



# **Role of REIT in a Multi-asset Portfolio**

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| <p>Abstract:</p> <p>There have been a number of studies that have examined the allocation of real estate investment trust security in the mixed asset portfolio, although none of the studies examines conspicuously which are the benefits REITs offer explicitly to the traditional portfolio by combining and considering mean variance theory, capital asset pricing model and different markets. The data for this research are collected from NewYork University (2014), National Association of REIT (2014), McGraw Hill Financial (2014) and through an interview with the Orava Residential REIT. The research model is developed by following the suggested approaches of Benninga (2008), Palmiter (2003), Shane (2013) and Roychoudhury (2007). The research highlights whether REIT is return enhancer, diversifier, risk hedger or risk enhancer. Major asset classes have been compared to identify the relative advantages of REIT. The research shows that REIT adds significant benefits and risks in a multi-asset portfolio and REIT benefits depend on the alternative asset classes of a multi-asset portfolio. In addition, the benefits of REIT have changed over the years. The research used fictitious portfolios and did not identify the underlying mechanism behind the growth, fluctuations and correlation mechanism of REIT. The future of REIT in a multi-asset portfolio significantly depends on the performance of REIT versus other major asset classes</p> |   |
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## **List of Abbreviations:**

REIT: Real Estate Investment Trust

NREIT: National Association of REIT

NCREIF: National Council of Real Estate Investment Fiduciaries

S&P 500: Standard & Poor's 500

DJIA: Dow Jones Industrial Average

US: United States

FI: Finland

# 1 INTRODUCTION

Private real estate is a distinctive investment opportunity with manifold advantages. It is a physical asset with low risk rate and it offers an optimal income source and prolonged appreciation period. Moreover, it brings essential diversification benefits to stocks and bonds. Therefore, there are numerous literatures that embed the remarkable presence of real estate in a multi-asset portfolio. (Youguo, Arjun, Willard 1995)

Despite the significant benefits of real estate, it has noteworthy disadvantages too. It is not liquid, needs a huge amount to create a diversified portfolio and also requires crucial management. So, private real estate can be concluded only for the mighty investors.

Thus investors tried different methods to invest in real estate and such security is publicly traded real estate securities REIT to achieve the benefits of real estate investment, avoiding the drawbacks. Therefore, many large, medium and small investors invested in liquid real estate securities in contrast to real estate equities which require large investments. Since the invention of REIT there have been various arguments whether REITs are real estate, stocks, bonds or combination of all three. (McMahan 1994)

There has been argument that REIT return are achieved through real estate so the REIT should be impacted by the factors of private real estate like normal demand and supply fluctuations because of changes in environmental issues, rents. However, REIT overall returns do not show a close correlation with physical real estate sector. The main difference occurs because NAREIT index measures most commonly retail, multi family and healthcare; on the other hand NCREIF index was consisted of various office, industry and private properties. (Mueller & Mueller 2003)

REITs have always been a significant instrument to enhance the return or to minimize risk in a portfolio. Moreover, the prominent advantages brought by REIT are considered as major benefits that there are no taxes on the dividend unless the stocks are sold. Research found that, REITs has performed better than other large stock markets with fifty percent less risks since 1960 to 2005.

REIT is structured as a commercial institution listed on the stock exchange; REIT buys real estate properties from a specified real estate sector or from various property sectors depending on their business strategy to maintain diversification (Geltner 2007). Depending on the generated cash flow from the acquired real estate properties, REIT issues securities to get investors on a usual basis. Based on the tax regulations, REIT distributes most of the dividends that is earned from their acquired real estate to these investors or share holders. Since REIT provides the benefit of higher returns and significantly lower risk in a portfolio, they have evolved as an inevitable part of diversified multi-asset portfolio. (Imperiale 2007)

For more than twenty years a number of studies have been done on the risk and return behavior of REITs and their diversification advantages for portfolio asset allocations in markets such as US, Europe and Australia. Despite this fact, there are fairly few researches have been done on the risk and return characteristics of REIT in the recent period. REIT has changed drastically after the financial crisis. Moreover, this research result is derived from a qualitative and quantitative method by consideration of two different markets. REIT in Finland is rather a new topic, there are only a handful of researches have been done on the characteristics of REIT in Finland. REIT provides different benefits in different countries, and the investors should consider this new investment opportunity in order to improve their strategic asset allocations (Idzorek, Barad and Meier 2006). So, it is essential to continue the research on the characteristics of REIT in various markets.

## **1.1 Specific Aim:**

The research question finds the advantages and disadvantages of adding REITs in a multi asset portfolio. The research could help the traditional investors to get a great insight while considering REITs as their investment.



## **1.2 Research Question:**

What are the risks and returns of adding real estate investment trust in a multi asset portfolio?

## **1.3 Significance of the Study**

There have been a plenty of studies which finds the inclusion of REIT in a portfolio but only a few studies have taken or considered different methods to find the optimal result. Many traditional investors want to gain a stable income through real estate but unable to invest with a large amount; this research would be beneficial for them.

Moreover, most of the studies had been done before the financial crisis, so it is important to understand the performance of REIT in the current market.

In academic manners this research tries look in the wider aspects collecting vital data on the basis of analyzing them on narrowed topic for future development or the general use of the findings. This research shows the overall performance of REIT in past thirty years. This study also could be used as the current and well diversified research of all the past reports.

In addition, this research also provides the significant information of REIT in Finland which is rather a new tool for investors in Finland or Foreign investors willing to invest in Finland.

## **1.4 Limitations:**

The research measures two fictitious portfolios based on the returns of the stocks that does not reflect an actual portfolio. Moreover, to understand the REIT situation in Finland it is crucial to analyze the overall performance of REIT and comparing them with other stocks in Finland. REIT is a new security in Finland so, it is hard to measure and predict the result.

Moreover, all the reports of Orava Residential REIT are in Finnish language that hinders the research. The research could be more pertinent if the data had been collected from a portfolio investment institution.

## **2 METHODOLOGY**

Qualitative and quantitative both approaches have been used to find the answer. Basically, the most common securities of a multi asset portfolio is taken into consideration and most importantly all the data relevant to analyze these assets are collected from the period of 1983 to 2013, these data presents a significant overview of the securities from the past and allows the investor to predict the future performance. The data are analyzed via portfolio theories. Analyses have been made by considering different perspective and approaches which seeks the relevant advantages or disadvantages of having Real Estate Investment Trust.

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### **2.1 Data and Research Approach:**

Historical returns of S&P 500, three months Treasury bill, and the ten years Treasury bond from last three decades have been collected from New York University and the historical returns of US Equity REIT have been obtained from National Association of Real Estate Investment Trust. These data have been analyzed through modern portfolio theory generally referred to as mean variance model.

Mean variance model consists of means, variances and covariances, this model was developed in 1950-1960 by Markowitz, Tobin, Sharpe, Lintner and many others. In this model, mean finds the average of the returns, variance measures the volatility of returns and covariance identifies the movement of two different stocks. Efficient frontier is the main part of the mean variance model. It identifies the optimal portfolio allocation, performance, risk and return. Two portfolios have been constructed by following the

mean variance model which is depicted as efficient frontier. Earlier mentioned securities have been used to create the portfolios. Efficient frontier analyzes the inclusion of REIT in an existing portfolio and the impact it holds on the risk and return.

To understand the current performance of REIT and other stocks it is important to examine the recent data. So, analyses of REIT and other stocks have been made which shows the volatility, returns and correlation among them in the recent period. The data have been collected from the same sources, but the analyses are made from the end of the financial crisis (2009-2013).

Capital asset pricing model has been used to examine the inclusion of REIT in a portfolio. CAPM is implemented in a manner that it identifies the addition of REIT in an existing portfolio that enhances the expected return. Two portfolios are constructed to measure the impact of the addition of REITs. The selected stocks for this model are Dow Jones Industrial Average, three months Treasury bill, ten years Treasury bond and REIT. In this model, the data has been considered from 1983-2013. Dow Jones Industrial Average data is collected from McGraw Hill Financial and this model used the same data for all other stocks which are collected for the mean variance model. Core components of CAPM are beta, risk free rate and market premium. Beta identifies the movement of the stock with the market. For the calculation of beta, S&P 500 has been used as the benchmark and regression analysis has been done to identify the beta (see Appendix 5 for regression analysis)

An interview has been conducted with the sole REIT (Orava Residential REIT) company in Finland. The reason to undertake this interview is to understand the performance of REIT in Finland and to identify the performance of REIT in different countries. Moreover, this interview highly complements the findings of the researcher.

## **2.2 Research Methods and Their Applicability:**

**Quantitative method:** This kind of research method is either descriptive or experimental. The main goal of using quantitative method is the development and employ-

ment of mathematical models and hypothesis related to the research. *Quantitative research deals in numbers, logic and the objective, focusing on logic, numbers, and unchanging static data and detailed, convergent reasoning rather than divergent reasoning.* (Babbie, Earl R 2010)

For the research, quantitative method has been used for most of the findings except the interview. The raw data have been collected from reliable sources as mentioned earlier. Various mathematical models have been used by the researcher and the collected data have been processed via the mathematical models to find the answer.

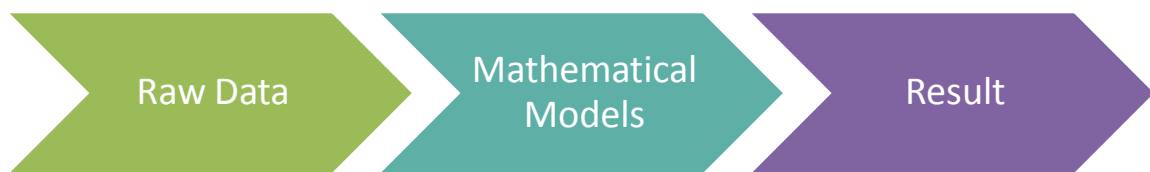


Figure 1: Process of quantitative method. Source: The Author

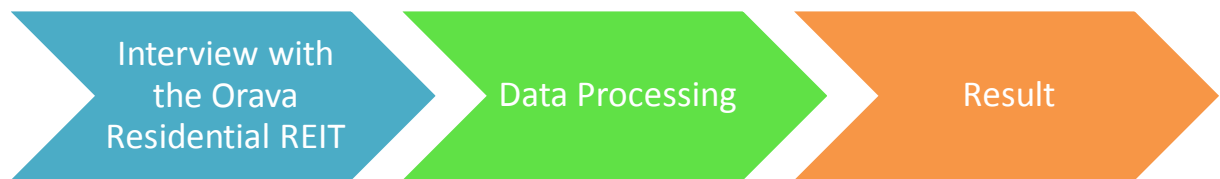
**Applicability of quantitative method:** ``*The Changing Benefits of REITs to the Mixed-asset Portfolio*`` by Stephen L. Lee, ``*Performance and Role of Singapore REITs in Multi-Asset Class Investment Portfolios*`` by Anthony Wong, ``*Measuring the Diversification Benefit of an Investment*`` by Youguo & Willard and many other major studies related with this research topic had been done by using quantitative method. The researchers found that the selection and the usage of quantitative method is the optimal method in finding the answer. The quantitative method allowed the researcher to find the desired answer in a rational manner.

### **Qualitative Method:**

The aim of qualitative method is to obtain a firm understanding of a particular organization or event. Qualitative method focuses to get a better insight by primary experience, honest reporting, and quotations of a real conversation. It tries to evaluate the underly-

ing meaning of the response from the participant. Interview and observation are the data collection method for a qualitative research. (California State University 2002)

Qualitative method has been used to identify the performance of REIT in Finland. In accordance with the qualitative method, an interview with the Orava Residential REIT company has been conducted. The interview is constructed by combining various important questions related with performance and behaviour of REIT in Finland.



*Figure 2: Process of qualitative method. Source: The Author*

**Applicability of qualitative method:** Qualitative method is more appropriate to find answer in researches such as marketing, strategy, management. In accordance with the research topic qualitative method is not the best possible solution. Though qualitative method is not the optimal method for this research but it is still useful to understand the performance of REIT in Finland. Because REIT is a new topic in Finland, the only REIT company in Finland started its journey at the end of 2013. So, there are very few financial reports to consider and evaluate the performance of REIT Finland. In consideration of the little history of REIT in Finland, qualitative method is appropriate to create an overview of REIT in Finland.

## 2.3 Research Process at a glance:

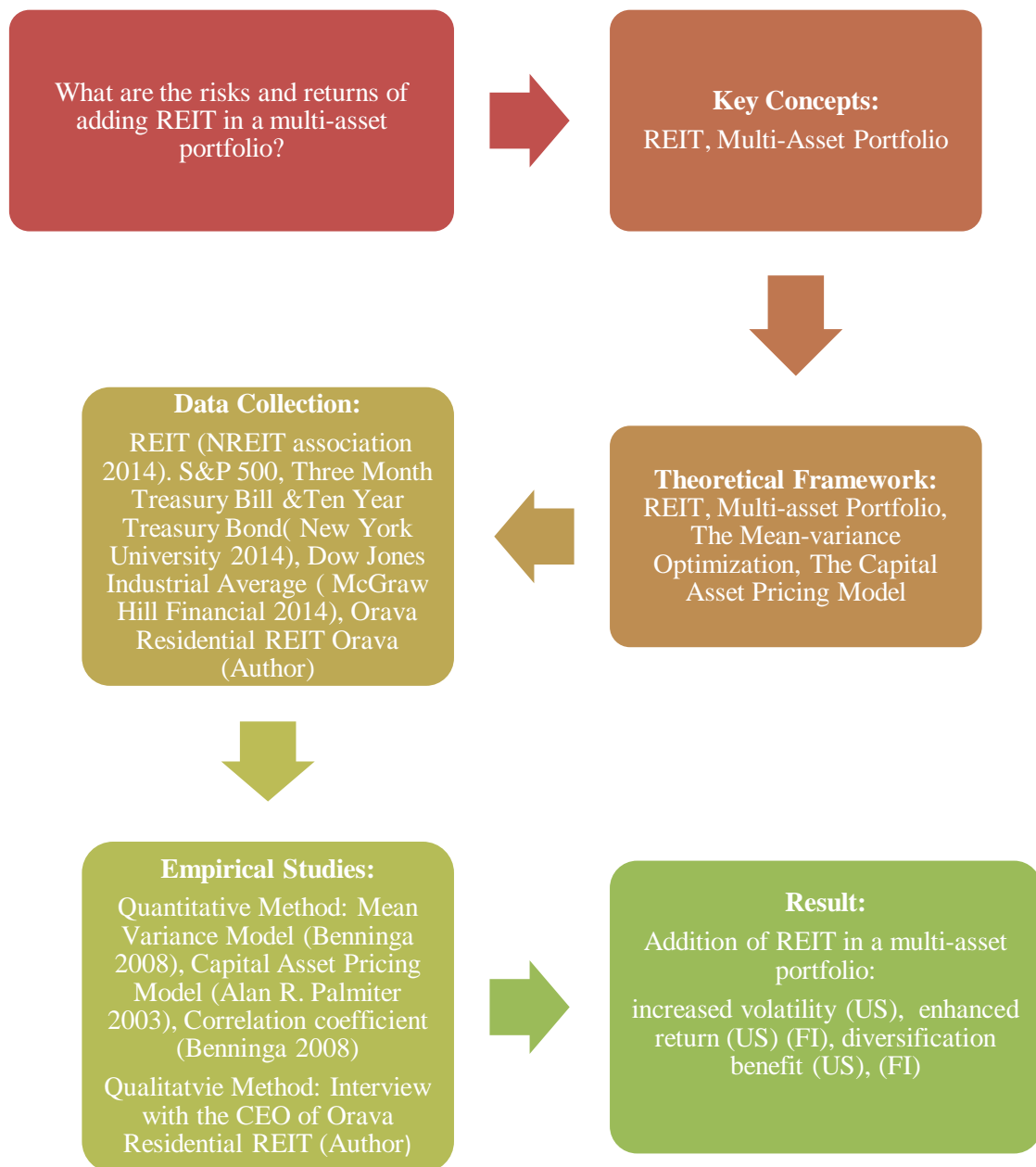


Figure 3: Research process at a glance. Source: The Author

### 3 THEORETICAL FRAMEWORK:

This chapter consists of theories that have been used for this research. The main parts of this chapter are REIT, multi-asset portfolio, mean variance model, covariance matrix, the efficient frontier, correlation coefficient and the capital asset pricing model. All of these theories and mathematical models are combined with the collected data and used to find the research answer. These concepts are at the core of this research, based on these theories the researcher developed the research model.

#### 3.1 REIT

**Definition of REIT:** *REIT stands for Real Estate Investment Trust generally, is a company that owns – and typically operates – income-producing real estate or real estate-related assets. REITs provides a way for individual investors to earn a share of the income produced through commercial real estate ownership – without actually having to go out and buy commercial real estate. The income-producing real estate assets owned by a REIT may include office buildings, shopping malls, apartments, hotels, resorts, self-storage facilities, warehouses, and mortgages or loans. (SEC 2013)*

Higher returns comes from higher risk, but for an investor who is looking for higher average returns with a substantial price growth in the course of time and with minimum amount of risk, the investor will undoubtedly would like to invest in real estate sector. Commercial real estate can be leased to tenants and the investor would be able to generate a continuous stream of income.

In consideration of the disadvantages associated with real estate, an investor would like to find an easy way, where professionals manage the business and the investor just deals with the profit. Again, if it was possible with real estate to sell and purchase like common stocks such as Nokia, Microsoft etc. (Ralph 2012)

REITs have brought in the convenient way to invest in commercial real estate for the investors. It has the major benefits of investing in real estate such as a continuous flow of income with a predictable amount by accompanying the liquidity of common stocks.

In addition, REITs have real time access to capital and so, it can invest more in commercial real estate while running the business. (Ralph 2012)

REITs not only brings stability to the investor's portfolio but also has been historically classified as an inflation hedge, and it has also maintained minimal amount of correlation with other common stocks over the time. (Ralph 2012)

Congress passed the REIT legislation in 1960, but it has been widely acknowledged in the last two decades. From 1992 to 2013 the overall size of REIT sector has achieved a growth of over 42 times (NAREIT 2014). By 2010, the industry has acquired only 10 to 15 percent of all commercial estate owned by institutions; it can be assumed that the higher growth rate of the industry will continue since there are plenty of investment opportunities left. (Ralph 2012)

Former managing partner of Ernst & Young Real Estate Group, Stan Ross has described REIT as, *“They are real operating companies that lease, renovate, manage, tear down, rebuild, and develop from scratch.”* (Ralph 2012)

REITs also give significant amount of dividend yields, REIT yields has historically surpassed the yields of many other major common stocks which makes REIT as absolute investment tool for individual retirement account (IRA). Over the historical period dividend yields of REITs has been observed as correlated with US ten year Treasury bond. In comparison with other major common stocks, REITs are more likely to grow since REITs income comes from the properties and the REIT properties are increasing rapidly. (Ralph 2012)

### **3.1.1 Provisions to qualify as a REIT**

A company must require some certain provisions in order to qualify as a REIT. And these provisions must be within the Internal Revenue Code. As required by the Tax Code, a REIT must:

- *have entity that is taxable as a corporation;*
- *Be managed by a board of directors or trustees;*
- *Have shares that are fully transferable;*
- *Have a minimum of 100 shareholders;*



- *Have no more than 50 percent of its shares held by five or fewer individuals during the last half of the taxable year;*
- *Invest at least 75 percent of its total assets in real estate assets;*
- *Derive at least 75 percent of its gross income from rents from real property or interest on mortgages financing real property;*
- *Have no more than 25 percent of its assets consist of stock in taxable REIT subsidiaries;*
- *Pay annually at least 90 percent of its taxable income in the form of shareholder dividends; (NREIT 2014)*

### **3.1.2 Types of REIT**

The REIT industry has a separate profile, which offers different kinds of investment opportunities. REITs are often classified in one of two categories: Equity or Mortgage. For this research Equity REIT has been used because it is more stable and has significantly higher return and capitalization than the Mortgage REIT. The two categories of REITs provide investors the opportunity to invest in either the equity financing or the debt financing of real estate (NREIT 2014), these are explained below:

#### **Equity REITs**

Equity REITs are mostly those kinds of real estate companies which own and operate income-producing real estate. They have increasingly become real estate operating based companies which involved in various kinds of real estate activities; such as: leasing, maintenance and development of real property and tenant services. The main difference of Equity REITs from other real estate companies is that an Equity REIT must acquire and develop its properties primarily to operate them as a part of its own portfolio rather than to resell them once they are usually developed. (NREIT 2014)

#### **Mortgage REITs**

Mortgage REITs are mostly engaged in lending money directly to real estate owners and operators or extending credit indirectly by the acquisition of loans or mortgage-backed securities. Now-a-days, the Mortgage REITs are usually trying to extend their

mortgage credit only to the existing properties. Also many mortgage REITs are using secure mortgage investments, dynamic hedging techniques and some other accepted derivative strategies in order to manage and control their interest rate and credit risks. (NREIT 2014)

### **3.2 Multi-Asset Portfolio**

The word *portfolio* means collection of anything. Therefore, the word *portfolio* denotes conjugation of companies in an investment basket, conjugation of companies consisting of products it produces or the conjugation of artists which is a collection of her noteworthy creations.

From a financial point of view, a portfolio is a collection of investments. It can be a collection of financial assets such as stocks, bonds and cash equivalents, as well as their mutual, exchange-traded and closed-fund counterparts. These instruments can have different characteristics regarding liquidity, dividends and valorization rate, etc. These portfolios are usually owned by investors and managed by asset managers. The portfolios can be compared to a pie that is allocated among different sizes to a variety of asset classes or types of investments to maximize the value of the portfolio.

Modern investment process generally involves three steps of process, (1) choosing securities that are more likely to perform better in future than other securities in as asset class (2) selecting a portfolio of assets that will outperform other multi- asset portfolios and (3) allocating best percentages of investments on assets according to the investors risk aversion. The selection of assets and asset portfolios is constantly influenced by different changing factors such as new information, new interrelationships with the economy as well as the other asset classes with new modes of product delivery, etc. (Crowder, Schneeweis and Kazemi 2012).

Multi-asset investing requires consideration of various conditions of the investor it includes assets, return expectation, amount of risk, liabilities, particular factors, location etc. All these factors in combination of economic and the stock market situation in a

certain period, permits the investor to create a multi-asset portfolio gaining the investment goals (Yoram 2013).

Multi-asset portfolio consists of more than one asset class; the asset class could be described as a group of investment that has common risk and return factors, also has the identical performance in particular market conditions, has the same effect on a financial event. Moreover, shares the same legal and regulatory description (Yoram 2013).

A general portfolio may consist of equities and bonds in a certain market and consider an asset allocation of 60% in equities and 40% in Treasury bonds, this portfolios are called balanced portfolio. A dynamic multi-asset portfolio invests in more diversified international asset classes, utilizes various investment tools, organized and managed by expert portfolio managers, requires strategic asset allocation and uses financial derivatives. This is generally referred as a multi-asset fund (Yoram 2013).

An investor needs to follow a framework to build and compare different investment portfolios rationally and consistently. Primarily utility functions can work as an effective technique where it is possible to acquire a composition of assets that creates the largest satisfaction and value maximization for the investors. Utility functions are derived by using four basic axioms of utility, i.e; completeness, transitivity, continuity, independence etc.

### **3.3 Mean Variance Model**

Mean variance portfolio model is based on decision theory; optimal allocation among various assets for an investment is the primary goal of this model. This quantitative model allows the investor to allocate the assets by considering the risk and return factor. It is a sophisticated investment model that is significantly effective for applied problems. Mean variance model was developed in 1950-1960 by Markowitz, Tobin, Sharpe, Lintner and many others. (Philip H. Dybvig 2000)

Main ideas of Mean variance model as stated by Professor Philip H. Dybvig :

- *Take on risk in proportion to the risk premium and in inverse proportion with variance and risk aversion.*
- *Diversification pays.*
- *The market rewards the investor for taking a share of economy-wide risk.*
- *The market does not reward the investor for taking on security-specific (idiosyncratic) risk.*
- *All investors hold a mixture of two portfolios, one riskless (if there is a riskless asset), and the market portfolio.*

Mean Variance Model is consisted of means, variances, co-variances and correlations. The next two subchapters deal with covariance and correlation matrix.

### **3.3.1 Correlation Coefficient**

Correlation coefficient has a range from -1.0 to +1.0. Positive correlation shows that the returns from two different stocks tend to move in a similar manner, on the other hand, negative correlation indicates that the securities normally tend to move in an opposite manner. The more close the correlation, the more strong the relationship between the two securities. When, the correlation between two securities is 0, then it means that the securities are uncorrelated to each other, they have no relationship between whether it is positive direction or negative direction. Most of the securities in the present day are prone to move together, but they are not perfectly correlated. Thus, the correlation coefficient of two different stocks is normally positive but less than 1 (James & John 2013)

#### **Karl Pearson's Correlation Coefficient**

Karl Pearson has provided a quantitative way of calculating correlation of two variables. The method was developed in 1890 (T.R. Jain 2007). This test is used to measure the

strength of a linear association between two variables, where the value  $r = 1$  means a perfect positive correlation and the value  $r = -1$  means a perfect negative correlation.

#### Requirements

- ✚ *Scale of measurement should have interval or ratio*
- ✚ *Variables should be approximately normally distributed*
- ✚ *The association should be linear*
- ✚ *There should be no outliers in the data (Social Science Statistics 2014)*

Equation of correlation coefficient:

$$r = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_i (x_i - \bar{x})^2} \sqrt{\sum_i (y_i - \bar{y})^2}}$$

*Source: Social Science Statistics 2014*

### 3.3.2 Covariance Matrix

Covariance matrix of the returns is the key to classic risk and return analysis. Covariance has long been used to estimate the volatility of a portfolio, to understand its values for related risks, for diversification of the portfolio, and also to achieve the efficient portfolio which has optimally balanced risk and return factor. Risk analyst and portfolio professionals utilize covariance which is consist of various assets or risk factors. For example a multinational risk analyst department of an international bank can summarize

all the significant yield curves, equity indexes, currency rate and commodity price in one large dimensional covariance matrix. (Carol 2008)

The equation of a portfolio variance includes three different elements, weights of portfolio, single asset variance and covariance (or correlation) of a pair of assets.

If we undertake an equally weighted portfolio with a vast number of  $N$  stocks the variance formula for this portfolio will have  $N$  distinct terms ( $\sigma_1, \sigma_2, \dots, \sigma_N$ ) and  $N^2 - N$  covariance terms ( $\sigma_{12}, \sigma_{13}, \dots, \sigma_{1N}, \sigma_{21}, \sigma_{23}, \dots, \sigma_{2N}, \dots, \sigma_{N1}, \sigma_{N2}, \dots, \sigma_{N,N-1}$ ). The chart shows all the available terms in the matrix, referred as variance-covariance matrix. Every single element on the main diagonal of this matrix shows that the every single asset's variance which contributes to the portfolio risk. (Graham, Smart; Megginson 2010)

| Variance-Covariance Matrix |  |  |  |  |
|----------------------------|--|--|--|--|
| Stock                      | 1  | 2  | 3  | $N$                                      |
| 1                          | $\left(\frac{1}{N}\right)^2 \sigma_1^2$  | $\left(\frac{1}{N}\right)^2 \sigma_{12}$ | $\left(\frac{1}{N}\right)^2 \sigma_{13}$ | $\left(\frac{1}{N}\right)^2 \sigma_{1N}$ |
| 2                          | $\left(\frac{1}{N}\right)^2 \sigma_{21}$ | $\left(\frac{1}{N}\right)^2 \sigma_2^2$  | $\left(\frac{1}{N}\right)^2 \sigma_{23}$ | $\left(\frac{1}{N}\right)^2 \sigma_{2N}$ |
| 3                          | $\left(\frac{1}{N}\right)^2 \sigma_{31}$ | $\left(\frac{1}{N}\right)^2 \sigma_{32}$ | $\left(\frac{1}{N}\right)^2 \sigma_3^2$  | $\left(\frac{1}{N}\right)^2 \sigma_{3N}$ |
| $\vdots$                   | $\vdots$                                 | $\vdots$                                 | $\vdots$                                 | $\vdots$                                 |
| $N$                        | $\left(\frac{1}{N}\right)^2 \sigma_{N1}$ | $\left(\frac{1}{N}\right)^2 \sigma_{N2}$ | $\left(\frac{1}{N}\right)^2 \sigma_{N3}$ | $\left(\frac{1}{N}\right)^2 \sigma_N^2$  |

| Portfolio Variance Equation  |  |
|--|--|
| $\sigma_p^2 = N \left(\frac{1}{N}\right)^2 \overline{\sigma^2} + N(N-1) \left(\frac{1}{N}\right)^2 \overline{\sigma_{ij}}$ |  |
| $\sigma_p^2 = \frac{\overline{\sigma^2}}{N} + \left(\frac{N-1}{N}\right) \overline{\sigma_{ij}}$                           |  |

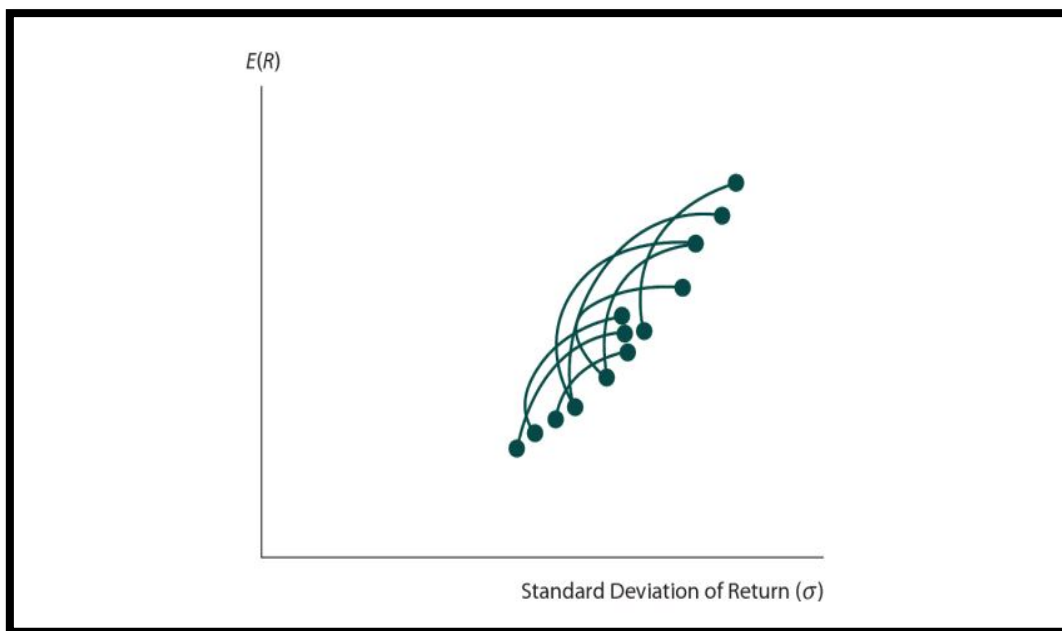
Figure 4: Variance-covariance matrix and portfolio variance equation. Source: Graham, Smart; Megginson 2010

### 3.3.3 The Efficient Frontier

Efficient frontier is used in this research to construct two portfolios, where two asset portfolio represents S&P 500 and Treasury bill, and three asset portfolio represents S&P 500, three month Treasury bill and the inclusion of REIT. The theory below is the demonstration of efficient frontier mechanism that is the core to evaluate an efficient

frontier. Moreover, the theory below is the model that has been used to evaluate the constructed portfolios in the research.

If two different asset classes are considered and the curve is obtained from utilizing all the considerable weights, there would be a graph as shown below (Figure 5). The envelope curved below which shows all the optimal possible matches is called efficient frontier. Precisely, the efficient frontier shows that number of portfolios which have the highest rate of return for all the given risks or the lowest risk in accordance with the rate of return. For instance, a similar frontier is given below on Figure 6. (Reilly & Brown 2012)



*Figure 5: Numerous Portfolio Combinations of Available Assets. Source: Reilly & Brown 2012*

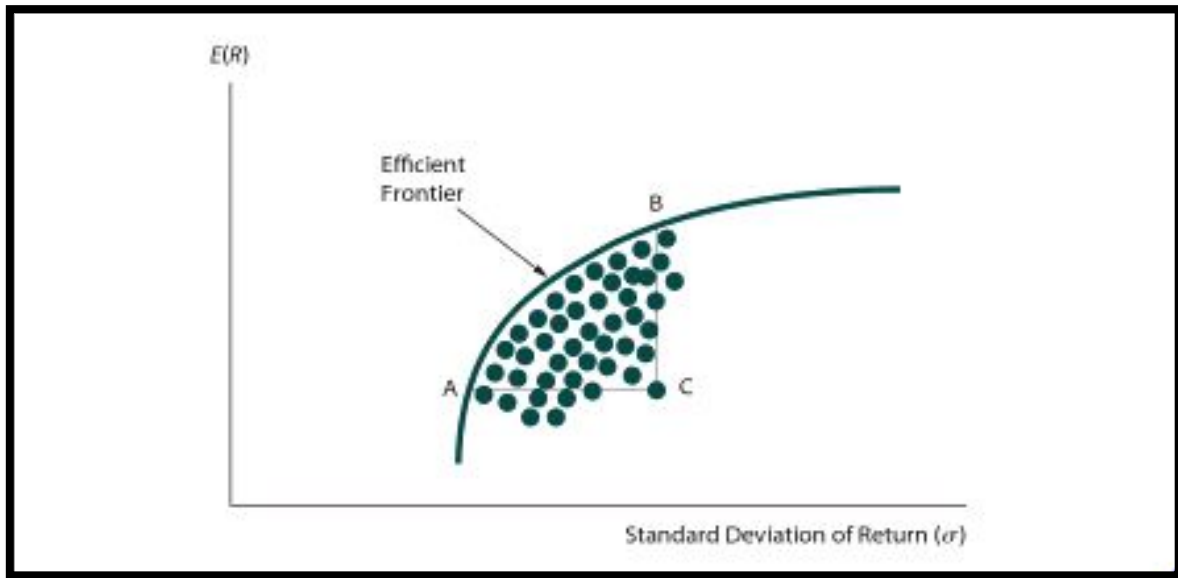


Figure 6: *Efficient Frontier for Alternative Portfolios*. Source: Reilly & Brown 2012

All the portfolios shown on the efficient frontier represents greater return for the same risk or lower risk for the same return than few portfolios under the frontier line. In figure 6, it is visible that Portfolio A is better than Portfolio C, because we can see that Portfolio A & C shares the same return but portfolio A carries significantly less risk. Again, it is clear that the portfolio B is better than portfolio C in terms of risk, because they share the same risk, but portfolio B has higher returns. Since, diversification of less correlated asset class adds greater benefit to a portfolio, it is essential to make the efficient frontier with portfolios of investments despite considering single securities. (Reilly & Brown 2012)

### 3.4 The Capital Asset Pricing Model

After analyzing two portfolios by the mean variance model (efficient frontier), the researcher tried to employ more modern and sophisticated model of portfolio theory that is capital asset pricing model. The reason behind in using the capital asset pricing model is to establish the findings of the research by different approaches. These approaches allowed the researcher to construct a logical model to find the accurate answer.



The capital asset pricing model has been used to construct two portfolios referred to as portfolio X and portfolio Y. Where, portfolio X is consist of Dow Jones Industrial Average, three month Treasury bill and ten year Treasury bond and portfolio Y is consist of Dow Jones Industrial Average, three month Treasury bill, ten year Treasury bond and Equity REIT (US). Below is the core theory that has been used to understand the main ideas of capital asset pricing model.

The Capital Asset Pricing Model, CAPM, is a formula that describes the relationship between risk and return. It is a hand tool of an analyst or a corporate manger to reckon the needed reward of an investment project to offer in order to compensate the investors for their risks.

Applying this formula, the required compensation can be calculated by measuring the market beta or risk as well as expected rate of return or reward. In other words, if the project's relevant risk characteristics are given, which is generally used in pricing of risky assets, securities or portfolio, it is possible to figure out the cost of capital and appropriate expected rate of return through this model.

According to Welch (2013), CAPM states that an investment's cost of capital is lower when it offers better diversification benefits for an investor who holds the overall market portfolio- less required reward for less risk contribution. Market beta is its measure of risk contribution. Projects contributing more risk (market beta) require a higher expected rate of return whilst project contributing less risk require a lower expected rate of return.

CAPM helps an analyst to decide the price of a particular stock. If 'stock x' is riskier than 'stock y', the price of 'stock x' should be lower to compensate investors for taking on the increased risk. The CAPM formula of a project named 'i' is-

$$E(r_i) = r_F + [E(r_M) - r_F] \cdot \beta_i$$

Here,

$E(r_i)$  = The expected rate of return on the project

$E(r_M)$  = The expected rate of return on the overall market

$r_F$  = The risk free rate of return

$\beta_i$  = Project's beta with respect to the market

So, the difference between the expected rate of return in the stock market and the risk free investment,  $[E(r_M) - r_F]$ , is called the equity premium or market risk premium. However, an example of CAPM formula is given below:

An assumption can be made that X is a portfolio company which offers three different types of investment on the basis of risk and interest to its clients:

- a. Risk free investment with 3% interest (No risk)
- b. Investment with Systematic or Medium risk with 3% interest
- c. Investment with Higher risk with 3% interest

Among the options a, b and c, the most safe and attractive offer for investment is option a where there is no risk and the interest rate is same to rest b and c which are not risk free. Now, if the X Company wants to make option b as attractive as option a, then inevitably the criteria have to offer some extra percentage as interest. It is imagined that, for option b, X Company is offering an extra 5% interest to its investors. As a result, option b stands for the investment with systematic or medium risk with  $3\% + 5\% = 8\%$  expected market return which makes it similarly attractive. Here, this extra 5% interest is called risk premium.

On the other hand, in order to make option c as attractive as option a and b to the investors, the X Company needs to increase the interest rate also in this case. To quantify how much interest in total should the company offer to its clients to make the option c attractive the CAPM can be applied.

Based on the previous assumptions, the risk-free rate is 3% and the expected market return is 8% and the market as a whole has a beta of 1.

So, the expected rate of return  $E(r_i) = 3\% + [8\% - 3\%].1 = 3\% + 5\% = 8\%$

By the above mentioned calculation it is found that the X Company has to compensate total 8% as expected rate of return to make option c similarly attractive to its clients.

## **4 EMPIRICAL STUDIES**

This chapter is the analytical research model developed for this research. Various statistical and mathematical models have been developed and employed for the research; the main parts of this study are mean variance model, capital asset pricing model and the interview with the Orava Residential REIT. Mean variance model identifies the maximum level of return for a given level of risk; moreover, it allows the investor to identify the return, diversification level and the volatility of a stock. In addition, the efficient frontier that is the part of a mean variance theory has been used to compare two portfolios, to examine the impact of adding REIT in an existing portfolio. After examining the historical data from 1983 to 2013, another analysis has been made to visualize the performance of REIT and other major stocks from 2009 to 2013. A more sophisticated portfolio theory capital asset pricing model has also been implemented to compare the two portfolios and to measure the addition of REIT in an existing portfolio. Afterwards, an interview with the Orava Residential REIT company of Finland has been conducted to evaluate the performance of REIT in Finland.

### **4.1 Summary Statistics of US Asset Classes**

Table 1 presents various calculated statistics for the major asset classes selected for this research, the risk and return statistics for the S&P 500, ten year Treasury bond, Equity REITs and three month Treasury bill within the US investment market from 1983 to 2013.

**Table 1: Annual Summary Statistics of US Asset Classes (From 1983 to 2013)**

| <b>Asset Class</b>                        | <b>REIT</b> | <b>S&amp;P 500</b> | <b>Three month Treasury bill</b> | <b>Ten year Treasury bond</b> |
|---|-------------|--------------------|----------------------------------|-------------------------------|
| <b>Mean Return</b>                        | 13%         | 12.80%             | 4.13%                            | 8.09%                         |
| <b>Standard Deviations of Returns (%)</b> | 0.179650513 | 0.171551177        | 0.027351091                      | 0.100152622                   |
| <b>Variance of Returns</b>                | 0.032274307 | 0.029429806        | 0.000748082                      | 0.010030548                   |

*Raw data source: New York University (2014), NREIT (2014). Calculation Source: The Author. (See appendix 2 for the calculations)*

The average mean return of asset classes is shown accordingly for the REIT at 13%, followed by S&P 500 at 12.8%, three month Treasury bill at 4.13% and lastly the ten year Treasury bond at 8.09%. Accordingly, the standard deviation of the average annual returns of these asset class is shown as 17.9% for the REIT; also 17.15% for S&P 500, followed by 2.7% for three month Treasury bill and 10% for ten year Treasury bond. Here it is observed that the highest standard deviation is for REIT and lowest standard deviation is for three month Treasury bill. After, analyzing these statistics it is visible that the higher the annual return is, the higher the standard deviation is. Standard deviation calculates and analyzes the amount of risk and volatility engaged with different asset classes, it appears that the asset classes those have higher returns are prone to have higher risks, on the other hand, assets which have lower returns will follow a lower amount of risks. (Geltner, Miller, N.G 2007)

**Findings from the Annual Summary Statistics of US Asset Classes:**

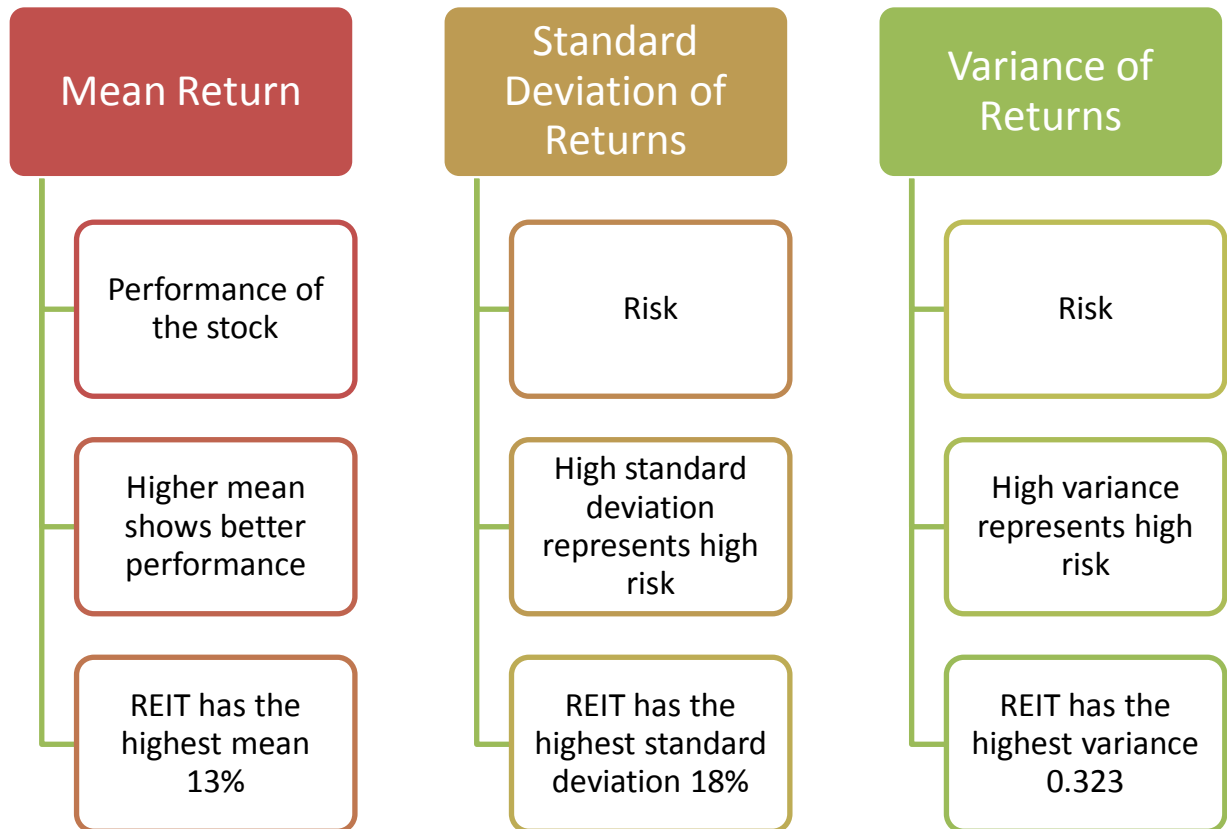


Figure 7: Findings from the Annual Summary Statistics of US Asset Classes. Source: The Author

Mean return of a stock shows the performance of stock and also represents the value of the stock in a portfolio. Higher mean return of a stock will enhance the return of a portfolio; since, REIT has highest mean return so the inclusion of REIT will enhance the performance of a portfolio.

Standard deviation and variance represents risk associated with a stock. Inclusion of a risky asset such as REIT will increase the overall risk of a portfolio.

## 4.2 Correlation and Covariance Matrix of US Asset Classes

Table 2 and Table 3 shows the correlation coefficient and covariance matrix among Equity REIT, S&P 500, three month Treasury bill and ten year Treasury bond. These researched statistics will show the annual returns of two asset classes and asset classes that are prone to move in the same manner in the course of time.

**Table 2: Correlation of annual returns among four different asset classes (From 1983 to 2013)**

| Correlation Coefficients | US REIT      | S&P 500     | Three month Treasury bill | Ten year Treasury bond |
|--------------------------|--------------|-------------|---------------------------|------------------------|
| REIT                     | 1            | 0.460070697 | 0.005731387               | -0.081067207           |
| S&P 500                  | 0.460070697  | 1           | 0.175513909               | -0.09985696            |
| 3-month T.Bill           | 0.005731387  | 0.175513909 | 1                         | 0.327806955            |
| 10-year T. Bond          | -0.081067207 | -0.09985696 | 0.327806955               | 1                      |

Raw data source: New York University (2014), NREIT (2014). Calculation Source: The Author

**Table 3: Covariance matrix of annual returns among four different asset classes  
(From 1983 to 2013)**

| Variance-<br>Covariance Ma-<br>trix | US REIT      | S&P 500      | Three month<br>Treasury bill | Ten year Treas-<br>ury bond |
|-------------------------------------|--------------|--------------|------------------------------|-----------------------------|
| US REIT                             | 0.0312332    | 0.013721649  | 2.72535E-05                  | -0.001411548                |
| S&P 500                             | 0.013721649  | 0.028480458  | 0.000796965                  | -0.001660328                |
| 3-month T.Bill                      | 2.72535E-05  | 0.000796965  | 0.00072395                   | 0.00086899                  |
| 10-year T. Bond                     | -0.001411548 | -0.001660328 | 0.00086899                   | 0.009706982                 |

*Raw data source: New York University (2014), NREIT (2014). Calculation Source: The Author.*

After analyzing the correlation and covariance matrix from the above tables, it is visible that the annual returns of 10 year bonds has a negative correlation with both REIT and S&P 500 and the three month Treasury bill has a lower correlation than 10 year bond both with the REIT and S&P 500. The annual returns of S&P 500 have a positive correlation both with the REIT and three month Treasury bill though, S&P 500 is more highly correlated with REIT than the three month Treasury bill. The annual return of REIT is also correlated with three month Treasury bill with a correlation coefficient of 0.005731387. The annual return of REIT is highly correlated with S&P 500 with the correlation coefficient of 0.460070697 which is higher than any other asset class. Despite this positive correlation of REIT with other asset classes, REIT is not perfectly correlated with any other asset classes.

### **4.3 The Efficient Frontier (US)**

Within a portfolio the reduction of volatility or the amount of risk and the better performance is achievable by combining various combinations of these asset classes. (Brueggemen, W.B & J.D 2008). Here, Figure 8 shows the calculated efficient portfolio for two different investments by the various combinations of Equity REIT, S&P 500 and three month Treasury bill. Two asset portfolio represents S&P 500 and Treasury bill; three asset portfolio represents S&P 500, three month Treasury bill and the inclusion of REIT. Efficient frontier is computed by following the Benninga (2008) and Roychoudhury's (Capital University 2007) suggested approach.



### Efficient Frontier

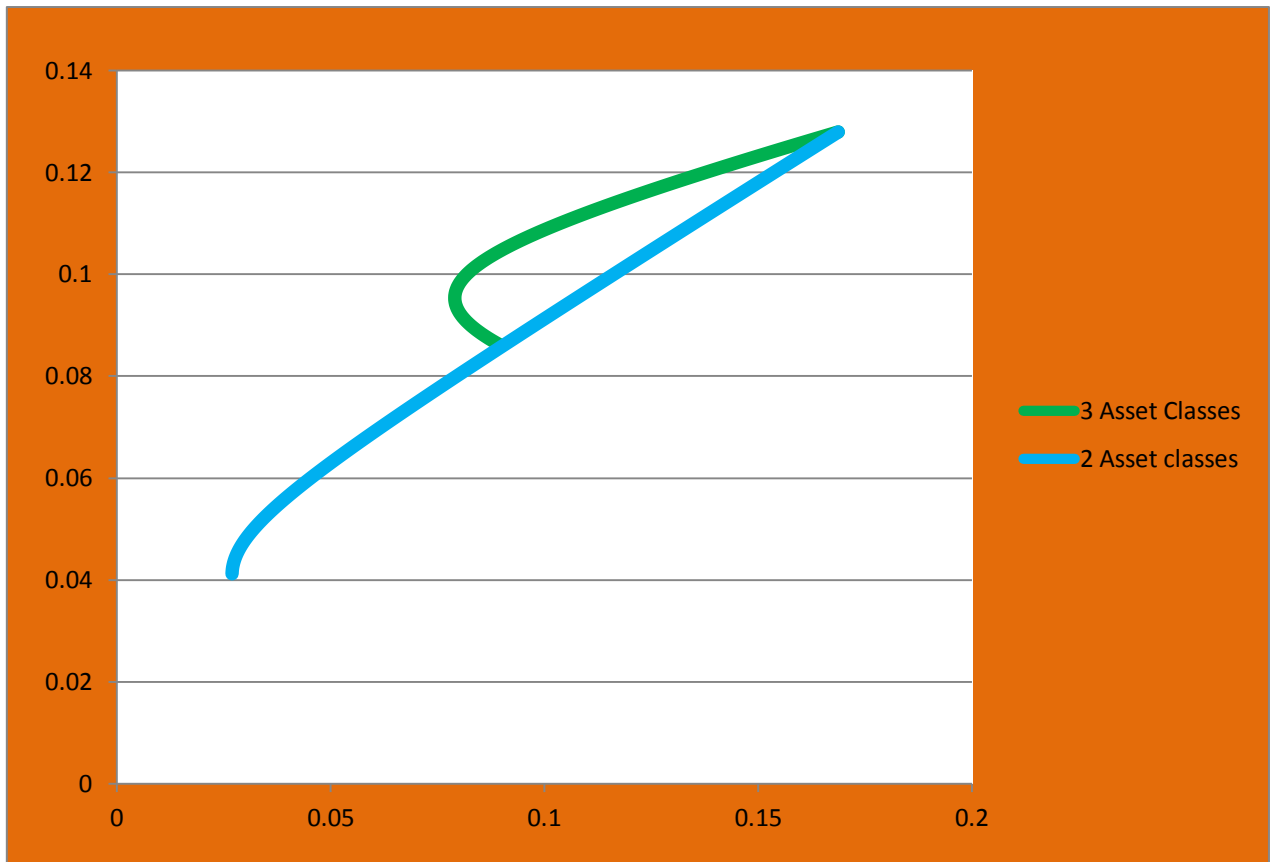


Figure 8: Efficient Frontier of a Two Asset Class Portfolio and a Three Asset Class Portfolio. Raw data source: New York University (2014), NREIT (2014). Calculation Source: The Author (See appendix 1 for the calculations)

Here, vertical axis represents portfolio mean (%) and horizontal axis represents portfolio standard deviation (%). The historical portfolio standard deviation is from 0.02 to 0.17 within this range the three asset class portfolio has gained mean return of 9 % to 13% and the two asset class portfolio has gained mean return of 4% to 13%. It is clearly visible that, three asset classes have performed better within the certain level of risks. Hence, it can be said that the inclusion of REIT in the portfolio has enhanced the performance of the portfolio. In addition, three asset class portfolio has outperformed two asset class portfolio within the standard deviation of 0.1 to 0.17 remarkably.

Moreover, the correlation and covariance matrix calculation among REIT and other asset classes of S&P 500, three month Treasury bill and the 10 year Treasury bond have historically proved that the REIT has a strong correlation with S&P 500 in comparison with other asset classes. Despite the strong correlation of REIT with S&P 500, it is still less than one which makes it possible to have the REIT and S&P 500 in the same port-

folio, and it is significantly lower with 10 year Treasury bond and three month treasury bill. All of these prove that REIT can bring diversification and return enhancement benefit to any multi asset portfolio.

#### 4.4 After the Financial Crisis (US)

Since, the financial world is changing every now and then so it crucial to focus on the recent data and market. Therefore, it is essential to understand the current situation of the Equity REIT, S&P 500, three month Treasury bill and 10 year Treasury bond to make any investment.

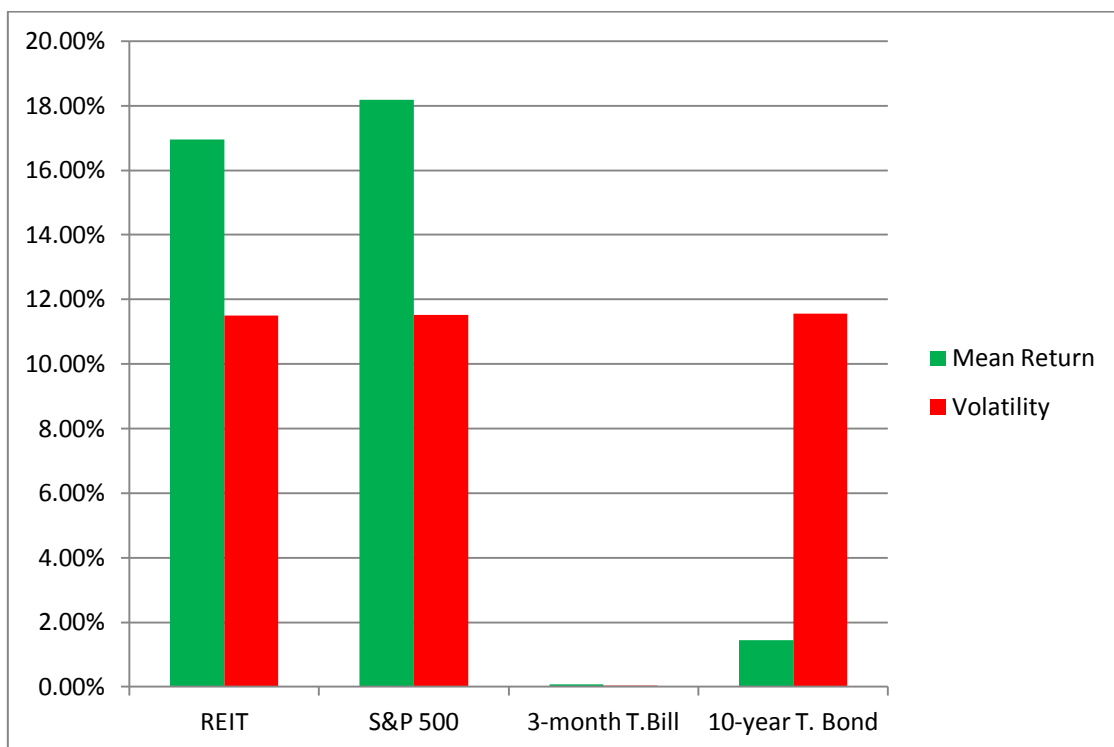


Figure 9: Return and Volatility of REIT, S&P 500, three month T. bill and ten year T. Bond (From 2009 to 2013) US. Raw data source: New York University (2014), NREIT (2014). Calculation Source: The Author. (See appendix 4 for the calculations)

From the above figure it seems that the US financial market has changed drastically, REIT has the return of 17% with the standard deviation of 11.5%, S&P 500 has return of 18% with the standard deviation of 11.5%, three Month T. Bill has return of 0.8% and the volatility close to 0, on the other hand, Treasury bond has high volatility.

It is also crucial to identify the correlation of these asset classes on the basis of recent data to create an optimal portfolio. So, in the table 4 the correlation coefficient of REIT, S&P 500, three month Treasury bill and 10 year Treasury bond is shown to understand the current movement of the returns of these asset classes.

**Table 4: Correlation Coefficient of annual returns among four different asset classes (From 2009 to 2013)**

| Correlation Coef-<br>ficient | <i>REIT</i>  | <i>S&amp;P 500</i> | <i>3-month T.Bill</i> | <i>10-year T.<br/>Bond</i> |
|------------------------------|--------------|--------------------|-----------------------|----------------------------|
| <b>REIT</b>                  | 1            | -0.031983297       | 0.802275867           | -0.062562727               |
| <b>S&amp;P 500</b>           | -0.031983297 | 1                  | 0.426093269           | -0.952101311               |
| <b>3-month T.Bill</b>        | 0.802275867  | 0.426093269        | 1                     | -0.439233032               |
| <b>10-year T. Bond</b>       | -0.062562727 | -0.952101311       | -0.439233032          | 1                          |

*Raw data source: New York University (2014), NREIT (2014). Calculation Source: The Author.*

REIT had a strong correlation of around 50 percent with S&P 500 before the financial crisis but after the financial crisis the positive correlation turned into negative correla-

tion. Ten year Treasury bond has negative correlations around 95% percent with S&P 500 and 43% with three month Treasury bill but much lower negative correlation of around 6% with REIT. Three month Treasury bill has significant positive correlation with REIT around 80% and also positive correlation with S&P 500 about 43% but negative correlation with 10 year Treasury bond.

These results prove that REIT has performed much better after the financial crisis, and it has lower volatility than S&P 500. Most importantly, the correlation of REIT and S&P 500 has become negative 3% that brings a great diversification benefit when combining REIT and S&P 500 in a multi asset portfolio. Since, REIT and S&P 500 both have higher return rate and negative correlation, REIT would be a great enhancer within a multi asset portfolio.

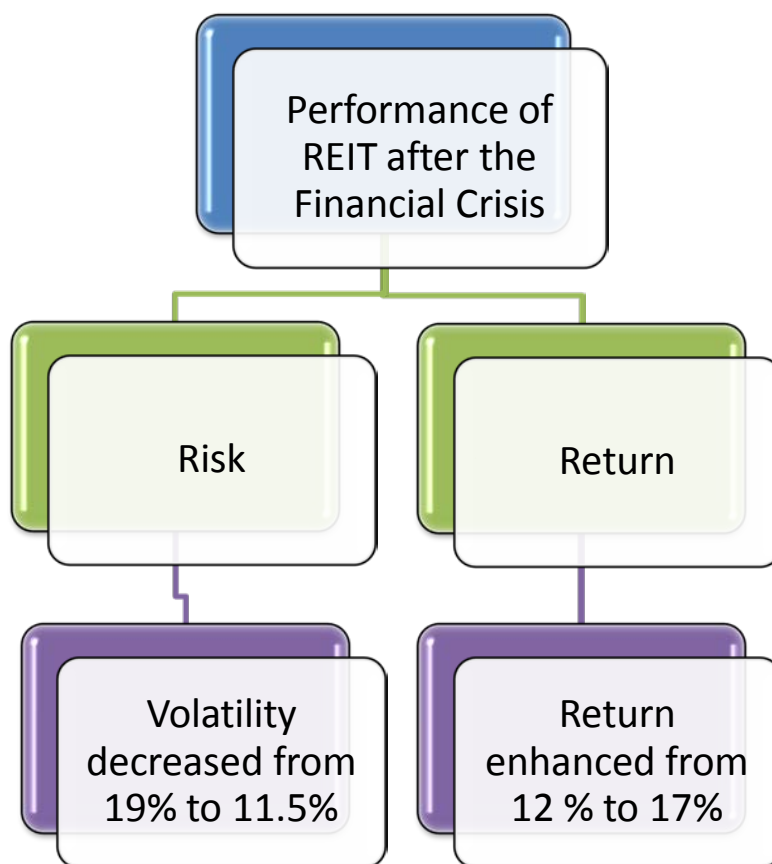


Figure 10: Performance of REIT after the financial crisis. Raw data source: New York University (2014), NREIT (2014). Calculation Source: The Author. (See appendix 3 and 4 for the calculations)

REIT had a volatility rate of 19% from the period of 1983 to 2008 that volatility rate has decreased from 19% to 11.5% in the period of 2009 to 2013. REIT had annual average return of 12% from the period of 1983 to 2008 but after the financial crisis the annual average return of REIT has become 17%. So, it can be concluded that REIT has performed better after the financial crisis that means now REIT will add higher benefits in a multi-asset portfolio than the past.

#### **4.5 Construction of two portfolios (Capital Asset Pricing Model)**

The calculation of the portfolios is influenced by the Professor Alan R. Palmiter's (Wake Forest University 2003) suggested approach. Market risk premium and risk free rate are obtained from the report of Fernandes, Aguirreamalloa and Linares (IESE Business School 2013). Beta calculations have been done by following the approach of Professor Shane (Notre Dame University). The beta has been computed by using the regression analysis of data analysis tool of Microsoft Excel (See appendix 5 for the calculations of beta). For the calculations of beta S&P 500 has been used as the benchmark.

Every investor would like to identify the expected return from the stock and the investor having a portfolio would like to understand the expected return of a portfolio. In an investor's perspective a portfolio which has higher return than other portfolios is an optimal portfolio. Therefore, an investor would like to maximize the return of the portfolio and to balance the risk factor (Robert, Scott & Elko 2001).

To measure the impact of adding REIT in an existing portfolio two portfolios have been created: portfolio X (Table 5) and portfolio Y (Table 6). In portfolio X, the selected securities are Dow Jones Industrial Average, three month Treasury bill and ten year Treasury bond. In portfolio Y, the selected securities are Dow Jones Industrial Average, three month Treasury bill, ten year Treasury bond and Equity REIT (US). Both of the portfolios are created based on the data from the period of 1983 to 2013 (See Appendix 2 & 6 for the raw data)

|                            |              |
|----------------------------|--------------|
| <b>Market Risk Premium</b> | <b>5.70%</b> |
| <b>Risk Free Rate</b>      | <b>2.40%</b> |

Figure 11: Market risk premium and risk free rate of US. Source: Fernandes, Aguirreamalloa and Linares 2013

**Table 5: Portfolio X (From the period of 1983 to 2013)**

| Stock                        | Beta         | % Portfolio    | Weights Beta | E(RRR) | Weighted (ERR) |
|------------------------------|--------------|----------------|--------------|--------|----------------|
| Dow Jones Industrial Average | 0.83962281   | 33.33%         | 0.27987427   | 7.19%  | 2.40%          |
| Three Months T.Bill          | 0.027982885  | 33.33%         | 0.009327628  | 2.56%  | 0.85%          |
| 10 Year Treasury Bond        | -0.058297101 | 33.33%         | -0.019432367 | 2.07%  | 0.69%          |
|                              |              | Portfolio Beta | 0.269769531  | Total  | 3.94%          |

Raw data source: New York University (2014), McGraw Hill Financial (2014). Calculation Source: The Author (See appendix 5 for the beta calculations).

Portfolio X is based on equally weighted asset allocation of 33% for each stock. DJIA has the highest beta and ten year Treasury bond has a negative beta. All of these securities have a beta of less than one. Three month Treasury bill has a beta of 0.028 that is lower than the beta of DJIA 0.84 and higher than the beta of three month Treasury bill -0.059. DJIA has a beta of close to one that means DJIA has almost the same amount of risk as the market and the movement of DJIA is in the similar direction with the market. Three month Treasury bill has a lower beta which shows that this security is less volatile than the market and the movement of this stock is in the same manner with market but the correlation is much lower than the market. Ten year Treasury bond has a negative beta which means this security moves in an opposite direction with the market.

DJIA has the highest expected return and ten year Treasury bond has the lowest expected return. Three month Treasury bill has a return of 2.56% that is higher than the return of ten year Treasury bond 2.07% and lower than the return of DJIA 7.19%. The total expected return of portfolio X is 3.94%.

**Table 6: Portfolio Y (From the period of 1983 to 2013)**

| Stock                        | Beta         | % Portfolio    | Weights Beta | E(RRR) | Weighted (ERR) |
|------------------------------|--------------|----------------|--------------|--------|----------------|
| Dow Jones Industrial Average | 0.83962281   | 25.00%         | 0.209905703  | 7.19%  | 1.80%          |
| US REIT                      | 0.48179172   | 25.00%         | 0.12044793   | 5.15%  | 1.29%          |
| Three Months T.Bill          | 0.027982885  | 25.00%         | 0.006995721  | 2.56%  | 0.64%          |
| 10 Year Treasury Bond        | -0.058297101 | 25.00%         | -0.014574275 | 2.07%  | 0.52%          |
|                              |              | Portfolio Beta | 0.322775078  | Total  | 4.24%          |

Raw data source: New York University (2014), McGraw Hill Financial (2014) and NREIT (2014). Calculation Source: The Author (See appendix 5 for the beta calculations).

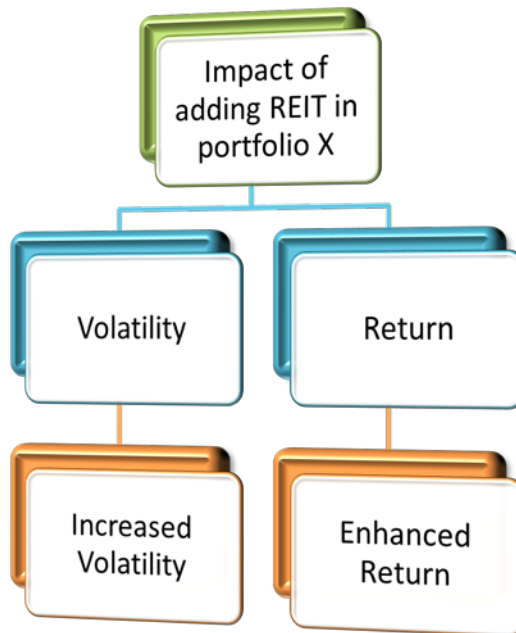
Portfolio Y is based on the equally weighted asset allocation of 25%. The REIT has a beta of 0.48 that is higher than the three month Treasury bill and ten year Treasury bond and a lower beta than the Dow Jones Industrial Average. REIT has the expected return of 5.15% that is again higher than the expected return of three month Treasury bill and ten year Treasury bond and lower than the expected return of DJIA.

In portfolio X and portfolio Y, one point is clear that higher beta has a higher expected return, so as much the risk as much the return. An interesting factor about REIT in portfolio X is that the REIT has a beta of 0.48 that is almost 43% less than the beta of Dow Jones Industrial Average and REIT has a return of 5.15% that is almost 30% less than the expected return of DJIA. So, REIT clearly has a better risk and return tradeoff



After adding REIT in portfolio X, portfolio Y is created. The portfolio X has an expected return of 3.94% and the portfolio Y has a return of 4.24%. So, portfolio Y clearly outperforms portfolio X. It is transparent that the addition of REIT enhanced the performance of an existing portfolio.

### **Results:**



*Figure 12: Impact of adding REIT in portfolio X. Source: The Author*

Volatility: The inclusion of REIT has increased the average beta of the portfolio from 0.269769531 to 0.322775078. That means the systematic risk of portfolio X has increased after the addition of REIT.

Return: By adding, REIT in the portfolio X the average return of the portfolio has increased from 3.94% to 4.24%. The enhancement of the average return signifies that after the inclusion of REIT in portfolio X, the portfolio has performed better.

## **4.6 Orava Residential REIT**

Orava is situated in Helsinki, which was established in 2010. Orava went for public offering in October 2013.

Orava REIT is the first and only Real Estate Investment Trust company in Finland. The company invests mainly in rental apartments in large and medium-sized cities in Finland. Its operations are regulated by the Act of Real Estate Fund and the Act of REIT Tax Exemptions. The company distributes dividends four times a year, based on the results from the previous financial year. Orava REIT has more than 1,500 shareholders, and it owns more than 650 apartments.

Veli Matti Salmenkylä, EX-CEO of Orava Residential Real Estate Investment Trust Plc, commented: *“We are pleased to be the first Finnish REIT on NASDAQ OMX Helsinki. Through our listings, all investors will have easy and efficient access into real estate market.”*

**Interviewed Person: Pekka Peiponen**

**Position: Chief Executive Officer**

### **How does the REIT concept in Finland?**

Back in 2009, there were changes in the tax legislation in Finland which allowed basically made it possible to launch it in the market. REIT is considered in the same tax law as direct properties of investment in real estate, meaning that REIT is exempted from profit taxes or income taxes. This is the motivation to start REIT in Finland. Then there is ruling that whoever starts REIT in Finland should be listed in the third operational year. So, our Orava was founded in 2010 and it became listed in 2013. Currently, we are the first and only REIT in Finland.

### **How is REIT performing in comparison with other stocks such as equity stocks?**

That is an important factor, though it is hard to say whether it is relevant to compare Orava REIT with other stocks which are rather different. Since we were listed we were happy to have 1500 hundred shareholders in the beginning, and these owners are mainly private owners who have increased over the time. Now, the number of shareholders has doubled which are close to four thousand. This actually proves that there have been a growing number of interests in REIT that can also be optimized by our prices that has increased rapidly. Especially, after we have published our financial statement bulletin of 2013 in February of 2014, and afterwards, prices changed a lot. That is something that we can compare with other equities. Our price changes, which I mean the fluctuations, have not been seen in other equities in this period of time. This also means that it will continue, though there are a lot of factors behind the pricing mechanism.

### **What do you think about the future of REIT in Finland?**

We have a positive impression about REIT in Finland, whether it is our REIT or someone competing us. As I mentioned earlier, in order to be allowed to create REIT in Finland, ownership must be spread, which means not a single owner can have more than ten percent of the shareholdings. That is something should be considered while launching REIT in Finland. There should be at least eleven partners and no one can have more than ten percents of the holdings. That is the minimum; as I said we are happy to have a few thousand shareholders, there is no single owner to have more than the restricted limit.

### **What do you think of REIT in a portfolio?**

In an equity portfolio it will be considered, for instance, if someone wants to have real estate portfolio it would be an excellent alternative. Again, it depends on the investor's strategy, what fields or sectors the investor is interested to invest in, if the investor wants to invest in real estate. Then REIT is a great investment.

### **Do you think REIT can work as a risk hedger?**

It would also be considered as risk hedger, as it is like a real estate. If the investor looks real estate as the balancing factors it can work to minimize the risk of a portfolio. It can balance the risk and neutralize or minimize the risk.

**Do you think REIT is a diversifier?**

It can also work as a diversifier of a portfolio. However, I think, it is a sector that depends on the investor. One can diversify by investing in telecommunications, forest industry, banking and different industry. If the investor is interested in real estate, then obviously REIT is a great instrument.

**What does REIT describe accurately? Is it diversifier or return enhancer?**

It could be both; for instance, we are the only company in Finland who gives dividends four times a year. We decide our dividend annually, and it is distributed four times a year. Our first dividend was paid on the last day of March, December, September and June. That is something in Finnish market which not only gives dividends but four times a year.

**How about the correlation of the stocks and REIT? Do they move in a parallel manner? What do you think?**

It is really hard to say as we are the sole REIT Company and we have been listed for only half a year. As I explained earlier, our stock prices have moved differently with the market as a whole; there is too short history to say that how we will follow. However, the general effectiveness of REIT depends on how people see REIT. It could be for any business, for instance, telecommunications is doing well, and something comes in the other businesses which are causing a fall. So, it is vague to say with a short history.

**What is the difference between physical properties and REIT? What are the added benefits that investors can get?**

REIT gives the investor a diversified portfolio. In direct property investments, there are couples of things, for instance, the investor need to buy a unit that is typically starts with ten thousand of Euros, and then the investment is defined by that housing unit. In comparison with REIT, if the investors invest the same ten thousand Euros or couples of ten thousand Euros then the investment is diversified. It does not affect a particular market; the investor is not very vulnerable with what happened in a defined sector or market in Finland. For example, at the moment, we have eight hundred apartments and forty three houses in twenty three cities. If we want to compare with physical properties, the investor has to follow all the operational routine to lease or rent that we are doing on behalf

of the investors of REIT. REIT is easy to invest in and the investor can invest in a really flexible amount. Then liquidity is another factor which needs to be considered, for instance, if the investor buys an apartment and would like to sell the apartment which is a matter of time, on the other hand stock exchange is a liquid market. By the way, our stock Orava REIT has been the most or second most liquid stock since we got listed. It has been extremely liquid comparing with other big companies like Nokia or big banks.. If an investor invests seventy thousand Euros in direct properties and wants to exchange it with a car which amounts twenty thousand Euros; how to exchange it and leave the fifty thousand Euros. It is not possible; the investor cannot simply sell the kitchen and take out twenty thousand Euros. The investor needs to sell the whole apartment. But if the investor invested those seventy thousand Euros in REIT he could easily sell twenty thousand amounting REIT shares and would be able to make his purchase and leave fifty thousand. There are many benefits I see in investing in REIT in comparison with physical properties those are especially for private investors; but in terms of institutional investors, scenario would be different. Their investment is so big that they could easily make multiple investments; but for private investors it is hard to invest in physical properties. The comparison between one unit of REIT and one unit of physical property is thirteen Euros versus ten thousand Euros.

### **Do you see any risk involved in investing in REIT?**

I would see there are risks as any business. **Is there any particular risk?** Finnish economy and housing market affects REIT. In Finland, we are somehow isolated from risk in comparison with other companies who are doing heavily export those are vulnerable with EU or US legislation. If there is an economic crisis, Finland will be affected and eventually we will be affected in some extent. But I do not see any particular risk which we should be aware of, and we are investing Finnish apartments.

### **How is Orava REIT performing?**

So far we are doing really well, even though the market has not been so lucrative. Financial crisis, banking crisis, and all other crisis had hit Finland and Finnish market. So the housing and apartment prices have not really risen if we take the long history into consideration. If we see the price changes that had been +4 per person every year, now it is close to zero. So, there is almost no change in the recent days, which has made the market difficult to operate, even though we have achieved quite success and are looking positively for the future.

#### **4.6.1 Summary of the interview with Orava Residential REIT (Finland)**

In 2009, the changes in the tax legislation allowed the investors to start REIT in Finland. Any REIT company willing to be listed in the NASDAQ OMX Helsinki stock market is allowed to do it in the third operational year. In addition, the ownership must be spread out meaning that a single shareholder can not possess more than ten percent shares.

Since the listing of Orava in the stock market the company has achieved tremendous growth, the number of shareholders has increased from 1500 to approximately 4000. In other words, REIT in Finland has made a glorious beginning. In 2013, the revenue of Orava was €9.68 million, and the revenue in 2012 was 3.18 million, so there was 204% change in the revenue (Orava Annual Report 2013).

REIT has relatively performed better than other equities in the short period of time, the growth Orava has achieved within six months of being listed, no other company has seen that growth from 2013-2014. REIT in Finland can be used for portfolio diversification, risk hedging or as return enhancer. Orava distributes dividends four times a year; they provided dividends on March, December, September and June; no other company provides dividend four times a year in Finland.

Though there is a really short history to measure the correlation of REIT in Finland with other stocks but it is clear from the performance of REIT (FI) that it has performed in a totally different manner with Finnish market. It can be assumed that, REIT (FI) has very low correlation with other equity stocks.

Orava does not see any particular risk or association of risk in their business strategy. It has similar risks as every other company but nothing significant that can hinder the business process. One big risk that will affect the business is the occurrence of economic crisis.

It can be drawn that, REIT in Finland enjoys the benefit of liquidity, diversification, flexibility, easy management of ownership and all other benefits brought from physical assets.

## 5 SUMMARY OF THE FINDINGS:

| Researched Topic  | Evidence   | Result   |
|---|--|--|
| <b>Average annual return of REIT (US), S&amp;P 500, three month Treasury bill and ten year Treasury bond from 1983 to 2013.</b> | <p><b><u>Suggested approach by:</u></b> Simon Benninga (2008)</p> <p><b><u>Raw data:</u></b> National Association of REIT (2014) and New York University (2014)</p> <p><b><u>Software:</u></b> Microsoft Excel, <b>function:</b> AVERAGE</p> | From 1983 to 2013 during this period REIT had the highest average rate of return 13% and S&P 500 had the second highest average rate of return 12.8%. REIT has established as the highest return enhancer from this point of view. |

|   |   |   |
|---|---|---|
| <p><b>Standard deviation of returns of REIT(US), S&amp;P 500, three month Treasury bill and ten year Treasury bond from 1983 to 2013.</b></p> | <p><b>Suggested approach by:</b> Simon Benninga (2008)</p> <p><b>Raw data:</b> National Association of REIT (2014) and New York University (2014)</p> <p><b>Software:</b> Microsoft Excel, <b>function:</b> STDEV</p> | <p>Higher returns generally related with higher risks. In this category REIT has the highest percentage of risks that is 18%. Three month Treasury bill has the lowest standard deviation of 3%. In this category REIT can be classified as the most volatile security.</p> |
| <p><b>Variance of returns of REIT(US), S&amp;P 500, three month Treasury bill and ten year Treasury bond from 1983 to 2013.</b></p>           | <p><b>Suggested approach by:</b> Simon Benninga (2008)</p> <p><b>Raw data:</b> National Association of REIT (2014) and New York University (2014)</p> <p><b>Software:</b> Microsoft Excel, <b>function:</b> VAR</p>   | <p>Depending on the historical data REIT has the highest variance among the asset classes that is 0.0322. This research signifies the volatility or variability of REIT and it is significantly higher than other asset classes. That makes REIT a risky stock.</p>         |



|   |   |   |
|---|---|---|
| <p><b>Mean Variance Model</b></p> <p><b>Correlation coefficient of annual returns among REIT (US), S&amp;P 500, three month Treasury bill and ten year Treasury bond from 1983 to 2013.</b></p> | <p><b><u>Suggested approach by:</u></b> Simon Benninga (2008)</p> <p><b><u>Raw data:</u></b> National Association of REIT (2014) and New York University (2014)</p> <p><b><u>Software:</u></b> Microsoft Excel, <b><u>tool:</u></b> Data Analysis, <b><u>tool function:</u></b> correlation</p> | <p>REIT has a correlation of 46% with S&amp;P 500, less than 1% with three month Treasury bill and negative 8% with ten year Treasury Bond. From this research it is visible that REIT is not perfectly correlated with any stock. Moreover, It also means that REIT can be used as a great diversifying instrument. REIT along with other stocks can be utilized for the creation of an optimal portfolio.</p>                         |
| <p><b>Covariance matrix of annual returns among REIT (US), S&amp;P 500, three month Treasury bill and ten year Treasury bond from 1983 to 2013</b></p>  | <p><b><u>Suggested approach by:</u></b> Simon Benninga (2008)</p> <p><b><u>Raw data:</u></b> National Association of REIT (2014) and New York University (2014)</p> <p><b><u>Software:</u></b> Microsoft Excel, <b><u>tool:</u></b> Data Analysis, <b><u>tool function:</u></b> covariance</p>  | <p>In this research of measuring the relationship of movement between two stocks REIT has covariance of 0.13 with S&amp;P 500 and negative covariance of 0.0014 with ten year Treasury bond. This experiment is great tool to identify the similarities of movement between two variables. Here, it can be concluded that REIT has little dependency with the movement of other stocks and this makes REIT an ultimate diversifier.</p> |

|  |   |   |
|--|---|---|
| <p><b>Efficient Frontier of a two asset class (S&amp;P 500 and three month Treasury bill) and a three asset class (S&amp;P 500, three month Treasury bill and US REIT) portfolio</b></p>           | <p><b><u>Suggested approach by:</u></b> Simon Benninga (2008) and Saurav Roychoudhury (2007)</p> <p><b><u>Raw data:</u></b> National Association of REIT (2014) and New York University (2014)</p> <p><b><u>Software:</u></b> Microsoft Excel, <b>tool:</b> Data Analysis, <b>tool function:</b> covariance and <b>formula:</b> Saurav Roychoudhury (Capital University 2007)</p> | <p>The historical portfolio standard deviation is from 0.02 to 0.17, within this range the three asset class portfolio has gained mean return of 9 % to 13% and the two asset class portfolio has gained mean return of 4% to 13%. From the standard deviation range of 9% to 16% three asset class portfolio has significantly outperformed the two asset class portfolio. Hence, It can be said that the inclusion REIT can enhance the return of a portfolio.</p>  |
| <p><b>After the financial crisis, the scenario of REIT (US), S&amp;P 500, three month Treasury bill and ten year Treasury bond (2009-2013). Return, volatility and correlation among them.</b></p> | <p><b><u>Suggested approach by:</u></b> Simon Benninga (2008)</p> <p><b><u>Raw data:</u></b> National Association of REIT (2014) and New York University (2014)</p> <p><b><u>Software:</u></b> Microsoft Excel,</p> <p><b>function:</b> STDEV, AVERAGE</p> <p><b>tool:</b> Data Analysis, <b>tool function:</b> correlation</p>   | <p>In the recent period both REIT and S&amp;P 500 have performed significantly well. REIT has an average return of 17% and S&amp;P 500 has an average return of 18%. Both three month Treasury bill and ten year Treasury bond have performed poorly. The volatility for REIT has decreased to 11.5% and the volatility of ten year Treasury bond has increased to 11.5%. Before the financial crisis REIT had a correlation of about 50% with S&amp;P 500 but it</p> |

|  |  |  |
|--|--|--|
|  |  | has changed dramatically in recent period now, it is negative 3%. So, in the recent period REIT has performed extremely well by the enhancement of annual return and by decreasing the volatility.   |
| <b>Interview with Orava Residential REIT (Finland)</b> | <p>Qualitative research approach.</p> <p><b>Raw data:</b> collected by the researcher.</p> | <p>Since the listing of the company in October 2013, the company has performed tremendously; the number of shareholders has increased from 1500 to approximately 4000. The revenue has doubled from 2012 to 2013. There are continuous price changes in REIT (FI) in a positive direction. The correlation of REIT with other stocks in Finland is assumed to be very low. All these critical points make REIT Finland an ideal portfolio security which can be utilized for portfolio return enhancement and diversification.</p> |

|   |  |  |
|---|--|--|
| <p><b>Construction of two portfolios by using Capital Asset Pricing Model. Portfolio X is consist of Dow Jones Industrial Average, three month Treasury bill and ten year Treasury bond and portfolio Y is consist of all the securities of portfolio X and REIT (From the period of 1983 to 2013).</b></p> | <p><b><u>Suggested approach by:</u></b> Alan R. Palmiter (Wake Forest University 2003) and Shane (Notre Dame University).</p> <p><b><u>Raw data:</u></b> National Association of REIT (2014) , New York University (2014) , McGraw Hill Financial (2014) and Fernandes, Aguirreamalloa and Linares (IESE Business School 2013)</p> <p><b><u>Software:</u></b> Microsoft Excel, <b><u>tool:</u></b> Data Analysis, <b><u>tool function:</u></b> Regression Analysis (for beta calculations)</p> | <p>Portfolio Y clearly dominates portfolio X. The result proved that the inclusion of REIT in an existing portfolio has increased the performance. The portfolio X has an expected return of 3.94% and after adding REIT into the portfolio X the return becomes 4.24%. Moreover, REIT has a lower beta than Dow Jones Industrial Average that makes REIT less volatile. So it is affirmative after the CAPM analysis that the REIT is both return enhancer and diversifier.</p> |
|---|--|--|

*Source: The Author*

## 5.1 Research Findings at a glance:

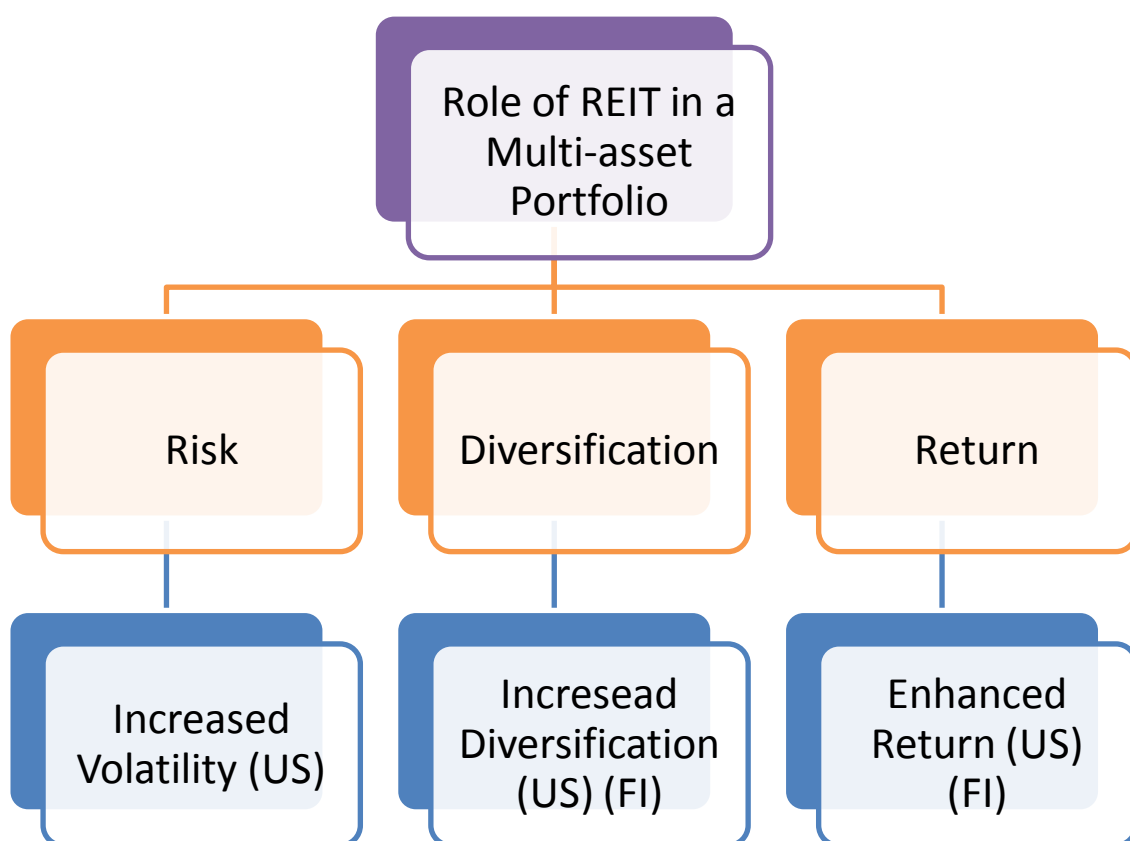


Figure 13: Research findings at a glance. (Risk of Finland REIT in a multi-asset portfolio not available) Source: The Author

## **6 DISCUSSION**

### **6.1 Contributions**

The research has showed the behavior and action of REIT as an asset class which distinguishably contrary from other significant assets, that is to say S&P 500, Treasury bonds and three month Treasury bills. If an investor is able to identify and undertake these phenomena of REIT, then the investor would be able to create a perfectly diversified portfolio. An expert investor also would be able to understand the continuous changes of the market over the time and will be able observe these asset classes. Thus, it would benefit him/her while investing in a portfolio in the current market.

This research will allow the investor to understand the importance of different asset class; REIT is a rather new topic but an important financial tool. The investor would also be able to consider combining the old and new asset classes to form a portfolio. This research provides a significant understanding of less common asset class to creating an optimal portfolio by creating risk diversification and also improving the return.

This research also goes with hand in hand with earlier researches, where researchers found that REIT has different performance and characteristics in different investment market such as Finland and US. These differences occurs for various reasons, it could be the structure of the market, performance of the market, rules and regulations etc. (Sing & Ling, 2003). So, it is crucial to observe the REIT over the time and validate them with previous findings.

The research has computed the correlation of the major asset classes and their effects on the portfolio or market. However, the research doesn't highlight the reasons behind the correlation mechanism. These correlation changes over the time, drastic changes can be seen at the occurrence of a financial crisis. The research shows that the correlation of REIT with S&P 500 was around 50% before the financial crisis and it has changed to negative 3% after the crisis. So, it is important for the investors to understand the under-

lying mechanism of the correlation matrix of major asset classes, so they can always benefit themselves from the financial changes.

## **6.2 Future Research Direction**

In accordance with the research findings and the limitations mentioned earlier, the below areas are suggested for any future research on this field. The research finds the action and behavior of various asset classes, and in terms of REIT (US) (FI), may evolve over the upcoming years because of the changing circumstances. So it is crucial to validate the research findings continuously and to identify the changing benefits and risks associated with it. Most significantly the research over the Finland REIT must continue in future, in order to identify the characteristics, behavior and action of Finland REIT, when more financial data becomes available for evaluation.

For this research equity REIT (US) has been considered, there is another type of REIT that is called mortgage REIT. So, it is important to understand the performance and role of mortgage REIT in a multi-asset portfolio moreover, the suitability of mortgage REIT in a multi-asset portfolio.

The research focused on the diversification benefit that REIT adds in a multi-asset portfolio but the research did not examine the reasons behind the underlying factors of diversification. So, future studies on the mechanism of diversification, may help the investor to understand better and to create an optimal portfolio.

This sophisticated research has found that there is a significant importance of newer and sophisticated asset allocation models to create a well diversified and balanced multi-asset portfolio. However, the newer asset allocation model such as CAPM is a technical and mathematical model that is rather difficult for general investors. Hence, there is a significant need to develop these portfolio models so that the general investors can use them easily.

## **7 CONCLUSION:**

By using annual data from 1983 to 2013 and the interview with Orava Residential REIT, and the method suggested by Benninga (2008) & Palmiter (2003) the research finds that REIT enhances the risk (US) and return (US) (FI) of a portfolio and there are significant differences among REIT and other major asset classes. This differences make REIT an ideal portfolio asset class that allows to bring diversification and performance benefit in an existing portfolio.

Historically, from the period of 1983 to 2013 REIT has performed vigorously. The annual average return of REIT (US) is 13% that is higher than other major asset classes and from this point of view REIT is an attractive security for return enhancement of a portfolio. However, REIT is not risk free asset; REIT has a notable amount of risk that surpasses the other major classes as well.

Despite being a historically risky asset REIT has performed differently in recent period. Even though the volatility of REIT has decreased drastically, the REIT has maintained to generate the same amount of return. So, REIT (US) has managed to cut the risk off and to sustain the return.

Moreover, the correlation mechanism of REIT (US) has changed dramatically after the financial crisis. Before the financial crisis REIT had about fifty percent correlation with the most significant portfolio product S&P 500. Now, the correlation matrix is negative three percent which makes REIT an amazing diversifying portfolio security.

The changing benefits of REITs to other asset classes express that any research of historical performance and benefits of REITs needs to consider the structural formation of REIT over the decades, otherwise the research may end in vain.



The efficient frontier and CAPM shows that the inclusion of REIT in an existing Portfolio has increased the rate of return. However, it doesn't mean that the REIT also decreases the amount of risk. In wise words, it can be concluded that REIT brings diversification, return enhancement and a significant amount of risk.

In recent days, there are plenty of asset allocation models available to guide the investors to create an optimal portfolio with balanced and diversified multi-asset combination strategy to gain their optimal return and minimizing the risk. Since, REIT is a rather new topic in Finland; there will be more research in future to understand the mechanism of REIT in stock market of Finland thus, benefitting the investors.

## 8 GLOSSARY

**Annual Mean Return:** A mean is the average of the data set. Annual mean return is the average of yearly returns of the stocks. Higher mean returns show higher performance and lower returns show poor performance.

**Standard Deviation:** It is the measurement of the dispersion of a set of data from its average mean. The higher spread of the data means the higher deviation. It is represented by the Greek letter  $\sigma$ . The higher standard deviation shows higher volatility

**Variance:** It is the average of the squared differences from the computed mean. It measures the distance of every number in the data set from its mean. Higher variance is the representation of higher risk, and lower variance is the opposite.

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## 10 APPENDICES

Appendix consists of the efficient frontier calculation, regressions analysis for beta calculation of CAPM; calculations of: annual summary statistics of US asset classes (From 1983 to 2013), annual summary statistics of US asset classes (From 1983 to 2008), annual summary statistics of US asset classes (From 2009 to 2013); historical returns of S&P 500, Equity REIT, three month Treasury bill, ten year Treasury bond and Dow Jones Industrial Average (From 1983 to 2013).

Efficient Frontier calculation is shown from appendix table I to table IV. Table I and table III is variance covariance matrix. Table II and table IV is the combination of numerous asset allocations, calculation of standard deviation and return of the portfolio.

### Appendix 1: Efficient Frontier

**Table I: Variance Co-variance Matrix (US)**

|                     | <i>S&amp;P 500</i> | <i>Three Month</i> |
|---------------------|--------------------|--------------------|
| <b>S&amp;P 500</b>  | 0.028480458        | 0.000796965        |
| <b>Three Months</b> | 0.000796965        | 0.00072395         |

**Table II: Two asset class's portfolio by combining various asset allocations (US)**

| <i>S&amp;P 500 (Weight)</i> | <i>Three Months Treasury Bill (Weight)</i> | <b>Standard Deviation of the Portfolio</b> | <b>Return of the Portfolio</b> |
|-----------------------------|--|--|--------------------------------|
| 1.00                        | 0.00                                       | 0.168761541                                | 0.127973899                    |
| 0.99                        | 0.01                                       | 0.16712136                                 | 0.127106744                    |

|             |             |             |             |
|-------------|-------------|-------------|-------------|
| 0.98        | 0.02        | 0.165481607 | 0.126239589 |
| <b>0.03</b> | 0.163842295 |             | 0.125372434 |
| 0.96        | 0.04        | 0.162203437 | 0.124505278 |
| 0.95        | 0.05        | 0.160565048 | 0.123638123 |
| 0.94        | 0.06        | 0.158927141 | 0.122770968 |
| 0.93        | 0.07        | 0.157289733 | 0.121903813 |
| 0.92        | 0.08        | 0.155652838 | 0.121036658 |
| 0.91        | 0.09        | 0.154016473 | 0.120169503 |
| 0.90        | 0.10        | 0.152380655 | 0.119302348 |
| 0.89        | 0.11        | 0.150745402 | 0.118435193 |
| 0.88        | 0.12        | 0.149110732 | 0.117568038 |
| 0.87        | 0.13        | 0.147476665 | 0.116700882 |
| 0.86        | 0.14        | 0.145843221 | 0.115833727 |
| 0.85        | 0.15        | 0.144210422 | 0.114966572 |
| 0.84        | 0.16        | 0.142578288 | 0.114099417 |
| 0.83        | 0.17        | 0.140946845 | 0.113232262 |
| 0.82        | 0.18        | 0.139316115 | 0.112365107 |
| 0.81        | 0.19        | 0.137686124 | 0.111497952 |
| 0.80        | 0.20        | 0.136056899 | 0.110630797 |
| 0.79        | 0.21        | 0.134428468 | 0.109763641 |
| 0.78        | 0.22        | 0.132800859 | 0.108896486 |
| 0.77        | 0.23        | 0.131174104 | 0.108029331 |

|      |      |             |             |
|------|------|-------------|-------------|
| 0.76 | 0.24 | 0.129548234 | 0.107162176 |
| 0.75 | 0.25 | 0.127923283 | 0.106295021 |
| 0.74 | 0.26 | 0.126299287 | 0.105427866 |
| 0.73 | 0.27 | 0.124676283 | 0.104560711 |
| 0.72 | 0.28 | 0.123054311 | 0.103693556 |
| 0.71 | 0.29 | 0.121433411 | 0.102826401 |
| 0.70 | 0.30 | 0.119813627 | 0.101959245 |
| 0.69 | 0.31 | 0.118195005 | 0.10109209  |
| 0.68 | 0.32 | 0.116577594 | 0.100224935 |
| 0.67 | 0.33 | 0.114961444 | 0.09935778  |
| 0.66 | 0.34 | 0.11334661  | 0.098490625 |
| 0.65 | 0.35 | 0.111733149 | 0.09762347  |
| 0.64 | 0.36 | 0.11012112  | 0.096756315 |
| 0.63 | 0.37 | 0.108510588 | 0.09588916  |
| 0.62 | 0.38 | 0.10690162  | 0.095022004 |
| 0.61 | 0.39 | 0.105294289 | 0.094154849 |
| 0.60 | 0.40 | 0.10368867  | 0.093287694 |
| 0.59 | 0.41 | 0.102084843 | 0.092420539 |
| 0.58 | 0.42 | 0.100482896 | 0.091553384 |
| 0.57 | 0.43 | 0.098882918 | 0.090686229 |
| 0.56 | 0.44 | 0.097285008 | 0.089819074 |
| 0.55 | 0.45 | 0.095689269 | 0.088951919 |



|      |      |             |             |
|------|------|-------------|-------------|
| 0.54 | 0.46 | 0.094095812 | 0.088084763 |
| 0.53 | 0.47 | 0.092504753 | 0.087217608 |
| 0.52 | 0.48 | 0.09091622  | 0.086350453 |
| 0.51 | 0.49 | 0.089330347 | 0.085483298 |
| 0.50 | 0.50 | 0.087747277 | 0.084616143 |
| 0.49 | 0.51 | 0.086167167 | 0.083748988 |
| 0.48 | 0.52 | 0.084590181 | 0.082881833 |
| 0.47 | 0.53 | 0.083016498 | 0.082014678 |
| 0.46 | 0.54 | 0.081446309 | 0.081147523 |
| 0.45 | 0.55 | 0.079879819 | 0.080280367 |
| 0.44 | 0.56 | 0.078317252 | 0.079413212 |
| 0.43 | 0.57 | 0.076758847 | 0.078546057 |
| 0.42 | 0.58 | 0.075204861 | 0.077678902 |
| 0.41 | 0.59 | 0.073655576 | 0.076811747 |
| 0.40 | 0.60 | 0.072111294 | 0.075944592 |
| 0.39 | 0.61 | 0.070572344 | 0.075077437 |
| 0.38 | 0.62 | 0.069039081 | 0.074210282 |
| 0.37 | 0.63 | 0.067511894 | 0.073343126 |
| 0.36 | 0.64 | 0.065991204 | 0.072475971 |
| 0.35 | 0.65 | 0.064477472 | 0.071608816 |
| 0.34 | 0.66 | 0.062971198 | 0.070741661 |
| 0.33 | 0.67 | 0.061472931 | 0.069874506 |

|      |      |             |             |
|------|------|-------------|-------------|
| 0.32 | 0.68 | 0.059983272 | 0.069007351 |
| 0.31 | 0.69 | 0.058502877 | 0.068140196 |
| 0.30 | 0.70 | 0.057032468 | 0.067273041 |
| 0.29 | 0.71 | 0.055572837 | 0.066405886 |
| 0.28 | 0.72 | 0.054124858 | 0.06553873  |
| 0.27 | 0.73 | 0.05268949  | 0.064671575 |
| 0.26 | 0.74 | 0.051267792 | 0.06380442  |
| 0.25 | 0.75 | 0.049860934 | 0.062937265 |
| 0.24 | 0.76 | 0.048470209 | 0.06207011  |
| 0.23 | 0.77 | 0.047097044 | 0.061202955 |
| 0.22 | 0.78 | 0.045743023 | 0.0603358   |
| 0.21 | 0.79 | 0.044409895 | 0.059468645 |
| 0.20 | 0.80 | 0.0430996   | 0.058601489 |
| 0.19 | 0.81 | 0.041814284 | 0.057734334 |
| 0.18 | 0.82 | 0.040556323 | 0.056867179 |
| 0.17 | 0.83 | 0.03932834  | 0.056000024 |
| 0.16 | 0.84 | 0.038133233 | 0.055132869 |
| 0.15 | 0.85 | 0.036974189 | 0.054265714 |
| 0.14 | 0.86 | 0.035854707 | 0.053398559 |
| 0.13 | 0.87 | 0.034778606 | 0.052531404 |
| 0.12 | 0.88 | 0.033750036 | 0.051664249 |
| 0.11 | 0.89 | 0.032773473 | 0.050797093 |

|      |      |             |             |
|------|------|-------------|-------------|
| 0.10 | 0.90 | 0.0318537   | 0.049929938 |
| 0.09 | 0.91 | 0.030995774 | 0.049062783 |
| 0.08 | 0.92 | 0.030204965 | 0.048195628 |
| 0.07 | 0.93 | 0.029486673 | 0.047328473 |
| 0.06 | 0.94 | 0.028846317 | 0.046461318 |
| 0.05 | 0.95 | 0.028289188 | 0.045594163 |
| 0.04 | 0.96 | 0.027820288 | 0.044727008 |
| 0.03 | 0.97 | 0.02744414  | 0.043859852 |
| 0.02 | 0.98 | 0.027164596 | 0.042992697 |
| 0.01 | 0.99 | 0.026984659 | 0.042125542 |
| 0.00 | 1.00 | 0.026906328 | 0.041258387 |

**Table III: Variance Co-variance Matrix (US)**

|                     | <i>REIT</i> | <i>S&amp;P 500</i> | <i>Three Months</i> |
|---------------------|-------------|--------------------|---------------------|
| <b>REIT</b>         | 0.0312332   |                    |                     |
| <b>S&amp;P 500</b>  | 0.013721649 | 0.028480458        |                     |
| <b>Three Months</b> | 2.72535E-05 | 0.000796965        | 0.00072395          |

**Table IV: Three asset class portfolio by combining various asset allocations (US)**

| <i><b>REIT(Weight)</b></i> | <i><b>S&amp;P 500(Weight)</b></i> | <i><b>Three Months<br/>Treasury Bill</b></i> | <i><b>Standard De-<br/>viation of the<br/>Portfolio</b></i> | <i><b>Return of<br/>the Portfolio</b></i> |
|----------------------------|-----------------------------------|--|---|---|
| 0.00                       | 1.00                              | 0.00   | 0.168761541   | 0.127973899                               |
| 0.01                       | 0.98                              | 0.01   | 0.165395971   | 0.127137784                               |
| 0.02                       | 0.96                              | 0.02   | 0.162050525   | 0.126301669                               |
| 0.03                       | 0.94                              | 0.03   | 0.158726475   | 0.125465555                               |
| 0.04                       | 0.92                              | 0.04   | 0.155425193   | 0.12462944                                |
| 0.05                       | 0.90                              | 0.05   | 0.152148163   | 0.123793325                               |
| 0.06                       | 0.88                              | 0.06   | 0.148896985   | 0.12295721                                |
| 0.07                       | 0.86                              | 0.07   | 0.14567339  | 0.122121095                               |
| 0.08                       | 0.84                              | 0.08   | 0.14247925  | 0.121284981                               |
| 0.09                       | 0.82                              | 0.09   | 0.139316591   | 0.120448866                               |
| 0.10                       | 0.80                              | 0.10   | 0.136187607   | 0.119612751                               |
| 0.11                       | 0.78                              | 0.11   | 0.133094673   | 0.118776636                               |
| 0.12                       | 0.76                              | 0.12   | 0.13004036  | 0.117940521                               |
| 0.13                       | 0.74                              | 0.13   | 0.127027455   | 0.117104407                               |
| 0.14                       | 0.72                              | 0.14   | 0.124058975   | 0.116268292                               |
| 0.15                       | 0.70                              | 0.15   | 0.121138186   | 0.115432177                               |
| 0.16                       | 0.68                              | 0.16   | 0.118268621   | 0.114596062                               |
| 0.17                       | 0.66                              | 0.17   | 0.115454099   | 0.113759947                               |
| 0.18                       | 0.64                              | 0.18   | 0.112698745   | 0.112923833                               |
| 0.19                       | 0.62                              | 0.19   | 0.110007005   | 0.112087718                               |
| 0.20                       | 0.60                              | 0.20   | 0.107383662   | 0.111251603                               |
| 0.21                       | 0.58                              | 0.21   | 0.104833851   | 0.110415488                               |

|      |      |      |             |             |
|------|------|------|-------------|-------------|
| 0.22 | 0.56 | 0.22 | 0.102363068 | 0.109579373 |
| 0.23 | 0.54 | 0.23 | 0.099977171 | 0.108743259 |
| 0.24 | 0.52 | 0.24 | 0.097682381 | 0.107907144 |
| 0.25 | 0.50 | 0.25 | 0.095485268 | 0.107071029 |
| 0.26 | 0.48 | 0.26 | 0.093392724 | 0.106234914 |
| 0.27 | 0.46 | 0.27 | 0.091411931 | 0.105398799 |
| 0.28 | 0.44 | 0.28 | 0.089550306 | 0.104562685 |
| 0.29 | 0.42 | 0.29 | 0.087815426 | 0.10372657  |
| 0.30 | 0.40 | 0.30 | 0.086214945 | 0.102890455 |
| 0.31 | 0.38 | 0.31 | 0.084756476 | 0.10205434  |
| 0.32 | 0.36 | 0.32 | 0.083447466 | 0.101218225 |
| 0.33 | 0.34 | 0.33 | 0.082295046 | 0.100382111 |
| 0.34 | 0.32 | 0.34 | 0.081305876 | 0.099545996 |
| 0.35 | 0.30 | 0.35 | 0.080485975 | 0.098709881 |
| 0.36 | 0.28 | 0.36 | 0.079840557 | 0.097873766 |
| 0.37 | 0.26 | 0.37 | 0.07937388  | 0.097037651 |
| 0.38 | 0.24 | 0.38 | 0.079089107 | 0.096201537 |
| 0.39 | 0.22 | 0.39 | 0.078988206 | 0.095365422 |
| 0.40 | 0.20 | 0.40 | 0.079071881 | 0.094529307 |
| 0.41 | 0.18 | 0.41 | 0.079339548 | 0.093693192 |
| 0.42 | 0.16 | 0.42 | 0.079789354 | 0.092857077 |
| 0.43 | 0.14 | 0.43 | 0.080418245 | 0.092020963 |
| 0.44 | 0.12 | 0.44 | 0.081222059 | 0.091184848 |
| 0.45 | 0.10 | 0.45 | 0.082195666 | 0.090348733 |
| 0.46 | 0.08 | 0.46 | 0.083333115 | 0.089512618 |

|      |      |      |             |             |
|------|------|------|-------------|-------------|
| 0.47 | 0.06 | 0.47 | 0.084627798 | 0.088676503 |
| 0.48 | 0.04 | 0.48 | 0.086072622 | 0.087840389 |
| 0.49 | 0.02 | 0.49 | 0.087660162 | 0.087004274 |
| 0.50 | 0.00 | 0.50 | 0.089382815 | 0.086168159 |

Computed result source: The Author

## Appendix 2: Annual Summary Statistics of US Asset Classes (From 1983 to 2013) Calculation

| Year | Return (%) | <i>S&amp;P 500</i> | <i>3-month T.Bill</i> | <i>10-year T. Bond</i> |
|------|------------|--------------------|-----------------------|------------------------|
| 1983 | 0.31       | 22.34%             | 8.45%                 | 3.20%                  |
| 1984 | 0.21       | 6.15%              | 9.61%                 | 13.73%                 |
| 1985 | 0.19       | 31.24%             | 7.49%                 | 25.71%                 |
| 1986 | 0.19       | 18.49%             | 6.04%                 | 24.28%                 |
| 1987 | -0.04      | 5.81%              | 5.72%                 | -4.96%                 |
| 1988 | 0.13       | 16.54%             | 6.45%                 | 8.22%                  |
| 1989 | 0.09       | 31.48%             | 8.11%                 | 17.69%                 |
| 1990 | -0.15      | -3.06%             | 7.55%                 | 6.24%                  |
| 1991 | 0.36       | 30.23%             | 5.61%                 | 15.00%                 |
| 1992 | 0.15       | 7.49%              | 3.41%                 | 9.36%                  |
| 1993 | 0.20       | 9.97%              | 2.98%                 | 14.21%                 |
| 1994 | 0.03       | 1.33%              | 3.99%                 | -8.04%                 |
| 1995 | 0.15       | 37.20%             | 5.52%                 | 23.48%                 |
| 1996 | 0.35       | 22.68%             | 5.02%                 | 1.43%                  |
| 1997 | 0.20       | 33.10%             | 5.05%                 | 9.94%                  |
| 1998 | -0.18      | 28.34%             | 4.73%                 | 14.92%                 |

|                     |             |         |       |             |
|---------------------|-------------|---------|-------|-------------|
| 1999                | -0.05       | 20.89%  | 4.51% | -8.25%      |
| 2000                | 0.26        | -9.03%  | 5.76% | 16.66%      |
| 2001                | 0.14        | -11.85% | 3.67% | 5.57%       |
| 2002                | 0.04        | -21.97% | 1.66% | 15.12%      |
| 2003                | 0.37        | 28.36%  | 1.03% | 0.38%       |
| 2004                | 0.32        | 10.74%  | 1.23% | 4.49%       |
| 2005                | 0.12        | 4.83%   | 3.01% | 2.87%       |
| 2006                | 0.35        | 15.61%  | 4.68% | 1.96%       |
| 2007                | -0.16       | 5.48%   | 4.64% | 10.21%      |
| 2008                | -0.38       | -36.55% | 1.59% | 20.10%      |
| 2009                | 0.28        | 25.94%  | 0.14% | -11.12%     |
| 2010                | 0.28        | 14.82%  | 0.13% | 8.46%       |
| 2011                | 0.08        | 2.10%   | 0.03% | 16.04%      |
| 2012                | 0.18        | 15.89%  | 0.05% | 2.97%       |
| 2013                | 0.02        | 32.15%  | 0.07% | -9.10%      |
| Mean                | 13%         | 12.80%  | 4.13% | 8.09%       |
| Standard Deviation  | 0.179650513 | 17.16%  | 2.74% | 0.100152622 |
| Variance of Returns | 0.032274307 | 2.94%   | 0.07% | 0.010030548 |

Historical returns data source: New York University 2014, National Association of REIT 2014.

Computed result source: The Author

### Appendix 3: Annual Summary Statistics of US Asset Classes (From 1983 to 2008) Calculation

| Year               | Return (%) | <i>S&amp;P 500</i> | <i>3-month T.Bill</i> | <i>10-year T. Bond</i> |
|--------------------|------------|--------------------|-----------------------|------------------------|
| 1983               | 0.31       | 22.34%             | 8.45%                 | 3.20%                  |
| 1984               | 0.21       | 6.15%              | 9.61%                 | 13.73%                 |
| 1985               | 0.19       | 31.24%             | 7.49%                 | 25.71%                 |
| 1986               | 0.19       | 18.49%             | 6.04%                 | 24.28%                 |
| 1987               | -0.04      | 5.81%              | 5.72%                 | -4.96%                 |
| 1988               | 0.13       | 16.54%             | 6.45%                 | 8.22%                  |
| 1989               | 0.09       | 31.48%             | 8.11%                 | 17.69%                 |
| 1990               | -0.15      | -3.06%             | 7.55%                 | 6.24%                  |
| 1991               | 0.36       | 30.23%             | 5.61%                 | 15.00%                 |
| 1992               | 0.15       | 7.49%              | 3.41%                 | 9.36%                  |
| 1993               | 0.20       | 9.97%              | 2.98%                 | 14.21%                 |
| 1994               | 0.03       | 1.33%              | 3.99%                 | -8.04%                 |
| 1995               | 0.15       | 37.20%             | 5.52%                 | 23.48%                 |
| 1996               | 0.35       | 22.68%             | 5.02%                 | 1.43%                  |
| 1997               | 0.20       | 33.10%             | 5.05%                 | 9.94%                  |
| 1998               | -0.18      | 28.34%             | 4.73%                 | 14.92%                 |
| 1999               | -0.05      | 20.89%             | 4.51%                 | -8.25%                 |
| 2000               | 0.26       | -9.03%             | 5.76%                 | 16.66%                 |
| 2001               | 0.14       | -11.85%            | 3.67%                 | 5.57%                  |
| 2002               | 0.04       | -21.97%            | 1.66%                 | 15.12%                 |
| 2003               | 0.37       | 28.36%             | 1.03%                 | 0.38%                  |
| 2004               | 0.32       | 10.74%             | 1.23%                 | 4.49%                  |
| 2005               | 0.12       | 4.83%              | 3.01%                 | 2.87%                  |
| 2006               | 0.35       | 15.61%             | 4.68%                 | 1.96%                  |
| 2007               | -0.16      | 5.48%              | 4.64%                 | 10.21%                 |
| 2008               | -0.38      | -36.55%            | 1.59%                 | 20.10%                 |
| Mean               | 12.37%     | 11.76%             | 4.90%                 | 9.37%                  |
| Standard Deviation | 19.04%     | 18.03%             | 2.25%                 | 9.41%                  |

Historical returns data source: New York University 2014, National Association of REIT 2014.

Computed result source: The Author



#### Appendix 4: Annual Summary Statistics of US Asset Classes (From 2009 to 2013) Calculation

| Year                    | REIT        | <i>S&amp;P 500</i> | <i>3-month T.Bill</i> | <i>10-year T. Bond</i> |
|-------------------------|-------------|--------------------|-----------------------|------------------------|
| 2009                    | 0.28        | 25.94%             | 0.14%                 | -11.12%                |
| 2010                    | 0.28        | 14.82%             | 0.13%                 | 8.46%                  |
| 2011                    | 0.08        | 2.10%              | 0.03%                 | 16.04%                 |
| 2012                    | 0.18        | 15.89%             | 0.05%                 | 2.97%                  |
| 2013                    | 0.02        | 32.15%             | 0.07%                 | -9.10%                 |
|                         |             |                    |                       |                        |
| Mean                    | 0.17        | 0.18               | 0.00                  | 0.01                   |
| Standard Devia-<br>tion | 0.115004208 | 0.115142261        | 0.000476886           | 0.115493417            |

Historical returns data source: New York University 2014, National Association of REIT 2014.

Computed result source: The Author

## Appendix 5: Regression Analysis

Calculations of Beta ( Microsoft Excel Data analysis tool has been used for the regression analysis)

From the regression analysis only the beta has been used for this research and the beta is marked in red color for the ease of the reader.

### Summary output of Dow Jones Industrial Average

| <i>Regression Statistics</i> |          |
|------------------------------|----------|
| Multiple R                   | 0.957863 |
| R Square                     | 0.917502 |
| Adjusted R Square            | 0.914658 |
| Standard Error               | 0.043929 |
| Observations                 | 31       |

| <i>ANOVA</i> |           |           |           |          |                       |
|--------------|-----------|-----------|-----------|----------|-----------------------|
|              | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i> | <i>Significance F</i> |
| Regression   | 1         | 0.622411  | 0.622411  | 322.5279 | 2.97028E-17           |
| Residual     | 29        | 0.055964  | 0.001933  |          |                       |
| Total        | 30        | 0.678375  |           |          |                       |

|           | <i>Coefficients</i> | <i>Standard Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower 95%</i> | <i>Upper 95%</i> | <i>Lower 95.0%</i> | <i>Upper 95.0%</i> |
|-----------|---------------------|-----------------------|---------------|----------------|------------------|------------------|--------------------|--------------------|
| Intercept | 0.003223998         | 0.009902              | 0.32559       | 0.74707        | 0.023475701      | 0.017028         | 0.02348            | 0.017028           |

|            |          |        |        |        |          |        |        |        |
|------------|----------|--------|--------|--------|----------|--------|--------|--------|
| X Variable | 0.839622 | 0.0467 | 17.959 | 2.97E- | 0.744004 | 0.9352 | 0.7440 | 0.9352 |
| 1          | 81       | 52     | 06     | 17     | 144      | 41     | 04     | 41     |

Source: The Author

### Summary output of Three Month Treasury Bill

| <i>Regression Statistics</i> |          |
|------------------------------|----------|
|                              | 0.17551  |
| Multiple R                   | 4        |
|                              | 0.03080  |
| R Square                     | 5        |
| Adjusted                     |          |
| R Square                     | -0.00262 |
| Standard                     | 0.02738  |
| Error                        | 7        |
| Observa-                     |          |
| tions                        | 31       |

| <i>ANOVA</i> |           |           |           |          |                                   |
|--------------|-----------|-----------|-----------|----------|-----------------------------------|
|              | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i> | <i>Signifi-</i><br><i>cance F</i> |
| Regres-      |           | 0.0006    | 0.0006    | 0.9217   |                                   |
| sion         | 1         | 91        | 91        | 43       | 0.344955                          |
|              |           | 0.0217    | 0.0007    |          |                                   |
| Residual     | 29        | 51        | 5         |          |                                   |
|              |           | 0.0224    |           |          |                                   |
| Total        | 30        | 42        |           |          |                                   |

|            | <i>Coeffi-</i><br><i>cients</i> | <i>Stand-</i><br><i>ard</i><br><i>Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower</i><br><i>95%</i> | <i>Upper</i><br><i>95%</i> | <i>Lower</i><br><i>95.0%</i> | <i>Upper</i><br><i>95.0%</i> |
|------------|---------------------------------|---|---------------|----------------|----------------------------|----------------------------|------------------------------|------------------------------|
| Intercept  | 0.03767                         | 0.0061                                      | 6.1034        | 1.2E-          |                            | 0.0503                     | 0.0250                       | 0.0503                       |
|            | 7                               | 73  | 23            | 06             | 0.025052                   | 03                         | 52                           | 03                           |
|            |                                 |   |               |                |                            |                            | -                            |                              |
| X Variable | 0.02798                         | 0.0291                                      | 0.9600        | 0.3449         |                            | 0.0875                     | 0.0316                       | 0.0875                       |
| 1          | 3                               | 47  | 75            | 55             | -0.03163                   | 94                         | 3                            | 94                           |

Source: The Author

## Summary output of Ten year Treasury Bond

| <i>Regression Statistics</i> |          |
|------------------------------|----------|
| Multiple R                   | 0.099857 |
| R Square                     | 0.009971 |
| Adjusted R Square            | -0.02417 |
| Standard Error               | 0.101356 |
| Observations                 | 31       |

| <i>ANOVA</i> |           |           |           |          |                       |
|--------------|-----------|-----------|-----------|----------|-----------------------|
|              | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i> | <i>Significance F</i> |
| Regression   | 1         | 0.003001  | 0.003001  | 0.292083 | 0.593015              |
| Residual     | 29        | 0.297916  | 0.010273  |          |                       |
| Total        | 30        | 0.300916  |           |          |                       |

|              | <i>Coefficients</i> | <i>Standard Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower 95%</i> | <i>Upper 95%</i> | <i>Lower 95.0%</i> | <i>Upper 95.0%</i> |
|--------------|---------------------|-----------------------|---------------|----------------|------------------|------------------|--------------------|--------------------|
| Intercept    | 0.088356            | 0.022846              | 3.867451      | 0.000573       | 0.041631         | 0.135082         | 0.041631           | 0.135082           |
| X Variable 1 | -0.0583             | 0.107868              | -0.54045      | 0.593015       | -0.27891         | 0.162318         | -0.27891           | 0.162318           |

Source: The Author

## Summary Output of Real Estate Investment Trust

| <i>Regression Statistics</i> |          |
|------------------------------|----------|
| Multiple R                   | 0.460071 |
| R Square                     | 0.211665 |
| Adjusted R Square            | 0.184481 |
| Standard Error               | 0.162235 |
| Observations                 | 31       |

| ANOVA      |           |           |           |          |                       |
|------------|-----------|-----------|-----------|----------|-----------------------|
|            | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i> | <i>Significance F</i> |
| Regression | 1         | 0.20494   | 0.20494   | 7.786394 | 0.00921               |
| Residual   | 29        | 0.763289  | 0.02632   |          |                       |
| Total      | 30        | 0.968229  |           |          |                       |

|              | <i>Coefficients</i> | <i>Standard Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower 95%</i> | <i>Upper 95%</i> | <i>Lower 95.0%</i> | <i>Upper 95.0%</i> |
|--------------|---------------------|-----------------------|---------------|----------------|------------------|------------------|--------------------|--------------------|
| Intercept    | 0.069421            | 0.036569              | 1.898374      | 0.067639       | -0.00537         | 0.144213         | 0.00537            | 0.144213           |
| X Variable 1 | 0.481792            | 0.17266               | 2.790411      | 0.00921        | 0.128663         | 0.834921         | 0.128663           | 0.834921           |

Source: The Author

**Appendix 6: Annual historical returns of Dow Jones Industrial  
Average from the period of 1983 to 2013.**

| Dow Jones Industrial Average Annual Return |         |
|--|---------|
| Date                                       | Return  |
| 1983                                       | 20.27%  |
| 1984                                       | -3.74%  |
| 1985                                       | 27.66%  |
| 1986                                       | 22.58%  |
| 1987                                       | 2.26%   |
| 1988                                       | 11.85%  |
| 1989                                       | 26.96%  |
| 1990                                       | -4.34%  |
| 1991                                       | 20.32%  |
| 1992                                       | 4.17%   |
| 1993                                       | 13.72%  |
| 1994                                       | 2.14%   |
| 1995                                       | 33.45%  |
| 1996                                       | 26.01%  |
| 1997                                       | 22.64%  |
| 1998                                       | 16.10%  |
| 1999                                       | 25.22%  |
| 2000                                       | -6.18%  |
| 2001                                       | -7.10%  |
| 2002                                       | -16.76% |
| 2003                                       | 25.32%  |
| 2004                                       | 3.15%   |
| 2005                                       | -0.61%  |
| 2006                                       | 16.29%  |
| 2007                                       | 6.43%   |
| 2008                                       | -33.84% |

|      |        |
|------|--------|
| 2009 | 18.82% |
| 2010 | 11.02% |
| 2011 | 5.53%  |
| 2012 | 7.26%  |
| 2013 | 26.50% |

Source: McGraw Hill Financial 2014