EMPIRICAL ASSET PRICING: MODELS FOR THE KENYAN SCENARIO

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Declaration

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by any other person except where due reference is made in the Research Project itself.

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19/5/2016

This Research Project has been submitted for examination with my approvals as the supervisor.

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Abstract

This study compared the capital asset pricing model to the consumption based capital asset pricing model in pricing assets in the Kenyan market using the NSE-20 index, 91-day T-bill rate and the quarterly consumption growth rate over the period from 2000 to 2012. The assets that were evaluated are Sasini, Nation Media Group, Kenya Commercial Bank, Athi River Mining Company Limited, Jubilee Insurance and Mumias Sugar Company Limited. The reason for doing this was to take into account commonly traded assets for the largest industries in Kenya.

This paper attempted to undertake the two step procedure recommended by (Mankiw & Shapiro, 1986). Theoretically, by nesting the capital asset pricing model and the consumption based capital asset pricing model into one equation, the validity of both betas can be compared for the asset prices being evaluated.

Due to the lack of data available in the Kenyan market, it became clear during step 1 the procedure that utility functions could not be estimated effectively for individual stocks. Thus an aggregate market beta was estimated for the CCAPM. In contrast the estimation of a market CAPM beta proved too complex as the model is simple and incorporating prices of different assets into one model was not possible. Step 2 could therefore not be undertaken in this paper.

The paper concludes that is necessary to conduct further research and in depth collection of data to allow for the CCAPM model to be tested for the Kenyan market. In the meantime CAPM remains the better model to use for asset pricing in Kenya.

Contents

1. Introduction

1.1 Background of the Study

The financial system in Kenya has experienced steady levels of growth over the past decade. This can be observed specifically in the securities market, which plays a major role in the financial system by enhancing the efficiency in capital formation and allocation. It does so by facilitating the exchange of financial assets such as stocks and bonds. This function of mobilization of capital enables and contributes positively to economic growth (Olweny & Kimani, 2011). It therefore follows that it is important to properly understand the financial market so as to improve policy and future economic decision making.

Financial decision making is largely dependent on characteristics of financial asset such as risk and return which are characterized by prices. Prices of assets therefore are good indicators of macroeconomic factors such as inflation and output (Hordahl & Packer, 2006). According to Hordahl and Packer, this means that the stability and reliability of the predictive content of asset prices reflects to a considerable extent the nature of the underlying "shocks" that hit the economy, for which asset price movements may be a proxy. Hence understanding asset prices is important to understand the nature of the economy at large. Asset pricing models provide us the ability to understand asset prices and make predictions about the future.

A number of different models have been developed by scholars to explain asset prices. Two of the most prominent models are the Capital Asset Pricing Model (CAPM) and the Consumption based CAPM. (Sauer, 1992). The CCAPM is often considered to be a theoretically superior model in literature; however, CAPM has been discovered to be more consistent with data in the US markets. In his comparison of CCAPM and CAPM in Germany, Sauer finds that this is also true of German capital markets. This comparison is yet to be done in Kenya. The need for this investigation exists due to the difference between the Kenyan financial market and those of developed markets. It is therefore important to see which model best describes prices of Kenyan financial assets.

1.2 Problem Statement

With the in depth research that has been conducted into asset pricing in financial markets there exists a large gap in literature concerning this phenomenon in developing countries. There exist unique characteristics of financial markets in developing countries which require a deeper look into solutions applied to asset pricing in these markets. It is therefore advantageous to discover which asset pricing models commonly taught in theory best describe assets in the Kenyan financial system.

It is for this reason that the main investigation of this research is to compare the Sharpe-Lintner Capital Asset Pricing model with the Consumption-Based Capital Asset Pricing Model in pricing assets in Kenya.

1.3 Research Objectives

The objectives of the study are as follows:

1. To understand the standard Capital Asset Pricing and Consumption-based Capital Asset Pricing Models through literature.
2. Compare the Capital Asset Pricing Model to the Consumption-based Capital Asset Pricing Model in pricing financial assets in Kenya through an empirical test.

1.4 Research Questions

The research question that shall steer this study is as follows:

1. Which of the two models, the standard Capital Asset Pricing Model or the Consumption-based Capital Asset pricing model, better explains asset prices in the Kenyan financial sector

1.5 Scope of the Research

This research intends to compare the standard Capital Asset Pricing Model to the Consumption-based Capital Asset Pricing Model using stock market data from 2000 to 2012 more specifically the NSE-20 index, 91-day T-Bill rate and quarterly consumption growth rate over the same period.

2. Literature Review

In order to understand the importance of comparing CAPM to the Consumption Based CAPM the first part of this section will take a look at the origins, theories and assumptions underlying both asset pricing models. The second part of this section will take a look at some of the differences and similarities between the two that literature has illuminated.

2.1 Asset Pricing Models

The behavior of asset prices is essential not only for decision making by investors and individuals in their daily lives but also for the macro economy as they provide crucial information for key economic decisions (Committee, 2013). Given the fundamental role of asset prices it is important to understand their determinants. Asset pricing models have been developed by a number of scholars to this end. Such models include the Present Value Model, Utility theory, portfolio selection theory, Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT), Intertemporal CAPM, Cosumption-Based CAPM among others (Krause, 2001).

The question of whether asset prices are predictable is a central one in finance theory (Committee, 2013). Scholars attempt to predict asset prices using these models. However as has been illustrated by the recent recession, asset prices do not always act in a predictable manner. Mispricing of assets may lead to financial crises characterized by bubbles and crashes. This has been attributed to the fact that asset pricing models are based on several strong underlying assumptions which attempt to explain how markets function. However, although scholars are yet to develop complete and generally accepted explanations for how financial markets function, the research of scholars has greatly improved our understanding of asset prices.

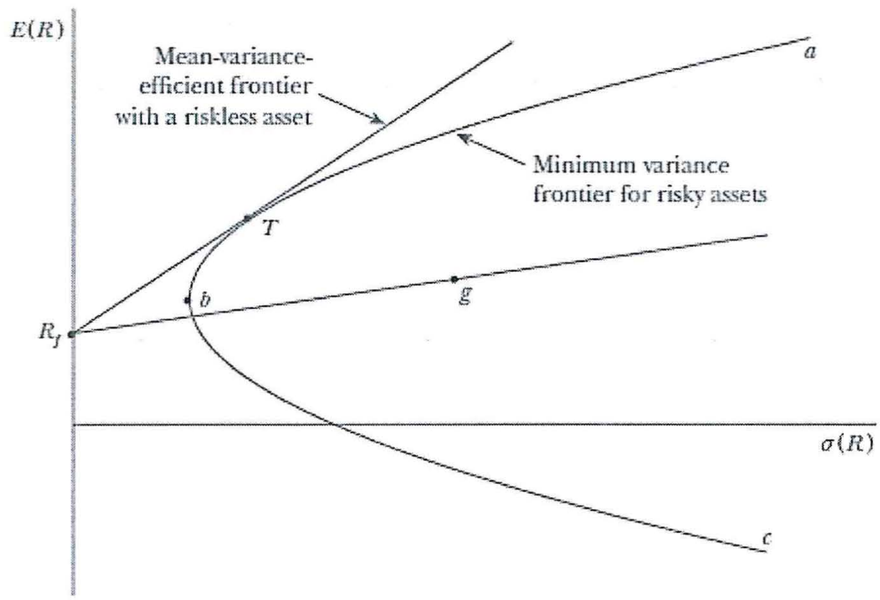
In particular the Capital Asset Pricing Model (CAPM) of William Sharpe (1964) and John Lintner (1965) is the most widely accepted asset pricing model. It is used in most finance curricula as well as in practice (Fama & French, 2004). This is because it provides powerful and intuitively pleasing predictions about risk and its relationship with returns.

2.1.1 Capital Asset Pricing Model (CAPM)

The CAPM builds on the intuition of the Mean Variance Model developed by Harry Markowitz in 1959 (Fama & French, 2004). This model assumes a one-period investment horizon. According to the model investors choose a portfolio at time $t-1$ that produces a stochastic return at time t. The Mean Variance Model assumes that investors are risk averse and choose this portfolio based on the variance and mean of its returns. As a result investors choose a portfolio that minimizes variance and maximizes expected return given variance.

Sharpe and Lintner add two key assumptions to the model. The first is complete agreement. This means that investors must agree on the joint distribution of returns of an asset from time $t-1$ to time t. In other words investor beliefs about expected returns, variance and covariance are homogeneous even though preferences may differ. The second is there is borrowing and lending at a risk-free rate which is the same for all investors and does not depend on the amount borrowed or lent.

Figure 1:



The graph above explains the intuition behind CAPM. The vertical axis shows risk of an asset represented by the variance of returns while the horizontal axis shows the return on the asset. The minimum variance frontier shows the combination of return and risk of all risky assets in the market. Only portfolios above point **b** are mean variance efficient because they maximize return as well as minimizing variance. Adding risk free borrowing and lending makes the optimal combination of mean variance efficient portfolios a straight line tangent to the minimum variance frontier at point **T**. Thus all mean variance efficient portfolios are a combination of risk free borrowing and lending (the risk free asset) and a single risky portfolio T.

With complete agreement about distributions of returns, all investors see the same opportunity set and they combine the same risky tangency portfolio **T** with the risk-free asset. Since all investors hold the same portfolio **T** of risky assets, it must be the value-weight market portfolio of risky assets (**M**). CAPM assumptions imply that the market portfolio **M** must be on the minimum variance frontier if the asset market is to clear. This means that the algebraic relation that holds for any minimum variance portfolio must hold for the market portfolio. Specifically, if there are *N* risky assets,

$$E(R_i) = E(R_f) + [E(R_M) - E(R_f)]\beta_{iM}, i = 1, \ldots, N.$$

In this equation, *E(Ri)* is the expected return on asset *i*, and β*iM*, the market beta of asset *i*, is the covariance of its return with the market return divided by the variance of the market return,

$$\beta_{iM} = \frac{cov(R_i, R_M)}{\sigma^2(R_M)}$$

The first term on the right-hand side of the minimum variance condition, *E(Rf)*, is the expected return on assets that have market betas equal to zero, which means their returns are uncorrelated with the market return. The second term is a risk premium — the market beta of asset *i*, times the premium per unit of beta, which is the expected market return, *E(RM)*, minus *E(Rf)*. Since the market beta of asset *i* is also the slope in the regression of its return on the market return, a common interpretation of beta is that it measures the sensitivity of the asset's return to variation in the market return.

This is the classical or Sharpe-Lintner CAPM which is commonly used today.

2.1.2 The Consumption-based Capital Asset Pricing Model (CCAPM)

The consumption-based capital asset pricing model (CCAPM) is the simplest and most intuitive of all asset-pricing models (Cochrane, 2001). The CCAPM follows from the first-order condition for a utility-maximizing agent's intertemporal consumption and investment choice problem. In equilibrium, the agent invests to the point where the marginal utility lost from foregoing current consumption is equal to the discounted expected marginal utility gained from that investment in the future. The consumption-based asset pricing model would be preferred over the standard

CAPM where differences in consumption baskets across markets are an important factor in determining the cross-sectional variation in stock returns (Karolyi and Stulz, 2003).

The most basic version of CCAPM incorporates a representative investor whose utility function is modeled as:

$$\mathbf{U(c_t + c_{t+1}) = u(c_t) + \beta E_t[u(c_{t+1})]}$$

Where $\mathbf{c_t}$and$\mathbf{c_{t+1}}$ denote consumption at time **t** and **t+1** respectively and $\boldsymbol{\beta}$ denotes a time-based discount factor.

The difference that arises between the standard asset pricing model and CCAPM is the framework. CCAPM captures the fundamental desire to consume more rather than focusing on the mean and variance of the returns of the portfolio.

An investor can buy or sell an asset(s) to forego current utility in return for some expected utility in the future from the payoff. He will do so until the marginal cost of obtaining an extra asset is equal to the marginal benefit of the expected payoff as shown below:

$$\mathbf{U'(C_{k,t})P_{it} = \delta E_t[U'(C_{k,t+1})X_{I,T+1}]}$$

The consumption based asset pricing model came about as a result of the shortcomings of the standard asset pricing model. Asset prices are influenced by the trading behavior of investors who are heterogeneous in nature. The standard based model failed to explain some asset pricing phenomena such as the high ratio of equity premium to standard deviation, the cross sectional variation in expected returns and the predictability of excess stock returns of the market over a long term period.

2.2 Comparison and Critiques

This paper is aimed at analyzing the suitability of CCAPM in pricing assets in the Kenyan stock market through an empirical test of quarterly Kenyan data covering the time period between 2000 and 2013.

Hansen & Singleton (1982) and Epstein &Zin (1991) use the orthogonality restrictions implied by the Euler equations of the agent's optimization problem to identify and estimate the parameters of the utility function using the generalized method of moments (GMM). A critical point of testing CCAPM models is the choice of a measure for the asset returns. The authors above have assumed as a standard the use of a riskless return and some index of as a measure of an optimal portfolio. For instance, Hansen and Jaganathan (1983) use the S&P500 index and the Treasury Bills as a risk-free rate of return. Epstein and Zin (1991) use individual stock return indices that are value weighted returns for broad groups of the standard industrial classification and the Treasury Bills as a risk-free rate of return. In this paper, I will use aggregated data on consumption to test the models in the CCAPM, as in Hansen and Singleton (1982).

The generalized method of moments (GMM) is used to identify and estimate the parameters of the utility function.

The central intuition of traditional consumption based models is that the marginal utility of consumption is the Stochastic Discount Factor that prices all the assets. In other words, asset returns are compensation for their covariance with the marginal utility of consumption. Under some assumptions (for example, time-separable power utility) the marginal utility of consumption can be linearized to be the growth rate in aggregate consumption. Early tests in Breeden et al. (1989) find weak support for Consumption-based Capital Asset Pricing Model (CCAPM). Part of the difficulty lies in measuring consumption growth. Jagannathan and Wang (2007) argue that year-to-year fourth-quarter consumption growth works better than quarterly consumption growth in pricing assets.

Another avenue that has proved fruitful is to add labor income and/or wealth to usual CCAPM tests. Santos and Veronesi (2006) show that labor income to consumption ratio as a conditioning variable is useful for testing conditional version of CCAPM. Jacobs and Wang (2004) also show that idiosyncratic consumption risk is a priced factor. Lettau and Ludvigson (2001a, 2001b) argue that the co-integration ratio of consumption, wealth, and income is a priced risk factor and improves the cross-sectional pricing performance over both standard consumption-based models and Fama and French (1993) model. Non separable utility has also been found to be useful in explaining stock returns, Yogo (2006). A more recent line of attack to resurrecting CCAPM comes from the observation that consumption risk should be measured by covariance of returns and consumption over several quarters, Parker and Julliard (2005). An influential paper by Bansal and Yaron (2004) proposes the so-called long-run risk model in which small but persistent innovations to consumption growth and its volatility can overcome several shortcomings of the basic CCAPM. Hansen et al. (2008) and Malloy et al. (2009) find support for this model. However, Beeler and Campbell (2011) take issues with some of the implications of these models.

Therefore, the usual practice in empirical research is to still check for pricing errors of these portfolios from alternative factor models and test them against the CAPM and Fama and French (1993) factors.

Grossman and Shiller (1981) and Hansen and Singleton (1983) had already empirically tested the representative agent model and, in both cases, the estimated parameters led to the rejection of the CCAPM for the data from the North American economy. Other empirical studies based on the North American economy have also demonstrated that the CCAPM is inconsistent, particularly the studies of Mankiw and Shapiro (1986) and Grossman, Melino and Shiller (1987). The only evidence found to be favorable to the CCAPM in the North American setting is presented by Breeden, Gibbons and Litzenberger (1989), which reported the existence of a statistically significant relationship between expected returns and the consumption beta, although the expected linear relationship between the variables had been rejected. In the international economy, Campbell (1996) tested the CCAPM in several developing countries and his results revealed the existence of the equity premium puzzle in almost all the countries. Of the twelve countries tested only one failed to present the phenomenon showing that the puzzle is an internationally robust phenomenon.

The equity premium puzzle and all the studies that have demonstrated empirical inconsistencies when testing the CCAPM imply serious restrictions to the representative agent models. Therefore, testing the model in other countries, mainly among the emerging economies, becomes of great importance for the modern neoclassical theory of asset pricing, as favorable evidence for the model, in emerging countries, could shed new light on this theory and could provide the better understanding of the causes of its rejection in other countries; while the rejection of the model in these countries could lead academics to reformulate the theoretical bases supporting the model, incorporating new characteristics, in a way that the model becomes more compatible with the observed behavior of the individuals. Given this situation, the aim of the present study is to empirically test whether the Consumption Based Capital Assets Pricing Model (CCAPM) is consistent with the economic data in Kenya. According to Cochrane (2005, p.41), "the consumption-based model is, in principle, the complete answer to all asset pricing questions, but works poorly in practice", that is, despite being insightful from the theoretical point of view, in practice, there are difficulties with the CCAPM that are made evident by the large number of studies that reject the model at the international level. In spite of the empirical rejections, the author emphasizes that instead of inventing, testing and rejecting new models, studies such as those of Mehra and Prescott (1985) and Hansen and Jagannathan (1991), for example, have offered new insights into the characteristics of the model, thus, opening the door to improvements of the model that may allow it to adjust to economic data more easily. The present study can further the understanding of the CCAPM by testing it in Kenya, contributing towards the theoretical enhancement of the model and advancing the understanding of the factors that lead to its rejection at an international level.

The evidence adduced so far seems to be skewed towards the developed world. Evidence from Africa is sparse and also conflicting. This has created a knowledge gap as to how innovations in growth and volatility of consumption growth has strong explanatory power for a broad set of assets in Africa. This study contributes to the existant literature in two ways. First, it adds to the evidence on the Consumption Capital Asset Pricing Model in Africa by using a panel generalized method of moments (GMM), a statistical tool which has not been used for investigation into the CCAPM in the African context; thus, introducing a methodological innovation in the African evidence . Second, most of the studies on CCAPM have been country-specific. Although there is a budding notion that country-specific studies should be preferred to cross-section and panel studies, Africa's story on the CCAPM model will be better told if more panel studies are undertaken to boost the few case studies in Africa that have produced conflicting results. Doing this will, undoubtedly, present a considerable African perspective on the CCAPM connection and consequently aid the understanding of the topic in Africa.

3. Methodology

In 'Risk and Return: Consumption Beta vs. Market Beta' (Mankiw & Shapiro, 1986), a comparison of the two asset pricing models is conducted using data from the New York stock exchange. As has been the case with many of the empirical tests conducted comparing the two models, including Germany (Sauer, 1992), the traditional CAPM is more consistent with historical data even though CCAPM is a more theoretically sound asset pricing model. This comparison however, has not been conducted in developing countries. For reason this a similar methodology will be used to compare the two models for Kenyan assets.

Mankiw and Shapiro suggest a two-step methodology to compare the traditional CAPM to CCAPM. The first step involves the estimation of both the CAPM beta and the CCAPM beta. The second step involves running a regression to determine which beta best describes or explains the returns of an asset. The two steps are further described below.

The data used to conduct this study is the NSE-20 index, 91-day T-bill rate and the quarterly consumption growth rate over the period from 2000 to 2012. The assets that were evaluated are Sasini, Nation Media Group, Kenya Commercial Bank, Athi River Mining Company Limited, Jubilee Insurance and Mumias Sugar Company Limited. The reason for using this data was to take into account commonly traded assets for the largest industries in Kenya as well as to make use of the most readily available data.

3.1 Step 1: Beta Estimation

The first step is made up of two processes. Two regressions are run in this step. The first is to estimate the beta for the classical CAPM. The second estimates the beta for the consumption based CAPM.

3.1.1 Estimation of CAPM Beta

CAPM betas can be estimated in the first stage by regressing the time-series excess returns above the risk-free rate on the excess returns on the market portfolio (Sauer, 1992).

$$(R_i - R_f) = \beta_M (R_M - R_f) + u_t$$

According to Sauer heteroskedasticity may exist in the model relative to the independent variable id the betas are non-stationary. In this case conducting a general least square regression may be more appropriate than the more commonly used ordinary least squares regression. We for this by conducting a White heteroskedasticity test. This is necessary because if there is an error in estimating the beta in the first stage there will be an error in the second stage regression.

3.1.2 Estimation CCAPM Beta

A classic application of GMM to a consumption-based asset pricing model is given in Hansen and Singleton (1982) who use the methodology to estimate and test the standard consumption-based model. In this model, investors maximize utility:

$$\max_{C_t} E_t\left[\sum_{i=0}^{\infty} \beta^i u(C_{t+i})\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The utility function is the power utility form:

$$u(C_t) = \frac{C_t^{1-\gamma}}{1-\gamma} \quad \gamma > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$u(C_t) = \ln(C_t) \quad \gamma = 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

If there are i= 1,.....,N traded asset returns, the first-order conditions for optimal consumption choice are

$$C_t^{-\gamma} = \beta E_t\left\{(1 + R_{i,t+1})\frac{C_{t+1}^{-\gamma}}{C_t^{-\gamma}}\right\} \qquad i = 1 \ldots . N$$

The moment condition for the above equation forms the basis for the GMM estimation. As required by the GMM theory, the equation is re-written to be expressed in terms of strictly stationary variables as shown below

$$0 = E_t\{1 - \beta\left[(1 + R_{i,t+1})\frac{C_{t+1}^{-\gamma}}{C_t^{-\gamma}}\right\} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Thus the model has two parameters to be estimated: β and γ and using the notation $\theta = (\beta, \gamma)'$ the above equation is a cross-sectional asset pricing model given a set of i =1,...,Nasset returns, the equation states that cross-sectional variation in expected returns is explained by the covariance of returns with $M_{t+1} = \beta(C_{t+1}/C_t)^{-\gamma}$ where β is the time discount factor of which we shall try to estimate.

Let x_t^* denote the information set of investors. Then the equation (1) implies

$$0 = E\{[1 - \{\beta(1 + R_{i,t+1})\, C_{t+1}^{-\gamma}/C_t^{-\gamma}\}]|x_t^*\} \qquad i = 1 \ldots\ldots N$$

Let $x_t \subseteq x_t^*$ observable by an econometrician, then the conditional expectations of the equation above implies an unconditional model:

$$0 = E\left\{\left[1 - \left\{\beta(1 + R_{i,t+1})\frac{C_{t+1}^{-\gamma}}{C_t^{-\gamma}}\right\}\right]x_t\right\} \qquad i = 1 \ldots\ldots N$$

If $x_t$is $M \times 1$, then there are $r = N \cdot M$ moments restrictions with which the asset pricing model can be tested, where

$$\boldsymbol{h}(\boldsymbol{\theta}, W_{t+1}) = \begin{bmatrix} \left[1 - \left\{\beta(1 + R_{1,t+1})\frac{C_{t+1}^{-\gamma}}{C_t^{-\gamma}}\right\}\right]x_t \\ \left[1 - \left\{\beta(1 + R_{2,t+1})\frac{C_{t+1}^{-\gamma}}{C_t^{-\gamma}}\right\}\right]x_t \\ \vdots \\ \left[1 - \left\{\beta(1 + R_{N,t+1})\frac{C_{t+1}^{-\gamma}}{C_t^{-\gamma}}\right\}\right]x_t \end{bmatrix} \ldots\ldots\ldots\ldots\ldots\ldots\ldots.\,\textbf{(2)}$$

$\boldsymbol{h}(\boldsymbol{\theta}, W_{t+1})$implies a set of r population moment where $W_t$is an $h \times 1$ vector of variables known at t and θ is an $a \times 1$ vector of unknown parameters to be estimated. The idea is to choose θ to make the sample moment as close as possible to the population moment.

Taking the sample mean of (2) we obtain $\boldsymbol{g}(\boldsymbol{\theta}; \boldsymbol{y_T})$and from Hansen and Singleton (1982) we minimize

$$\min_{\theta} Q(\theta; y_T) = [\boldsymbol{g}(\boldsymbol{\theta}; \boldsymbol{y_T})]'\hat{S}_T^{-1}[\boldsymbol{g}(\boldsymbol{\theta}; \boldsymbol{y_T})]$$

Where $\hat{S}_T^{-1}$ is an estimate of the optimal weighting matrix, s^{-1}.

3.2 Step 2: Comparison of the classical CAPM and CCAPM

This step is fairly simple. The traditional CAPM and consumption based CAPM can easily be nested into one equation (Mankiw & Shapiro, 1986). The returns on asset i can be regressed on its market beta and its consumption beta to see which beta best explains the return. Thus we estimate

$$R_i = \alpha_0 + \alpha_1\beta_{Mi} + \alpha_2\beta_{Ci} + u_i$$

In the equation above the constant term $\alpha_0$can be interpreted as the unconditionally expected return on a zero beta asset; or more simply the return on a risk free asset. One way to test the results is to examine whether the estimated constant accords with other estimates of risk free return. Another way (and the one that we shall use in this paper) is to compare the coefficients $\alpha_1$and α_2 to gauge the relative success of the two CAPM formulations.

3.2.1 Hypothesis

The CAPM implies that $\alpha_1 = ER_M - R_f$ and $\alpha_2 = 0$ while CCAPM implies that $\alpha_1 = 0$ and $\alpha_2 = ER_M - R_f$.

Considering previous comparisons of the models in other countries have found the CAPM is an empirically better model than CCAPM we shall test the following hypothesis

$$H_0: \alpha_1 = 0; \alpha_2 = ER_M - R_f$$

$$H_1: \alpha_2 = 0; \alpha_1 = ER_M - R_f$$

This test shall be conducted at a 10% significance level.

3.3 Parameter definitions

I. $R_{i,t+1}$is the return of an asset i and will be given by theunrealized yield of the Nairobi Securities Index, NSE 20.

II. $x_t$is our observable informational set, instrumental variables, which will be given by lags of consumption growth and lags of asset returns.

III. C_{t+1}/C_t is our consumption growth rate.

IV. β_{Mi} is the traditional CAPM Beta

V. β_{Ci} is the consumption based CAPM beta

4. Results and Discussion

After analyzing the data as described in the methodology above, the following results were found:

4.1 Betas

The regressions in step 1 were carried out in order to find CAPM and CCAPM betas.

i) CAPM

The results for traditional CAPM beta are given below.

Table 1:

	Sasini	NMG	KCB	ARM	JUBILEE	MUMIAS
Beta	0.236138	0.312399	0.244322	0.135941	0.092416	0.177226

As we can see the model effectively estimates a beta for each individual asset. Beta, indicating additional risk above the market portfolio for each asset, can only be estimated in this way using the simple CAPM model.

ii) CCAPM

The Consumption based CAPM industry beta was found to be 0.12231 using the GMM method of estimation.

The individual betas for each asset could not be calculated using this model due to the unavailability of data in the Kenyan scenario to form utility functions.

4.2 Comparison

Beta results for the two models, as discussed above, are not comparable. For this reason it was not possible to move to the second step of the study. In order for an effective comparison to be conducted, it would be important to find individual asset betas using the CCAPM.

4.3 Discussion

It is difficult to compare the two models in the Kenyan scenario. However, due to the lack of comprehensive data to form company utility functions, one can deduce that it is better to use the traditional CAPM model to estimate asset prices.

5. Conclusion and Recommendation

While literature and theory clearly support the more robust nature of the CCAPM model, it is next to impossible to use it to predict asset prices in the Kenyan Scenario. We can therefore conclude that the traditional CAPM model is the better model to be used in the current state of Kenya's financial market.

More research needs to be done to allow for the collection of comprehensive data to form useful utility functions in the Kenyan scenario.

6. Bibliography

Cochrane, J. (2001). *Asset Pricing.* Princeton: Princeton University Press.

Committee, N. P. (2013). Understanding Asset Prices . *Nobel Prize Committee* .

Company Profile: Metropol Corporation. (n.d.). Retrieved June 15, 2014, from Metropol Corporation: http://www.metropolcorporation.com/about/company-profile/

Credit bureaux: CRB Africa. (n.d.). Retrieved June 15, 2014, from CRB Africa: http://www.crbafrica.com/bureaux/bureaux.asp?local=ke

Epstein, L. G., & Zin, S. E. (1991). Substitution, risk aversion, and the temporal behavior of consumption and asset returns: An empirical analysis. *Journal of Political Economy* , 263-286.

Fabozzi, F. J., Focardi, S. M., & Jonas, C. (2014). *Investment Management: A Science to Teach or an Art to Learn?* The CFA Institute Research Foundation.

Fama, E. F., & French, K. R. (2004). The Capital Asset Pricing Model: Theory and Evidence. *Journal of Economic Perspectives* , 25-46.

Hansen, P. L., & Singleton, K. J. (1983). Stochastic Consumption, Risk Aversion and the Temporal Behaviour of Asset Returns. *Journal of Political Economy* , 249-265.

Hordahl, P., & Packer, F. (2006). Understanding Asset Prices: An Overview. *BIS Papers* .

Jacobs, B. I., & Levy, K. N. (2012). Leverage Aversion and Portfolio Optimality. *Financial Analysts Journal,* , 89-94.

Japelli, T., & Pagano, M. (2006). The Role and Effects of Credit Information Sharing. In R. D. Giuseppe Bertola, *The Economics of Consumer Credit* (pp. 347-371). MIT Press.

Karolyi, A. G., & Stulz, R. M. (2003). Are financial assets priced locally or globally? In C. G.M., H. M., & S. R.M., *Handbook of the Economics of Finance* (pp. 975-1020).

Krause, A. (2001). An Overview of Asset Pricing Models.

Licensed Credit Reference Bureaus: Central Bank of Kenya. (n.d.). Retrieved June 14, 2014, from Central Bank of Kenya: https://www.centralbank.go.ke/index.php/credit-reference-bureaus/14-bank-supervision/85-licensed-credit-reference-bureaus

Lucas, R. (1978). Asset Prices in an Exchange Economy. *Econometrica* , 1429-1445.

Mankiw, G. N., & Shapiro, M. D. (1986). Risk and Return: Consumption Beta Versus Market Beta. *The review of Economics and Statistics* , 452-459.

Markowitz, H. (1952). “Portfolio Selection. *Journal of Finance* , 77–91.

Olweny, T. O., & Kimani, D. (2011). Stock market performance and economic growth: Empirical Evidence from Kenya using Causality Test Apporach. *Advances in Management & Applied Economics* , 153-196.

Oxford Dictionaries. (2014). Retrieved May 2, 2014, from Oxford Dictionaries: http://www.oxforddictionaries.com

Pagano, M., & Padilla, J. A. (2000). Sharing default information as a borrower discipline device. *European Economic Review , 44* (10), 1951-1980.

Sauer, A. (1992). An Empirical Comparison of Alternative Models of Capital Asset Pricing in Germany. *Journal of Banking and Finance* , 183-196.

Stiglitz, J. E., & Weiss, A. (1981). Credit Rationing in Markets with Imperfect information. *The American Economic Review , 71*, 393 - 410.

Tang, T. T. (2009). Information asymmetry and firms' credit market access: Evidence from Moody's credit rating format refinement. *Journal of Financial Economics* , 325-351.

Wolf, C. (2002). Financial Crises and the challenge of 'Moral hazard'. In C. Wolf, *Straddling Economics and Politics* (pp. 36 - 40). Santa Monica, CA, USA: RAND.