A Role Of Surya Namaskara On Health Related Physical Fitness Components

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Abstract: Ancient people were lovers of sun and nature. In history it was believed that doing Surya Namaskar would bring health and peace. Even the origin of Surya Namaskar is unclear to us till today, some 17th century sources say that Surya namaskar was originated by Saint Samarth Ramdasa in India. this Surya Namaskar consists of 12 asanas and chanting mantras. According to some scriptures it is said that one does not face any kind of trouble by doing Surya Namaskar. Elements of physical fitness related to health. Physical fitness consists of five elements: muscular strength, flexibility, body composition, endurance of muscles, lung capacity. In order to help achieve a healthy body composition, Suraya namaskar activities burn calories and improve cardio respiratory endurance. Surya namaskara is build muscles, improve endurance and power of the muscles as well as help to create a balanced physique. Doing Suraya namaskar that increase flexibility, muscular strength, body composition, muscular endurance, cardio respiratory endurance, burn calories.

Index Terms - Surya Namaskara, techniques, 12 Asanas, Mantras, Health related Physical components, Benefits.

I. INTRODUCTION

Surya Namaskar is found in Yudha Kanda of Ramayana. Lord Rama, after a continuous battle with Ravana, is unable to kill him and is confused. In the Ramayana, in the context of Rama not defeating Ravana, this is a great prayer taught to Rama by Sage Agastya. Some references state that with this prayer, Rama is able to save Sita and defeat Ravana. Some references state that we can find Surya Namaskar even in the verses of Yajurveda. Here Krishna's Taittiriya Aranyaka is described in the first study. In ancient times there was a practice of worshiping the sun of the solar system.

Sages have said that different parts of the human body are compared to different deities. Sages are of the opinion that doing Surya Namaskar increases the creativity and natural abilities of the plexus system in our body. Surya Namaskar is a series of asanas with a rhythmic pattern of breathing. Namaskara Asana, Urdvasana, Padahastasana, Aswasanchalanasana, Budarasana, Ashtangasana, Bhujangasana, Bhudarasana, Aswasanchalanasana, Padahastasana, Urdvasana, Surya Namaskara position, this Surya Namaskar consists of 12 asanas and chanting mantras. According to some scriptures it is said that one does not face any kind of trouble by doing Surya Namaskar. Some scriptures say that Surya Namaskar before sunrise rejuvenates and p unifies the body.

3.1 Population and Sample

KSE-100 index is an index of 100 companies selected from 580 companies on the basis of sector leading and market capitalization. It represents almost 80% weight of the total market capitalization of KSE. It reflects different sector company's performance and productivity. It is the performance indicator or benchmark of all listed companies of KSE. So it can be regarded as universe of the study. Non-financial firms listed at KSE-100 Index (74 companies according to the page of KSE visited on 20.5.2015) are treated as universe of the study and the study have selected sample from these companies.

The study comprised of non-financial companies listed at KSE-100 Index and 30 actively traded companies are selected on the bases of market capitalization. And 2015 is taken as base year for KSE-100 index.

3.2 Data and Sources of Data

For this study secondary data has been collected. From the website of KSE the monthly stock prices for the sample firms are obtained from Jan 2010 to Dec 2014. And from the website of SBP the data for the macroeconomic variables are collected for the period of five years. The time series monthly data is collected on stock prices for sample firmsand relative macroeconomic variables for the period of 5 years. The data collection period is ranging from January 2010 to Dec 2014. Monthly prices of KSE -100 Index is taken from yahoo finance.

3.3 Theoretical framework

Variables of the study contains dependent and independent variable. The study used pre-specified method for the selection ofvariables. The study used the Stock returns are as dependent variable. From the share price of the firm the Stock returns are calculated. Rate of a stock salable at stock market is known as stock price.

Systematic risk is the only independent variable for the CAPM and inflation, interest rate, oil prices and exchange rate are the independent variables for APT model.

History of Surya Namaskar

Ancient people were lovers of sun and nature. In history it was believed that doing Surya Namaskar would bring health and peace. Even the origin of Surya Namaskar is unclear to us till today, some 17th century sources say that Surya namaskar was originated by Saint Samarth Ramdasa in India. Thus Surya Namaskar was popularized by Bhavan Rao Srinivas Pant in 1920.

A technique for saluting the Sun that involves physical postures and mantras with the goal of promoting mental, spiritual, and physical well-being is called Surya Namaskar. The Sanskrit terms "surya" and "namaskara," which mean "sun" or "Agni" respectively, are the root of the phrase "Surya Namaskara." "Namaskara" means "greeting." The bodily postures used to bow to the sun god at the sunrise in the morning are explained, with the sun indicating east.

Surya Namaskara

First 12 Asanas start with 12 mantras and beeja mantras After reciting the mantra, proceed to do asanas

1st Step and 12th Step - Pranamasana (prayer pose) 1st and 12th

This is the "Pranama" stance, and stands upright on both legs, spread your shoulders with your hands at your sides, and then relax. Now take a breath, raise both hands, and, as you release the breath, adopt the "Namaskara" stance (mudra).

Pranamasana (prayer pose)

➢ **Mantra;** "OM MITRAYA NAMAH" Prostration to Him who is affectionate to all.

➢ **12th Step Mantra** "OM BHĀSKARĀYA NAMAH" Prostration to Him who is the cause of luster.

Breathing patter – Inhale and Exhale

Take a standing position, place your feet jointly equally distribute your body weight across your toes. Slowly raise the arms from the sides parallel to the shoulders. Gently turn the palm upwards. Slowly raise the hands up and take them to Namaskar position,

the hands should be straight and the arms should touch the ears. Wear the Namaskar position in front of the chest.

Benefits:

1. Improves Muscular strength; Anterior hand muscles Brachioradialis, Capri radialis and ulnaris are Extension and strengthening of the muscles. The limbs finding the ability to support the entire weight of the individual while in this position, which also nourishes the hip and knees ligaments.
2. Improves Flexibility; Anterior hand muscles Brachioradialis, Capri radialis and ulnaris are Extension, and Posterior hand muscles Capri Ulnaris, Digitorum, Extensors retinaculum, are improves flexibility.
3. Improves Body composition of practicing pranamasana prayer pose.
4. Improves Muscular endurance; Anterior hand muscles Brachioradialis, Capri radialis and ulnaris are Extension, Posterior hand muscles Capri Ulnaris, Digitorum, Extensors retinaculum, are flexes and improves muscular endurance.
5. Regularly practicing pranamasana is extensions the chest and improves Cardio respiratory endurance.

2ⁿᵈ Step and 11ᵗʰ Step – Urdvasana (raised arms pose)

Mantra - "OM RAVAYE NAMAH" Prostration to Him who is the cause for change.

11ᵗʰ Step Mantra "OM ARKAYA NAMAH" Prostration to Him who is fit to be worshipped.

Breathing pattern - Inhale

Urdvasana (raised arms pose)

While inhaling, raise and lower your arms, keeping your biceps near your ears, starch back your arms. The goal of this stance is to extend your entire body upward and bend back ward, from your heels to your finger tips. Raise both hands in pray stance and extend your body backward from your feet to the tips of your fingers, keeping your biceps near your eyes.

Benefits:

1. Improves Muscular strength, and flexibility and muscular endurance; Surya Namaskar enhances muscle strength and flexibility, Enhances shoulders strength and flexibility. strengthening all the muscles extension of the quadriceps femoris group, rectus Abdominals, Sartorius, external oblique, latissimus dorsi, triceps brachii, and pectoralis major Extend the abdominal muscles,

2. Body composition; Improves fat loss and maintain good posture are practicing Urdvasana (raised arms pose)
3. Cardio respiratory endurance; regular practicing and reputations of Urdvasana is improving cardio respiratory endurance.
4. Burn calories; belly fat, abdominal fat, upper body fat burning.

3ʳᵈ Step and 10ᵗʰ Step – Padahastasana (hand to foot pose)

Mantra – "OM SURYAY NAMAH"

10ᵗʰ Step Mantra "OM SAVITRE NAMAH" Prostration to Him who produces everything.

Breathing patter - Exhale

Exhale and bending downward from the abdomen while maintaining an upright posture. Place your palms on the floor next to your feet as you fully exhale. Now, with your back straight, bend down from your hips and touch the ground with both hands. Aim toward touching head to knees and maintain a straight posture.

Benefits:

1. The vigorous stretched posture Padahastasana aids in stabilizing and toning the whole body, leading to in a balanced, agile form. Shielding the hard muscle of the hamstrings, wrist, and lower back from a variety of conditions.

2. Rectus Abdominis, sartorius, quadriceps femoris group, external oblique, latissimus dorsi, triceps brachii, pectoralis major, extension and improve muscular strength. It improves flexibility, muscular endurance and strengthens the back muscles. It elongates the calves, hamstrings, and hips.

3. Body composition; this asana training is improving full body posture and improving mobility of body composition.

4. Oblique's, abdominals, flexion and gastrocnemius, biceps femoris, gluteus maximums, upper body posterior muscles, fore arm muscles, posterior core muscles, extension and improving muscular endurance.

5. Cardio respiratory endurance; Doing padahastasana reputations is improving leg muscles, lower and upper body muscular systems, Improved Cardiovascular endurance: The inverted pose of padahastasana, in which the head is positioned below the heart to increase blood flow in the veins, guarantees improved blood flow from head to heel.

6. Burn calories; by reducing extra fat, this stance shields our bodies from heart disease and other related conditions. Regularly performing of this pose is the best way to lose abdominal fat.

4th Step and 9th Step – Ashwa Sanchalanasana (Equestrian Pose)

Mantra – "OM BHANAVE NAMAH" Prostration to Him who diffuses Light.

9th step Mantra "OM ADITYAYA NAMAH" Prostration to him who is god of gods.

Breathing pattern - Inhale

Inhaling, push out your left leg as far as you can, bending your foot so that it touches the ground. Position the right knee between the two palms. Then maintain your posture while looking up. Using your toes to help balance it on the floor, feet should be straight.

Benefits:

1. Muscular endurance; It strengthens the spine and improves the brain and spinal cord. It tones the liver and kidneys, two digestive organs. It strengthens the will. Expands Improves, Increases: The lower belly, thighs, the groin, hips, thigh muscles, knee, ankles, and foot can all be stretched with Ashwa Sanchalanasana.

2. Flexibility; bye doing Ashwa Sanchalanasana is improving, gastrocinamus, sartorius, quadriceps femoris group, Abdominis, lower body thigh muscles and upper body muscles are improving flexibility.

3. Body composition; doing Ashwa Sanchalanasana digestive tract, muscles, the intestines kidneys, liver, and skeletons all contain this type of fat. Your body needs fat in certain areas for working properly.

4. Cardio respiratory endurance; Regular practice Ashwa Sanchalanasana is increases cardio respiratory endurance the speed and

5. Burn calories; practicing daily is burn calories example the gastrocinamus, sartorius, quadriceps femoris group, Abdominis, lower body thigh muscles and upper body muscle

5th Step and 8th Step – Bhudarasana

Mantra – "OM KHAGAY NAMAH" Prostration to Him who moves in the sky.

8th Step "OM MARICAYE NAMAH" Prostration to Him who possesses rays.

Breathing pattern - Exhale

Reposition your left leg and pull your entire body into a straight line as you inhale the position resembles a mountain, or "Parvata." Exhale, and then bring your right leg back from Ashwa Sanchal anasana stance such that it is parallel to your left leg. Raise both the wrist and the buttocks simultaneously. Hold the body weight steady with your hands straight. It is proper to place the head between hands.

Benefits:

1. Muscular strength; It gives the spine a nice stretch. The peripheral nervous system is toned by it. It makes the muscles in the upper and lower limbs stronger. It supports the development of wrist, shoulder, and arm strength and endurance

2. Flexibility: This posture maintains the equilibrium spaces among the vertebral joints by promoting the spinal flexibility. The cervical to lumbar regions of the spine get

Longer. The torso joints and sacrum are stabilized by the pelvic opening, which is achieved by building the hamstrings, shin, and quadriceps muscles.

3. Body composition: this asana training is improving full body posture and improving mobility of body composition.
4. Muscular endurance; the spine muscles in the upper and lower limbs stronger and the torso joints and sacrum are stabilized by the pelvic opening, which is achieved by building the hamstrings, shin, and quadriceps muscles improving muscular endurance.
5. Cardio respiratory endurance: doing the budarasana is thigh muscles during prolonged physical activity, which is a crucial sign of overall cardio respiratory endurance
6. Burn calories: practicing daily is burn calories example the gastrocinamus, sartorius, quadriceps femoris group, Abdominis, lower body thigh muscles and upper body muscle.

6th Step – Ashtanga namaskarasana (salute with eight parts or points)
Mantra – "OM PUSHNE NAMAH" Prostration to Him who nourishes all.
Breathing pattern - Exhale

Breathe out as you lower your knees gently to the floor. Gradually recline your pelvis, move forward, and place your chin and chest on the ground. Lift your rear end slightly. The eight body parts the two palms, two feet, two knees, chest, and chin should come into contact with the ground. Lower your knees gently to the floor; then slide your hips back and forward to rest your chin and chest there. Continue touching all eight body parts; the palms, toes, the knees, the chest, and the chin to the ground while maintaining this posture.

Benefits:
1. Muscular strength: Develops the whole back muscles, biceps, triceps, chest region, belly, and knees. Tone both the upper and lower limbs. Preserve the spine's natural curvature. Boost your range of motion and posture. Invigorate the internal systems Assists the physique produce more energy Reduces back discomfort
2. Benefits: It tones the skeletal muscles in both upper and lower limbs as well as the system for respiration.
3. Flexibility: back muscles, biceps, triceps, chest region, belly, and knees. Tone both the upper and lower muscles extend and flex is improving the flexibility.
4. Body composition: this Ashtangasana training is improving full body posture and improving mobility of body composition. This asana is improving bake bone mobilaigetion.
5. Muscular endurance and Cardio respiratory endurance: Regularly a practice Ashtangasana or Eight Limbed Pose is Increases, flexibility, and enhances Ashtangasana, flexes your toes and soles of the feet. It specifically stretches the soles' plantar fascia muscles. It fortifies the back, the hamstrings, thighs, and arms, and wrists' shoulders, rhomboids, and trapezius muscles are improving Muscular endurance.
6. Burn calories: Extends the neck, back part of the hips extended, and your toes. Cracks open to the chest and belly.

7th Step – Bhujangasana (cobra pose)
Mantra – "OM HIRANYAGARBHĀYA NAMAH" Prostration to Him who contains everything.
Breathing patter - Inhale

In order to assume the Cobra position, slide forward and lift your chest upward. In this stance, you can maintain your arms bent and your shoulders away from your ears. Examine the ceiling above you. Slide looking forward to elevate the upper body from this last posture. The hands are bowed and pointing skyward. Half of the body is in the air and the other half is on the floor in this stance. This is Bhujangasana, often known as Cobra position.

Benefits:

1. Muscular strength: By doing Bhujangasana, the back bone shrinks and the abdominal muscles are strengthened. It helps to strengthen the back muscles, particularly the lower back, which has the largest lumbar spine compression. the back bone shrinks and the abdominal muscles increase endurance
2. Flexibility: It increases the muscles' and spine's flexibility.
3. Body composition: It is helpful in neck, back, sciatica, asthma, and menstrual cycles and supports the reproductive, gastrointestinal, respiratory, and urogenital systems.
4. Muscular endurance: It helps to strengthen the back muscles, particularly the lower back, which has the largest lumbar spine compression.
5. Cardio respiratory endurance: doing the Suryanamaskara is hearts and lungs' capacity to supply oxygen to working muscles during prolonged physical activity, which is a crucial sign of overall cardio respiratory endurance. then increases the breathing rate and improves blood circulation
6. Burn calories: doing Bujangasana is burn calories are the muscles core muscles fat and back muscles fat and hip gluteus muscles.
7. Every yoga pose has a chakra that corresponds with it. When doing Surya Namaskara, it is advised to align posture, breathing, mantras, and your concentration to specific chakras. It requires all of your attention. Specific mantras are uttered or repeated during
8. This helps in the development of back muscles.

Advantages of Surya Namaskara:

1. This specific pattern of twelve poses combines the benefits of Pranayama and Asanas. Helps your entire body Sun Salutations are an excellent method to warm up the entire body before starting any kind of movement activity, including yoga. You can activate all of your main muscle groups and tell them it's time to work by combining motion and stretching.
2. Increases heart rate: Risk One of the finest ways to increase your pulse while doing yoga is with Sun Salutations. Here, it's all about moving fast without compromising alignment or attention to detail. For an added cardio boost, use some forward and backward leaping.
3. Muscles' tones: while the standing positions strengthen your leg muscles, the vinyasa sequence's plank, chaturanga, and other poses strengthen your upper body and abs. With Chair Pose is very beneficial for your legs.
4. Increases Adaptability: you extend a lot; yoga particular, downwards faced dog and uttanasana work the hamstrings and extensions of the arms. Pose with your arms, back, and shoulder in the same manner. Try moving gently through a few rounds, maintaining each position for a few breaths until you find a deeper stretch.
5. Strengthens the body, calms the mind, and enhances general health.
6. Aids in muscular toning, flexing, and stretching.
7. The Surya Namaskar, often known as the sun salute, is the foundation of yoga since it increases general body strength, endurance, and flexibility.
8. Aids in keeping the heart healthy.
9. Increases nervous system activity.
10. Aids in muscular toning, flexing, and stretching.
11. Great activity to help control weight loss.

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Consumer Price Index (CPI) is used as a proxy in this study for inflation rate. CPI is a wide basic measure to computeusualvariation in prices of goods and services throughout a particular time period. It is assumed that arise in inflation is inversely associated to security prices because Inflation is at lastturned into nominal interest rate andchange in nominal interest rates caused change in discount rate so discount rate increase due to increase in inflation rate and increase in discount rateleads todecreasethe cash flow's present value (Jecheche, 2010). The purchasing power of money decreased due to inflation, and due to which the investors demand high rate of return, and the prices decreased with increase in required rate of return (Iqbal et al, 2010).

I. RESEARCH METHODOLOGY

The methodology section outline the plan and method that how the study is conducted. This includes Universe of the study, sample of the study,Data and Sources of Data, study's variables and analytical framework. The detailsare as follows;

3.1Population and Sample

KSE-100 index is an index of 100 companies selected from 580 companies on the basis of sector leading and market capitalization. It represents almost 80% weight of the total market capitalization of KSE. It reflects different sector company's performance and productivity. It is the performance indicator or benchmark of all listed companies of KSE. So it can be regarded as universe of the study.Non-financial firms listed at KSE-100 Index (74 companies according to the page of KSE visited on 20.5.2015) are treated as universe of the study and the study have selected sample from these companies.

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Exchange rate is a rate at which one currency exchanged with another currency. Nominal effective exchange rate (Pak Rupee/U.S.D) is taken in this study.This is assumed that decrease in the home currency is inverselyassociated to share prices (Jecheche,2010). Pan et al. (2007) studied exchange rate and its dynamic relationship with share prices in seven East Asian Countries and concludethat relationshipof exchange rate and share prices varies across economies of different countries. So there may be both possibility of either exchange rate directly or inverselyrelated with stock prices.Oil prices are positively related with share prices if oil prices increase stock prices also increase (Iqbal et al, 1012).Ataullah (2001) suggested that oil prices cause positive change in the movement of stock prices. The oil price has no significant effect on stock prices (Dash & Rishika, 2011).Six month T-bills rate is used as proxy of interest rate. As investors arevery sensitive about profit and where the signals turn into red they definitely sell the shares. And this sensitivity of the investors towards profit effects the relationship of the stock prices and interest rate, so the more volatility will be there in the market if the behaviors of the investors are more sensitive. Plethora (2002)has tested interest rate sensitivity to stock market returns, and concluded an inverse relationship between interest rate and stock returns. Nguyen (2010) studies Thailand market and found thatInterest rate has aninverse relationship with stock prices.

KSE-100 index is used as proxy of market risk. KSE-100 index contains top 100 firms which are selected on the bases of their market capitalization. Beta is the measure of systematic risk and has alinear relationship with return (Horn, 1993). High risk is associated with high return (Basu, 1977, Reiganum, 1981 and Gibbons, 1982). Fama and MacBeth (1973) suggested the existence of a significant linear positive relation between realized return and systematic risk as measured by β. But on the other side some empirical results showed that high risk is not associated with high return (Michailidis et al. 2006, Hanif, 2009). Mollah and Jamil (2003) suggested thatrisk-return relationship is notlinear perhaps due to high volatility.

3.4Statistical tools and econometric models

This section elaborates the proper statistical/econometric/financial models which are being used to forward the study from data towards inferences. The detail of methodology is given as follows.

3.4.1 Descriptive Statistics

Descriptive Statics has been used to find the maximum, minimum, standard deviation, mean and normally distribution of the data of all the variables of the study. Normal distribution of data shows the sensitivity of the variables towards the periodic changes and speculation. When the data is not normally distributed it means that the data is sensitive towards periodic changes and speculations which create the chances of arbitrage and the investors have the chance to earn above the normal profit. But the assumption of

the APT is that there should not be arbitrage in the market and the investors can earn only normal profit. Jarque bera test is used to test the normality of data.

3.4.2 Fama-Mcbeth two pass regression

After the test statistics the methodology is following the next step in order to test the asset pricing models. When testing asset pricing models related to risk premium on asset to their betas, the primary question of interest is whether the beta risk of particular factor is priced. Fama and McBeth(1973)develop a two pass methodology in which the beta of each asset with respect to a factor is estimated in a first pass time series regression and estimated betas are then used in second pass cross sectional regression to estimate the risk premium of the factor. According to Blum (1968) testing two-parameter models immediately presents an unavoidable errors-in-the variables problem.It is important to note that portfolios (rather than individual assets) are used for the reason of making the analysis statistically feasible.Fama McBeth regression is used to attenuate the problem of errors-in-variables (EIV) for two parameter models (Campbell, Lo and MacKinlay, 1997).If the errors are in the β (beta)of individual security are not perfectly positively correlated, the β of portfolios can be much more precise estimates of the true β (Blum, 1968).

The study follow Fama and McBeth two pass regressionto test these asset pricing models.The Durbin Watson is used to check serial correlation and measures the linear association between adjacent residuals from a regression model. If there is no serial correlation, the DW statistic will be around 2. The DW statistic will fall if there is positive serial correlation (in worst case, it will be near zero). If there is a negative correlation, thestatistic will lie somewhere between 2 and 4. Usually the limit for non-serial correlation is considered to be DW is from 1.8 to 2.2. A very strong positive serial correlation is considered at DW lower than 1.5 (Richardson and smith, 1993).

According to Richardson and smith(1993) to make the model more effective and efficient the selection criteria for the shares in the period are: Shares with no missing values in the period, Shares with adjusted R^2 < 0 or F significant (p-value) >0.05of the first pass regression of the excess returns on the market risk premium are excluded. And Shares are grouped by alphabetic order into group of 30 individual securities (Roll and Ross, 1980).

3.4.2.1 Model for CAPM

In first pass the linear regression is used to estimate beta which is the systematic risk.

$$R_i - R_f = (R_m - R_f)\beta \qquad (3.1)$$

Where $R_i$isMonthly return of thesecurity, R_f isMonthly risk free rate, R_m isMonthly return of market and $\beta$is systematic risk (market risk).

The excess returns R_i - R_f of each security is estimated from a time series share prices of KSE-100 index listed shares for each period under consideration. And for the same periodthe market Premium R_m - $R_f$also estimated. After that regress the excess returns R_i - R_f on the market premium R_m - $R_f$to find the beta coefficient (systematic risk).

Then a cross sectional regression or second pass regression is used on average excess returns of the shares and estimated betas.

$$\hat{R}_i = \gamma_0 + \gamma_1\beta_1 + \epsilon \qquad (3.2)$$

Where λ_0= intercept, $\hat{R}_i$is average excess returns of security i,$\beta_i$isestimated be coefficient of security I and ϵ is error term.

3.4.2.2 Model for APT

In first pass the betas coefficients are computed by using regression.

$$R_i - R_f = \beta_i f_1 + \beta_{i2} f_2 + \beta_{i3} f_3 + \beta_{i4} f_4 + \epsilon \qquad (3.3)$$

Where Ri is the monthly return of stock i,R_f is risk free rate, β_i is the sensitivity of stock i with factors and ϵ is the error term.

Then a cross sectional regression or second pass regression is used on average excess returns of the shares on the factor scores.

$$\hat{R} = \gamma_0 + \gamma_1\beta_1 + \gamma_2\beta_2 + \gamma_3\beta_3 + \gamma_4\beta_4 + \epsilon_i \qquad (3.4)$$

WhereR̂ is average monthly excess return of stock I, λ = risk premium, β_1 to β_4 are the factors scores and ε_i is the error term.

3.4.3 Comparison of the Models

The next step of the study is to compare these competing models to evaluate that which one of these models is more supported by data.This study follows the methods used by Chen (1983), the Davidson and Mackinnon equation (1981) and the posterior odds ratio (Zellner, 1979) for comparison of these Models.

3.4.3.1 Davidson and MacKinnon Equation

CAPM is considered the particular or strictly case of APT. These two models are non-nested because by imposing a set of linear restrictions on the parameters the APT cannot be reduced to CAPM. In other words the models do not have any common variable. Davidson and MacKinnon (1981) suggested the method to compare non-nested models. The study used the Davidson and MacKinnon equation (1981) to compare CAPM and APT.

This equation is as follows;

$$R_i = \alpha R_{APT} + (1 - \alpha)R_{CAPM} + e_i \qquad (3.5)$$

Where$R_{i=}$ the average monthly excess returns of the stock i, $R_{APT=}$ expected excess returns estimated by APT, $R_{CAPM=}$ expected excess returns estimated by CAPM and α measure the effectiveness of the models. The APT is the accurate model to forecast the returns of the stocks as compare to CAPMif α is close to 1.

3.4.3.2 Posterior Odds Ratio

A standard assumption in theoretical and empirical research in finance is that relevant variables (e.g stock returns) have multivariate normal distributions (Richardson and smith, 1993). Given the assumptionthat the residuals of the cross-sectional regression of the CAPM and the APT satisfy the IID (Independently and identically distribution) multivariate normal assumption (Campbell, Lo and MacKinlay, 1997), it is possible to calculate the posterior odds ratio between the two models.In general the posterior odds ratio is a more formal technique as compare to DM equation and has sounder theoretical grounds (Aggelidis and Maditinos, 2006).

The second comparison is done using posterior odd radio. The formula for posterior odds is given by Zellner (1979) in favor of model 0 over model 1.

The formula has the following form;

$$R = [ESS_0/ESS_1]^{N/2} N^{K_0 - K_1/2} \qquad (3.6)$$

WhereESS_0iserror sum of squares of APT, ESS_1iserror sum of squares of CAPM, Nisnumber of observations, $K_0$is number of independent variables of the APT and K_1 isnumber of independent variables of the CAPM.As according to the ratio when;

R> 1 means CAPM is more strongly supported by data under consideration than APT.

R < 1 means APT is more strongly supported by data under consideration than CAPM.

IV. RESULTS AND DISCUSSION

4.1 Results of Descriptive Statics of Study Variables
Table 4.1: Descriptive Statics

Variable	Minimum	Maximum	Mean	Std. Deviation	Jarque-Bera test	Sig
KSE-100 Index	-0.11	0.14	0.020	0.047	5.558	0.062
Inflation	-0.01	0.02	0.007	0.008	1.345	0.510
Exchange rate	-0.07	0.04	0.003	0.013	1.517	0.467
Oil Prices	-0.24	0.11	0.041	0.060	2.474	0.290
Interest rate	-0.13	0.05	0.047	0.029	1.745	0.418

Table 4.1 displayed mean, standard deviation, maximum minimum and jarque-bera test and its p value of the macroeconomic variables of the study. The descriptive statistics indicated that the mean values of variables (index, INF, EX, OilP and INT) were 0.020, 0.007, 0.003, 0.041 and 0.047 respectively. The maximum values of the variables between the study periods were 0.14, 0.02, 0.04, 0.41, 0.11 and 0.05 for the KSE- 100 Index, inflation, exchange rate, oil prices and interest rate.

The standard deviations for each variable indicated that data were widely spread around their respective means.

Column 6 in table 4.1 shows jarque bera test which is used to checkthe normality of data. The hypotheses of the normal distribution are given;

H_0 : The data is normally distributed.

H_1 :The data is not normally distributed.

Table 4.1 shows that at 5 % level of confidence, the null hypothesis of normality cannot be rejected. KSE-100 index and macroeconomic variables inflation, exchange rate, oil prices and interest rate are normally distributed.

The descriptive statistics from Table 4.1 showed that the values were normally distributed about their mean and variance. This indicated that aggregate stock prices on the KSE and the macroeconomic factors, inflation rate, oil prices, exchange rate, and interest rate are all not too much sensitive to periodic changes and speculation. To interpret, this study found that an individual investor could not earn higher rate of profit from the KSE. Additionally, individual investors and corporations could not earn higher profits and interest rates from the economy and foreign companies could not earn considerably higher returns in terms of exchange rate. The investor could only earn a normal profit from KSE.

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