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Does Capital Asset Pricing Model Hold? Evidence from United Kingdom

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Abstract
An equilibrium Capital Asset Pricing Model (CAPM) of Treynor (1962), Sharpe (1964), Lintner (1965), Mossin (1966) asserts that stock returns are explained by their betas. Other study by Fama and French (1992) shows that the stock returns can be explained by not only their betas but also their sizes and growth. In this research-based article regressions and hypothesis testing are carried out. With a sample of 50 United Kingdom (UK) stocks, covering the period from 1980-2005, the hypothesis that stock returns are explained only by their betas is rejected. The results from this study also show that stock returns are not related to market returns and there is no linear relationship between actual stock returns and their respective betas. The hypotheses that size and growth have no power to explain the stock returns are also rejected in some cases and accepted in other cases.
Keywords: Capital Asset Pricing Model, CAPM, Beta Validity**,** Stocks.

1. Introduction

1.1 Origin of CAPM

The CAPM was introduced independently by Treynor (1962), Sharpe (1964), Lintner (1965), Mossin (1966) and Tobin (1958) building on the earlier foundation laid by Markowitz (1952) on diversification and modern portfolio theory. Before Markowitz's work investors had been focusing their choice on risk-return profiles of individual securities in forming their portfolios. Markowitz (1952) points out that investors should focus on selecting portfolios based on their overall risk-return profiles instead of forming portfolios from securities that each individually attractive risk-return characteristics.

Tobin (1958) expanded on Markowitz's work by incorporating a risk-free asset to the analysis. Treynor (1962), Sharpe (1964) and Lintner (1965) introduced the concepts of systematic risk and specific risk to the earlier works of Markowitz (1952) and Tobin (1958). Systematic risk (also known as undiversifiable risk) is the risk of holding a portfolio of assets whereby individual assets are affected either positively or negatively when the market moves. Specific risk (also known as diversifiable risk or idiosyncratic risk) on the other hand is the risk unique to an individual asset and as such it can be eliminated through diversification. Specific risk represents asset's return uncorrelated to general market moves. Treynor (1962), Sharpe (1964) and Lintner (1965) point out that investors are rewarded for assuming systematic risk rather than total risk or specific risk because specific risk can be diversified away.

These studies resulted into CAPM which stipulates that the expected return of a stock equals to the risk-free rate of return plus the expected excess return of the portfolio multiplied by its beta, β. This can be represented as

$$E(R_i)=R_f+\beta_i[E(R_m)-R_f] \qquad \text{Equation (1)}$$

Where:
$E(R_i)$= expected return of a stock; R_f=risk-free rate of return; β_i= beta of a stock,
$[E(R_m)-R_f]$=expected excess return of the portfolio

1.2 Objectives of this Paper

The objective of this study is to test the validity of CAPM and Fama-French (1992, 1993, 1996) three factor-pricing model. Specifically the objectives of this study are as follows:

(a) To test whether stock returns can be explained by their betas;
(b) To test whether there is relationship between stock return and market return;
(c) To test whether there is linear relationship between stock returns and their respective betas; and
(d) To test the validity of Fama-French empirical evidence that size and growth can explain the average stock excess return.

The remaining sections of this paper are arranged as follows section 2 provides a review of literature, section 3 describes research method, section 4 describes the data, section 5 gives a description of the hypotheses tested, section 6 gives an analysis and interpretation of empirical results and section 7 provides the concluding remarks.

2. Review of Literature

In CAPM the expected return of a stock [i.e. $E(R_i)=R_f+\beta_i[E(R_m)-R_f]$, is the function of risk measured by beta, β and defined as in equation (2) and risk premium defined as in equation (3).

$$\beta_i= [Cov(R_i,R_m)]/[\delta^2(R_m)] \qquad \text{Equation (2)}$$

(R_m-R_f) Equation (3)

Where:

$Cov(R_i,R_m)$ = Covariance of stock returns to market returns and

$\delta^2(R_m)$=Variance of market return

Fama and MacBeth (1973) point out that CAPM, i.e. equation (1) has three testable implications namely:

(a) The relationship between the expected return on a security and its risk in any efficient portfolio is linear;
(b) β_i is a complete measure of the risk of security in the efficient portfolio;
(c) In a market of risk-averse investors, higher risk should be associated with higher expected return, that is $(E(R_m)-R_f)>0$.

Despite the anomalies associated with CAPM which are also highlighted in this paper the model is still widely used in practice. The following are some of uses of CAPM:

(a) Investment appraisal: In this case CAPM is used to find the presents value, ACCA (2015)
(b) Estimation of Profitability of a Financial Instrument Portfolio, Anghel Mădălina – Gabriela and Liliana Paschia (Dincă) (2013),
(c) Financial markets' pricing of securities and the determination of expected returns, Mullins (1982)
(d) Discounting cash flows to evaluate Mergers & acquisitions, Mullins (1982)

Most of extant empirical studies conclude that CAPM does not hold because market is not efficient or/and because of a variety of anomalies associated with CAPM. Anomalies associated with CAPM include, small-capitalization effect, the turn-of-the-year effect**,** the weekend effect, the size of the firm effect and growth of the firm effect. The literature on whether CAPM is valid is visited before assessing empirically the validity of CAPM using the data of 50 UK stocks. Some of these anomalies are visited.

According to Banz (1981) and Reinganum (1981) small-capitalization companies (i.e. small firms) on the NYSE generated higher average returns from 1936-1975 than predicted by Sharpe (1964) and Lintner (1965) CAPM. Banz (1981) also found that the coefficient on size has more explanatory power than the coefficient on beta in describing the cross section of returns. This is referred to as small-firm effect.

Keim (1983) and Reinganum (1983) point out that much of the abnormal return to small firms occurs during the first two weeks of the year. This anomaly is referred to as turn-of-the-year effect. Rezvanian; Turk and Mehdian (2008) find no calendar anomaly in 6 Chinese equity market indices implying that these markets are to a certain level efficient in spite of the assumption that Chinese equity markets are not developed and might demonstrate signs of inefficiencies. Mehdian and Perry (2001) in their study conclude that stock returns in US are lowest on Monday compared with other days of the week. Mehdian and Perry (2002) confirm the existence of the January effect in US equity markets by verifying that the stock returns are higher in the month of January compared to other months. However, they report that while January mean returns are positive in US stock returns, they are not statistically significant after 1987 US stock market crash.

According to Reinganum (1983) if small firms earn higher returns than large firms during the first two weeks of January, α_i in a formula $(R_i-R_f)= \alpha_i+\beta_i(R_m-R_f)$ should be reliably positive implying that average excess return of a small firm will be reliably higher than that of a large firm.

Studies by French (1980) and Keim and Stambaugh (1984) on the effect of stock returns on the weekends came up with similar findings explained here. French (1980) points out that average return of S&P composite portfolio was reliably negative over weekends in the period of 1953-1977. This phenomenon is referred to as the weekend effect where weekend returns are reliably lower than returns on weekdays. Keim and Stambaugh (1984) in their study covering 1928 – 1952 came up with the same finding that the weekend effect was more negative.

Other studies such as Fama and French (1992, 1993) suggest that the size (as measured by natural logarithm of market value) and growth (as measured by book-to-market value of common stock) have an effect in predicting the abnormal stock returns. In other words they suggest that size and growth of the firm should be incorporated in the stock return model as risk factors and thus they suggest that the stock excess return model should be as follows:

Average $(R_i-R_f)=Y_0+Y_1\beta_i+Y_2(\ln MV)+Y_3BV/MV$ Equation (4)

Where:

$(\ln MV)$=average of natural log of market value. This is the proxy for the size of the firm.

BV/MV= book-to-market-value of common stock. This is the proxy for growth of the company.

Ang and Chen (2003) in their study of CAPM in the long-run covering the period of 1926 – 2001 found some evidence of book-to-market effect among medium-sized stocks but not among smallest stocks. In other words they found that growth of the firm have explanatory power on the stock return of medium-sized stocks. However, when considering the whole sample they found no evidence of the effect of book-to-market on the stock returns in the long-run.

According to Roll (1977) CAPM is not testable because market portfolio does not posses mean-variance efficiency and because market portfolio is unobservable. The market portfolio is said to be mean-variance efficient if the security market line touches the individual security line for every available investment opportunity, which is normally not the case. Note that if the market portfolio is mean-variance efficient there would be no arbitrage opportunity. Roll (1977) points out also that market portfolio is unobservable since market portfolio in practice would necessarily include every single possible available asset including real estate, precious metals, stamp collections, jewelry, and anything with any worth. The returns on all possible investments opportunities are unobservable.

Ross (1976) argues that CAPM will hold only when there is perfect competition and the total number of factors affecting the stock return may never surpass the total number of assets (in order to avoid the problem of matrix singularity) and as such there is no arbitrage opportunity. Arbitrage opportunity exists if the same asset is priced differently in different markets. According to Ross (1976) since stocks listed in different markets have different prices there is scope for arbitrage which is contrary to the CAPM assumption.

Oke (2013) undertook a study of 110 companies listed in Nigeria Stock Exchange (NSE) from January 2007 to February 2010. While CAPM asserts that the higher the risk (beta) the higher the return, the findings from this study does not support this CAPM assertion. Specifically, Oke's findings show that although there is no exact negative relationship, some portfolios with higher returns have lower betas. For example, the portfolio with the highest returns (portfolio A) has the second lowest beta while the portfolio with the lowest returns (portfolio G) has the highest beta. Similarly, Oke's portfolio J, which is the second lowest in terms of returns (9th out of 10), has the second highest beta.

According to the CAPM, the intercept ($\lambda 0$) should be equal to zero when estimating Security Market Line (SML). However, Oke finds that the intercept has a value less than zero (-1.784374). The findings also indicate that the intercept of the SML (-1.784374) is less than the interest rate on risk free security of 0.0606 (or 6.06%). These results are obviously inconsistent with the zero beta assertion of the CAPM.

Also, according to CAPM, the SML slope should equal the excess return on the market portfolio. Oke's findings show that the excess return on the market portfolio is -6.1943 while the estimated SML slope is -3.932879.This in effect, invalidates the prediction of the CAPM.

Qamar et al (2014) examine the applicability of CAPM on Pakistan Stock Markets and Karachi Stock Exchange which are main capital market of Pakistan. They take a sample of 10 performing companies from 2006 – 2010. Qamar et al (2014) found that values of expected returns calculated by using CAPM are slightly different from the actual returns in certain years. This is also applied on few companies only. In all the cases of βeta their results shows a very slight difference in the actual and expected returns.

According to Qamar et al (2014) the acceptance of CAPM in Pakistan Stock Market is applicable only on few results, out of the sample of 10 companies; only 5 companies' results support the validity of CAPM in few years. Only five results are verifying the validity of the model from 51 results. With their sample and time period only 9.8% of the results are supporting the validity of the model.

In some cases Qamar et al (2014) finds that the values of expected returns (as calculated by using CAPM) are very high in comparison with the values of the actual returns. In some cases they also present totally different results but here the results are undervalued. The expected returns calculated with the help of CAPM are less than the actual results obtained from the data with a huge intensity. Out of the total of 10 companies 8 are showing the undervalued results of expected returns.

This study attempt to study whether UK listed stock risk-return profiles may be different from the existing empirical results.

3. Research Method

In this study regression analysis for hypothesis testing is used to test whether CAPM holds.

3.1 Regression Analysis

Treynor (1962), Sharpe (1964), Lintner (1965), Mossin (1966) CAPM predicts the linear relationship between the expected stock return and stock betas, β_i. This model is shown here below:

$E(R_i)=R_f+\beta_i[E(R_m)-R_f]+\varepsilon_i$ Equation (5)

Where:

$E(R_i)$=Expected return on a stock; R_f= Risk-free rate of return;

β_i= Beta coefficient, i.e. the sensitivity of the $[E(R_m)-R_f]$ stock to the market returns;

= $Cov(R_i,R_m)/Var(R_m)$

$E(R_m)$=Expected return of the market; $[E(R_m)-R_f]$=Risk premium=market premium

ε_i=Noisy term=Error term

The model can be re-arranged to reflect the excess returns of the stocks as follows:

$(E(R_i)- R_f) = \beta_i[E(R_m)-R_f]+\varepsilon_i$ Equation (6)

Where:

$(E(R_i)- R_f)$=Excess stock returns of stock i.

The researcher undertakes the first-pass regression of excess returns of each of the 50 stocks against the market excess returns in order to get (among other variables) stock betas, error term for each stock, t-values and P-values.
However, before undertaking the first-pass regressions the monthly stock returns for 50 stocks are determined using the formula below:
Monthly Stock Returns = $\ln[(P_t + D_t)/(P_{t-1})]$ Equation (7)
Where:
P_t=Stock price on day t; D_t=Dividend on day t; P_{t-1}=Stock price on day t-1, i.e stock price of previous day
The output from the first-pass regression is also used to test whether CAPM holds for the 50 stocks. Also the output from first-pass regression is used as data for second-pass regression. These data are betas, β; δ^2, β^2.
Three second-pass regressions are carried out by using data obtained from first-pass regressions to determine whether stock returns are explained by risk; whether stock returns and their respective betas have linear relationship and whether size and growth have explanatory power on stock returns. The financial and statistical analysis software known as Minitab is used to determine the 50 first-pass regressions.

3.2 Hypothesis Testing

In order to achieve the objectives of this study spelt out in section 1.2 the hypotheses testing is carried out. The hypotheses tested in this study are explained in section 5 and the empirical results from the hypotheses tests are presented in section 6.

4. Data

50 stocks for companies listed in the UK covering the period from 1980-2005 are used. These are stocks of companies which belong to different industries. They are Allied Domecq (food & beverage), Invesco (investment management), Aviva (insurance), Alliance Boots (pharmacy & beauty), British Land (property management), Bunzl (consumables), Cadbury Schweppes (confectionary), DSG International (electrical specialist retailers), EMAP (media), Glaxosmithkline (healthcare company), Hanson Dead (manufacturer of aggregates, ready-mixed concrete, asphalt and cement), Ladbrokes (betting & gaming), Imperial CHM.Inds. (chemicals), Johnson Matthey (chemicals), Land Securities (property management), Marks&Spencer Group (multi-channel retailer), Morrison (WM) SPMKTS (food & grocery retailer), Next (clothing & accessories), Prudential (life assurance & retirement services), Reed Elsevier (information and analytics), Rexam (can beverages), Royal & Sun All.In. (insurance), Sainsbury (J) (food retailer), Smith & Nephew (medical equipment manufacturing), Standard Chartered (corporate & personal banking), Unilever (UK) (consumables), Whitbread (hospitality), Wolseley (distributor of heating and plumbing products), WPP Group (advertising and marketing services), Meggitt (engineering-aerospace equipment), Inchcape (automotive distributor and retailer), Segro (property management), Weir Group (engineering solutions), Cookson Group (high technology products), JPMF Mercantile IT (investment trust), Caledonia Investments (investment trust), Cattles (financial services), Close Brothers Group (merchant banking), Bellway (house builders), Provident Financial (financial services-personal credits), Laird Group (electronics and technology business), ElectroComp (Engineering products distributor), Premier Oil (oil & gas exploration and production), Great Portland Estate (property investment and development), Marston's (pubs and brewing beer), Brixton (clothing & accessories), Smith (DS) (corrugated & plastic packaging), Morgan Crucible (engineering products), Croda International (chemical manufacturer), PZ Cussons (manufacturer of personal healthcare products and consumer goods).

312 observations are available for stock prices, FTSE & T-Bill indices, market value of companies and book value to market value ratios. Stock prices and dividends are used in determining stock returns, FTSE indices are used to determine the market returns, T-Bill returns are proxy for risk free returns, market value of companies are used as proxy for company size and book value/market value ratios are used as a proxy for growth because as assets grow the market recognizes this and pushes up the market value of the company. T-Bill returns are regarded as risk free because they are issued by government and the government does not default.

5. Hypotheses being tested

Four hypotheses tests are carried out in order to achieve the objectives of this study as spelt out in Section 1.2. These tests are numbered as test 1, test 2, test 3 and test 4.
Test 1: In order to achieve research objective (a), it is tested whether the stock returns can be explained by their betas. The following hypotheses are used:

H_o: Beta Effect to Stock Return=0; and H_a: Beta Effect to Stock Return>0

H_o: Y_0=0 and H_a: Y_0>0

The null hypothesis here says that stock beta cannot explain the stock return whereas an alternative hypothesis says that stock betas can explain stock return. In other words this suggests that if CAPM holds Y_0 is supposed to be equal to zero.

Test 2: In order to achieve the research objective (b), it is tested whether there is relationship between stock returns and market returns. The following hypotheses are used:

H_o: Y_1=Average (R_m-R_f); and H_a: $Y_1 \neq$ Average (R_m-R_f)

The null hypothesis here says that Y_1 coefficient is equal to the average excess market return (or market risk premium) whereas alternative hypothesis says that Y_1 is not equal to average excess market.

The relevant equation for test 1 and test 2 is:

$$\text{Average } (R_i\text{-}R_f)=Y_0+Y_1\beta_i+Y_2\delta^2(\varepsilon_i)+\bar{U}_i$$

Test 3: In order to achieve the research objective (c), it is tested whether there is linear relationship between beta-stock returns and their respective betas. The following hypotheses are used:

H_o: There is linear relationship between stock return and their respective betas

H_a: There is no linear relationship between stock return and their respective betas

Alternatively the hypotheses to test linearity of stock returns and their betas can be formulated as follows:

H_0:Y_2=0; and H_a: Y_2>0

The relevant equation for test 3 is:

$$\text{Average } (R_i\text{-}R_f)=Y_0+Y_1\beta_i+Y_2\beta_i^2$$

This equation is obtained from the results of the second-pass regression.

If CAPM holds:

Y_0=0 (as in tests 1 and 2); Y_1=R_m-R_f (as in test 2); and Y_2=0

Test 4: In order to achieve the research objective (d), it is tested whether size (as measured by the logarithm of the average firm market capitalization value, (i.e. lnMV) and growth (as measured by the average book value-to-market value ratio, (i.e. BV/MV) can explain the average excess returns as found by Fama and French (1992, 1996). The following hypotheses are tested:

H_o: There is no size effect on stock return; and H_a: There is size effect on stock return

Alternatively the hypotheses to test size effect on stock returns can be formulated as follows:

H_0:Y_2=0; and H_a: Y_2>0**.**

The hypotheses to test growth effect are as follows:

H_o: There is no growth effect on stock return; H_a: There is growth effect on stock return

Alternatively the hypotheses to test growth effect to stock returns can be formulated as follows:

H_0:Y_3=0; and H_a: Y_3>0.

The relevant equation for test 3 (i.e. size test and growth test) for is:

$$\text{Average } (R_i\text{-}R_f)=Y_0+Y_1\beta_i+Y_2[\ln(MV)]+Y_3(BV/MV)$$

This equation is obtained from the results of the second-pass regression.

If CAPM holds:

Y_0=0 as in tests 1 and 2; Y_1=Average (R_m-R_f) as in test 2; Y_2=0; and Y_3=0.

6. Empirical Results

Empirical results are presented and discussed in two parts namely empirical results from testing CAPM and empirical results from hypothesis testing.

6.1 Empirical Results from Testing CAPM

According to Fama and MacBeth (1973) third testable implication, the higher the beta the higher the expected return but with a sample of 50 stocks some companies with smaller betas have higher return. For example Aviva has a beta of 1.08 and average excess return of 0.0023641 (or 0.23641%); British Land with a beta of 0.905 have average excess return of 0.0035266 (or 0.35266%) and Cadbury Schweppes with a beta of 0.791 have average excess return of 0.005287 (or 0.5287%) (Refer to Table 1) just to mention a few.

These empirical results contradict with Fama and MacBeth (1973) third testable implication of CAPM. Table 1 shows that CAPM predicts that the higher the beta the higher the expected return, for example Aviva has a beta of 1.08 and a CAPM predicted return of 0.008104 (or 0.8104%); British Land with a beta of 0.905 has a CAPM predicted return of 0.007931 (or 0.7931%) and Cadbury Schweppes with a beta of 0.791 has CAPM predicted return of 0.007818 (or 0.7818%). It can be observed here that Aviva has higher beta than British Land but it has smaller return than British Land (refer to Table 1). This anomaly may partly be attributable to the size effect for some stocks. From Table 1 ln(MV) for Aviva is 8.6909; ln(MV) for British Land is 7.2854 and ln(MV) for Cadbury Schweppes is 8.3778. Aviva's return is less than that of British Land. This is in line with the "size effect" as British Land is smaller than Aviva and British Land has higher return than Aviva. This empirical result is consistent with studies carried out by Keim (1981); Ball (1978) and Fama and French (1992, 1993) which came up with similar findings that small firms generate higher returns than predicted by CAPM.

However, for some of stocks "the size effect" is not consistent with findings of studies carried out by Keim (1981); Ball (1978) and Fama and French (1992, 1993), for example ln(MV) for Allied Domecq is 8.2214 and its excess return is 0.0050617 (or 0.50617%) whereas ln(MV) for British Land is 7.2854 and its excess return is 0.0035266 (or 0.35266%). British Land's ln(MV) is smaller than that of Allied Domecq hence we would expect its return to be higher than that of Allied Domecq which is not the case.

Figure 1 below shows stock betas Vs actual returns and returns as per CAPM. It can be observed from Figure 1 that actual returns of the 50 stocks follow the random walk (i.e. they go up and down as betas increase) pattern which is inconsistent to the returns predicted by CAPM. In this regard CAPM fails because it predicts that the higher the risk, β_i the higher the returns [as in Treynor (1962), Sharpe (1964), Lintner (1965), Mossin (1966) and Tobin (1958)] whereas the actual returns do not follow this pattern. This failure of CAPM prediction suggests that there are other factors in addition to stock betas which influence stock returns. These factors are size effect as pointed out by Keim (1981); Ball (1978); Fama and French (1992, 1993) and the value effect as pointed out by Fama and French (1992, 1993); Ball (1978).

The failure of CAPM regarding the size and growth of the firm hypotheses is also attributable to the fact that stock index is not the proper proxy for market portfolio as pointed out by Roll (1977). As it has been mentioned in section 2 of this paper, FTSE indices are used as a proxy market portfolio and these indices do not include all assets. Failure of CAPM is also attributable to the fact that there is arbitrage opportunity as pointed out by Ross (1976).

CAPM model predicts linear relationship between stock returns and their respective betas. The returns of 50 stocks as per CAPM show the linear and up-ward trend. This is consistent with CAPM model and consistent with studies carried out by Treynor (1962), Sharpe (1964), Lintner (1965), Mossin (1966) and Tobin (1958)]. However, actual returns and their respective betas are not related.

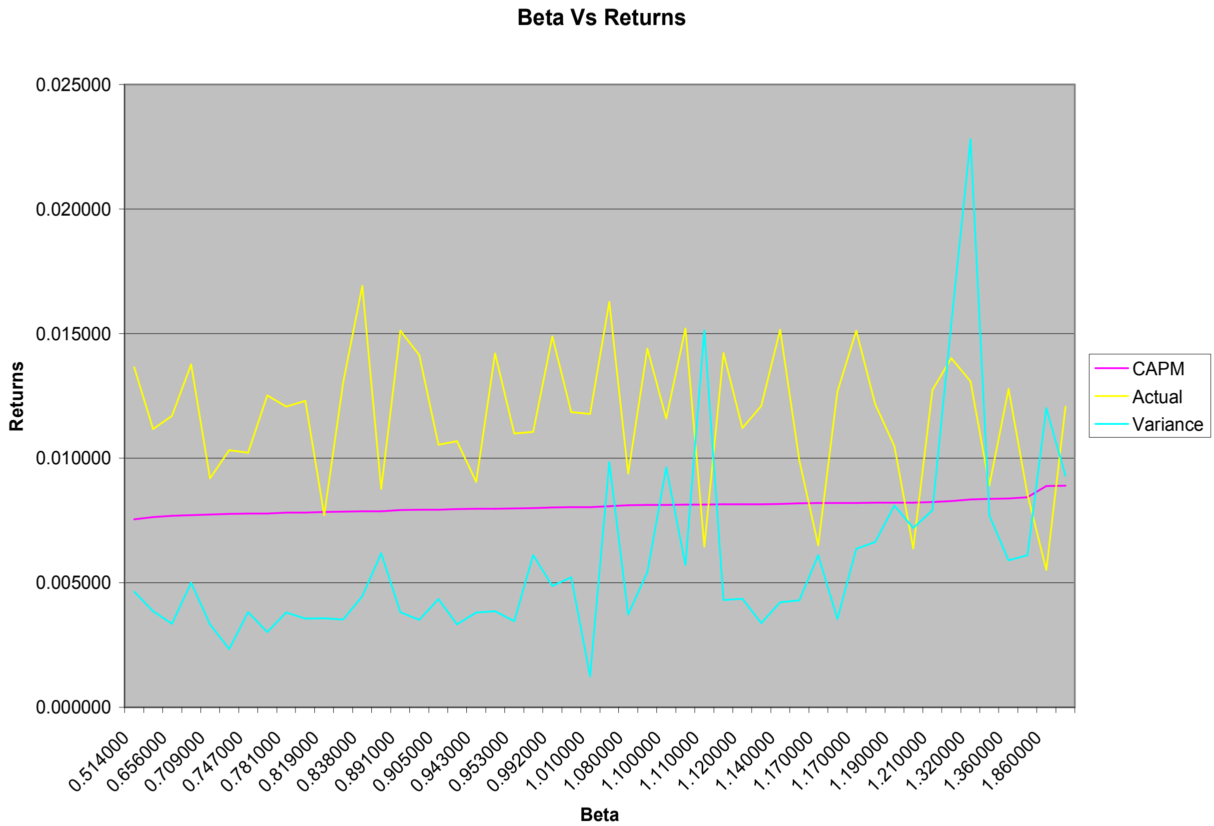

Figure 1: Beta Vs Actual Returns and Returns predicted by CAPM

Figure 2 below shows the actual returns and their associated equilibrium returns as per CAPM for 50 stocks. It generally shows that actual returns exceed the equilibrium returns (i.e. return as predicted by CAPM). This is attributable to the fact that CAPM assumes equilibrium condition where there is no opportunity to make profit whereas most of the 50 companies in the sample have an opportunity to make profits because of market inefficiency. However, there is an exception to this phenomenon as some stocks are observed to have higher equilibrium returns than actual returns. These exceptional cases are stocks for Johnson Matthey (stock no. 14), JPMF Mercantile IT (stock no. 35), Great Portland Estate (stock no. 44), Marston's (stock no. 45), and Morgan Crucibles (stock no. 48), where their actual stock returns are less than their equilibrium returns. This exception is attributable to the fact that the level of market efficiency differs from one sector (or industry to another).

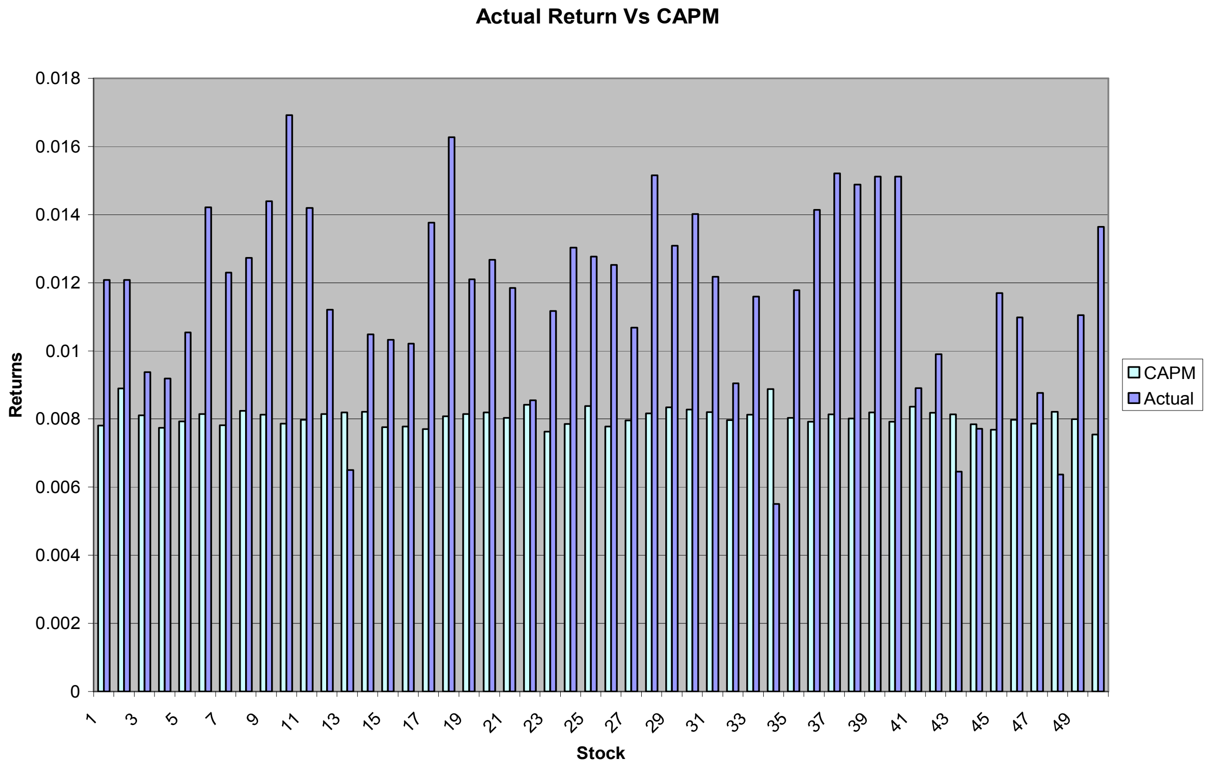

Figure 2: Stocks and their Actual Returns and Equilibrium Returns as per CAPM

As it has been already mentioned in section 3.1 of this paper, the first-pass regression is carried out for the aim of getting the data for carrying out the second-pass regressions and for getting data for testing the CAPM. The first-pass regression involves regressing the excess stock returns (i.e. R_i-R_f) and excess market returns (i.e. R_m-R_f). The data for CAPM testing are betas, β_i, β_i^2, variances, δ^2. Betas obtained from the first-pass regression are compared against the actual returns in order to be able to evaluate the validity of CAPM, i.e. to find whether the CAPM prediction that the higher the beta the higher the return is valid or not. This study finds out that CAPM does not hold in this regard.

The CAPM also predicts that there is linear relationship between stock betas and returns whereby beta-return function is upward sloping. Figure 1 above shows that with the sample of 50 stocks CAPM holds as far as linearity is concerned because as betas increase the stock returns (as predicted by beta) increase too.

Three second-pass regressions are also carried out indicated below as equations (8), (9), and (10).

Average $(R_i-R_f)= Y_0+Y_1\beta_i+Y_2\delta^2(\varepsilon_i)$ Equation (8)

Average $(R_i-R_f)= Y_0+Y_1\beta_i+Y_2\beta_i^2$ Equation (9)

Average $(R_i-R_f)= Y_0+Y_1\beta_i+Y_2(\ln MV)+Y_3(BV/MV)$ Equation (10)

Equation (8) is used to evaluate the validity of CAPM regarding the beta-return profile, equation (9) to assess the CAPM assertion that beta-return CAPM has linear relationship and equation (10) to assess whether size (measured by lnMV) and growth (measured by BV/MV) can explain the stock returns.

The first-pass regressions assert that stock returns are explained by their betas [as pointed out by Sharpe (1964) and Lintner (1965)] whereas the second-pass regressions assert that stock returns are explained by not only betas but also by other factors namely size and growth as pointed out by Fama and French (1992).

6.2 Empirical Results from Hypothesis Testing

6.2.1 Empirical Results for Test 1

From Table 2 Y_0= 0.00669 with t-ratio of 4.39 and p-value of 0.000. CAPM fails in this test. This implies that stock betas cannot explain the stock returns. The null hypothesis is rejected because Y_0 is significantly different from zero at 5% level of significant.

6.2.2 Empirical Results for Test 2

From the sample of 50 stocks Average (R_m-R_f)=0.00099156 (see Table 1) where as that of Y_1=-0.00201 (see Table 2). It should be positive but it is negative. Y_1=0.00201 has a t-ratio equal to -1.20 and p-value of 0.235. It is significantly different from average market risk premium at 5% level of significance. It implies that there is no relationship between stock returns and market returns. Therefore, null hypothesis is rejected on this basis.

6.2.3 Empirical Results for Test 3

Table 3 shows that Y_2=-0.002271 and its associated t-ratio is -0.70 and p-value of 0.488. This is not significantly different from zero. Therefore, null hypothesis is not rejected at 5% level of significance. This implies that for a sample of 50 companies there is linear relationship between stock return (as predicted by CAPM) and their respective betas.

The assertion that there is linear relationship between stock returns and their respective betas can be shown (with a sample of 50 stocks) as Figure 1.

The empirical results from the 50 stocks used in this study show that CAPM fails except for linearity test. CAPM fails in three tests because of various factors including size effect as pointed out by Keim (1981); Ball (1978); Fama and French (1992, 1993) and others, the turn-of-the-year effect as pointed out by Keim (1983) and Reinganum (1983), the weekend effect as observed by French (1980), the value effect as pointed out by Fama and French (1992, 1993) and Ball (1978).

6.2.4 Empirical Results for Test 4

Table 4 shows that Y_0=0.008583 (with t-ratio of 3.02 and p-value of 0.004); Y_1=-0.002436 (with t-ratio of -1.83 and p-value of 0.0073), Y_2=-0.0003783 (with t-ratio of -1.08 and p-value of 0.0285) and Y_3=0.0004458 (with t-ratio of 2.90 and p-value of 0.0006).

Y_2=-0.0003783 (with t-ratio of -1.08 and p-value of 0.0285) shows that it is not significantly different from zero at 5% level of significance and on the basis of this null hypothesis is rejected. It implies that size has a role in explaining the stock return.

The Y_3=0.0004458 (with t-ratio of 2.90 and p-value of 0.0006) shows that it is significantly different from zero at 5% level of significance and on the basis of this null hypothesis is rejected. It implies that growth has a role in explaining the stock returns.

7. Conclusion

This study assesses the validity of CAPM in UK. A sample of 50 stocks covering a period from 1980 – 2005 is taken.

The results show that CAPM assertion that risk-return profile is linear is supported by this study. The results from this study also show that stock returns are not related to market returns and there is linear relationship between stock returns (as predicted by CAPM) and their respective betas. However, there is no linear relationship between actual returns and their respective betas. The CAPM assertion that firm size and growth have explanatory power is supported by the findings for some stock but not supported for some stocks.

This failure of the CAPM in this case is attributable to the various anomalies including the turn-of-the-year effect, weekend effect, etc. The facts that risk cannot be captured by betas only; the proxy for market portfolio is not perfect; no asset is entirely risk-free (T-bills are subject to the risk inflation); have the role to play in the failure of CAPM in my sample of 50 UK stocks. Also the problem associated with betas estimation play a role in CAPM failure in my sample of 50 stocks. Due to CAPM anomalies investors using the model to make investment decisions may end up making wrong decisions in most cases. Despite of all the anomalies associated with CAPM, the model is still used by practitioners. This calls for further researches to come up reasons why they still use it. Also further researches can be made to come up with the "better beta", or the "best beta".

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Table 1: Stock Name, Betas, CAPM, Actual Returns, Excess Returns, Firm Sizes, Firm Growth and Variances

	Stock Name	Est.Beta ß	CAPM	Actual	Excess Return $(R_i - R_f)$	Firm Size lnMV	Firm Growth BV/MV	Variance $\delta^2(\theta_i)$		Stock Name	Est.Beta ß	CAPM	Actual	Excess Return $(R_i - R_f)$	Firm Size lnMV	Firm Growth BV/MV	Variance $\delta^2(\theta_i)$
1	ALLIED DOMECQ	0.781	0.007808	0.012076	0.0050617	8.2214	0.226835	0.003800	26	UNILEVER (UK)	0.750	0.007777	0.012517	0.0055031	9.0878	0.17774	0.003010
2	INVESCO	1.88	0.008898	0.012077	0.0050632	7.4556	0.175322	0.009300	27	WHITBREAD	0.931	0.007957	0.010681	0.0036666	7.5570	0.786906	0.003330
3	AVIVA	1.080	0.008104	0.009378	0.0023641	8.6909	0.689085	0.003730	28	WOLSELEY	1.140	0.008164	0.015154	0.0081401	7.5104	0.465875	0.004210
4	ALLIANCE BOOTS	0.7090	0.007736	0.009187	0.002173	8.2667	0.368216	0.003320	29	WPP GROUP	1.320	0.008342	0.013089	0.0060748	7.7667	0.088656	0.022800
5	BRITISH LAND	0.905	0.007931	0.010541	0.0035266	7.2854	1.399384	0.004340	30	MEGGITT	1.250	0.008273	0.014019	0.0070051	5.6983	0.453741	0.015400
6	BUNZL	1.120	0.008144	0.014214	0.0072004	6.7616	0.361559	0.004300	31	INCHCAPE	1.180	0.008203	0.012175	0.0051612	6.8421	0.514907	0.006630
7	CADBURY SCHWEPPES	0.791	0.007818	0.012301	0.005287	8.3778	0.353932	0.003560	32	SEGRO	0.943	0.007968	0.009046	0.0020322	6.8417	1.372495	0.003800
8	DSG INTERNATIONAL	1.210	0.008233	0.012732	0.005718	7.4563	0.238892	0.007900	33	WEIR GROUP	1.100	0.008124	0.011591	0.0045767	5.7238	0.579845	0.009620
9	EMAP	1.100	0.008124	0.014400	0.0073857	6.8790	0.217723	0.005420	34	COOKSON GROUP	1.860	0.008878	0.005508	-0.001506	6.6692	0.447047	0.012000
10	GLAXOSMITHKLINE	0.838	0.007864	0.016921	0.0099072	10.4595	0.060875	0.004460	35	JPMF MERCANTILE IT	1.010	0.008035	0.011774	0.0047603	6.0541	1.243626	0.001240
11	HANSON DEAD	0.945	0.007970	0.014197	0.0071829	8.4742	0.436453	0.003860	36	CALEDONIA INVESTMENTS	0.895	0.007921	0.014141	0.0071268	6.1796	1.133787	0.003500
12	LADBROKES	1.120	0.008144	0.011208	0.0041939	7.6389	0.873362	0.004360	37	CATTLES	1.110	0.008134	0.015207	0.0081933	5.8863	0.351087	0.005720
13	IMPERIAL CHM.INDS.	1.170	0.008194	0.006497	-0.000517	8.4715	0.194901	0.006110	38	CLOSE BROTHERS GROUP	0.992	0.008017	0.014885	0.0078706	6.0615	0.492368	0.004870
14	JOHNSON MATTHEY	1.190	0.008213	0.010483	0.0034694	6.9175	0.507408	0.008100	39	BELLWAY	1.170	0.008194	0.015118	0.0081036	5.5346	0.855359	0.006360
15	LAND SECURITIES	0.734	0.007761	0.010323	0.0033086	8.0299	1.276324	0.002330	40	PROVIDENT FINANCIAL	0.891	0.007917	0.015115	0.0081012	6.7122	0.290994	0.003810
16	MARKS&SPENCER GROUP	0.747	0.007774	0.010213	0.0031986	8.8628	0.312872	0.003810	41	LAIRD GROUP	1.340	0.008362	0.008907	0.0018929	5.6795	0.676727	0.007700
17	MORRISON (WM)SPMKTS	0.676	0.007704	0.013763	0.0067487	7.2232	0.398533	0.005000	42	ELECTROCOMP.	1.160	0.008184	0.009900	0.0028858	6.9247	0.192352	0.004290
18	NEXT	1.050	0.008075	0.016277	0.0092632	7.1789	0.179517	0.009830	43	PREMIER OIL	1.110	0.008134	0.006449	-0.0005648	5.4528	0.571429	0.015120
19	PRUDENTIAL	1.120	0.008144	0.012100	0.0050856	8.9129	0.208869	0.003380	44	GREAT PORTLAND ESTATE	0.819	0.007846	0.007717	0.0007025	6.1461	1.221747	0.003580
20	REED ELSEVIER	1.170	0.008194	0.012672	0.0056577	8.2200	0.282853	0.003550	45	MARSTON'S	0.656	0.007684	0.011696	0.0046816	5.7763	1.001302	0.003350
21	REXAM	1.010	0.008035	0.011849	0.0048346	7.0404	0.464037	0.005220	46	BRIXTON	0.953	0.007978	0.010988	0.0039736	5.9208	1.337435	0.003450
22	ROYAL & SUN ALL.IN.	1.400	0.008422	0.008550	0.0015356	8.0278	0.968711	0.006100	47	SMITH (DS)	0.842	0.007868	0.008762	0.0017475	5.9066	0.633914	0.006180
23	SAINSBURY (J)	0.602	0.007630	0.011170	0.0041557	8.5158	0.416736	0.003860	48	MORGAN CRUCIBLE	1.190	0.008213	0.006371	-0.000643	6.0772	0.463865	0.007200
24	SMITH & NEPHEW	0.828	0.007854	0.013030	0.0060158	7.5233	0.210886	0.003510	49	CRODA INTERNATIONAL	0.966	0.007991	0.011055	0.0040405	5.6537	0.392927	0.006100
25	STANDARD CHARTERED	1.360	0.008382	0.012772	0.005758	8.4052	0.647585	0.005900	50	PZ CUSSONS	0.514	0.007543	0.013643	0.0066288	4.7573	0.892857	0.004640

Table 2: Results of the Second-Pass Regression: Test 1 & Test 2

Coefficient	Result	T-Value	P-Value	SE
Y_0	0.00669	4.39	0.000	
Y_1	- 0.00201	-1.20	0.235	0.001668
Y_2	0.0097	0.08	0.935	

Table 3: Results of the Second Pass-Regression: Test 3

Coefficient	Result	T-Value	P-Value	SE
Y_0	0.00189	0.43	0.669	
Y_1	0.002593	0.34	0.737	0.007674
Y_2	-0.002271	-0.70	0.488	

Table 4: Results of the Second Pass-Regression: Test 4

Coefficient	Result	T-Value	P-Value	SE
Y_0	0.008583	3.02	0.004	
Y_1	-0.002436	-1.83	0.073	0.001330
Y_2	-0.0003783	-1.08	0.285	
Y_3	0.0004458	2.90	0.006	

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