Fujji, 1993-1994) and (Bakshi and Chen, 1994). Bakshi and Chen used a Euler equation utilizing historical time-series data (e.g., stock market prices, price deflators, and so on.) from the period 1926-1990 to conclude that a rise in average age was found to predict a rise in investment risk premiums, while (Sung and Hanna, 1996a).

Using data from both the 1983 and 1986 SCF to conduct an ordered probit analysis using willingness to take financial risks as the dependent variable, concluded that older individuals were less risk tolerant than younger persons. More recently (Palsson, 1996), using survey data from 7,000 Swedish households, also concluded that decreasing risk tolerance was correlated with increasing age.

The reporting and acceptance of these findings has become so widespread that there is now substantial consensus among financial advisors that as one ages, the cash portion (i.e., a risk-free asset) of one’s portfolio should be increased (Reichenstein, 1996). The trade press has even advocated using age based formulas to create simple investment management strategies to account for the perceived negative relationship between age and risk tolerance

(Reichenstein, 1996). According to (Botwinick, 1984), “there is a persistent belief that increasing age makes for increasing cautiousness or conservatism. There are researches data in support of this belief, but there are also data indicating otherwise”.

(Okun, 1976) concluded that “adult age differences were observed only in the case when adults were permitted to refrain from responding to situations depicted”. (Blum, 1976) suggested that “variables other than age are more significantly related to a desire for security in decisions concerning investment preferences”.

For example, based on results from an experiment with 18 younger and 18 older adults using a vocabulary task which involved degrees of risk with a payoff structure that varied either directly or inversely with risk, (Okun and Elias, 1977) concluded that risk taking was a function of payoff structure, not age. Recent studies have shed doubts on the
validity of claims that age is effective in differentiating between levels of investor risk tolerance.

Using a combination of econometric modeling and data from the 1983 SCF, (Haliassos and Bertaut, 1995) suggested that individuals routinely depart from expected utility maximization, and that other factors, such as education and race account for risk tolerances more than age. (Gehrels, 1991), using German micro census data, also found no relationship between age and risk tolerance in his analysis of the life-cycle hypothesis.

(Lee and Hanna, 1991), in attempting to investigate the rate of stock ownership among U.S. households, using log-linear methods to analyze the 1983 SCF, concluded that age was not a significant variable in determining ownership of risky assets.

One of the most significant research studies to understand financial risk tolerance undertaken in recent years was conducted by the Boettner Institute under the leadership of Neal (Cutler 1995).

Cutler and his associates attempted to explore the concept that “risk-tolerance is a simple one-dimensional attitude” by testing data from a comprehensive mail survey (N = 801). Cutler concluded that there was no cause and effect linkage between age and comfort with financial risk. According to Cutler, “it is a myth to believe that age has an across-the-board effect on financial attitudes”. Research concerning the relationship between age and risk tolerance is not entirely conclusive.

(Riley and Chow, 1992), using an ordinary least squares regression model employing data obtained from 17,697 participants of the Survey of Income and Program Participation, found that relative risk aversion decreased as one aged until age 65, when risk aversion began to increase. Similar results have been obtained by other researchers employing a variety of methodologies.

(Feldstein and Washburn, 1980) used (Kogan and Wallach’s, 1964) choice dilemmas questionnaire twice, with an intervening group discussion with 192 volunteer subjects (88 males and 104 females), at 3 age levels.

Feldstein and Washburn found that overall, younger subjects preferred more risk than older subjects, but that all age levels shifted their risk tolerance following group discussions.
The results of a regression analysis using data from 587 observations of the fraction of total assets invested in risky assets, and the betas of portfolios held with an investment firm, led (Holland, 1991) to conclude that any differences in the degree of risk tolerance between younger households relative to older households was minimal.

(Hutchison and Clemens, 1980) used a modified version of the choice dilemmas questionnaire with a 152 participants who ranged in age from 60 to 84. Based on results from a three-factor analysis of variance, Hutchison and Clemens concluded that age effects found in previous studies of young subjects were not present in their study.

(Schoemaker, 1980) used 82 MBA students, who were taking an introductory quantitative methods course at the Wharton School, as subjects in a two-phase risk-tolerance experiment that focused on general probabilities and risk taking.

He found that expected utility theory did not predict better than chance, and that findings of age differences in relation to risk tolerances were inconclusive. Finally, (Weagley and Gannon, 1991) reported the results of a multi nominal log it model from a sample of 249 randomly selected Missouri households. They concluded that as individual's age they take on increasing levels of risk but at a decreasing rate to a point where they begin to reduce the risk in their portfolio. The relationship between age and investor risk tolerance was not linear.

Financial planners have begun to acknowledge this type of finding in practice. While there may be some differences between age groups, some investment managers do acknowledge that age/risk tolerance assumptions simply may not be correct (Gibson, 1997).

Recent research indicates that past conclusions on aging and cautiousness have been plagued by critical problems which lead to contradictory results. (Okun, 1976) outlined three problems associated with early research attempts: (a) prior to 1976 only one study included young, middle-aged, and older adults; (b) all investigators working in this area employed cross sectional analyses; and (c) most studies were not multidimensional in design, indicating a lack of theoretical grounding.

In general, adult age differences were observed only in those cases when adults were permitted to refrain from responding to situations presented to them; when
respondents were not allowed to refrain from responding, no adult age differences were found (Okun).

(Okun, Stock, and Ceuvorst, 1980) determined that much of the past research also was plagued by researchers drawing samples from extremes of the adult age range, relying on single criterion variables, and not reporting data bearing on the reliability and validity of their measures. Okun et al. concluded that “the currently popular notion that people become more cautious as they grow older” was inaccurate.

Although an inverse or negative causal relationship between age and investor risk tolerance has long been accepted, based on research analysis conducted by investigators like Okun et al. (1977), future research attempts must take into account past methodological problems that appear to diminish any causal effects.

Regardless of Okun et al.’s assertion, due to the number of investment managers using age as an investor risk tolerance differentiating and classifying factor, researchers should assume such an association exists when developing hypotheses (Sung & Hanna, 1996a).

MARITAL STATUS AND RISK TOLERANCE

According to (Baker and Haslem, 1974), “the balancing of risk and return represents the classic dilemma faced by investors”. It is widely assumed by investment managers that marital status is a factor that significantly influences risk and return preferences, and an individual’s satisfaction with finances (Lazzarone, 1996). In some circumstances researchers have found that non-married individuals prefer more investment risk than similar married individuals.

(Sung and Hanna, 1996a, 1996b) concluded that single females were less likely to take financial risks than single males and married individuals. (Lee and Hanna, 1991) found a positive relationship between stock ownership, wealth levels, and being a married couple. At a given level of wealth, single-headed households tended to have more stock ownership than married couple households. Lee and Hanna went on to state, “this result could be interpreted as being due to single-headed households having less risk aversion than married couple households”. Although widely accepted as true, very little evidence exists to substantiate the claim that “unmarried individuals are more prone to take risks than married individuals” (Roszkowski et al., 1993, p. 220).
Researchers have suggested that married individuals, not singles, possess greater risk-taking propensities, although others have failed to find any statistically significant relationship between marital status and risk tolerance (Haliassos & Bertaut, 1995; McInish, 1982). (Master, 1989), who administered Wallach and (Kogan’s, 1961) choice dilemmas questionnaire to 480 randomly sampled investors from a mid western investment firm, reported that singles appeared to be more conservative investors than married; however he was unable to offer an explanation to explain this finding. (Mugenda, Hira, and Fanslow, 1991) interviewed 123 randomly selected family financial managers from a mid western town.

They concluded, using path analysis, that marital status was positively related to satisfaction with quality of life and higher levels of wealth. (Hawley and Fujii, 1993-1994) concluded that among females, married women were the least risk averse, and that male heads of household (i.e., single) did not differ from married men in their risk tolerances.

Findings relating to marital status and risk tolerance tend to be conflicting. For example, (Lee and Hanna, 1995), in an apparent reversal of earlier findings based on an analysis of the 1983 SCF, suggested that single males and married respondents had significantly higher predicted probabilities of being willing to take risks than single females.

Similar confusing findings have been presented by (Baker and Haslem, 1974) who used a sample of 1,623 active investors, and (Xiao and Noring, 1994) who analyzed data from the 1986 SCF. Others, such as (Lazzarone, 1996) who analyzed data collected from 129 older subjects who were surveyed regarding satisfaction with finances, have concluded that marital status was not a significant classification factor for either married or singles. In general, conclusions from the literature make it difficult to confidently hypothesize about the expected relationship between marital status and risk tolerance; however, as pointed out above, it is still widely accepted among investment managers that single individuals are more risk tolerant when compared to married persons (Roszkowski et al., 1993).
According to (Roszkowski et al. 1993), other things being equal, different occupations can be used to differentiate between levels of investor risk tolerances. For example, it has long been believed that self-employed individuals, salespersons, and people employed by private firms rather than public employers tend to be more risk tolerant (both generally and in relation to investments) (Leonard, 1995). An early attempt to test occupational and employment status relationships on risk tolerances was undertaken by (Meyer, Walker, and Litwin, 1961).

Meyer et al. used a risk tolerance questionnaire similar to the choice dilemmas questionnaire in an experiment utilizing managers and entrepreneurs. They found that entrepreneurial types showed greater tolerance for intermediate level risks than comparable non-entrepreneurial subjects.

Similar findings were obtained by (Grey and Gordon, 1978), who followed the career paths of 700 persons in one large multinational company. Grey and Gordon related the number of promotions people received to scores on a risk-taking scale. They found that risk takers, when measured in a multidimensional manner, tended to be promoted more rapidly than those who scored lower in risk taking. This finding was similar to one obtained by (Hammond, Houston, and Melander, 1967) who regressed data from occupation scales in the 1953 and 1962 SCF to determine which factors influenced life insurance premium expenditures.

Hammond and his associates concluded that entrepreneurial types showed tolerances for greater risks. Based on an analysis of the responses to a series of investor risk-tolerance questions by 1,015 randomly chosen investors (author’s note: the original study was undertaken by the Wharton Survey Institute in 1974), (Blume, 1978) concluded that “professionals in particular and the self-employed had a lower propensity to minimize risks than did other investors and were at least as willing as the rest of the stockholding population to assume substantial risks. Corporate officials, on the other hand, were the least willing of all occupational groups to assume substantial risks”. (Quattlebaum, 1988) explained this phenomenon in terms of “symptoms of timidity”.

Quattlebaum concluded, based on an analysis of proprietary client data obtained from Brown Brothers Harriman, Inc. of New York City, that occupations such as non-
surgical physicians, non-surgical dentists, and not self-employed lawyers represented positions of timidity. Aggressive occupations included entrepreneurs, surgeons, independent CPAs, and independent lawyers. Based on Quattlebaum’s findings, it appears that individuals who take less risk typically choose occupations with relatively small economic and political risks (Barnewall, 1988). (Masters, 1989) also found patterns of risk tolerance tied to occupational choice.

Researchers found that nonprofessionals (clerical workers, farmers, unskilled and skilled laborers) tended to be more conservative in investment decisions than professionals (educators, doctors, lawyers, business owners, and managers) and retired persons. As Masters pointed out, “this does not mean that they [nonprofessionals] have any less money to invest but, as a group, they probably will invest differently”.

Similar results indicating the classification nature of occupational choice on risk tolerances also have been obtained by (Haliassos and Bertaut, 1995), (Lee and Hanna, 1995), and (Sung and Hanna, 1996a, 1996b) each of whom analyzed data from the SCF.

These researchers found that persons employed in occupations like farming, business ownership, and managerial positions were more willing to take risks (including financial and investment risks) than those in “low risk” occupations.

Since the early 1970s, only one research team reported conflicting results. (Baker and Haslem, 1974), using chi square analysis of independence on data obtained from a random sample of investors (N = 851), noted that occupation was not significantly related to risk and return variables. They admitted that their findings were inconsistent with the literature.

Based on the review of relevant occupational/risk-tolerance research, a relationship appears to exist indicating that certain occupations and employment classifications can be said to appeal to individuals with higher risk tolerances, while other occupations and employment classifications appeal to persons with lower overall risk tolerances.

Using (Masters, 1989) findings as a guide, nonprofessional occupations (e.g., clerical workers and unskilled/skilled laborers) tend to be associated with lower risk tolerances, while professional occupations (educators, doctors, lawyers, business owners, and managers) appear to be associated with greater risk tolerance.
INCOME AND RISK TOLERANCE

In 1976, Blume conducted a thorough examination of risk-taking behavior, using a combination of data obtained from a large random sample of investors (N = 1,015) and an exhaustive research review, and concluded that stockholders with annual gross incomes of $50,000 or more were willing to take more investment risks than those with lower incomes.

Over the years this pattern has been observed frequently, and increased levels of income have become a commonly accepted characteristic of high risk-tolerance persons. (Cohn et al, 1975) used a 100 item questionnaire to elicit responses from 972 randomly selected, geographically stratified, brokerage firm clients regarding investment decision processes, goals, asset holdings, and market beliefs.

Based on a combination of regression analysis, multiple discriminate analysis, and chi-square analysis, Cohn et al. concluded that relative investor risk tolerance increases with wealth and income.

Similar findings were reported by (Friedman, 1974) who used econometric modeling techniques to analyze aggregate U.S. employer provided insurance premiums and coverage ratio data. He concluded that higher salaried employees displayed a higher degree of risk tolerance. (Schooley and Worden, 1996) arrived at the same conclusion based on a multivariate regression analysis of multiple imputed data from the 1989 SCF. Most recently (Shaw, 1996), using regression techniques to analyze data from the 1983 SCF, concluded that wage growth was positively correlated with tolerances for risk taking. Based on a random sample of 25,009 observations of residential customer billings in the Mountain Bell Colorado service area, (Cicchetti and Dubin, 1994) also determined that risk tolerance varied systematically with levels of income.

Other researchers using similar methods, primarily analysis of data from the SCF, have arrived at comparable conclusions (e.g., Hawley & Fujii, 1993-1994; Lee & Hanna, 1991; Xiao & Noring, 1994; Riley & Chow, 1992).

The effect of income on risk tolerance is not conclusive however. In 1969, Samuelson used a Bernoulli type utility model to analyze the relationship between affluence and risk tolerance, and income and risk tolerance. He arrived at the conclusion that high salaries were not predictive of greater risk taking or tolerance. Samuelson also
added that he failed to find more affluence associated with higher risk tolerance. (Blume
and Friend, 1975) also concluded that risk tolerance remained relatively constant as
wealth and income increased.

Blume and Friend based their conclusion on a regression analysis of a random
sample of 17,056 individual federal income tax returns from the year 1971, and a similar
analysis of the 1962 SCF (see also Friend & Blume, 1975). (Schoemaker, 1980), using
experimental methods, also failed to find a relationship between income and risk
tolerance. Finally, (Palsson, 1996) used regression analysis to calculate the degree of risk
aversion among households in order to investigate the extent of risk that varied with
household characteristics. Based on an analysis of Swedish tax data, Palsson concluded
that risk tolerance did not systematically vary with changes in income.

The results of these studies, both pro and con, suggest that caution be used when
developing hypotheses concerning income as a differentiating and classifying factor in
determining levels of investor risk tolerance.

However, based on the empirical evidence offered, a hypothesis suggesting that
income is positively associated with investor risk tolerance seems appropriate.

RACE AND RISK TOLERANCE

There are few empirical studies concerning the relationship between race and
investor risk tolerance. (Lefcourt, 1965) was the first researcher to explore risk-taking
differences between Black and White adults. Using a risk-taking experiment using 30
Blacks and 30 Whites, Lefcourt concluded that Blacks choose fewer low probability bets,
made less shifts of bets, and generally took less risk than Whites.

Recently there has been a renewed focus on the relationship between risk-taking
propensities and race. (Haliassos and Bertaut, 1995), (Hawley and Fujii, 1993-1994),
(Lee and Hanna, 1995), and (Sung and Hanna, 1996a) each used the 1983 and 1986
Surveys of Consumer Finance to conduct logit and profit analyses of multistage area-
probability samples (N = 3,824).

Each of these research teams found that White respondents had a higher
probability of taking investment risks. (Zhong and Xiao, 1995) used the 1989 Survey of
Consumer Finances to conduct a tobit analysis that showed bonds and stocks were more
likely to be held by Whites than non-Whites, controlling for other factors.
Zhong and Xiao concluded that since most non-White cultures tend to focus on the past or present rather than the future, non-Whites may not be encouraged to invest in more risky investments which require a relatively long period in order to even out the volatility associated with stock and bond investments. These assertions were confirmed by (Sung and Hanna, 1996b) who conducted a logistic regression using the 1992 SCF. Only one study was found to indicate that non-Whites take more risks than Whites. (Leigh, 1986), using a combination of correlation techniques and econometric models, concluded that non-Whites were more likely to prefer more risk than Whites.

Investment managers and researchers generally accept the notion that there is a relationship between race and investor risk tolerance. Controlling for other factors, Whites are considered to have higher risk tolerances than non-Whites. This difference may be attributable to cultural values, preferences, and tastes.

According to (Zhong and Xiao, 1995) “further investigation will be helpful to enhance the understanding of the investment behavior between Whites and non-Whites”.

EDUCATION AND RISK TOLERANCE

Education, as used in investor risk-tolerance research, has been defined as the level of formal education completed by an individual (Masters, 1989). Numerous researchers have concluded that greater levels of attained education are associated with increased risk tolerance.

(Baker and Haslem, 1974), using data from 851 respondents to a risk-tolerance questionnaire that was randomly distributed to customers of five brokerage firms, determined that investors with less education found price stability more important than those with at least some college training. Baker and Haslem acknowledged that their findings conflicted with findings from other researchers that suggested that those with little education were desirous of quick profits from risky trading.

(Hammond et al, 1967) used a general regression model to consider life insurance premium expenditures by household. They found that education of the head of the household was significantly related to premium expenditures, and that those with lower levels of education tended to have lower risk tolerances.

(Masters, 1989) concluded that general education level was not always a factor influencing investment decisions, but that in general, investors with higher education
levels tended to invest in higher risk investments. Finally, (Shaw, 1996) used data from the 1983 SCF to estimate a wage growth equation. She determined that more educated individuals were more likely to be risk takers, and that risk taking explained a portion of the returns to education. (Haliassos and Bertaut, 1995) determined that education was an important factor in overcoming the barriers to stockholding, which included an initial risk of loss associated with equities.

They also found that those who have not attended college were significantly less likely to hold stocks than those with at least a college degree. (Zhong and Xiao, 1995), after conducting a to bit analysis using data from the 1989 SCF, reported that increased ownership of bonds and stocks (risky assets) increased with education.

(Lee and Hanna, 1995), who also used data from the SCF, concluded that the proportion of individuals willing to take risks increased significantly with education, while (Sung and Hanna, 1996a, 1996b), using data from the SCF, also determined that education was statistically significant in determining someone’s willingness to assume greater risk.

Although it is generally accepted by investment managers and researchers that increased educational levels are associated with increased levels of investor risk tolerance, there is research to suggest otherwise.

(Blume, 1978), using results from a large random national survey of NYSE investors, concluded that educated heads of households were somewhat less willing than others to take substantial risks, “but at the same time, they reported a less than average propensity for reducing financial risks to the barest minimum, preferring some intermediate trade-off between risk and expected return”. (McInish, 1982), as a result of a regression of betas against Rotter scores and demographic variables, found that educational levels showed a predicted positive relationship with risk tolerance, but that education coefficients were not significant in any of the regressions. The literature suggests that a positive relationship between attained education and increased investor risk tolerance is reasonable.

However, as with the implications derived from research concerning other demographics, this relationship is not definite and additional research is warranted.
WHY IS RISK TOLERANCE IMPORTANT?

According to (Jarrett, 2000), risk is not only a probability of success, but is also always a probability given a set of premises. The decision-makers risk tolerance must always be coupled with the established definition of risk.

Though risk tolerance is often a neglected topic of discussion in many firms, there are numerous reasons why top management, project managers, and stakeholders should all have a unified vision and firms grasp of it in connection with any project. Attention to risk tolerance leads to more efficient use of resources because the project team has a better understanding of how much of the project’s risk should be remedied. Managing risk can be an expensive scheme; therefore, it is important not only to prioritize risks and address the most crucial ones, but also to know how much to reduce them so that the risk is acceptable.

The project team should have a better understanding of how far down the list of prioritized risks should go. This will result in improved decision-making that leads to lower costs, better performance, and a shorter duration of the project.

Minimizing risk as much as a project’s budget is quite straightforward and is the approach many firms take. Conversely, recognizing when a higher level of risk is suitable and accepting that situation to reap the benefits of innovation is much more difficult. (Ahmed, 1998) argued that many companies only pay lip service to the idea of innovation and that a precious few possess a culture to promote smart risk-taking.

Great financial windfalls and industry dominance do not come without some measure of risk. When a firm’s strategy is to be first to market a new product, it is imperative risks be taken to ensure the product is not held up in development. In instances such as this, the project manager should have a detailed understanding of the firm’s tolerance level for the possible occurrence of every sizeable risk. Because defined risk tolerance levels are rarely communicated effectively throughout the firm’s, lower level employees and managers are rarely willing to try to innovate and engage in activities that depart from traditional business.
FINANCIAL RISK-TOLERANCE ASSESSMENT

The study of risk has been of interest to investors and academics for hundreds of years (Bernstein, 1996); however, most research attempts to understand financial risk tolerances are relatively recent.

Over the 75 years of study in the United States, the assessment of financial risk tolerance has tended to revolve around five methodologies: choice dilemmas, utility theory, objective measures, heuristic judgments, and subjective assessment. The following discussion briefly describes these methods.

Choice dilemmas were a popular method of risk assessment until the mid-1970s. Basically, choice dilemmas are scenarios where respondents are asked to make a risk choice for themselves or someone else regarding an everyday life event.

After years of use these tests were found to generate little evidence of general risk-taking propensity across situations because the items were one-dimensional (MacCrimmon and Wehrung 1986).

Summarized findings related to choice dilemmas by concluding that items that ask someone “how risk tolerant are you?” measure only a small part of the multidimensional nature of risk and that most people misstate their risk tolerance in these situations.

Utility theory continues to be a popular method of assessing financial risk tolerance; however, recent research challenges the standard utility function assumption by showing that most people do not have a constant risk aversion throughout the entire domain of wealth (Shefrin and Statman, 1993). It has been suggested that utility theory cannot adequately represent risk-taking preferences and tolerances because “the magnitudes of potential loss and gain amounts, their chances of occurrence, and the exposure to potential loss contribute to the degree of threat (versus opportunity) in a risky situation” (Kahneman and Tversky, 1979).

In other words, people tend to be consistently more willing to take risks when certain losses are anticipated, and are more willing to settle for a sure gain when absolute gains are anticipated (Statman, 1995).

The difficulty of measuring and assessing someone’s risk tolerance has prompted some researchers to recommend that “financial planners should focus on measurements
of objective risk tolerance” (Sung and Hanna, 1996). Objective measure analysis appears to offer great potential in the assessment of financial risk tolerance (Schooley and Worden, 1996); however, objective risk-tolerance measures that require researchers to deduce someone’s risk tolerance via their asset holdings may also pose serious validity problems. Objective measures assume that investors act in a rational way and that a person’s asset allocation is a result of personal choice rather than the advice of a third party. As a result, objective measures 1) tend to be descriptive rather than predictive, 2) do not account for the multidimensional nature of risk, and (c) often fail to explain actual investor behavior (Elvekrog, 1996; Train, 1995).

Financial services professionals commonly use heuristic judgments to assess and predict financial risk tolerance (Roszkowski et al., 1993). This method assumes strong correlation’s between demographic and socioeconomic characteristics and financial risk tolerance (Grable and Lytton, 1998).

For example, it is commonly assumed that older investors are inherently less risk tolerant than younger investors are based on this heuristic, older individuals are typically advised to invest less of their assets in equities and more in fixed income securities. Although often assumed to be based on empirically tested assumptions, heuristic judgments often fail to adequately explain or predict actual investor behavior.

In many cases heuristic judgments are little more than commonly accepted myths (Cutler, 1995). As Haliassos and Bertaut (1995) and Yoo (1994) concluded, “the current body of theoretical literature does not adequately describe the behavior of individuals” (Yoo, 1994, p.1), leaving many to conclude that past research gives limited insight into the relationship between demographic and socioeconomic characteristics and risk tolerance.

Research findings related to choice dilemmas, utility analysis, objective functions, and heuristic judgments have led some researchers and practitioners studying risk-tolerance theory to conclude that these methods are not entirely appropriate when attempting to assess a person’s financial risk tolerance (e.g., Grable and Lytton, 1998; MacCrimmon and Wehrung, 1986; Statman, 1995).

Instead, it has been argued that the best way to concisely and accurately identify a person’s financial risk tolerance is to use an assessment instrument designed specifically
to measure subjective risk tolerance using multidimensional financial scenarios and situations (MacCrimmon and Wehrung, 1986). However, as noted above, there are few, if any, widely accepted and commonly used measures or instruments designed to ascertain someone’s financial risk tolerance (Roszkowski, 1995).

Recommended the use of a questionnaire type instrument over other types of measures or experiments because a questionnaire does not subject a respondent’s tolerances to “subtle influences of the decision analyst during the assessment process” (MacCrimmon and Wehrung, 1986, p. 65).

Questionnaires also were recommended because they allow large numbers of subjects to participate in assessments, thus eliminating response biases that can arise when multiple analysts are used to assess tolerances on an interactive basis.

Additionally, instead of relying on a single item, MacCrimmon and Wehrung recommended that surveys and experiments include situation items where respondents are asked to make financial decisions concerning lotteries, stocks, bonds, mutual funds, real estate, options, commodities, and other types of investments.

**A REVIEW OF INSTRUMENT DEVELOPMENT ISSUES**

Roszkowski (1998) noted that assessing someone’s level of risk tolerance is a difficult process because risk tolerance is an elusive, ambiguous concept. Some researchers have suggested that risk taking is constant across situations, but evidence indicates that, for example, a person’s level of risk tolerance for physical activities is not a good gauge of risk taking in financial situations (Roszkowski, 1998; Rowland, 1996).

Because many people are unsophisticated about investments, it is essential that assessment instruments consider different classes of assets and situations. Without this consideration and the addition of multidimensional questions, research indicates that people will tend to overestimate their actual level of risk tolerance because of a desire to appear socially acceptable. A greater range of financial choices also permits researchers to make more specific distinctions among individuals.

When making risky financial choices, the literature suggests that people consider four distinct elements: 1) the probability of gains, 2) the probability of loss, 3) the dollar amount of potential gains, and 4) the potential dollar loss (MacCrimmon and Wehrung,
To assess risk tolerance accurately, Roszkowski et al. (1993) suggest that risk-tolerance assessments include items querying respondents’ tolerances for guaranteed versus probable gambles, minimum probability of success items that require a risky course of action, and items offering minimum returns that require respondents to undertake a risky course of action.

Others have suggested including financial assessment items that elicit a choice between a sure loss of a definite amount and the probable loss of a larger amount. Most people become risk seeking in “the sense that they are more willing to risk a large loss than to accept a small, but certain, loss” (Roszkowski, 1995).

It also has been recommended throughout the literature that multidimensional situations remain within the context of personal finance rather than including situations outside the realm of personal finance (Rowland, 1996).

(Roszkowski and Snelbecker, 1989) found “that to gauge risk-taking propensity, it is necessary to ask many different items and to integrate the answers. Diversifying the items used to assess risk tolerance is a sound procedure to follow” (Roszkowski and Snelbecker, 1989); however, it is important to keep in mind that a questionnaire need not be too long. Roszkowski and Bean (1990), based on the results of a comprehensive review of response biases found in the literature, concluded that questionnaire length is inversely related to response rate, and that shorter questionnaires are almost always better than longer ones.

FINANCIAL RISK TOLERANCE AS A STABLE TRAIT

Research that looks at the relationship between personality and financial risk taking is providing increasing evidence that financial risk tolerance resembles a psychological trait, as are intelligence, personality, aptitude, attitudes and values (Zuckerman, 1983). A trait can be defined as any distinguishable, relatively enduring way in which one person varies from another.

(Carducci and Wong, 1998) investigated the extent of which personality factors could determine financial risk taking in everyday money matters. It was found that Type A individuals took greater financial risks than Type B individuals, providing evidence that personality factors influence financial risk tolerance. However, it is still debatable on whether such robust psychological trait exists, for instance, is well known for his critique
of the trait theory in which he argued that the individual’s behavior is highly variable and relatively situation-specific. He and his colleagues concluded that individuals have stable behavioral tendencies that are contextualized in terms of particular types of psychological situations.

(Grable and Joo 1999) found that financial knowledge is a strong determinant of one’s financial risk tolerance. They hypothesized that financial risk tolerance may not be a fixed psychological trait, but somewhat elastic, and that financial education could change one’s attitudes and risk tolerance. However, the study was cross-sectional, an alternative explanation to their observations could be that those who are more financially risk tolerant are generally attracted to financial matters, and their interests in this area would have resulted in their high scores on the financial knowledge tests. In order to investigate the robustness of financial risk tolerance and the effects of financial knowledge, a study with repeated measures would be more appropriate.

THE FIVE MOST COMMONLY-USED INVESTMENT RISK TOLERANCE CATEGORIES

The life factor that has the most influence on the mix of asset classes someone should hold, and how risky they should be, is called their "investment risk tolerance." This is why one of the first things most all financial advisors do is pull out some kind of an investment questionnaire to gauge how someone feels about losing their money.

Investment risk tolerance is known by many different names, but it's all the same thing. Some of the other names are: Investor risk tolerance, risk temperament, risk profile, investment profile, investor profile, investment profiler, investor profiler, risk attitudes, and investing risk tolerance. Investment risk tolerance is used in most of the CFA readings, so we're sticking with that. Because none of this is an exact science, most investment managers work with three to seven risk categories. We use five because we feel there isn't enough and seven is too many.

These five categories are summaries of how the investor feels about investment risk, how much downside market fluctuations can be tolerated, and how much they expect to profit when markets are going up. The biggest reason for needing to classify someone into a pre-defined category is because most investment advisors use asset allocation models that correspond directly with each category. This is exactly what we do
with our portfolio models. Once one is put into a category, an investment adviser can easily invest their money appropriately by using the corresponding model portfolio.

Our financial tool used to gauge an investor's risk tolerance category is called the Investment Fact Finder. It has multiple-choice questions that then feed both into a manual scoring section (some clients like doing it on paper themselves) and there's also a spreadsheet that does this task semi-automatically. (http://toolsformoney.com).

THE FIVE INVESTMENT RISK CATEGORIES IN DETAIL

CONSERVATIVE

This investor isn't willing to tolerate "noticeable downside market fluctuations," and is willing to forego most all significant upside potential, relative to the markets, to achieve this goal. In English, they really don't want to get their monthly statement and see less money than they had before (unless it was due to withdrawals).

Most conservative investors want their portfolio to provide them with an inflation-adjusted income stream to pay their living expenses.

They're either currently depending on their investments to give them a retirement paycheck, or are expecting this to happen soon. Some are on tight budgets and are barely making a living as it is, so they are very afraid of losing what little money they have left. They do not have time to recoup any losses (because they can't go back to work for a multitude of reasons). Some realize they don't need their portfolio to provide income for more than several years, because of low life expectancy, so growth is not the objective.

The majority of their money should be held in cash and high-quality short- and intermediate-maturity bonds. Very risky asset classes are typically avoided altogether. Satisfying their needs is hard to achieve when inflation is high, or rising, because the market value of fixed income securities typically are declining due to increasing interest rates. So investing defensively is not without risk. There is no way to eliminate all risks when investing. So the investments most desired by Conservative investors are the ones that lose the most value from inflation (e.g., fixed annuities). Investing defensively is not without risk, and there is no free lunch, nor a magic investment to solve one's problems, for anyone in investing (but our Conservative High-income Model is the closest thing to a magic solution to this dilemma as humanity will ever create).
In this case, the potential for the large loss of nominal dollars (how many dollars one has relative to how many they started with) is low, but the loss of real dollars (the inflation-adjusted worth of those dollars) is guaranteed. This is caused by the loss of purchasing power due to the prices of everything in their family budget going up. Cash (savings accounts, money market funds, and CDs) most always lose real value over time because of the combined effect of taxes and inflation. There isn't much one can do if this happens, except to have exposure beforehand to asset classes that benefit when inflation increases (real estate and tangible / commodity-based mutual funds, like the precious metals and energy sectors). The catch is most of these are the same asset classes that are minimized, because they're "too risky," or don't provide a reasonable income yield. Because Conservative investors are still "investing," they should have a higher return over most rolling three-year periods than investing 100% in money market funds, fixed annuities, CDs, and other bank instruments.

The typical range of annual returns in down financial markets are -3% to +2% per cent, in flat markets 3% per cent to 6% per cent, and in up markets 7% per cent to 9% per cent. Conservative portfolios produce the highest annual income yields - typically in the range of 4% per cent to 9% per cent.

Conservative portfolios produce very little capital gains distributions. If an investor is so risk adverse that they cannot tolerate ANY downside risk to the nominal value of their money, then we recommend money market funds, or just putting their money in the bank. We don't use an investor risk tolerance category for these ultra-conservative investors because we don't think these folks are investors in the first place. They have resigned to the fact that their real returns will be negative after considering taxes and inflation, and just care about not seeing the number of dollars they have decline. They should just hide it all in the safest vehicles possible. But not "under the mattress" because of its purchasing power will be substantially eroded from being 100% exposed to inflation.

MODERATELY CONSERVATIVE

If a worried investor can tolerate a little more risk than the Conservative investor, but still is adverse to large short-term downside fluctuations, and wants a little more return with a little less income, then this is the category for them. The typical investor in
this category is either retired and getting their paycheck from portfolio income, soon to be retired, or has been burned by poor investment management and lost a lot of money in the past. These folks want to be protected somewhat from large downside market fluctuations and are willing to not fully-participate when markets rally upwards to get it.

Informed investors realize that if their life expectancy is more than a decade, then having exposure to investments that increase in value is needed to provide adequate income in the later years. These folks want to be protected somewhat from large downside market fluctuations and are willing to not fully participate when markets rally upwards to get it. Their portfolio will still fall when the markets' decline, but they want to be somewhat protected from sudden double-digit percentage declines in their portfolios. They want to be in the game, but they are definitely playing defense. They also want to see low double-digit percentage gains when the financial markets are going up.

This is achieved by having a significant exposure to fixed income securities, several different types of stocks, real estate, and commodities that track inflation. Core equity asset classes are used, but very risky asset classes are still held to a minimum. Moderately Conservative portfolios produce significant annual income yields - typically in the range of 3Per cent to 6Per cent. Moderately Conservative portfolios produce little capital gains distributions. They're typically going to achieve returns a little more than taxes and inflation. When the major markets are increasing, they could realize double-digit returns. The typical range of annual returns in down financial markets are -5Per cent to -1Per cent, in flat markets 2Per cent to 8Per cent, and in up markets 9Per cent to 12Per cent.

**MODERATE**

The majority of investors are in this middle-of-the-road category. The reasons for people to be in this category are too many to list here. The most-common is the desire to invest long-term for retirement or college funding. These investors want good returns, and know they're taking some risk to get them. They should expect returns similar to a basket of similarly weighted market indices. Their portfolio should go up less than the markets as a whole, but should also go down less when markets go down. A Moderate portfolio will hold a balanced mix of most all-major viable asset classes (for maximum diversification), which will include conservatively-managed bond funds as well as high-
risk stock funds. This category typically uses the largest number of asset classes to both reduce risk and increase profits. Both safe and risky asset classes are utilized pragmatically. Balance between profits and loss reduction is the goal. They know they will lose money if the markets go down, but also expect to be along for the ride if they go up. Moderate portfolios produce modest annual income yields - typically in the range of 2 Per cent to 4 Per cent. Moderate portfolios produce a moderate amount of capital gains distributions.

Moderate investment portfolios are usually compared to the S&P 500 to see how well they're doing. When the S&P 500 is going up, it should be up a little more than a Moderate investment portfolio (if it's very well managed). When the S&P 500 is down, the Moderate portfolio should be down less. They're typically going to achieve returns greater than taxes and inflation.

When the major markets are increasing, they could easily realize double-digit returns. The typical range of annual returns in down financial markets are -8 Per cent to -4 Per cent, in flat markets 5 Per cent to 9 Per cent, and in up markets 10 Per cent to 15 Per cent.

MODERATELY AGGRESSIVE

If an investor wants to outperform a basket of similarly weighted indices when the markets are up, and doesn’t mind too much being down a little more than the markets when they are down, then this is the category for them. They are taking on more downside risk than the markets, but expect to be substantially ahead of the game when markets go up. Fixed income positions are minimized and risky asset classes are fully utilized. Most of the bond and international stock mutual funds in this portfolio are aggressively-managed. These investors want to take the risks of winning the game by playing hard offense, but still don’t want to lose too much in a short period of time. Most Moderately Aggressive investors want to accumulate a significant amount of wealth in the future, are willing to wait a significant amount of time for the rewards (and to recoup short-term losses), and have a little income to contribute to the portfolio over time. They know they will lose a high percentage of their money if the markets go down (more than the S&P500), but also expect to profit greatly if they go up. More emphasis is put on making money than preventing the loss of money. Moderately Aggressive portfolios
produce the little annual income yields - typically in the range of 0.5 Per cent to 2 Per cent.

Moderately Aggressive portfolios produce a high amount of capital gains distributions. They're typically going to achieve long-term returns far greater than taxes and inflation. When the major stock markets are increasing, they expect to realize double-digit returns. The typical range of annual returns in down financial markets are -10 Per cent to 0 Per cent, in flat markets 1 Per cent to 10 Per cent, and in up markets 11 Per cent to 20 Per cent.

**AGGRESSIVE**

Damn the torpedoes, full speed ahead! These investors want to substantially outperform the markets and (should) know they are exposed to much more risk than the markets. They could easily lose up to 40Per cent of their portfolio value in a few months, and it may take years to recoup these losses.

These investors typically hold mostly growth, small-cap, and sector mutual funds (or stocks or ETFs). Any fixed-income mutual funds in the portfolio are a small percentage of the portfolio, and also are of the riskier type that is aggressively-managed. The purpose of any cash held is to handle any unexpected withdrawals, and to take advantage of perceived buying opportunities. Aggressive investors are typically younger (The Invincibles), and intend to contribute relatively large amounts into the portfolio periodically over time. Most aggressive investors either want to accumulate substantial wealth in the future, are in a hurry, have enough income from other sources to fund their living expenses, and/or have plenty of time to work and recoup losses. Some just may have not yet personally experienced significant losses in the markets, so their bravery usually ends up being their own downfall. They should know they would lose a very high percentage of their money if the markets go down, but also expect to profit greatly if they go up. Most all emphasis is put on making money and little, other than the diversification benefits of using mutual funds with asset allocation, is used in preventing the loss of money.

Aggressive portfolios produce the little-to-no annual income yields - typically in the range of 0 Per cent to 1 Per cent. Aggressive portfolios produce a very high amount of capital gains distributions. They're typically going to achieve long-term returns far
greater than taxes and inflation. When the major markets are increasing, they expect to realize large double-digit returns. The typical range of annual returns in down financial markets are -15 Per cent to -5 Per cent, in flat markets -3 to 7 Per cent, and in up markets 15 Per cent to 25 Per cent. (http://toolsformoney.com).

**DATA ENVELOPMENT ANALYSIS**

Data Envelopment Analysis is a methodology which is used to determine relative efficiencies between decision making units (DMUs). It was first developed by Charnes, Cooper and Rhodes (1978). A DMU can be any entity like a hospital, school or bank. Among a group of DMUs, DEA helps to distinguish between the efficient and the inefficient DMUs.

DEA uses the mathematical method of linear programming. It uses a non-parametric method or a method which does not need a production function to determine efficiency. DEA utilizes the inputs and outputs of the DMUs to determine its output: input ratio. The efficiency of the DMUs is determined by their place on the efficient frontier which is a graphical representation of all the DMUs with their respective inputs and outputs. The slope of the line joining the DMU to the point of origin will determine its output: input ratio. The highest slope formed by a DMU is therefore called the efficient frontier. Hence all the DMUs which fall on this line are deemed efficient and the ones below the line, inefficient. The further a DMU is located from the efficient frontier, the more inefficient it is. In fact the term ‘Envelopment’ in DEA comes due to the property of the efficient frontier to ‘envelop’ all the efficient and inefficient points.

This can be explained by determining the weights for the output: input ratios. An inefficient DMU will have a lesser weight on the ratio than an efficient one. Hence DEA uses the weighted sum of the outputs to the weighted sum of the inputs to determine the performance between DMUs.

The linear program used will have the weights as the decision variables and they are determined in a way such that it gives each DMU the highest efficiency score. The number of linear programs which will need to be run will depend on the number of DMUs because each DMU is compared to the rest of the DMU in one formulation to see
how efficient it is compared to the others. The weights derived from this process will be the DMUs optimal weights.

The linear program can be input or output oriented. An input oriented model will have an objective function which will generate a value of 1.0 if a DMU is efficient. The closer this value is to 1.0 the more efficient the DMU.

An output oriented linear program will have its opposite logic and hence the lower the value of the objective functions, the more efficient the DMU will be. This is related to input reduction and output augmentation. The desired outcome for a DMU will be a way to reduce its inputs to get more output. For example a hospital may want to reduce its inputs like nurses, doctors and still get more patient hours. This is the methodology used by DEA.

DEA can be compared to statistical regression analysis as it has similar objectives. Regression gives the “average” performance of a DMU. Like the efficient frontier regression analysis uses the regression line. All units above it are deemed efficient and below it are deemed inefficient. The magnitude of inefficiency is determined from the distance to this line. DEA is similar but it compares all the DMUs to the most efficient DMU in its group. Hence an advantage comes out of this method. The most efficient DMU can serve as a “benchmark” for improvements. Regression analysis does not exclude the efficient from the inefficient when providing suggestions for improvement. DEA measures performances relative to all the other DMUs.

The efficiency derived in DEA is in a sense “technical efficiency” compared to “economic efficiency”. This is because its objective does not use its inputs and outputs in a production function. Hence the objective is not cost reduction by a combination of inputs and outputs and unit cost saved by a set of inputs is not the focus. DEA actually identifies target for achievement for a DMU compared to the others in the reference set. In other words it calculates a method to eliminate “waste”. Hence the term “technical efficiency” has been given to it.

Data envelopment analysis (DEA) is a nonparametric method in operations research and economics for the estimation of production frontiers. It is used to empirically measure productive efficiency of decision making units (or DMUs). Non-parametric approaches have the benefit of not assuming a particular functional
form/shape for the frontier; however they do not provide a general relationship (equation) relating output and input. There are also parametric approaches which are used for the estimation of production frontiers (see Lovell & Schmidt 1988 for an early survey). These require that the shape of the frontier be guessed beforehand by specifying a particular function relating output to input.

One can also combine the relative strengths from each of these approaches in a hybrid method (Tofallis, 2001) where the frontier units are first identified by DEA and then a smooth surface is fitted to these. This allows a best-practice relationship between multiple outputs and multiple inputs to be estimated.

"The framework has been adapted from multi-input, multi-output production functions and applied in many industries. DEA develops a function whose form is determined by the most efficient producers. This method differs from the Ordinary Least Squares (OLS) statistical technique that bases comparisons relative to an average producer. Like Stochastic Frontier Analysis (SFA), DEA identifies a "frontier" on which the relative performance of all utilities in the sample can be compared: DEA benchmarks firms only against the best producers. It can be characterized as an extreme point method that assumes that if a firm can produce a certain level of output utilizing specific input levels, another firm of equal scale should be capable of doing the same. The most efficient producers can form a 'composite producer', allowing the computation of an efficient solution for every level of input or output. Where there is no actual corresponding firm, 'virtual producers' are identified to make comparisons" (Berg 2010)

Data Envelopment Analysis (DEA) is a powerful method widely used in the evaluation of performance of Decision Making Units (DMUs). These can be business units (for example points of sales, bank branches, dealers, and franchisees), government agencies, police departments, hospitals, educational institutions, and even people (DEA has been used in the assessment of athletic, sales and student performance). Although the mathematics of DEA is difficult for the general user, the assumptions and the underlying idea of the algorithm are quite simple.

Data Envelopment Analysis is concerned with evaluations of performance and it is especially concerned with evaluating the activities of organizations such as business firms, government agencies, hospitals, educational institutions, and so on. Such
evaluations take a variety of forms in customary analyses. Examples include cost per unit, profit per unit, satisfaction per unit, and so on, which are measures stated in the form of a ratio like the following.

\[
\frac{\text{Output}}{\text{Input}}
\]

This is a commonly used measure of efficiency. The usual measure of "productivity" also assumes a ratio form when used to evaluate worker or employee performance. (Charnes et al, 1978) "Output per worker hour" or "outputs per worker employed" are examples with sales, profit or other measures of output appearing in the numerator. Such measures are sometimes referred to as "partial productivity measures." This terminology is intended to distinguish them from "total factor Productivity measures," because the latter attempt to obtain an output-to input Ratio value which takes account of all outputs and all inputs.

Moving from partial to total factor productivity measures by combining all inputs and all outputs to obtain a single ratio helps to avoid imputing gains to one factor (or one output) that are really attributable to some other input (or output).

For instance, a gain in output resulting from an increase in capital or improved management might be mistakenly attributed to labor (when a single output to input ratio is used) even though the performance of labor deteriorated during the period being considered.

However, an attempt to move from partial to total factor productivity measures encounters difficulties such as choosing the inputs and outputs to be considered and the weights to be used in order to obtain a single-output-to-single-input ratio that reduces to a form like expression. (W.W. Cooper et al 2005)

Other problems and limitations are also incurred in traditional attempts to

Evaluate productivity or efficiency when multiple outputs and multiple inputs need to be taken into account. The relatively new approach embodied in DEA does not require the user to prescribe weights to be attached to each input and output, as in the usual index number approaches, and it also does not require prescribing the functional forms that are needed in statistical regression approaches to these topics. (Allen L. and Rai, 1996).
DEA utilizes techniques such as mathematical programming which can handle large numbers of variables and relations (constraints) and this relaxes the requirements that are often encountered when one is limited to choosing only a few inputs and outputs because the techniques employed will otherwise encounter difficulties.

Relaxing conditions on the number of candidates to be used in calculating the desired evaluation measures makes it easier to deal with complex problems and to deal with other considerations that are likely to be confronted in many managerial and social policy contexts. Moreover, the extensive body of theory and methodology available from mathematical programming can be brought to bear in guiding analyses and interpretations.

It can also be brought to bear in effecting computations because much of what is needed has already been developed and adapted for use in many prior application of DEA.

Much of this is now available in the literature on research in DEA and a lot of this has now been incorporated in commercially available computer codes that have been developed for use with DEA. (Berger, 1997).

DEA provides a number of additional opportunities for use. This includes opportunities for collaboration between analysts and decision-makers, which extend from collaboration in choices of the inputs and outputs to be used and include choosing the types of "what-if" questions to be addressed. Such collaborations extend to "benchmarking" of "what-if" behaviors of competitors and include identifying potential (new) competitors that may emerge for consideration in some of the scenarios that might be generated. (Tavares G. 2002).

All DMUs under comparison are assumed to operate homogeneously: they receive the same inputs and produce the same outputs (in differing quantities, of course) and these inputs and outputs are representative of the whole population. The figure below shows an indicative model for a bank branch.
Data Envelopment Analysis (DEA) is a relatively new “data oriented” approach for evaluating the performance of a set of peer entities called Decision Making Units (DMUs) which convert multiple inputs into multiple outputs.

The definition of a DMU is generic and flexible. Recent years have seen a great variety of applications of DEA for use in evaluating the performances of many different kinds of entities engaged in many different activities in many different contexts in many different countries.

These DEA applications have used DMUs of various forms to evaluate the performance of entities, such as hospitals, US Air Force wings, universities, cities, courts, business firms, and others, including the performance of countries, regions, and so on. Because it requires very few assumptions, DEA has also opened up possibilities for use in cases which have been resistant to other approaches because of the complex (often unknown) nature of the relations between the multiple inputs and multiple outputs involved in DMUs.

As pointed out in (Cooper, Seiford and Tone 2000), DEA has also been used to supply new insights into activities (and entities) that have previously been evaluated by other methods. For instance, studies of benchmarking practices with DEA have identified numerous sources of inefficiency in some of the most profitable firms that had served as benchmarks by reference to this (profitability) criterion – and this has provided a vehicle for identifying better benchmarks in many applied studies.
Because of these possibilities, DEA studies of the efficiency of different legal organization forms such as "stock" vs. "mutual" insurance companies have shown that previous studies have fallen short in their attempts to evaluate the potentials of these different forms of organizations. Similarly, a use of DEA has suggested reconsideration of previous studies of the efficiency with which pre- and post-merger activities have been conducted in banks that were studied by DEA.

Since DEA in its present form was first introduced in 1978, researchers in a number of fields have quickly recognized that it is an excellent and easily used methodology for modeling operational processes for performance evaluations. This has been accompanied by other developments.

For instance, (Zhu 2002) provides a number of DEA spreadsheet models that can be used in performance evaluation and benchmarking.

DEA’s empirical orientation and the absence of a need for the numerous a priori assumptions that accompany other approaches (such as standard forms of statistical regression analysis) have resulted in its use in a number of studies involving efficient frontier estimation in the governmental and nonprofit sector, in the regulated sector, and in the private sector. See, for instance, the use of DEA to guide removal of the Diet and other government agencies from Tokyo to locate a new capital in Japan, as described in (Takamura and Tone, 2003).

In their originating study, (Charnes, Cooper, and Rhodes, 1978). described DEA as a ‘mathematical programming model applied to observational data that provides a new way of obtaining empirical estimates of relations - such as the production functions and/or efficient production possibility surfaces – that are cornerstones of modern economics’.

Formally, DEA is a methodology directed to frontiers rather than central tendencies. Instead of trying to fit a regression plane through the center of the data as in statistical regression, for example, one ‘floats’ a piecewise linear surface to rest on top of the observations. Because of this perspective, DEA proves particularly adept at uncovering relationships that remain hidden from other methodologies. For instance, consider what one wants to mean by “efficiency”, or more generally, what one wants to mean by saying that one DMU is more efficient than another DMU.
This is accomplished in a straightforward manner by DEA without requiring explicitly formulated assumptions and variations with various types of models such as in linear and nonlinear regression models. Relative efficiency in DEA accords with the following definition, which has the advantage of avoiding the need for assigning a priori measures of relative importance to any input or output. (Cook, W.D. and Joe Zhu, 2008).

**DEFINITION**

(Efficiency – Extended Pareto Koopmans Definition): Full (100Per Cent) efficiency is attained by any DMU if and only if none of its inputs or outputs can be improved without worsening some of its other inputs or outputs.

In most management or social science applications the theoretically possible levels of efficiency will not be known. The preceding definition is therefore replaced by emphasizing its uses with only the information that is empirically available as in the following definition:

(Relative Efficiency): A DMU is to be rated as fully (100Per Cent) efficient on the basis of available evidence if and only if the performances of other DMUs does not show that some of its inputs or outputs can be improved without worsening some of its other inputs or outputs.

Notice that this definition avoids the need for recourse to prices or other assumptions of weights which are supposed to reflect the relative importance of the different inputs or outputs. It also avoids the need for explicitly specifying the formal relations that are supposed to exist between inputs and outputs. This basic kind of efficiency, referred to as “technical efficiency” in economics can, however, be extended to other kinds of efficiency when data such as prices, unit costs, and so on, are available for use in DEA. (Sherman and Joe Zhu, 2006).

**HISTORY**

In microeconomic production theory a firm's input and output combinations are depicted using a production function. Using such a function one can show the maximum output which can be achieved with any possible combination of inputs, that is, one can construct a production technology frontier. (Seiford & Thrall 1990).

Some 30 years ago DEA (and frontier techniques in general) set out to answer the question of how to use this principle in empirical applications while overcoming the
problem that for actual firms (or other DMUs) one can never observe all the possible input-output combinations.

Building on the ideas of (Farrell 1957), the seminal work "Measuring the efficiency of decision making units" by (Charnes, Cooper & Rhodes 1978) applies linear programming to estimate an empirical production technology frontier for the first time. Since then, there have been a large number of books and journal articles written on DEA or applying DEA on various sets of problems. Other than comparing efficiency across DMUs within an organization, DEA has also been used to compare efficiency across firms. There are several types of DEA with the most basic being CCR based on Charnes, Cooper & Rhoades, however there are also DEA which address varying returns to scale, either CRS (constant returns to scale) or VRS (variable). The main developments of DEA in the 1970s and 1980s are documented by Seiford & Thrall (1990).

TECHNIQUES

Data envelopment analysis (DEA) is a linear programming methodology to measure the efficiency of multiple decision-making units (DMUs) when the production process presents a structure of multiple inputs and outputs. DEA has been used for both production and cost data. Utilizing the selected variables, such as unit cost and output, DEA software searches for the points with the lowest unit cost for any given output, connecting those points to form the efficiency frontier. Any company not on the frontier is considered inefficient. A numerical coefficient is given to each firm, defining its relative efficiency. Different variables that could be used to establish the efficiency frontier are: number of employees, service quality, environmental safety, and fuel consumption. An early survey of studies of electricity distribution companies identified more than thirty DEA analyses indicating widespread application of this technique to that network industry.

(Ramanathan, R., 2003). A number of studies using this technique have been published for water utilities. The main advantage to this method is its ability to accommodate a multiplicity of inputs and outputs.

It is also useful because it takes into consideration returns to scale in calculating efficiency, allowing for the concept of increasing or decreasing efficiency based on size and output levels. A drawback of this technique is that model specification and
inclusion/exclusion of variables can affect the results.” (Berg 2010). DEA has many advantages why it has been a popular method for evaluating efficiencies

**Advantages of Data Envelopment Analysis**

1. It has the capability of handling multiple inputs and outputs
2. Inputs and outputs can have different units of measure.
3. It is a non parametric method which does not need a functional form for computing efficiency
4. It can calculate the sources and the extent of inefficiency in inputs and outputs
5. It can use benchmarking techniques to use the efficient units as a benchmark to evaluate inefficient units
6. It can be used in the measurement of productivity in addition to efficiency analysis.
7. It can be used as a “what-if” analysis tool to include certain inputs and exclude outputs for a DMU
8. No need to explicitly specify a mathematical form for the production function
9. Proven to be useful in uncovering relationships that remain hidden for other methodologies
10. Capable of handling multiple inputs and outputs
11. Capable of being used with any input-output measurement
12. The sources of inefficiency can be analyzed and quantified for every evaluated unit

But DEA has its share of limitations. Most of them have been addressed in past Literature and many researchers have formulated solutions to these problems. The main limitations are

**Limitations of Data Envelopment Analysis**

1. Extensive linear program formulations can make the analysis of all the DMUs lengthy and tedious
2. Only the relative efficiency is calculated and the absolute or maximal efficiency is not addressed
3. The possibility of extreme outliers DMUs to be termed efficient exists and hence weights have to be derived carefully. Hence discrimination between DMUs is poor.

4. It is difficult to perform statistical hypothesis testing as it is a non-parametric method.

5. Results are sensitive to the selection of inputs and outputs.


7. The number of efficient firms on the frontier tends to increase with the number of inputs and output variables (Berg 2010).

SAMPLE APPLICATION AND EXAMPLE

SAMPLE APPLICATION

DEA is commonly applied in the electric utilities sector. For instance a government authority can choose Data Envelope Analysis as their measuring tool to design an individualized regulatory rate for each firm based on their comparative efficiency. The input components would include man-hours, losses, capital (lines and transformers only), and goods and services. The output variables would include number of customers, energy delivered, length of lines, and degree of coastal exposure. (Berg, 2010)

EXAMPLE

In the DEA methodology, formally developed by (Charnes, Cooper and Rhodes 1978), efficiency is defined as a weighted sum of outputs to a weighted sum of inputs, where the weights structure is calculated by means of mathematical programming and constant returns to scale (CRS) are assumed. In 1984, Banker, Charnes and Cooper developed a model with variable returns to scale (VRS).

Assume that we have the following data:

- Unit 1 produces 100 pieces of items per day, and the inputs are 10 dollars of materials and 2 labour-hours
- Unit 2 produces 80 pieces of items per day, and the inputs are 8 dollars of materials and 4 labour-hours
- Unit 3 produces 120 pieces of items per day, and the inputs are 12 dollars of materials and 1.5 labour-hours
To calculate the efficiency of unit 1, we define the objective function as

- maximize efficiency = \( \frac{u_1 \times 100}{v_1 \times 10 + v_2 \times 2} \) which is subject to all efficiency of other units (efficiency cannot be larger than 1):
- subject to the efficiency of unit 1: \( \frac{u_1 \times 100}{v_1 \times 10 + v_2 \times 2} \leq 1 \)
- subject to the efficiency of unit 2: \( \frac{u_2 \times 80}{v_1 \times 8 + v_2 \times 4} \leq 1 \)
- subject to the efficiency of unit 3: \( \frac{u_3 \times 120}{v_1 \times 12 + v_2 \times 1.5} \leq 1 \) and non-negativity:
- all \( u \) and \( v \geq 0 \).

But since linear programming cannot handle fraction, we need to transform the formulation, such that we limit the denominator of the objective function and only allow the linear programming to maximize the numerator.

So the new formulation would be:

- maximize Efficiency = \( u_1 \times 100 \)
- subject to the efficiency of unit 1: \( u_1 \times 100 - (v_1 \times 10 + v_2 \times 2) \leq 0 \)
- subject to the efficiency of unit 2: \( u_2 \times 80 - (v_1 \times 8 + v_2 \times 4) \leq 0 \)
- subject to the efficiency of unit 3: \( u_3 \times 120 - (v_1 \times 12 + v_2 \times 1.5) \leq 0 \)
- subject to \( v_1 \times 10 + v_2 \times 2 = 1 \)
- All \( u \) and \( v \geq 0 \).

INEFFICIENCY MEASURING WITH DEA

Data Envelopment Analysis (DEA) has been recognized as a valuable analytical research instrument and a practical decision support tool. DEA has been credited for not requiring a complete specification for the functional form of the production frontier nor the distribution of inefficient deviations from the frontier. Rather, DEA requires general production and distribution assumptions only. However, if those assumptions are too weak, inefficiency levels may be systematically underestimated in small samples. In addition, erroneous assumptions may cause inconsistency with a bias over the frontier.

Therefore, the ability to alter, test and select production assumptions is essential in conducting DEA-based research. However, the DEA models currently available offer a limited variety of alternative production assumptions only.

In doing so, they offer their contribution as an extension to the Sharpe measure (and standard finance theory), by applying DEA to include additional variables without
having to “adjust” the returns data. However, this inclusion makes a fundamental change. The dimensions added by these additional variables—cost to investors—represent values of concern to other economic agents. The Sharpe ratio exists as a measure dependent solely on the distribution of returns, and therefore, it represents an internal measure of performance reflecting the interests solely of the fund as an economic agent.

The DEA model includes those additional factors and thus allows other groups easily to adjust the analysis to reflect more closely their interests as investors in the fund, or potentially, for example, the interests of the fund family management. Moreover, exogenously given factors (for example, interest rates, foreign exchange rates, weather, natural disasters, political turmoil) may be included without prejudice to the evaluation.

Indeed, the method can indicate those who did well under extraordinarily difficult circumstances. In the mathematics of the model, the interests of all these factors are represented by the multiple input variables and multiple output variables.

DEA introduces other economic agents in another way. The efficiency surface that forms the standard of evaluation is determined by the actual performance values of the best among those being evaluated. That is, DEA is a relative measure. It computes the best possible performance score for each fund, consistent with how all other funds performed. The ones with the best scores are the benchmarks for the others. Thus, DEA is a comparative, a relative method. It computes performance in the management of factors of conflicting interests within the fund (tradeoffs among factors) by comparison against competing funds, conflicting interests of an external nature. In the mathematical model, the performances of these interests are represented by constraint equations.

DEA has the ability to incorporate multiple inputs and outputs but it may weaken the formulation. In (Meng et al, 2008), a model which can group inputs or outputs of same priority to use in DEA is explained. Hierarchical structures of these inputs and outputs were incorporated in their DEA model. Grouping of inputs and outputs which have same characteristics for computational benefits was also shown in Kao [2008] with a linear two level DEA model. Also sometimes, some of the inputs of a DMU cannot be controlled or changed to increase performance and productivity.

Banker and Morey [1986a] and Fried and Lovell [1996] developed a one-stage and a three-stage model respectively to address this issue. Muniz [2001] made some
changes to the three-stage model. All three models are effective tools to incorporate DEA with uncontrollable units. In fact Muniz mentioned that to get better results it is better to check the consistency of the results using both models.

Initially one of the disadvantages of DEA was the inability to influence weights with a decision maker’s preference.

This was overcome by many methods in recent literature. One such example is the Value Efficiency Analysis method by Halme et al [1999]. Their model derives a ‘Most Preferred Solution’ (MPS) by using an interactive multi objective linear program. The MPS incorporates the decision maker’s judgment and then the inefficient units are compared to this solution.

**WEIGHT RESTRICTION METHODS IN DEA**

One of the problems faced by traditional DEA methods is the dispersion of weights. This concept was first introduced by Dyson and (Thanassoulis,1988). Lower bounds on weight restrictions were constructed which can be specifically applied to a single input case. Here the author explains that the output weights are seen as resources needed per unit of the respective output.

It has been further explained in Roll, Cook and (Golany, 1991). They also used a single input multiple output model. (Pedraja-Chaparro et al, 1997) showed that this model had problems as the DEA Linear Programming model would lead to infeasible solutions. Their model involves the process of first running the model without weight constraints and then finding the feasible range and analyzing the results.

In (Jahanshahloo et al, 2003) the possibility of infeasibility because of adding multiple weight restrictions is eliminated. They achieve this by using goal programming and Big M techniques. If the alteration of the weights is small, infeasibility can be avoided. Another method, which made sure the weights are consistent with DMU objectives, is the Cone Ratio method by (Charnes, Cooper, Huang and Sun, 1990). It is a modification of the traditional CCR model using the mathematical concepts of polyhedral cones for the virtual multiplier or weights. The polyhedral cones are utilized to mathematically alter the input and output values.

It provides a constraint cone which the user can change to get a desired pattern of input usage and output production to get the desired efficiency. This is also useful to
incorporate expert opinion. It provides better efficiency outputs compared to the traditional CCR model. The disadvantage is that it needs to be converted to the cone ratio form and back to its original form for computational purposes. The advantages of this model are that it can be used on software in which weights cannot be incorporated.

The concept of using assurance regions to increase weight restrictions was introduced by Thompson, Singleton, Thrall and Smith [1986].

The decision maker decides on the values $\alpha$ and $\beta$ which will restrict the values of the input and output weights $u$ and $v$. The concept involves increasing the assurance region or the region where the DMU will be efficient till the decision maker is satisfied with the efficiency levels generated.

Another method which uses assurance region concepts is given in (Thanassoulis and Allen, 1998). Their method is another weight restriction method which uses ‘unobserved DMUs’ which are used to incorporate value judgments in DEA. All these methods involve knowing a priori information about the weights. This might be a disadvantage as errors might be introduced if the weights had some human error or were inconsistent. Hence the following methods incorporate weight restrictions without it. Li and Reeves formulated a multi criteria model using multi objective linear programming. It uses three objective functions based on deviational variables or a measure of inefficiency. They are (i) minimizing the deviational variable (ii) minimizing the maximum of the deviational variables (iii) minimizing the sum of the deviational variables.

The use of the minmax and minimum criteria provides greater restrictions and renders fewer efficient DMUs. Cross evaluation (Silkman, 1986) is another method of increasing discrimination among DMUs. It involves a method of peer evaluation among different efficient DMUs than the traditional DEA evaluation of a single DMU. This can be done by two different types of formulations. They are the ‘aggressive’ and ‘benevolent’ formulations. The aggressive formulation uses a multi objective model. The first objective is the efficiency calculated by a classical DEA model like the CCR model.

The second objective is used to minimize the cross efficiency of all other DMUs other than the DMU used in the classical DEA model. The aim is to get a weighting...
scheme which is optimal in the classical model and also involves all other DMUs. The benevolent formulation is the same except it minimizes the cross efficiency of the DMUs.

**MULTI CRITERIA METHODS IN DEA**

Multi criteria decision making methods and DEA have been used together in many situations for performance measurement. The first method integrating both concepts was put forth by (Golany, 1988) where he uses an interactive multi linear programming model.

This model helps DEA to choose the effective DMU rather than just the efficient DMU, the difference being the former will be able to achieve its objective more closely. Given a set of input and output vectors from previous experience for a DMU it aims at arriving at an efficient output level which a DMU can achieve for a given input level. The further a DMU is away from its DEA production function the more inefficient it is deemed. A series of sequential linear programs are solved to get a set of efficient points. Combining the use of MCDM and DEA is also seen in (Doyle and Green, 1993) where they extended the work of (Stewart, 1992) by using a multi objective model with the DEA output to input ratio in it. The objective is to maximize $D_{kk}$ which is for DMU $k$, the ratio of output weights to input weights and minimize $D_{kj}$ which is its cross evaluation with respect to another DMU $j$.

A visual approach was given by (Belton and Vickers, 1993) where they used DEA and MCDM to represent the efficient DMUs on the efficient frontier. While plotting the aggregate input versus the output measure they found that the efficient DMU all lie on the northwest efficient frontier. But this visual approach was found to be useful only when applied to a small set of units. The use of a reference point model using multi objective linear programming (MOLP) along with the CCR model in DEA was shown in (Joro, Korhonen and Wallenius, 1998). Here the reference point model, which is the MOLP discussed in the paper, is shown to be structurally similar to the CCR output oriented model. Hence they conclude that formulating a DEA model using MOLP gives more flexibility by finding a way to make inefficient DMUs efficient.

A Multi Objective Linear Fractional Program (MOLFP) was developed by (Kornbluth, 1991) which uses the cone ratio method of restricting weights. Here they prove that using MOLFP to solve DEA models gives more information than the standard
DEA model. They argue that the standard DEA model gives the efficiency of the DMU under consideration but does not give direct efficiency evaluations of other DMUs for a set of optimal weights. The MOLFP model gives this evaluation directly. 

(Bouyssou, 1999) shows the common violations which might occur when integrating MCDM and DEA techniques. Using three DEA based models he shows that using MCDM along with DEA may not give the right results as some normative properties may be violated.

(Stewart, 1996) contrasts the concept of relative efficiency in DEA with that of Pareto optimality in MCDM and discusses some issues in applying interactive MCDM techniques for solving the weight restriction problem in DEA. The paper focuses on how MCDM can solve the problems in DEA model particularly when it comes to setting bounds on weights. It is shown that MCDM helps in setting more realistic judgment when it comes to assigning weights.

**AHP and DEA**

The Analytical Hierarchy Process (AHP) has also been combined with DEA in past research. The AHP is a MCDM tool used for selecting and ranking of alternatives introduced by (Saaty, 1980). It compares the various alternatives available for making a decision with respect to conflicting multiple criteria and ranks the alternatives so that the best alternative can be identified easily.

The role of AHP in DEA problems have been studied in different ways. Primarily it has been used to derive weights for use in the DEA models. Qualitative factors to be used in DEA model were quantified in (Shang and Sueyoshi, 1995). Their goal was to find the best Flexible Manufacturing System and they used AHP to analyze only tangible factors such as long term goals and strategies and analyze monetary goals using a simulation model.

The efficiency of the system is then calculated by combining the AHP and simulation results by using a cross efficiency method to determine the most efficient system. The AHP helped the model by providing upper and lower bounds for the weights.

The drawback of this model is that it does not provide any preference structure for the decision maker in a linear relationship. In (Seiford and Zhu, 1998), the AHP and DEA
methods are integrated through the assurance region concept explained earlier. Their aim was to find ways to improve the industrial productivity in China by analyzing past data. The weights are incorporated in the DEA formulation in order to apply preference information of the decision maker or expert. They used a scale of 1 to 9 to give priorities to the input and output variations and formed a pair wise comparison matrix in order to get the final weights. Even though AHP and DEA are integrated for efficiency analysis there are some inherent problems.

A variation in the use of AHP and DEA to address the problems is explained in (Sinuany-Stern, Mehrez and Hadad, 2000). They prove that their model, the AHP/DEA model does uses AHP in a more quantifiable manner than using preference information and also the ranking is more accurate version when compared to the traditional DEA models. They conduct a pair wise comparison between two DMUs at a time providing the cross evaluation for all the DMUS. Then AHP uses this matrix to rank them by comparing the values in the matrix. But the problem of rank reversal exists in this method. When one of the alternatives is removed the ranking of all the alternatives could change. The Voting AHP method is different from the previous model as it removes the effort of making pair wise comparisons for providing weights to criteria.

(Wang, Liu and Elhag, 2008) propose a more efficient way to combine AHP and DEA methods. They use AHP to determine weights for the decision criteria and decision criteria for the problem. Then they use assessment levels provided by expert opinion for each criterion and solve the model they proposed for each criterion to get the local weights.

These local weights are then aggregated to get the ranking. The advantages of this mentioned when compared to the voting AHP method is that it has lesser computation and lesser pair wise comparisons. Recent research includes the paper by (Ramanathan, 2006) in which he develops a model called the DEAHP method. They eliminate the rank reversal problem that happens when an irrelevant alternative is removed. It uses AHP to make judgment matrices which give information on alternatives. This matrix is then used by DEA to get the local weights.

The final weights are derived after aggregation for the different criteria. Hence the combined logic used here led to the DEAHP method. There has been criticism of the
DEAHP method in (Wang and Chin, 2008). The authors believe that DEAHP method provides erroneous results when inconsistent matrices arise in the pair wise comparisons. They propose two DEA models which overcome this problem and prove mathematically the flaws of DEAHP. They were able to derive weights for inconsistent matrices and used the Simple Additive Weighting method (SAW) for determining the local weights. They extend their model to a group AHP scenario too where many pair wise comparison matrices are involved.

**SUPER EFFICIENCY**

Super efficiency is a measure used in DEA as a sensitivity analysis tool or a ranking tool for DMUs which are deemed efficient. The concept of super efficiency in DEA started when the idea of discriminating between efficient DMUs was brought to light by (Andersen and Petersen, 1993). Here they put forth a ranking method for efficient DMUs. They compare the DMU to be evaluated against the combinations of all the other DMUs. In essence it is a measure of the radial distance of that DMU from the efficient frontier. It is calculating how the inputs can be increased proportionally but still preserving the efficiency of the DMU under consideration.

It is very similar to the BCC model explained earlier. In the BCC model, efficiency is given by an index value equal to one but in Andersen and Petersen’s model (AP model) the value is greater than one. In the AP model they determine the technical efficiency of all the efficient units and then determine the super efficiency of one unit compared to the others. They do this by excluding the unit under study from the reference set. It has its own disadvantages. One of them is that in the process of ranking the efficient units, it may provide an efficiency score to a unit which may not be that useful in other measures and methods. In other words it may be ranked too high than what is necessary. The author suggests that this is due to the lack of prior knowledge of the weights used in the model. Hence this model essentially does not distinguish between economically efficient units and technically efficient units. The model discussed earlier which solves this problem is the cone ratio method and the assurance region methods for determining efficiency.

(Seiford and Zhu, 1998a) proposed a relationship between infeasibility and efficiency classification. Essentially the paper concludes that the CCR efficiency of a
DMU is stable to changes. (Seiford and Zhu, 1998b) showed that this extended to other DEA models like BCC model and the additive model. In (Seiford and Zhu,1999) he uses a worst case scenario for a DMU when its efficiency is deteriorating when all other DMUs efficiency increase. It conducts a sensitivity analysis of the scenario and provides the necessary and sufficient conditions for preserving DMUs efficiency when inputs and outputs of all other DMUs are changed simultaneously. Super efficiency has been used in models which use a different base logic other than the CCR model.

The CCR model uses the Farrell approach of proportional improvements between DMUs by using relative efficiency concepts. (Bogetoft and Hougaard,2002) use the proportional improvement method introduced by (Bogetoft,1999).This method lets the production outputs determine which direction it wants to improve. In other words it improves depending on actual possibilities when compared to the (Farrel method 1957) where the changes are structured proportionally. Using this theory they developed a super efficiency measure which they call the potential slack super efficiency measure. It differs from the original super efficiency measures as they can be invariant to linear and nonlinear transformations made.

RANKING IN DEA

In (Adler et al, 2002), the authors have listed and explained six different types of ranking methods which include the super efficiency method. He explains in detail six specific methods in previous literature for ranking in DEA and gives examples of which industries use these methods. The six methods include cross efficiency evaluation, super efficiency concepts, benchmarking techniques, multivariate statistics tools, ranking of inefficient units and ranking using DEA and MCDM. Cross efficiency and super efficiency have been described earlier. Ranking using two stage benchmarking was explained in (Torgesen et al, 1996).

The model uses the additive model to evaluate the set of efficient DMUs. It then uses the concept aggregation of weights to determine a benchmark value. This value essentially is the fraction of the total aggregated possible increase in an output for the DMU. However many units may get the same rank using this method. (Sinuany-Stern et al, 1994) also use a similar two stage technique of finding the efficient units and
comparing the inefficient units to the efficient. The multivariate statistical methods include the method put forth by (Friedman et al, 1997) called Canonical Correlation analysis. It is an extension of regression analysis but it uses multiple inputs and multiple outputs unlike regression. Linear discriminate analysis method is another multivariate statistical technique by (Sinuany-Stern et al, 1994).

Where they use a one dimensional linear equation to rank units according to the value Dj determined by the equation. Its disadvantage is that it can be used only on non-negative weights.

Discriminate analysis using ratios was developed by (Sinuany-Stern et al, 1998) is the same as the previous method but it does not use a linear equation but a ratio of the linear combination of inputs to the outputs. The infeasibility problem which arises in the previous two methods is resolved in this. However the author mentions that the optimal solution reached using this model using non-linear search optimization techniques may not be globally optimal.

In this chapter, researcher has given the details about the Portfolio Management and its role, elements, phases, functions and about portfolio investment process, portfolio construction, portfolio construction process, and approaches in portfolio construction, approaches of investment portfolio management, CAPM theory, management of investment portfolios, SEBI guidelines to portfolio management, Risk tolerance, Determining risk and the risk pyramid, Risk-Reward concept, Determining your Risk preference, the correlation between demographics, Socio-economic and attitudinal factors and financial risk tolerance, Data Envelopment Analysis, Inefficiency measuring with Data Envelopment Analysis, Weight restriction methods in Data Envelopment Analysis, Multicriteria methods in Data Envelopment Analysis, Analytical Hierarchy Process and Data Envelopment Analysis, Super Efficiency, and previous review.
REFERENCES

12. http://www.greekshares.com/index-61.php accessed on 10.08.11 at 0.45
13. http://www.greekshares.com/index-61.php accessed on 10.08.11 at 0.45
14. http://www.investopedia.com/articles/basics/11/5-popular-portfolio-types.asp#axzz1WQuelf3v accessed on 10.08.11 at 0.45
15. http://www.greekshares.com/index-61.php accessed on 10.08.11 at 0.45
16. http://www.investopedia.com/articles/basics/11/5-popular-portfolio-types.asp#axzz1WQuelf3v accessed on 10.08.11 at 0.45
17. http://academic.regis.edu/LAAP/eportfolio/basics_types.html accessed on 29.8.2011 at 10.23pm
18. http://www.pgcps.org/~elc/portfolio2.html accessed on 29.8.11 at 10.16pm
20. http://moneyterms.co.uk/portfolio-investment accessed on 10.5.2011 at 11.54pm


55. http://seekingalpha.com/article/218881-a-10-step-process-of-improving-portfolio-returns-part-iv accessed on 06.08.11 at 0.25
57. http://www.investopedia.com/articles/08/performance-measure.asp accessed on 20.01.12 at 0.39
63. http://www.investopedia.com/articles/08/performance-measure.asp accessed on 20.03.12 at 0.39
64. http://www.economywatch.com/investment/portfolio-management.html accessed on 13.02.12 at 00.28


113. http://www.eurojournals.com/Pages%20from%20irjfe17ayhan.pdf accessed on 25.05.2010 at 22.15.


120. http://www.investorwords.com/4310/risk_tolerance.html accessed on 5.9.2011 at 1.01pm


144. http://www.investopedia.com/articles/basics/03/050203.asp accessed on 09.5.2011 at 8.45pm

145. http://www.investopedia.com/articles/basics/03/050203.asp accessed on 09.5.2011 at 10.25pm

146. www.investopedia.com accessed on 10.5.2011 at 7.45am


190. Hollander, E, (1992), The essential interdependence of leadership and followership, Current directions in psychological science, 1, 71-75.


290. Quattlebaum O.M, (1988), Loss aversion: The key to determining individual risk, 

291. Barnewall M.M, (1988), Examining the psychological traits of passive and active 


Journal*, 105, 1110-1129.

the Academy of Financial Services*.

ordered profit analysis, *Consumer Interests Annual*, 42, 227-228.

Counseling and Planning*, 7, 11-20.

characteristics on risk and return preferences, *Journal of Business Research*, 2, 
469-476.


299. Cohn RA et al, (1975), Individual investor risk aversion and investment portfolio 

300. Friedman B, (1974), Risk aversion and the consumer choice of health insurance 

301. Schooley DK., & Worden DD, (1996), Risk aversion measures: Comparing 

302. Shaw KL, (1996), An empirical analysis of risk aversion and income growth, 


304. Blume M. E., & Friend I, (1975), The asset structure of individual portfolios and 


357. Roszkowski MJ, & Bean AG, (1990), Believe it or not Longer questionnaires have lower response rates, Journal of Business and Psychology, 4, 495–509.


177
178


Chapter – III

Profile of the Study