3 - CONCEPTUAL FRAMEWORK

In this chapter, the theoretical background of asset allocation and commodity futures is presented as it is needed for understanding of algorithms used in empirical part of this paper. This chapter will first highlight the importance of strategic asset allocation and then the method for single period optimum portfolio selection will be presented, namely Mean-Variance optimization technique. This method offers a solution for a problem of finding portfolio with optimum risk-return trade-off.

3.1 - ASSET ALLOCATION STRATEGIES THAT WORK

Asset allocation refers to the strategy of dividing total investment portfolio among various asset classes, such as stocks, bonds, commodities and money market securities etc. every asset class has different levels of return and risk and therefore each will behave differently over time. At a particular time it is possible that one asset is increasing in value, another may be decreasing or not increasing as much.

An investor should determine the proper mix of investments in their portfolio. Deciding what percentage of portfolio one should put into stocks, mutual funds, and low risk instruments like bonds and treasuries isn't simple. Thus, asset allocation is an organized and effective method of diversification. Choosing an appropriate asset allocation strategy and conducting periodic reviews will ensure that one maintains his/her long-term investment goals and reach desired return at the lowest amount of risk possible (Ibbotson & Kaplan, 2000)

To establish an appropriate asset mix is a dynamic process and it plays a key role in determining the portfolio's overall risk and return. As we know that portfolio's asset mix should reflect investors' goals at any point in time. There are a few different strategies of establishing asset allocations, and here we outline some of them and examine their basic management approaches (Brinson, et al 1991). These studies provide the theoretical background of our study.

1. **Strategic Asset Allocation**

   Strategic asset allocation is a method that establishes and adheres to what is a "base policy mix." This is a proportional combination of assets based on expected rates of return for each asset class. For example, if stocks have historically returned 10% per year and bonds have returned 5% per year, a mix of 50% stocks and 50% bonds would be expected to return 7.5% per year.

2. **Tactical Asset Allocation**

   Over the long run, a strategic asset allocation strategy may seem relatively rigid. Therefore, one may find it necessary to occasionally engage in short-term, tactical deviations from the mix in order to capitalize on abnormal or exceptional investment opportunities. This adds a component of market timing to the portfolio, allowing you to participate in economic conditions that are more favorable for one asset class than for others. Tactical asset allocation can be explained as a moderately active strategy, given that the overall strategic asset mix is returned to when desired short-term profits are achieved. This strategy demands some discipline, as you must first be able to recognize when short-term opportunities have run their course, and then rebalance the portfolio to the long-term asset position.

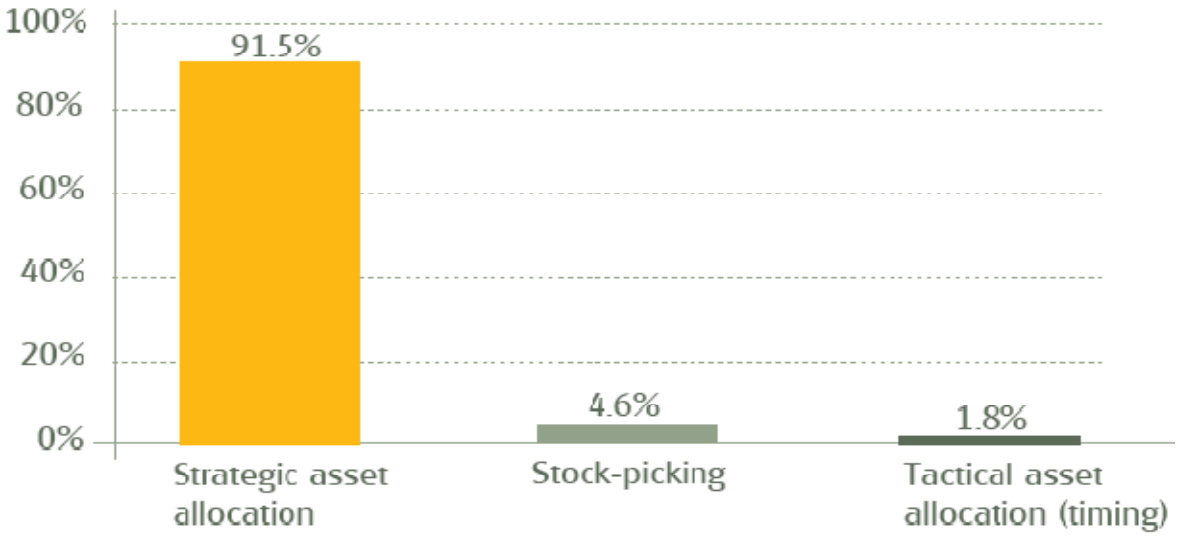
3. **Dynamic Asset Allocation**

   Another active asset allocation strategy is dynamic asset allocation, with which you constantly adjust the mix of assets as markets rise and fall and the economy strengthens and weakens. With this strategy you sell assets that are declining and purchase assets that are increasing, making dynamic asset allocation the polar opposite of a constant-weighting strategy. For example, if the stock market is showing weakness, you sell stocks in anticipation of further decreases, and if the market is strong, you purchase stocks in anticipation of continued market gains.

Distinct to market timing or the prospects for individual stocks, strategic asset allocation is the only factor affecting investments that can actually be managed successfully over the longer term. The landmark study, Determinants of Portfolio Performance, published in the Financial Analysts Journal in 1986 suggested that well

over 90% of investment performance is derived from asset allocation decisions, not market timing or stock selection. Brinson, Beebower and Singer confirmed this research in the follow up study in 1991, and numerous subsequent academic studies have reached similar conclusions.

Figurer 3.1 - What explains the return fluctuations?
Source – Brinson, et al (1991)



The above figure shows represents three strategies of asset allocation and it shows that how much percentage of return fluctuation is because of choosing particular strategy. We can see that 91.5% of returns are dependent on the strategic asset allocation policy of the investor rest is stock-picking and tactical asset allocation which is useful for short-term investment decision making. But in long term its SAA which affects the return on investment.

Similarly, Ibbotson Associates, et al 2000 also showed that 91% of investment returns were derived from asset allocation, where stock selection only delivered 5% of returns, market timing 2% and other factors 2%. It means that if you get the asset allocation correct, then you have given yourself more than a 90% chance of achieving superior investment performance and further if in addition you can then make stock selection and get that correct as well than your portfolio will on average have a 96.1% chance of out-performing the average.

It is now generally accepted that strategic asset allocation is by far the most important determinant of portfolio performance. It is the process of allocating the capital across a different range of asset classes, such as cash, fixed interest, property and equities. This is not simply a question of diversification, even though spreading risk amongst different asset classes is undoubtedly important. The optimum split between these asset classes depends on the individuals personal objectives for the portfolio as well as on the risk of failure for which the individual is prepared to accept.

3.2 - STRATEGIC ASSET ALLOCATION (SAA)

Strategic asset allocation, is explained in the theory of portfolio choice for long-term investors. Many institutional investors use beliefs, attitudes and expectations as the basis for predicting the future development of specific securities (Campbell 2002). Sometimes a belief will pay off. Sometimes the opposite happens. But what about the exposure to risk? And what about the match between assets and liabilities? How are these issues managed?

Research has shown that the strategic portfolio – effectively, the investment policy – accounts for more than 90% of the fluctuations in the return. Strategic Asset Allocation means accepting that economies have their ups and downs. Types of assets are chosen with a view to obtaining the best possible correlation. The strategy is maintained regardless of market fluctuations. By ignoring the psychological need to adapt to good or bad times, an investor will, in the long run, obtain a more consistent distribution of risk within the portfolio and enjoy a far more stable return. The major advantage lies in the systematic diversification that has its basis in the known correlations between different types of asset groups. Strategic Asset Allocation has the added advantage over Tactical Asset Allocation that the strategic discipline does not try to work with or against the wind. Instead, this method chooses to ignore it. (Bekkers, et al. 2009)

Strategic asset allocation is the theory of portfolio choice for long-term investors. Traditional definitions of asset allocation read something like this: “Asset allocation is a high level decision on how to allocate wealth to the broad asset classes, such as stocks, bonds, and cash”. Strategic asset allocation is such an approach to investing that it

involves making mindful selections regarding the types of assets that will be part of the investment portfolio (Ibbotson 2006).

Strategic allocation is the first stage in the investment process. It involves choosing an initial portfolio allocation consistent with the investor's objectives and constraints. This is equivalent to defining the benchmark, or reference, portfolio. Strategic asset allocation is both a process and a result. It is the process of determining the target long-term allocations to the available asset classes. Asset allocation is the process of dividing a portfolio among the major asset classes – such as bonds, stocks or cash – in order to reduce risk and optimize long-term returns through diversification. The starting point for the process is the investor's risk tolerance level. This not only determines the asset allocation goal for the portfolio at inception but also on an ongoing basis. The ultimate goal is to deliver to the investor an 'optimal portfolio' offering the highest possible return for the lowest risk (Gibson, 2000)

The skill of the strategic asset allocator lies in combining instruments that have contrasting behavior patterns in different economic conditions. Therefore, each asset is chosen for the beneficial effect that it will have on the portfolio as a whole – either because it has the capacity to enhance returns or else because its presence in the portfolio will help to neutralize the risks associated with other investments held. Because the value of assets can change depending on market conditions, the portfolio needs to be rebalanced periodically to maintain the right balance of assets for the agreed risk profile. (Erb & Harvey 2006)

Strategic asset allocation has a strong academic history and, in making this strategy the foundation for its investment style, here is an acknowledgement to all of the great thinkers who have helped to shape and work on the theory behind this method of investing over the last sixty years (Campbell and Viceira 2002). Key amongst them are:

Harry Markowitz

The American academic Harry Markowitz first developed his 'Modern Portfolio Theory' in the 1950's. He began by looking at the beneficial effects of asset diversification as a means of reducing risk within a portfolio. Taking his observations a stage further, he

discovered that by blending together non-correlated assets (that would perform entirely differently in different economic conditions); he could optimize the potential of a portfolio.

William Sharpe

A student of Harry Markowitz, Sharpe's studies further developed Markowitz' Portfolio Theory. Sharpe developed the 'Capital Asset Pricing Model' (CAPM), a pricing theory which helps measure a portfolio's systematic risk (beta) and the compensation – or returns – an investor can expect from it. Sharpe was awarded the Nobel Prize alongside Markowitz in 1990.

Fama & French

Eugene Fama and Kenneth French, jointly extended Sharpe's CAPM into a three-factor model. Fama and French plotted the returns from the US Stock Market for the three decades from 1964 to 1995 on a model that categorized stocks by their size and price-to-book characteristics. The results demonstrated that, above and beyond a stock's beta, size and value were two further factors that could have a positive impact on investment returns.

Eugene Fama's 1960's PhD dissertation also gave rise to the hugely influential 'Efficient Market Hypothesis' which states that at any given time, security prices fully reflect all information available to market participants. Therefore, if a market is efficient, no individual investor should expect to be able to outperform an appropriate benchmark of that market on a sustained basis.

Michael C Jensen

Jensen, 1968 paper, 'The Performance of Mutual Funds in the Period 1945-64', was the first major study of fund manager performance. It concluded that no mutual fund manager was able to use timing abilities to add value over the long term.

A strategic asset allocation specifies the proportion of various asset classes in a portfolio designed to provide an investor with an appropriate risk/return profile over a longer period of time. A strategic asset allocation framework will specify a range of

allocations appropriate for various levels of risk tolerance. For example, those with lower risk tolerance will tend to have lower exposure to more volatile, higher-risk assets such as stocks and commodities, and higher allocations to less volatile, lower-risk assets, including bonds and cash. Lifecycle changes may impact an individual's risk tolerance, which may at times suggest an adjustment to an individual's strategic asset allocation. However, the long-term nature of strategic asset allocation implies that changes should take place infrequently (Ibbotson & Kaplan 2000)

One of the key reasons why strategic asset allocations don't often change is that the long-term risk and return expectations that are the source for those allocations don't change frequently and although markets have a tendency to be volatile and returns often diverge sharply from year to year, if viewed over the longer term, the returns tend to become more stable, with gains in some years offsetting losses in other years. This suggests that the return and risk assumptions that form the framework of the strategic asset allocation process should be periodically evaluated and modified when the investment landscape has a material change, e.g., a shift in longer-term growth rates, a change in inflation expectations or a shift in risk premiums (Ibbotson 2006).

The essence of asset allocation is to use a basket of asset classes that are not highly correlated, meaning they do not move at the same rates at the same times. Some assets move in opposite directions. This is referred to as inverse correlation.

The first decisions when investing is to choose the broad categories of investment (or asset classes) to include in the overall portfolio and how much to invest in each. At the inception of the portfolio, a "base policy mix" is established based on expected returns. Because the value of assets can change given market conditions, the portfolio constantly needs to be re-adjusted to meet the policy. This long-term portfolio mix of broad asset classes (equities, commodity, property, bonds, cash and others) is commonly known as strategic asset allocation (Huber & Kaiser, 2003)

SAA traditionally considered a small number of broad, widely recognised, developed asset classes. More recently, in the search for further portfolio diversification and

additional source of uncorrelated returns, many portfolios have moved towards a much broader array of asset classes. It is not uncommon to see allocations to infrastructure, private equity, hedge funds, emerging market equities, and small cap equities.

SAA should take in to account the two most important factors for any investment portfolio – return and risk. Return – the investments should seek to match the returns of widely recognized benchmark representative of each individual asset class. For example, an equity investment might seek to match the return of Nifty or Sensex. Risk – volatility of returns relative to chosen benchmark should be minimized. This is best achieved by investing in passive managed strategies, which aim to closely track the stated benchmark.

The creation of a strategic asset allocation often begins with an assessment of the attitude of the investor toward the investment process. This helps to identify the different types of investment options that are a good fit for the investing style of the individual. For example, if the investor tends to be very conservative when it comes to buying and selling assets, that is an indication that a strategy that focuses on options that are low in volatility and are likely to yield a decent return over the long term would be a proper foundation for the portfolio. On the other hand, an investor who is more of a risk taker may be willing to acquire investments that are likely to yield a higher rate of return, but also have a higher degree of risk.

Along with stocks and bonds, strategic asset allocation plans normally involve assets like real estate, jewelry, and commodities. Strategic asset allocation means that the investor is primarily concerned with long-term returns. However, that does not mean the investor may not be open to some opportunities that are likely to yield a return in a short period of time. As part of the overall plan, the investor may choose to build a foundation of assets to hold onto for a number of years, but also set aside funds to engage in investments that are projected to increase in value for a short time, selling them as they begin to level off.

At its best, a solid approach to strategic asset allocation will provide a level of security that is constant from year to year, while increasing the net worth of the investments that make up the portfolio. The strategy is amended and adjusted when and as needed, as long as the adjustments help to keep the investor on track to achieve his or her long-term goals.

Despite considerable academic research, no definitive conclusions regarding the role of commodities in a strategic asset allocation exist. Possible reasons that commodities are excluded from the opportunity set include a limited number of implementation vehicles; the major commodity indices have short histories that have been backfilled; ambiguity over what constitutes an asset class and an investment strategy; the role of commodities in the market portfolio is undefined; the lack of an accepted commodity pricing model; and the lack of an understanding of the inherent returns of commodities.

Commodities are a unique asset class and it is this uniqueness that creates questions regarding the role of commodities in a strategic asset allocation. In addition to Erb and Harvey [2005] and Gorton and Rouwenhorst [2005], other works that investigate the role of commodities in an asset allocation include Anson [1999], Jensen, Johnson, and Mercer [2000], Lummer and Siegel [1993], and Kaplan and Lummer [1997]. Most of these asset allocation studies rely only on historical data.

Strategic asset allocation is the core of an investment plan. The strategic asset allocation is a set of long-term target allocations to applicable investable asset classes (proxied by market indices) with the highest probability of meeting long-term investment goals. The goal of the strategic asset allocation process is to determine the long-term exposure to the available asset classes. The identification of the investable opportunity set significantly changes the potential risk and return possibilities Greer [1997]. With a strategic asset allocation, investors typically buy, hold, and rebalance periodically. Trades aren't made based on market moves, but rather when personal circumstances change or asset allocations stray too far from the ideal percentages. Using a tactical approach, investors evaluate leading indicators for various markets, sectors, and asset classes to identify emerging opportunities, possibly making more

frequent asset allocation shifts to capitalize on perceived opportunities to potentially boost total portfolio return and reduce risk.

A variation of different assets will provide the investor with a variability of return in the investor's portfolio and reduce the risk. In order to achieve portfolio optimization the investor has to allocate the portfolio in different asset classes. The most beneficial way to allocate the assets is to let a global touch permeate the portfolio and by looking at different national markets in order to find independency, hence reduce the risk (Litterman, 2003). In order to attain optimization at a national level it is of great importance to look at different type of sectors and industries, this is supported by Markowitz (1959). The investor treats the national market as a global market with all its different industrial sectors where each sector symbolizes a national market. The diverse industrial sectors are to some extent uncorrelated and will provide a positive excess return and consequently should be added to the portfolio.

Independency and diversification is of significance to attain optimization, and allocating assets in different type of industries is what the investor practically does to achieve optimization. Search for the window of opportunity with mathematical tools, the statistical result gives the investor an indication of the suitability of the opportunity in the perspective of the investor's aversion to risk. When allocating the portfolio from a global point of view, it is important to be aware of that the transaction costs probably will rise to a great extent (Litterman, 2003).

Capital allocation decision is the choice of the proportion of overall portfolio to place in safe but low-return money market securities versus risky but higher-return securities like stocks and commodities (Michaud, 2008). The choice of the fraction of funds apportioned to risky investments is the first part of the investor's asset allocation decision, which describes the distribution of risky investments across broad asset classes – in the present research stock and commodities. The reason of including only stocks and commodities is that these represent a separate asset class unlike real estate and foreign asset. Further these two are most risky and gives highest possible return to an investor and thus allocation to these assets is major part of strategic asset allocation.

The goal of portfolio management is to generate maximum revenue while at the same time keep the level of risk as low as possible. For example, if the investor is likely to be very conservative when it comes to buying and selling assets, that is an indication that a strategy that focuses on options that are having lower volatility and are likely to yield a decent return over the long term would be a proper foundation for the portfolio. Alternatively, an investor who is more of a risk taker may be willing to acquire investments that are likely to yield a higher rate of return, but also have a higher degree of risk.

3.2.1 - Applying Markowitz's Model to Asset Allocation

The most widely quoted quantitative model in the strategic allocation literature is Markowitz's (1952) optimization model. The input data is the means and the variances, estimated for each asset class, and the covariance between the asset classes. The model provides the optimal percentage to assign to each asset class to obtain the highest return for a given level of risk, measured by portfolio volatility. The set of all optimal portfolios is known as the "efficient frontier". When Markowitz introduced his work, the primary hypothesis was that investors want to maximize return for a given level of risk or minimize risk for a given level of return. This means that at each level of return or risk only one set of stocks would satisfy the constraints and these portfolios are denoted to be 'efficient'. It should be noted however, that one efficient portfolio is not clearly better than any other efficient portfolio. The investor's risk-return preference function determines which portfolio is selected.

The primary tool for investigating the role of asset classes in a strategic asset allocation is Harry Markowitz's mean-variance optimization (Markowitz [1952, 1959]). Mean-variance optimization is at the heart of modern portfolio theory and over the last 50 or more years it has become the dominant asset allocation model. Mean-variance optimization requires three sets of inputs for the asset classes that make up a given opportunity set—returns, standard deviations, and correlations. Mean-variance optimization results in an efficient frontier, where each point on the frontier represents

the risk and return of an efficient asset allocation. Efficient asset allocations maximize expected return for a given level of risk, or equivalently, minimize risk for a given level of return (Ibbotson 2006).

3.2.2 - Asset allocation problem

In portfolio choice and in determining aggregate risk, the variance and correlation structures across assets are extremely important. It goes beyond this thesis to fully explain the causes of risk and to elaborate on the changes in valuations of specific risks which aggregate in portfolio theory. When academic students get assigned to determine the optimal asset allocation for a one million euro portfolio limited by stocks and bonds, and are only able to take long positions, they start with Modern Portfolio Theory (MPT). This is the framework they choose for optimizing a selection of stocks and bonds and from there they develop their strategies. The computational complexity of the model and time constraint of the students soon starts to limit the opportunities and only the most sophisticated future portfolio managers succeed in progressing from there. Stylized anomalies or predictive models are applied to select up till 100 assets used to construct a portfolio by using the mean-variance framework. Many financial firms are encountering the same difficulties in constructing their portfolios and so there is a need for practical translation of complex theory into useful models, which incorporate the advanced features of the financial time-series. The focus of this thesis is on efficient asset allocation, by using better inputs in the mean-variance framework one will reduce the realized variance by increasing the reliability of the diversification effects and will increase its return by using the knowledge of which economic conditions and so risks to expect. Key in this approach are the predictions for return, variance and correlation coefficients by use of the historical price series. Many financial firms are encountering the same difficulties in constructing their portfolios and so there is a need for practical translation of complex theory into useful models, which incorporate the advanced features of the financial time-series. (Edwin Hauwert 2011)

Bekkers et.al (2009), mentions that a key feature of strategic asset allocation is its long-term horizon. Does this mean that the investor should ignore business cycles and financial crises? These questions reveal confusion regarding the nature of the decisions.

Strategic asset allocation (SAA) is often defined as the opposite of tactical asset allocation (TAA). Below we have shown that how two strategies are different.

- TAA is a short to medium-term decision - It is as similar as market timing, decisions related to business cycles and/or market sentiment. Typically, the investor modifies the asset mix in the portfolio conditionally to the economic news flow or technical factors.
- SAA is a long-term decision – Over this horizon, the influence of financial crisis and business cycles is supposed to be less important. Then, long-run expectations obey to structural factors like the population growth (or demographic change), government policies and productivity. Thus, from long-term view point it is considered that SAA is best strategy and stock picking and market timing is better for making short term profits.

3.3 - COMMODITY

What kind of impact commodity markets has had throughout history is not fully known, but it has been pointed out that rice futures may have been traded in China 6000 years ago. It should be emphasized that shortages on critical commodities have sparked many wars throughout history. Examples are: in World War II, when Japan ventured into foreign lands in order to secure oil and rubber. Also, oversupply can have an overwhelming impact on a region by devaluing the prices of core commodities. Throughout history and in our modern times, commodity markets have had tremendous economic impact on nations and its people. It is known that ancient civilizations traded a wide selection of commodities. Such commodities were: livestock, seashells, spices and gold. Even if the quality of product, date of delivery and transportation methods were not reliable, commodity trading was an essential way of doing business. (Dumon, 2009)

Since the quality of commodities is not standardized every commodity has its own specific properties. An easy way to identify them is to distinguish between soft and hard commodities. Hard commodities are products from the energy, precious metals, and industrial metals sectors. Soft commodities are from the agricultural sector, such as grains, soybeans, or livestock, such as cattle or hogs and are usually weather-

dependent, perishable commodities for consumption. (Fabozzi, Fuss, and Kaiser, 2008, p.6)

Commodities are commonly used as inputs in the production of other goods like oil, energy etc. The quality of a given commodity that is traded has been standardized, and is essentially the same all over the world. When they are traded on an exchange market commodity must meet specified minimum standards, commonly often known as a basis grade (Investopedia).

Commodities actually offer huge potential to become a separate asset class for market-savvy investors, arbitrageurs and speculators. Retail investors, who claim to understand the equity markets, may find commodities an immeasurable market. But commodities are easy to understand as far as fundamentals of demand and supply are concerned. Historically, pricing in commodities futures has been less volatile compared with equity and bonds, thus providing an efficient portfolio diversification option. (Akey 2005)

Commodities are currently enjoying resurgence due to institutional investors such as pension funds and traditional portfolio managers are increasing that allocation in commodities (Bernd Scherer, 2005). Many market participants attribute the recent dramatic price increases in commodities to increased demand for consumer goods, particularly from the populous countries of India and China. Demand from Brazil and Russia, two of the fastest-growing economies currently, has undoubtedly also played a part. (Collectively, these four countries are referred to as the BRIC countries.)

Further researchers as well as institutions as pension funds are confirming the additional diversification benefits of commodities. For example - The investment strategy of ABP, the largest pension institution/fund of the Netherlands, states the following (ABP, 2011): *"“ABP invests in commodities for two reasons: The first reason is that commodities have no correlation with share and bond prices. By investing in commodities, ABP can enhance its risk-return profile. The total risk of the portfolio diminishes while the expected return remains constant. The second reason to invest in commodities is the compensation it offers for inflation.”"*

3.4 - FUTURES

A future is a financial obligation of a buyer to buy (or a seller to sell) a commodity or a financial asset in the future at a predetermined price and a holder of future contract is obligated to fulfill it. Futures are often fully collateralized to secure the transaction and that no money changes upon agreement (G.Gorton & K.G. Rouwenhorst, 2006). Future contracts are standardized contracts with very specific details on quality, volume, size, etc traded on organised exchange markets (Robert A.Haugen, 2001)

3.5 - COMMODITY FUTURES MARKET

A commodity futures market is a public market place where commodities are contracted for purchase or sale at an agreed price for delivery at a specified date. These purchases and sales, which must be made from through a broker who is member of an organized exchange, are made under the conditions of a standardized futures contract (R.L.Lerner, 2000).

3.6 - EXPOSURE TO COMMODITIES

Unlike many financial assets where the methods of obtaining exposure to the underlying asset class are relatively clear, this is not the case with commodities. The primary methods of obtaining exposure to commodities include:

I. Direct physical investment
II. A portfolio of commodity-related stocks
III. Commodity futures

These three methods result in different exposures that can result in significantly different risk and return characteristics. Commodity futures have already been discussed. Hence we describe the other two namely physical investment and commodity related stocks.

I. Direct physical investment

Generally, a direct physical investment in commodities is not practicable because most commodities are perishable and thus it cannot be stored for long periods of time. One exception in which a direct physical investment may be acceptable is precious metals.

Geman (2005) notes, however, that precious metals like gold, silver, and platinum are an exception. They do not have high current costs and are not difficult to store. However, a portfolio consisting solely of precious metals would not be sufficiently diversified. *Till and Eagleeye (2005)* find, commodities that are difficult to store have higher expected returns than those that are not. Also, their cost of carry, or holding costs are high. The owner pays for transportation, storage and insurance.

II. Commodity-related stocks

A third way to invest in commodities is to purchase securities in companies whose revenues are generated by the production or extraction of commodities. The hypothesis underlying this strategy is that owning stock in commodity producers provides the investor with exposure to commodity prices, and even to the gains from technological improvements in production. *Anson (1999)* says that an indirect investment in commodities (e.g., the purchase of petrochemical stocks) is only an insufficient substitute for a direct investment. It is difficult to identify a set of publicly traded companies that would serve as a good proxy for the basket of commodities covered by the futures index because many producers are privately held or are part of large conglomerates. Individual companies dedicated to the production of a single commodity are difficult to identify, and identifying a diversified pool of such companies is problematic. Fabozzi, Fuess and Kaiser (2007) note that the major sources of varying movements between commodity stocks and the underlying commodity are- operational risk caused by human or technical failure, internal regulations, external events, the strategic position of the company, management quality, capital structure (the debt/equity ratio), the expectations and ratings of company and profit growth, risk sensitivity, the risk of a total loss if prices decrease below total production costs, information transparency, information credibility, and temporary mispricing due to market disequilibriums. Furthermore, Georgiev (2006) shows that these sector-specific stocks are only slightly correlated with commodity prices.

Once you own stock of a commodity producer, you are exposed to the financial structure of that company, other businesses in which the company might be involved,

changes in accounting practices of that company, and the management talents of that company.

Georgiev (2005) shows that these sector-specific stocks are only slightly correlated with commodity prices, and hence prices of commodity stocks do not completely reflect the performance of the underlying market.

Investing in a portfolio consisting of commodity stocks via a commodity fund can be either active or passive. With a passively managed fund, the same discrepancies in the risk-return characteristics of the underlying commodity and commodity stock will apply. With an actively managed commodity fund (e.g., a commodity trading advisor [CTA]), there is additional distortion from the fund manager's skill [Gregoriou and Rouah (2004), Akey (2006) and Idzorek (2006)].

In summary, none of the abovementioned methods of obtaining commodity exposure measures the risk-return characteristics adequately. For the majority of investors, an index oriented investment will be the most efficient [Fabozzi, Fuess and Kaiser (2008)]. Therefore, investable commodity futures indices are the best available proxies for the risk-return profile of commodities, and most studies use these indices as benchmarks for the development of the commodity markets. The most widely used are the CRB/Reuters Commodity Index, the S&P GSCI Commodity Index, and the Dow Jones-AIG Commodity Index. But whether investors in commodities earn a risk premium is an ongoing discussion. Early studies such as Bodie and Rosansky (1980), Kaplan and Lummer (1998), and Greer (2000), as well as a more recent study by Gorton and Rouwenhorst (2006), find that historical returns of unleveraged commodity futures indices equal stock market returns. In contrast, Erb and Harvey (2006) find decreasing returns over time, and less evidence of a significant return persistence for single commodity sectors. Kat and Oomen (2007) also find no evidence of a consistent risk premium, except for energy commodities.

Thus the existence of a risk premium for single commodities is still a contentious issue. Nevertheless, structuring a commodity portfolio will only gain in importance for

investors, because even without a risk premium, a well diversified portfolio of commodities is assumed to offer a reliable source of return (Erb and Harvey (2006) and Scherer and He (2008) refer to this as the diversification return).

In contrast to the risk premium controversy, there is a consensus in the literature that investable commodity futures indices exhibit positive properties in diversifying mixed-asset portfolios [see, for example, Bodie and Rosansky (1980), Kaplan and Lummer (1998), Anson (1999), Jensen, Johnson and Mercer (2000), Gorton and Rouwenhorst (2005), Georgiev (2006), Gordon (2006), Idzorek (2006), Fabozzi, Fuess and Kaiser (2008), and Scherer and He (2008), among others].

Thus investable commodity futures indices are the most appropriate way to build an exposure to commodities that can capture the risk-return characteristics of the commodity market. It is not clear whether the underlying commodities of a commodity futures index generate a risk premium, but there is strong evidence that an index can earn a diversification return and exhibit positive properties in diversifying mixed-asset portfolios.

3.7 - COMMODITY INDICES ARE STRATEGIES

The two most commonly traded indices are the S&P Goldman Sachs Commodity Index (GSCI) and the Dow Jones-AIG Commodity Index (DJ AIG) in the world economy. Each of these indices is intended to be a broad representation of investment opportunities in the aggregate commodity futures market. Asset weights and asset returns drive portfolio returns. The return and risk differences amongst these two commodity indices can partially be explained by the different weights of individual futures contracts in each of the indices. Different portfolio weights imply that each of these indices suggest different definitions of the aggregate commodity futures market. (Gorton & Rowenhorst 2005)

The GSCI is heavily skewed towards energy exposure because its portfolio weighting scheme is based on the level of worldwide production for each commodity (S&P 2010).

In contrast, the DJ AIG index primarily focuses on futures contract liquidity data, supplemented with production data, to determine portfolio weights (Dow Jones 2010).

The composition of the indices differ from one another because there is no agreement upon which way to define the composition of the aggregate commodity futures market as there is with the aggregate equity market or the aggregate bond market. For example, the composition of the aggregate equity and bond markets is driven by market capitalization, the outstanding value of stocks and bonds. However, for every futures contract that one investor is long, there is another investor who is short the respective futures contract. The outstanding value of long and short futures contracts is exactly offsetting and consequently there is no commodity futures market capitalization. Lacking a market capitalization based portfolio weighting scheme, Erb and Harvey (2006) suggest that commodity indices can best be thought of as commodity portfolio strategies.

Figure 3.2 - Composition of MCX indices

MCX COMDEX latest Weights			
MCX COMDEX	**Commodity**	**Weight (New)**	**Group Adjusted Wts.**
MCX METAL INDEX	Gold	15.21%	**40.0%**
	Silver	9.66%	
	Copper	7.13%	
	Zinc	2.00%	
	Aluminium	2.00%	
	Nickel	2.00%	
	Lead	2.00%	
MCX ENERGY INDEX	Crude Oil	35.41%	**40.0%**
	Natural Gas	4.59%	
MCX AGRI INDEX	Ref. Soy Oil	3.91%	**20.0%**
	Potato	4.76%	
	Chana	4.14%	
	Crude Palm Oil	3.19%	
	Kapaskhalli	2.00%	
	Mentha Oil	2.00%	

Source - http://www.mcxindia.com/sitepages/abtcomdex.htm

The index is a significant barometer for the performance of commodities market and would be an ideal investment tool in commodities market over a period of time. The index allows per se as a "tradable" index (once approved by the regulatory body), which is readily accessible to market participants. Once launched for futures trading with regulatory approvals, by holding & rolling positions in the MCX COMDEX futures, investors would be able to replicate the returns on the basket of commodities included in the MCX COMDEX. The MCX COMDEX futures will give users the ability to efficiently hedge commodity and inflation exposure and lay off residual risk. Protection can be established regardless of overall market direction.

3.8 - THE FUNDAMENTALS OF COMMODITY FUTURES RETURNS

Commodity futures are considered to be a relatively unknown asset class. This may be because commodity futures are strikingly different from stocks, bonds, and other conventional assets. Among these differences Gorton and Rouwenhorst (2005) identify: (1) commodity futures are derivative securities; they are not claims on long-lived corporations; (2) they are short maturity claims on real assets; (3) unlike financial assets, many commodities have pronounced seasonality in price levels and volatilities. Another reason that commodity futures are considered to be relatively unknown in the literature may be more simple, namely, there is a lack of data.

The economic function of corporate securities, liabilities of firms, such as stocks and bonds, is to raise external resources for the firm. Investors are bearing the risk that the future cash flows of the firm may be low during bad times, like recessions. These claims represent the discounted value of cash flows over very long horizons. Their value depends on decisions of management as well as market conditions and investors are compensated for these risks. Gorton and Rouwenhorst (2005) call attention to the fact that commodity futures are rather different since they do not raise resources for firms to invest. Instead, commodity futures allow firms to obtain insurance for the future value of their outputs or inputs. Investors in commodity futures receive compensation for bearing the risk of short-term commodity price fluctuations.

When a currency weakens, the Federal Reserve has a variety of tools available to manage valuation and promote stability. Likewise, central banks can change interest rates to address economic concerns like inflation and deflation. Moreover, companies can address many near-term over- or underperformance matters through a variety of corporate actions. When a drought damages a grain crop or a hurricane destroys a key energy distribution channel, however, governments, banks, and companies often have restricted options to support short-term stability in commodity markets (Akey 2005). While all markets face periodic crises and disruptions, financial market contracts can be filed in a drawer or a hard drive. Commodity storage and distribution is a far more complex and expensive endeavor, so the production cycles of many natural resources are designed to reduce cost-of-carry and spoilage expenses. Hence, many commodities are mined in quantities commensurate to anticipated consumption. With limited intervention capabilities and slow production responses, the market has basically one response to short-term supply and demand disruptions: Price. This results in the extreme volatility of commodities prices and investments (Steien & Wachtmeister 2008).

3.9 - THE MECHANICS OF AN INVESTMENT IN COMMODITY FUTURES

According to Gorton and Rouwenhorst (2005), commodity futures do not represent direct exposure to actual commodities. Futures prices represent a bet on the expected future spot prices. Inventory decisions link current and future scarcity of the commodity and consequently provide a connection between the spot price and the expected future spot price. But commodities, and hence commodity futures, display a wide range of specific characteristics. Some are storable and some are not while some are input goods and some are intermediate goods.

Gorton and Rouwenhorst 2005 states that commodity futures contract is an agreement to buy or sell a specified quantity of a commodity at a future date, at a price agreed upon when entering into the contract – the future price. The future price is different from the value of a futures contract. Upon entering a futures contract, no cash changes

hands between buyers and sellers – and hence the value of the contract is zero at its inception. Since the future spot price is unknown today, a futures contract is a way to lock in the terms of trade for future transactions. In determining the fair futures price, market participants will compare the current futures price to the spot price that can be expected to prevail at the maturity of the futures contract. In other words, futures markets are forward looking and the futures price will embed expectations about the future spot price. If spot prices are expected to be much higher at the maturity of the futures contract than they are today, the current futures price will be set at a high level relative to the current spot price. According to Black (1976), lower expected spot prices in the future will be reflected in a low current futures price.

There are three sources of return in commodity investing: spot return, roll return and collateral interest. Spot return arise from the changes in spot price, roll return from the term structure of future prices and finally collateral interest is the interest earned on cash or money market account used to collateralize the futures position. In the following sections, the mechanics of these three sources of return are explained further (Erb and Harvey (2006).

3.9.1- Interpretation of the Sources of Return

Since anticipated trends in spot markets are taken into account when the futures prices are set, expected movements in the spot price are not a source of return to an investor in futures. Futures investors will benefit when the spot price at maturity comes out higher than expected when they entered into the contract, and lose when the spot price is lower than anticipated. Hence, a futures contract is a bet on the future spot price, and by entering into a futures contract an investor assumes the risk of unexpected movements in the future spot price. Unexpected deviations from the expected future spot price are by definition unpredictable, and should average out to zero over time for an investor in futures, unless the investor has the advantageous ability to correctly time the market. If an investor in futures does not benefit from expected spot price movements, and is unable to outsmart the market, the return expectations shall be based on risk premium: the difference between the current futures price and the expected future spot price (Gorton and Rouwenhorst (2005)).

If the futures price today is set below the expected future spot price, a purchaser of futures will on average earn money. If the futures price is set above the expected future spot price, a seller of futures will earn a risk premium. Keynes (1930) and Hicks(1939) theory of normal backwardation postulated that the risk premium would on average accrue to the buyers of futures.

They pictured a world in which commodity producers would seek to hedge the price risk of their output. For example, a grain producer would sell grain futures to lock in the future price of his crops an obtain insurance against the price risk of grain at harvest time. Speculators would provide this insurance and buy futures, but demand a futures price which is below the spot price that could be expected to prevail at the maturity of the futures contract. By backwardating the futures price relative to the expected future spot price, speculators would receive a risk premium from producers for assuming the risk of future price fluctuations. As the maturity date of the futures contract draws close, the futures price will start to approach the spot price of a commodity. At maturity, the futures contract will become equivalent to a spot contract, and the futures price will equal the spot price. If futures prices were initially set below the expected future spot price, the futures price will gradually increase over time, rewarding the long position. Whether the theory of normal backwardation is an accurate theory of the determination of the futures price is an empirical matter. Lastly, Expected trends in spot prices are not a source of return to an investor in futures. When the portfolio is rebalanced to its fixed weights, the portfolio automatically sells the commodity that has gone up in price and buys the one that has performed badly. Also The key to this is that most commodity prices are mean reverting, i.e. they tend to vary around a historical relatively stable mean. Thus, if the prices are mean reverting, the previous underperformer will now outperform and vice versa. This way, the constantly rebalanced portfolio tends to do exactly what a successful investor should do – buy low, sell high (Stein & Wachtmeister 2008).

3.10 - THE TERM STRUCTURE OF FUTURES PRICES – CONTANGO AND BACKWARDATION

The source of return in spot prices is the most uncomplicated for commodity investors to understand. This is the directional exposure to commodities many are looking for, particularly if their interest is based on a bullish outlook (Akey 2005). If an index has long exposure to heating oil and the price of heating oil increases, the position is profitable. Similarly, the collateral return is rather uncomplicated. A collateralized commodity futures program is unleveraged. That is, for every desired $1 in commodity futures exposure, an investor sets aside $1 in money-market funds or similar cash equivalents, hence making the futures program fully collateralized. When calculating returns to a collateralized commodity futures program or total return index, one typically includes the collateral returns (interest on the cash equivalent) as well. As previously mentioned, the theory of normal backwardation states that the risk premium would on average go to the buyers of futures, mainly because of commodity producers hedging their sales, thus accepting a lower futures price than the expected future spot price. According to Gorton and Rouwenhorst (2005), the producers thereby insure their profit from price effects, paying a risk premium for this to speculators buying the contracts. By rolling futures contracts forward, the investor realizes this so called roll yield. However, understanding the portion of return attributable to roll yield requires a review of the concepts of backwardation and contango as they apply to the pricing of commodity futures.

When a futures contracts price is at a discount to the spot price, the futures curve is called backwardation. When the futures contracts price is at a premium to the spot price, the shape of the futures curve is called contango. Futures returns are a combination of spot price returns plus the effect of the futures price converging to the spot. In a backwardated futures market, a futures contract converges (rolls up) to the spot price as the delivery date approaches. This is the roll yield that an investor captures. The spot price can stay constant, but one will still earn returns from buying discounted futures contracts, which continuously roll up to the constant spot price. In a contangoed market, reverse occurs: an investor continuously locks in losses from the futures contracts converging to a lower spot price. The term structure of futures prices

depicts the relation between futures prices and the maturity of futures contracts. While there are competing theories of commodity price determination, the term structure of futures prices is a market reality that investors face every day (Erb and Harvey 2006)

Previous researchers have found that crude oil prices are an example of market backwardation, in which the futures price for a commodity is lower than the current spot price. On the other hand the futures price for gold increases as the time horizon increases and this relationship is known as contango.

An upward or downward sloping term structure of futures prices creates the possibility of a futures price "roll return". In fixed income parlance, an upward sloping yield curve produces a return attributable to the passage of time known as "rolling down the yield curve". When market is in backwardation the roll return is positive and when the market is in contango than roll return is negative. Thus, "rolling" the futures positions and involves selling futures as their delivery time approaches and then buying new futures farther out the forward curve. In this manner the index investor maintains their investment in WTI crude oil futures at a fixed point on the forward curve, much like a bond investor seeking to maintain a constant maturity in their bond portfolio. By "rolling" their commodity futures positions in this way index investors never take physical delivery of the commodity and so cannot be adding to physical demand (Greely and Currie 2008).

3.11 - SPECULATORS, INDEX INVESTORS, AND COMMODITY PRICES

It is useful to address some of the questions that have been raised regarding the financial participants in the commodity futures markets. A common argument is that speculators and index investors perform very different roles in the commodity futures markets, and that these differences in economic roles imply very different influences on commodity prices. The role of speculators is to bring new information to the market on forward supply and demand fundamentals. Consequently, speculative buying and selling moves commodity prices to the extent that other market participants believe it is revealing new information on forward fundamentals. it is important to note that the empirical evidence shows that the size of the implied commodity price changes due to

speculative buying and selling are well below those sometimes suggested by market commentators (Greely and Currie (2008).

Unlike speculators who buy and sell on new information, the index investors buy and sell mechanically. Consequently, the buying and selling of index investors, does not "move the market" in the same manner that the buying and selling of speculators does. Instead, by allowing commodity producers to transfer their inherent commodity price risk exposure to long-term investors who are better-suited to bear it, the participation of the index investors in the commodity futures markets lowers the cost of capital to commodity producers, and by lowering costs helps to lower commodity prices over the long run.

3.11.1 - Hedgers and Financial Participants

The commodity futures markets are comprised of physical and financial participants. The physical participants are commonly called commercial participants, or hedgers. They are the producers and consumers of the physical commodities, and they are part of both the commodity futures markets and the underlying physical markets for the commodities.

The financial participants generally participate in only the commodity futures markets, not the underlying physical commodities markets. The financial participants are comprised of both speculators who actively trade the commodity futures markets and commodity index investors who passively hold a commodity futures position in their portfolio as part of their overall asset allocation strategy.

Commercials participate in order to hedge their inherent commodity price risk exposure, speculators to profit by anticipating commodity price movements, and index investors to earn a return for bearing commodity price risk. The commercials participate in the commodity futures markets in order to reduce their natural exposure to commodity price risk. This is why they are also known as hedgers, as they seek to hedge through commodity futures their exposure to commodity prices due to their role as producers and consumers of the physical commodities. The speculators, or active investors, trade in the commodity futures markets because they believe that they can profit by successfully anticipating movements in commodity prices. The index investors,

or passive investors, hold a commodity futures position as a part of their asset allocation strategy. Index investors seek to earn returns on these positions as a payment for bearing the commodity price risk that the physical participants want to hedge. Index investors also seek diversification and to protect their portfolios against inflation and adverse movements in equity and bond prices. In the commodity futures markets the desire of commodity producers to hedge generally exceeds that of commodity consumers.

This is according to Greely and Currie (2008) because commodity production is typically concentrated among far fewer participants than is consumption, leaving each commodity producer exposed to far greater commodity price risk than each consumer. Because of this underlying mismatch between the willingness of producers and consumers to hedge, commercials as a whole tend to be sellers of commodity futures. Commodity indices were designed to be long-only investment vehicles in order to create a stable supply of passive buyers to balance the commercial selling. Put simply, the index investors are the buyers of the commodity futures positions that the commercials want to sell in order to hedge their natural exposure to commodity price risk. Speculators will be either long or short, buyers or sellers, depending on the direction they anticipate commodity prices will move.

3.12 - NOTATION

In this study commodities and commodity futures as an asset class are explored. This means that there is no need of going through the details of individual future contracts and specific commodity future contracts. But it could be worth nothing that there are a lot of different contract types on a lot of different commodities. We take investment in Index of commodity futures and exclude individual contracts. Similarly for stock futures Nifty Index futures is used. Some of the largest trading places for commodities and commodity futures around the world are NYBOT, CBOT and LME. National-level Futures trading Exchanges in India are National Multi-Commodity Exchange (NMCE), Multi-Commodity Exchange (MCX), National Commodities and Derivatives Exchange (NCDEX), National Board of Trade (NBOT). This thesis is from Indian perspective so we take Nifty futures index and MCX commodity indices in our study.