JRL of the Faculty of Commerce for Scientific Research.

JAN 2015,Vol. 52 No. 1

Dr. Ahmed Sakr
Assistant Professor
College of Management and Technology

Dr.Silvia Saweris
Teaching Assistant
College of International Transport and Logistics
Arab Academy for Science and Technology

Evaluating The Validity Of Capm In The Egyptian Stock Market

Abstract:

Measuring stocks' expected return and determining the factors that affect this return are the main concerns of market practitioners and academic scientists. The most famous and simplest model that is used to calculate expected return for securities under risk is: Capital Asset Pricing Model (CAPM).

The purpose of this study is to test the validity of CAPM in the Egyptian Stock Market for the period from June 2005 to June 2013 using portfolios instead of individual stock, to determine whether beta is a sufficient measure of risk according to CAPM.

The study found that CAPM didn't hold in the Egyptian market, as beta was found to be not the only source of risk, also it was found that the intercept of CAPM was not equal to the risk free rate available in the Egyptian market. However the results confirmed the existence of positive linear relationship between risk and return.

1.Introduction

Analyzing the performance of the stocks' return is the main topic of finance, there was always an interest and concern about the models and theories that can be used to determine the proper value of any stock at any time, also finding out the portfolio that reflects the preferences of every investor. It started with the equilibrium market concept which proposed that the prices of the stocks would increase if the demand on it increases, which is not the case in real markets. Using these models would enable market participants to identify mispriced assets either the overpriced or the underpriced ones, moreover they can be used to estimate cost of equity for corporations which will provide help for the budgeting process (Sawa and Sklinda, 2003).

There are several assets pricing theories that relate expected return with different sources of risk that may be one source or more, the identity of these sources are based on the assumptions that are used to develop the theory. It started first by Markowitz (1952) who put the basic principles of assets pricing theory and measured the expected return and risk for the portfolio, also developed the efficient frontier which was used later by Tobin (1958) to define the efficient portfolio and determine how to allocate investors' wealth between risky and zero risk asset. Then Sharpe (1964) developed the single index model which related stock's return to common index's return.

Sharpe (1964), Lintner (1965) and Mossin (1966) developed a model which relates expected return on portfolios to risk free rate and market return; this model called Capital Asset Pricing Model (CAPM). This model faced several criticisms as it claims that securities' return is affected by only one source of risk called beta, while other researchers found other sources of risk.

Accordingly other models were introduced like the Arbitrage Pricing Theory (APT) developed by Ross (1976), which considers various macroeconomic variables affect stocks' prices. Also the three factor model developed by Fama and French (1996), which explained that assets' return is affected by three microeconomic variables: excess market return, difference between small portfolio return and large portfolio return, and the difference between portfolios of high book to market value and portfolios of low book to market value.

The aim of this study is firstly to know how well the CAPM explain stocks' prices. Secondly, is the market risk measured by beta the main source of risk that affects stocks' return in the Egyptian market.

This study will use the most active 50 stocks listed in the Egyptian stock market for the period from June 2005 to June 2013 excluding banks and financial firms to get portfolios' return. EGX30 will be used as a market return proxy in CAPM, and the rate of return on three month treasury bills will be used as a proxy for risk free rate.

Testing CAPM will be done on two steps using the Statistical Package for Social Science (SPSS) which is considered the most popular statistical tool. The testing is divided in two steps, in the first step, beta for each portfolio is estimated then these betas will be used as an independent variable in the cross sectional equation

The rest of the study is divided into four sections organized as follow; Section two covers a literature review for the previous studies in developed and emerging markets for CAPM. Section three explains the data, research methodology and the procedures that will be implemented to test the models. The empirical results and findings are presented in section four, at the end section five provide a brief conclusion.

2. Literature Review

2.1 Capital Asset Pricing Model

Sharpe (1964), Lintner (1965), and Mossin (1966) introduced the Capital Asset Pricing Model (CAPM) which is considered the main element of cost of capital. It is concerned with the equilibrium relationship between expected return and risk of the portfolio. Many extensions have been suggested for this model. However, the traditional model remains the basic tenet.

Capital Asset Pricing Model(CAPM) is based on several assumptions in order to facilitate its application. Some of these assumptions appear to be unrealistic.

CAPM involves two types of return, the risk free rate of return, mainly rate of return on Treasury bills and market risk premium, so it has the following equation:

$$E(r_i) = r_f + \beta_{iM} [E (r_m) - r_f] \qquad i= 1,2,..N \qquad (1)$$

Where

$E(r_i)$ = the expected return of the asset i.

r_f = the risk free rate of return.

$E(r_m)$ = expected return on the market portfolio

β_{iM} = the sensitivity of the asset i to movements in the market return.

During the last few decades the empirical test of CAPM covered three hypotheses (Fama and French, 2003): The existence of a linear relationship between beta and return; positive risk premium $E(R_m) - E(R_f)$, there are no other sources of risk other than beta, and the intercept $E(R_f)$ is equal to the risk free rate (according to Sharpe, Lintner version of the model).

2.2 Criticisms against CAPM

Black, *et. al,* (1972), the researchers criticized CAPM's assumption that investors can borrow or lend at a risk free rate, so they implemented a study without considering this assumption on stocks listed on New York Stock Exchange. The results found that the intercept in the traditional CAPM was not equal to zero, which led to the rejection of the traditional model and the formation of a two-factor model. Also they found that high beta portfolios got excess return lower than what proposed by the traditional model and low beta portfolios got excess return higher than what proposed; this opposed the original relationship in the traditional model that excess return is linearly related to beta.

While Merton (1973) criticized another assumptions of CAPM in which investors chose portfolio based on Markowitz mean-variance criterion, the homogenous expectation and the single holding period of the model, so the researcher developed another model called Intertemporal CAPM. The new model has the simplicity of the CAPM with the utility maximization and limited liability of assets but it kept the homogenous expectation assumption.

Roll (1976) argued that there is only one thing that can be tested about CAPM which is the mean-variance efficiency of the market proxy.The researcher explained that CAPM can only hold if the market portfolio used in the model is determined, which means that for the model to be testable all securityies need to be included in that market portfolio, which is not possible, so Roll started to reject CAPM completely. The same results were highlighted by Ross (1976) who argued that the market portfolio is unobservable accordingly CAPM cannot be tested.

Omran (2006) added to Rolls' findings that what is basically tested is the efficiency of the market portfolio and not the model itself and that the linearity between risk and return depends on the efficiency of the market portfolio used as a proxy in the model.

Fama and French (2003) added that in order for the market portfolio to be efficient it doesn't need unrestricted risk free borrowing or lending or unrestricted short selling, as investors will choose efficient portfolio. Also it doesn't

happen in all cases that portfolios consisting of efficient portfolios are always efficient, which means that the market portfolio may not be efficient and accordingly CAPM cannot hold.

While Pettengill, et. al, (1995) criticized the traditional studies used to test CAPM which states that there is a positive relationship between beta and realized return not expected return, although the model assumes a positive relationship between beta and expected return. Also the researchers criticized that the model didn't explain what will be the relation between beta and return if the risk free rate is greater than the realized return.

The following sections will present literature review for previous studies in different countries with different degree of development, and then will cover literature for asset pricing theories executed in the Egyptian stock market, and it ends by driving the hypotheses for testing CAPM in this study.

2.3 CAPM in different markets

CAPM was first used in 1960's as a model to calculate expected return for individual security and for portfolio; also it can provide help to investors to determine the rules for getting better investment decision. Many studies supported the model and others contradicted it.

Gursoy and Rejepova (2007) tested the validity of CAPM in Turkish stock market using Fama and MacBeth (1973) approach and Pettengil, et. al, (1995) approach as two alternative approaches, the method used is to regress the market risk premium of period (t) against beta coefficient calculated at period (t-1). The results indicated that there was no significant relationship between beta coefficient and ex-post risk premium when Fama & MacBeth approach was used. However when Pettengil, et. al, approach was applied a strong relationship was found. The analysis also determined that stocks with high beta performed better in up market condition (positive risk premium), while low beta stocks worked better in down market (negative risk premium).

There are also other approaches were used to test CAPM other than Fama and MacBeth (1973) and Pettengil, et. al, (1995) approaches; Rhaeim, et. al, (2007) applied a new approach to test CAPM based on the wavelets analysis to explore the relationship between risk and return in the light of CAPM at different time periods for the French Stock Market. The researchers stated that risk return relationship was strong at short and long periods, which means that CAPM is appropriate at short and long-term time horizon.

Also a recent approach was used to test CAPM in the Philippine Stock Market called Bayesian approach by Gordo (2012). It allows the combination of both individual's belief with the information gathered from different sources to reach adjusted probabilities. The Bayesian method is used in regression analysis, other asset pricing models, and some volatility models. The results found negative sign for the intercept with significance at only 10% while for the risk premium it was not significant and had a wrong sign.

Zhang and Wihlborg (2004) analyzed the cost of capital and pricing of equity applying the conditional and unconditional beta to test domestic CAPM and international CAPM in six emerg-

ing capital markets: Cyprus, Czech Republic, Greece, Hungary, Poland, Russia and Turkey. Testing the data from 1995 to 2002, the empirical results showed a positive relation between return and betas. The conditional outperform the unconditional relationship between beta and return as the emerging markets are more subject to negative risk premium due to its instability. The conditional international CAPM results were weak except in some countries but domestic CAPM found to be a useful measure for the cost of capital.

Rogers and Securato (2007) conducted a comparative study that compares the applicability of CAPM, with the three factor model developed by Fama and French and a third model called Reward Beta approach in the Brazilian Market. The study used two sub-sample, the first sample from July 1995 to June 2001 representing the ex-ante sample while the period from July 2001 to June 2006 represented the ex-post, the study applied two steps methods; the time series regression is used first to find out the parameters of the model then these parameters are used in the second step in order to carry out the cross sectional regression. The results proved that Fama and French model was the best model to estimate the expected return but the book to market factor had not a great effect thus the researchers concluded that market risk premium and the size factor are the most influencing factor in predicting expected return.

Most of the studies that tested asset pricing theories were carried out in advanced markets and limited studies were applied in emerging countries especially the MENA region; the following part presents the studies of CAPM and other asset pricing theories in the Egyptian stock market.

2.4 CAPM in the Egyptian stock market

Every emerging market has its own unique features, institutional history, market integration level, and domestic risk free rate. Egyptian Stock market is considered one of the developing markets.

Bon and Saiah (2010) used T-test to test difference between the actual return and expected return using the CAPM model. The results indicated that actual return of the companies of the sample under study was significantly different from the expected return calculated by the model, which indicated that the expected return on investment was not similar to the value of investment in the Egyptian stock market during the study period from 2005 to 2009.

Also Omran (2006) examined the period from 2001 to 2002 to test the validity of CAPM in the Egyptian Stock Market. The study adopted two methods to get the most active stocks for the study. The first method was the number of weeks when the stocks were active to the total number of weeks of the study period, while the second method was the total number of transaction undertaken by the stock during the period. The results found that beta had an important effect on the Egyptian stocks' return, also found that portfolios formed on consumer staples and financial companies whose beta is low worked better than other portfolios formed of constructions, materials, hotels and weaving companies whose beta is large.

2.5 Hypotheses of CAPM

Previous studies about CAPM covered three main hypotheses; the first hypothesis tested the existence of linear relationship between expected return and risk of the securities. Black, et. al, (1972) contradicted this linear relationship in the traditional model as the researchers found that high beta portfolios gained excess return lower than what was expected and the opposite for lower beta portfolios.

Gursoy and Rejepova (2007) found that there was no significant relationship between beta and risk premium in Turkish stock market when Fama and MacBeh (1973) approach was used while a significant relationship was observed when Pettengil, et. al, (1995) approach was implemented. Zhang and Wihlborg (2004) determined positive relationship between beta and return in the examined six emerging markets.

Stambaugh (1982) tested the impact of using different market index portfolios with various asset structures on the performance of CAPM in New York Stock Exchange Market and found that there was a linear relationship between beta and return, also found that the risk premium was positive whatever the index used.

Hasan, et. al, (2011) examined the validity of CAPM in Bangladesh using Dhaka Stock Exchange (DSE) data. The results were not supporting CAPM either for individual stocks or for portfolios. However, the test of the nonlinearity between return and beta revealed that CAPM linear relationship was sufficient to explain return generating process.

While Korkmaz, et. al, (2010) analyzed the relation between stock return of emerging markets and world index measuring their risk by using international CAPM, in which the local systematic risk can be diversified away without the need to accept lower return as a price for this diversification. The study examined 23 emerging market and found that for some countries the systematic risk was higher than the world average but the opposite for the other countries and found that there was no linear relationship between risk and return.

In review of the previous studies and their results, it is obvious that most of the studies confirmed the existence of the linear relationship between return and beta, accordingly this lead to driving the first hypothesis:

H1: There is a positive linear relationship between stocks' return and beta.

The second hypothesis that was examined is whether the risk measured by beta is sufficient measure of risk. Fama and MacBeth (1973) examined this through their study and highlighted that there was no sources of risk other than portfolio risk measured by beta in New York Stock Exchange.

Also Zhang and Wihlborg (2004) proved that beta was the best measure of risk for investors as showed by conditional domestic CAPM in the examined 6 emerging markets. The same results were reached by Paavola (2006) who found that market beta was significant for eleven equities out of 20 equities in the Russian Market.

Pettengill, et. al, (1995) used the modified approach of Fama and Mac-

Beth (1973), and concluded that beta was a sufficient measure of market risk. However, Soufian (2001) found that there was a problem in the consistency of beta in the UK market. While Hasan, et. al, (2011) proved that investors were compensated for the systematic risk not for unique risk, when the researchers tested whether CAPM is capable of capturing the unique risk and the interaction term of systematic test and unique risk.

It is noticed that most of the above studies supported the use of beta as the only source of risk, however this is not the case in the Egyptian stock market as Shaker and Elgiziry (2013) when compared the validity of five comparative asset pricing model: CAPM, Fama-French three factor model, Cahart model, the liquidity-augmented Fama-French three factor model of Chan and Faff, and the Five factor model (liquidity and momentum-augmentedFama-French three factor model), proved that Fama-French model was the best model and outperformed all the other models in explaining the cross-section of average return..

This leads to concluding that beta is not the only source of risk that affect the Egyptian stock market as there are other sources explained by Fama and French three factor model, which leads to driving the second hypothesis.

H2: Beta is not a sufficient measure of risk.

As for the third hypothesis; it tested whether the intercept is equal to the risk free; Fama and MacBeth (1973) criticized the CAPM model of Sharpe-Lintner-Black (SLB) as the empirical analysis couldn't prove that the expected return on the portfolio of zero correlation with the market equal to the risk free rate in New York stock market. Also Stambaugh (1982) through his study for the period from 1953 to 1976 for New York stock market for CAPM using different indexes rejected equality of the intercept to the risk free rate.

Hasan, et. al, (2011) reached the same results in Bangladesh stock market; as their results contradicted the hypothesis that the intercept should equal zero when using excess return as a dependent variable either for individual stock or for portfolios, also Sawa and Sklinda (2003) found through their analysis to the Polish stock market that the intercept was different from zero.

These findings were the same as the results reached by (Omran, 2006) when the researcher analyzed CAPM in the Egyptian stock market for the period from of 2nd March 2001 to 26th October 2001 as the researcher found that the intercept was significantly different from zero at 5% level of significance.

However this study recommends that the intercept is equal to zero when using the excess return as dependent variable as proposed by the model; this leads to the development of the third hypothesis.

H3: The intercept is equal to zero.

From the previous studies it is obvious that numerous researchers defended CAPM like Zhang and Wihlborg, (2004) and Stambaugh, (1982). Even when rejecting the model because of the market proxy due to the availability of several definitions for it, CAPM gained acceptance and is considered the most widely used model among the financial practitioners.

3. Reseach Methodology

The methodology applied to test CAPM is similar to that used by Black, et. al, (1972); the method is based on two stages regression tests which allow examining the model for all stocks in the market not only for a single stock. But there are many differences warranted to the availability of the data in the Egyptian market; one difference is that the length of the period under study which is eight years starting from June 2005 to June 2013; this is shorter than that in by Black, et. al, (1972) study which was 49 years (1926-1966). Researchers claimed that longer period would be better for the test but because of the nature of the emerging markets like the Egyptian market and the difficulties of getting data, many data were missed before 2005. On the other hand the study is similar in using the monthly frequency and not using the daily or weekly frequencies; this will reduce the volatility and the outliers in data (Farag, 2012).

There are three primary variables used in CAPM test presented in the following equation:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_p(R_{M,t} - R_{f,t}) + \varepsilon_t$$

1) Portfolios' return ($R_{p,t}$).
2) Return on Market index ($R_{M,t}$).
3) Risk free rate. ($R_{f,t}$).

3.1. Portfolios' return

This study is going to use the most active 50 stocks listed in the Egyptian stock market published in the disclosure book. Financial firms and banks will be excluded from the study as they have high leverage when compared to the remaining firms (Soufian, 2001).

10 financial firms and banks were excluded so the remaining is 40 firms. These 40 firms are examined to check that they are still listed in the Egyptian stock market till now, in order to avoid the survivorship bias which may result in overestimation of past results. Two companies out of the 40 companies were delisted so the sample size for the study is 38 stocks.

These stocks will be arranged decreasingly according to their market-value to form portfolios as using portfolios will provide more accurate results for the estimates (Nguyen, 2010). Chen, et. al, (1986) tested the best way to group securities into portfolios and found that market value of the company is the best norm for grouping stock into portfolios. Also Chen, et. al, (1986) fo-und that grouping stocks according to market value was better than the estimated beta or the estimated standard error of the market model regression. Accordingly stocks will be grouped with respect to their market value.

The market value of the firm is calculated by multiplying the stock's closing price by the number of outstanding shares. Since the analysis is done for the period from June 2005 to June

2013, the stock's closing price and the number of outstanding shares of the last working day on May 2005 will be multiplied to get the market value of the firm at the beginning of June 2005, then the firms will be arranged descending and divided into equally weighted portfolios of four stocks each except the last two portfolios which have only three stocks (Nguyen, 2010) this will result in ten portfolios.

However it should be noted the Egyptian stock market stopped working from 27th January 2011 to 23rd March 2011 because of the 25th January revolution, so there is no data for February 2011; hence the total number of observation is 96 for the whole period.

After the construction of portfolios; In order to calculate the return for each portfolio two steps will be followed. The First step is to calculate the return for each individual stock using monthly end closing prices by using the following equation:

$$R_{i,t} = \frac{P_t - P_{t-1}}{P_{t-1}} * 100$$

Where: $R_{i,t}$ is the return on individual stock for month (t), P_t is the closing price of the stock at the end of month (t), and P_{t-1} is the closing price of stock at the end of month (t-1).

The second step is to calculate the portfolio return which is weighted average return of the stocks forming each portfolio (Nguyen, 2010).

3.2 Market Index

EGX30 is used as a proxy for market index; monthly changes in this index are taken as measure for the rate of return on market. It involves the most active 30 stocks listed in the Egyptian stock market in terms of liquidity and activity. It is calculated as percentage of change as follow:

$$\text{Return on Market Index } (R_{m,t}) = \frac{MI_t - MI_{t-1}}{MI_{t-1}} * 100$$

Where: $R_{m,t}$ is the return on the Market index EGX30 at the end of month (t), MI_t is the points of the Market index (EGX30) at the end of month (t), and MI_{t-1} is the points of the market index (EGX30) at the end of month (t-1).

3.3 Risk Free Rate

The monthly change in the rate of return of the three months treasury bills will be employed as a proxy for the risk free rate (Dhankar and Singh, 2005), using the following equation (Sawa and Sklinda, 2003):

$$R_{f,t} = (R_{f,t} - R_{f,t-1})/R_{f,t-1}$$

Where: $R_{f,t}$ is the rate of return on 3 month treasury bills at the end of month (t), and $R_{f,t-1}$ is the rate of return on the 3 months treasury bills at the end of month (t-1).

3.4 CAPM Testing Methodology

The test involves two steps: in the first step time series regression is run to estimate betas for all portfolios, although the return on portfolio of the basic model was in terms of expected

return but Black *et. al*, (1972) stated that the realized return can be used in the following equation:

$$R_{p,t} = R_f + \beta\left(R_{M,t} - R_{f,t}\right) + \varepsilon_t \qquad (1)$$

Where: $R_{p,t}$ is the rate of return on portfolio, R_f is the risk free rate, $R_{M,t} - R_{f,t}$ is the market excess return and β is the sensitivity of portfolio return to market excess return.

The standard version of CAPM assumes constant value of the risk free rate; this contradicts the situation in the real markets as there are always fluctuations in interest rate; these changes are the result of increasing the rate of inflation, there are also other factors that influence the risk free rate like monetary policy (Sawa and Sklinda, 2003). Accordingly it is better to put the risk free rate as an independent variable and changing the model from the original form (1) to the following equation:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta\left(R_{M,t} - R_{f,t}\right) + \varepsilon_t \qquad (2)$$

So the constant value R_f becomes the variable $R_{f,t}$ and the dependant variables changes from portfolio return to the portfolio risk premium. This will make the model more real (Sawa and Sklinda, 2003).

The regression will be run on the monthly market risk premium (monthly return of EGX30- monthly return on three month treasury bills) against the monthly risk premium for each portfolio (monthly return on each portfolio - monthly return on three month treasury bills) for the whole period from June 2005 to June 2013.

The second step tests the hypotheses of the model where the betas estimated in the first step are used as explanatory variable by running cross sectional regression. Equation (2) will result in ten betas, one beta for each portfolio; the mean for these ten betas is going to be used as an independent variable and the same for portfolios' excess return where the mean return for the ten portfolios is used as a dependent variable, these results will be used in the following cross sectional regression:

$$R_p = \gamma_0 + \gamma_1 \beta_p + \eta_p \qquad (3)$$

Where R_p is the mean return for the ten portfolios excess return and β_p is the mean of the ten betas estimated from the first equation.

To test the applicability of the model in the Egyptian stock market, the coefficient γ_0 should equal the risk free rate according to the standard version of CAPM.

While the coefficient γ_1 should be greater than zero and positive as it indicates the price of market risk (Sawa and Sklinda, 2003). Various studies argued that using estimated beta in the cross sectional regression equation will result in biased results, but this bias will be

reduced when the individual shares are sorted into portfolios, although the error won't be totally eliminated but this will reduce its effect (Sawa and Sklinda, 2003).

Ordinary least squares is employed for all regression, as it is regarded as the best linear unbiased estimation method and since CAPM is a linear model then OLS method is the best to be used.

4. Emprical Study

4.1 Descriptive statistics

Table 4.1 presents the descriptive statistics for the monthly data of each portfolio excess return calculated by subtracting the monthly risk free rate from each portfolio monthly return for the whole period from June 2005 to June 2013; this resulted in 96 observations. The table shows that all portfolios have positive mean excess return except the third one. Their standard deviation is large compared to mean excess return. Skewness show negative values which mean that the excess return is skewed to the left i.e. mode is larger than the mean and the median and distribution tail is to the left. The results of Skewness and Kurtosis indicate non normality for portfolios except the last one; however, this study will apply test of normality using Kolmogorv-Smirnov test.

Table (4.1)
Descriptive statistics

The table shows minimum, maximum, mean, standard deviation, variance, skewness, and kurtosis for the ten portfolios. Data are in monthly interval. All portfolios' return are in excess return; portfolios are formed by ranking the most active 38 stocks descendingly according to their market value and grouping them in ten equally weighted portfolios so that each portfolio consists of four stocks except the last two portfolios which consist of only three stocks. N represents the number of observation for the whole period from June 2005 to June 2013.

portfolios	N	Min.	Max.	Mean	Std. Dev.	Variance	Skewness Stat.	Kurtosis Stat.
Portfolio 1	96	-59.54	24.39	.1319	12.824	164.454	-1.140	3.876
Portfolio 2	96	-52.88	25.38	.0453	11.486	131.924	-.854	3.955
Portfolio 3	96	-63.84	25.20	-.5357	13.227	174.955	-1.055	4.414
Portfolio 4	96	-60.13	30.99	.8952	14.271	203.668	-.897	2.517
Portfolio 5	96	-54.22	26.78	.3729	12.389	153.497	-1.053	3.314
Portfolio 6	96	-64.21	39.80	.3846	16.280	265.024	-.464	1.764
Portfolio 7	96	-54.87	55.29	1.0873	16.5193	272.887	-.058	1.637
Portfolio 8	96	-48.04	38.71	.9524	14.731	216.995	-.230	1.030
Portfolio 9	96	-63.41	65.79	2.5559	20.252	410.156	.382	1.891
Portfolio 10	96	-52.97	52.49	1.6785	17.439	304.120	-.158	.640

4.2 CAPM Testing

To test CAPM, two steps of linear regression will be conducted. First step is to calculate Beta for each portfolio. Then, these Betas are used as independent variable for the cross sectional model of CAPM. Tests will be applied by fitting models and estimating using ordinary least squares (OLS) method. The study first tested the assumptions of normality, autocorrelation and heteroscedasticity required for applying OLS method. Table 4.2 shows a summary for the results.

Table (4.2)
Test of Normality, Autocorrelation and Heteroscedasticity for the ten portfolios

The table shows normality test for the ten portfolios using Kolmogorv-Smirnov test, autocorrelation using Durbin-Watson test and heteroscadesticity using Breusch Pagan test to verify OLS assumptions. Portfolios are formed by ranking the most active 38 stocks descendingly according to their market value and grouping them in ten equally weighted portfolios so that each portfolio consists of four stocks except the last two portfolios which consist of only three stocks

Portfolio	Normality		Autocorrelation		Heteroscedasticity	
	Stat.	Decision	Stat.	Decision	Stat.	Decision
1	.086*	Normal	2.421	No autocorr.	0.3827*	Homoscedastic
2	.108	Not Normal	1.914	No autocorr.	0.3565*	Homoscedastic
3	.087*	Normal	2.456	No autocorr.	0.2556*	Homoscedastic
4	.078*	Normal	1.882	No autocorr.	0.4556*	Homoscedastic
5	.090*	Normal	2.285	No autocorr.	0.0777*	Homoscedastic
6	.064*	Normal	2.034	No autocorr.	0.1345*	Homoscedastic
7	.071*	Normal	1.914	No autocorr.	0.4323*	Homoscedastic
8	.081*	Normal	1.626	No autocorr.	0.1677*	Homoscedastic
9	.099*	Normal	2.186	No autocorr.	0.1456*	Homoscedastic
10	.066*	Normal	1.927	No autocorr.	0.0888*	Homoscedastic

*significant at 0.01.

4.2.1 Time Series Regression Model

This model is the first step of testing CAPM model, where an ordinary least square method is conducted between market excess return; as independent variable, and each portfolio excess return; as the dependent variable to obtain the betas for the following equation:

$$R_{p,t} - R_{f,t} = \alpha_p + \beta_p (R_{M,t} - R_{f,t}) + \varepsilon_t$$

Where $R_{p,t} - R_{f,t}$ is the portfolio's excess return, $R_{M,t} - R_{f,t}$ is the market excess return and β_p is the sensitivity of each portfolio to the movement in the market.

The results are shown in table 4.3, where betas and their significance are displayed. These results indicate that all betas are significant (P-Value = 0.000) at 0.01 significance level, which means that all betas are not equal to zero. So they have variation and affect returns. The value of 0.8371 of beta for the first portfolio means that for every 1% increase in market excess return will results in increase in portfolio excess return by 0.8371%.

The results also mean that the models are all accepted, which leads to observing the coefficient of determination R^2 of each portfolio. The coefficient of determination is the percentage of variation in the dependent variable which is explained by the model. Accordingly, high rates of R^2 ($R^2 \geq 0.85$) mean that the model explains a high percentage of variation in the dependent variable. This means that the model is sufficient for the dependent variable. On the other hand, low rates of R^2 ($R^2 < 0.85$) mean that the model explains a low percentage of variation in the dependent variable. This means that the model is insufficient for the dependent variable, which leads to assuming that there are other variables affecting the dependent variable, (Draper and Smith, 1998).

The values of coefficient of determination are shown in table 4.3 which shows relatively low rates, this means that there are some variables that may be affecting portfolio return other than Market Excess Return, only the first portfolio has R^2 greater than 85% which means that the model is sufficient to explain variation in this portfolio's return.

Table (4.3)
Beta of each Portfolio of CAPM

This table presents the beta of each portfolio and the coefficient of determination R^2. Numbers in Parentheses are tstatistics. Portfolios are in excess return formed by ranking the most active 38 stocks descendingly according to their market value and grouping them in ten equally weighted portfolios so that each portfolio consists of four stocks except the last two portfolios which consists of only three stocks.

Portfolio	Beta	R^2
1	0.8371 (24.33)*	86.3%
2	0.6938 (16.31)*	73.9%
3	0.8384 (20.27)*	81.4%
4	0.8879 (18.47)*	78.4%
5	0.7722 (18.63)*	78.7%
6	1.0094 (18.19)*	77.9%
7	0.9322 (13.07)*	64.5%
8	0.8600 (14.47)*	69%
9	1.1939 (14.95)*	70.4%
10	0.9164 (10.92)*	56.9%

* significant at 0.01
**significant at 0.05
*** significant at 0.1
+R^2 greater than 85%

4.2.2 Cross Sectional Regression Model

This model is the second step of testing CAPM model, where an ordinary least square method is conducted between the mean of the ten betas estimated from the first step; as the independent variable, and the mean of the ten portfolio excess return; as the dependent variable to obtain the intercept (γ_0) and the coefficient (γ_1) for the following equation:

$$\bar{R}_p = \gamma_0 + \gamma_1 \beta_p + \eta_p$$

Where: $\bar{R}_p$ represents the mean return of the ten portfolios' excess return, β_p represent the mean of the ten betas estimated from the previous step.

According to the hypotheses of this study for CAPM; the intercept γ_0 should be not significantly different from zero to indicate that the risk free used in the market is not significantly different from the risk free presented in CAPM, the beta's coefficient γ_1 should be significant and positive to indicate the existence of positive linear relationship between beta and portfolios' return also the market risk measured by beta is not a sufficient measure of risk.

The results are shown in the table 4.4; it shows that the model is significant (P-Value = 0.012) at significance level of 0.05 with R^2 = 56.3%, which

means that although the model is significant, it is insufficient to explain the variation in the dependent variable. Also shows the intercept γ_0 and the coefficient γ_1 of the Cross Sectional Model and their significance. It can be observed that both of them are significant at 0.05 significance level, this means that they are greater than zero.

Table (4.4)
Ordinary Least Square (OLS) Regression of CAPM

This table presents the results of the Cross Sectional Regression Model using OLS regression; it shows the intercept of the model, the coefficient of market excess return, the F-statistics of the model and the coefficient of determination R^2 which measure how much the independent variable is able to capture the variation in the dependent variable. Numbers in Parentheses are t-statistics

Variables	Coefficients	F R^2
Intercept	-3.611 (-2.626)**	10.301** (56.3%)
Market return	4.885 (3.210)**	

* significant at 0.01 **significant at 0.05
*** significant at 0.1

Accordingly, the model can be written as follows:

Average monthly excess Return = -3.611 + 4.885* Betas

The results above show that γ_1 which represent the coefficient of market excess return is positive and significant; the same as what was assumed by the model since it represents the price of bearing market risk, this leads to accepting the first hypothesis and means that the linear relation explained by the model between return and risk measured by beta is existing.

The same results were reached by Black (1972) who found the existence of linear relationship between risk and return in both cases the existence and nonexistence of risk free rate. Also Stambaugh (1982) proved the linear relation between beta and return in New York Stock Exchange market when the researcher used different market index portfolios with various asset structures to test the performance of CAPM, also found that the risk premium was positive whatever the index used. The same

for Gursoy and Rejepova (2007) whose study observed this linear relation in Turkish stock market when using the modified approach of Pettengil, et. al, (1995) however, when Fama and MacBeth approach was used the linear relation was violated. While Nimal and Fernando (2013) concluded that during up market there is a positive relationship and the opposite during down market. However, Korkmaz, et. al, (2010) rejected this linear relation when analyzing the relation between stock return of emerging markets and world index for 23 emerging markets.

The results also found that beta is not the only source of risk that affects portfolios' return through examining R^2 of the cross sectional model, this leads to accepting the second hypothesis and confirming the existence of other variables that affect portfolios' return in the Egyptian stock market. These results were opposite to the results reached by Fama and MacBeth (1973) in New York Stock Exchange, also Paavola (2006) found that market beta was significant for most of the companies tested in the Russian equity market, and the same with Zhang and Wihlborg (2004) whose study found that beta was the best source of risk as found by conditional domestic CAPM in the examined six emerging markets. Also Pettengill, et. al, (1995) whose study used the modified approach of Fama and MacBeth (1973) concluded that beta was a sufficient measure of market risk. While Shaker and Elgiziry, (2013) reached the same results as this study in the Egyptian stock market, since the researchers' study found that Fama and French three factors model is the best among the tested models, which involves the market risk premium plus two microeconomic variables; the size and the book to market value factors.

As for the intercept γ_0 the results found that it is not equal to zero. This is not the same as what was proposed by the model, since the dependent variable used in this study is the portfolios' risk premium; this leads to rejecting the third hypothesis and means that risk free rate of CAPM is significantly different from the risk free rate available in the Egyptian market.

These results where the same as the results reached by previous researchers; Fama and MacBeth (1973)'s empirical analysis in New York Stock Exchange market couldn't prove that the return on the portfolio of zero correlation with the market equal to the risk free rate. Also Stambaugh (1982) through a study in the same market for the period from 1953 to 1976 for CAPM rejected equality of the intercept to the risk free rate when using different market index portfolios. The same for Hasan, et. al, (2011) in Bangladesh stock market, Sawa and Sklinda (2003) in the Polish stock market and Omran (2006) in the Egyptian stock market who found that the intercept was significantly different from zero.

5. Conclusion

This study tested the validity of the main asset pricing model CAPM in the Egyptian stock market for the period from June 2005 to June 2013, using portfolios ranked by stocks' market values instead of individual stocks to improve the results of estimates. The study tested the three main hypotheses of the model; whether market risk measured by Beta is a sufficient measure of risk, the existence of positive

linear relationship between beta as a measure of risk and portfolios' return also whether the risk free available in the market is equal to the risk free rate presented in the model.

The results of the of CAPM proved the existence of positive linear relation between beta and portfolios' return; as the coefficient of market excess return γ_1 was found to be significantly different from zero and positive; this is true since it represents the price and the reward for bearing market risk, which leads to accepting the first hypothesis.

The second hypothesis also is accepted as the study proved that beta is not a sufficient measure of risk, which means that there are other sources of risk and factors that should be taken into consideration when predicting stocks' prices.

Also the results found that the intercept γ_0 of the CAPM was significantly different from zero, accordingly the study concluded that the risk free rate offered in the market is not the same as the risk free rate presented by the model, so the third hypothesis is rejected

References:

1. Angabini, A., & Wasiuzzaman, S. (2011). GARCH Models and the Financial Crisis-A Study of the Malaysian. *The International Jou-rnal of Applied Economics and Fin-ance Vol. 5 No. 3* , 226-236.
2. Black, F. (Jul., 1972). Capital Market Equilibrium with Restricted Borrowing. *The Journal of Business, Vol. 45, No.3.* , 444-455.
3. Black, F., Jensen, M. C., & Scholes, M. (1972). The Capital Asset Pricing Model: Some Empirical Tests. *Praeger Publishers Inc.*, 1-54.
4. Bon, A. T., & Saiah, A. A. (2010). Measurement of the rate of return of the Egyptian stock exchange by using the pricing model of the capital asset.
5. Chigozie, O. G. (2009). Analysis of Weak-Form Efficiency on the Nigerian Stock Market:Further Evidence from GARCH Model. *The International Journal of Applied Economics and Finance, ISSN 1991-0886.*
6. Draper, N. R., & Smith, H. (1998). Applied Regression Analysis, .*WileyInterscience, ISBN 0-471-17082-8* .
7. Fama, E. F., & French, K. R. (2003). The CAPM: Theory and Evidence. *Center for Research in Security Prices (CRSP) University of Chicago,Working Paper No. 550*,1-27.
8. Fama, E. F., & MacBeth, J. D. (May - Jun., 1973). Risk, Return, and Equilibrium: Empirical Tests. *The Journal of Political Economy, Vol 81, Issue 3* , 607-636.
9. Faruque, M. U. (2011). An empirical investigation of the arbitrage pricing theory in a frontier stock market: evidence from Bangladesh. *Munich Personal RePEc Archive* , 1-330.
10. Gordo, G. M. (2012). CAPM in the Philippines: A Bayesian Perspective. *UP College of Business Administration, Discussion Papers* .
11. Gursoy, C. T., & Rejepova, G. (2007). Test of Capital Asset Pricing Model in Turkey. *Dogus University Vol. 8 No.1* , 47-58.
12. Hasan, M. Z., Kamil, I. A., Mustafa, A., & Baten, M. A. (2011). Validity Test of Capital Asset Pricing Model for Dhaka Stock Exchange. *Journal*

of Applied Sciences Vol.11 No.20, ISSN 1812-5654 , 3490-3496

13. Merton, R. C. (Sep., 1973). An Intertemporal Capital Asset Pricing Model. *Econometrica, Vol. 41, No. 5.* , 867-887.
14. Nimal, P. D., & Fernando, S. (2013). The Conditional Relation between Beta and Returns. *The Hikone Ronso*, 94-105.
15. Omran, M. (2006). An analysis of the capital asset pricing model in the Egyptian stock market. *The Quarterly Review of Economics and Finance 46* , 801-812.
16. Pettengill, G. N., Sundaram, S., & Mathur, I. (Mar., 1995). The Conditional Relation between Beta and Returns. *The Journal ofFinancial and Quantitative Analysis, Vol. 30, No.1* , 101-116..
17. Rhaeim, N., Ammou, S. B., & Mabrouk, A. B. (2007). Wavelet Estimation of Systematic Risk at Different Time Scales; Application to French Stock Market. *The International Jomnal of Applied Economics and Finance Vol. 1 No.2, ISSN 1991-0886* , 113-119.
18. Rogers, P., & Securato, J. R. (2007). Comparative Study of CAPM, Fama and French model and Reward Beta approach in the Brazilian Market. *working papers series* , 1-18.
19. Roll, R. (1976). A Critique of the Asset Pricing Theory's Tests, Part I: On Past and Potential Testability of the Theory. *Journal of Financial Economics* , 129-176.
20. Sawa, A., & Sklinda, S. (2003). Capital Asset Pricing Model and Arbitrage Pricing Theory: An application of market equilibrium models to the Polish market. *Aarhus School of Business* .
21. Shaker, M. A., & Elgiziry, K. (2013). Asset pricing tests in the Egyptian stock market. *Department of Business Administration, Faculty of Commerce, Cairo University, Egypt; Social Science Research Network* .
22. oufian, N. (2001). Empirical Content of Capital Asset Pricing Model (CAPM) and Arbitrage Pricing Theory (APT) Across Time. *Manchester Metropolitan University Business School Working Paper Series, ISSN 1471-857X.*
23. Stambaugh, R. F. (1982). On the Exclusion of Assets From Tests of the two-parameter Model. *Journal of Financial Economics 10* , 237-268.
24. hang, J., & Wihlborg, C. (2004). Unconditional and Conditional CAPM: Evidence from European Emerging Markets. *Handelshögskolan. Centrum för finans* , 1-21.