MEASURING MARKET PERFORMANCE OF THE NAIROBI STOCK EXCHANGE

BY

SIMIYU M. WELLINGTON

A MANAGEMENT RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF BUSINESS AND ADMINISTRATION, FACULTY OF COMMERCE, UNIVERSITY OF NAIROBI.

JUNE, 1992.

DECLARATION

This Management Research Project is my original work and has not been presented for a degree in any other University.

Signed :---------- B Maakani
Simiyu M. Wellington

Date : ---------- 8/3/1993

This project has been submitted for examination with my approval as University Supervisor.

Signed : ---------- Date :---------- 9/3/93

K. M. Mwarania

Chairman, Department of Accounting

DEDICATION

This project is dedicated to mum, dad and my uncle Jack.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

This study is a product of the efforts of several people. I am very grateful to my supervisor, Mr. K. M. Mwarania for his patient advice and guidance during the study. I am also grateful to the University of Nairobi for making the entire project possible by financing me during the M.B.A programme.

Finally I thank all my lecturers, classmates and friends for their encouragement and support. My final appreciation goes to my research assistant Rachael Kioko for sacrificing her time to assist me in data collection and analysis.

ABSTRACT

This study set out to construct an alternative index for the Nairobi Stock Exchange. The need for the study emanated from the weaknesses of the current NSE 17-Share daily Index. The index excludes most of the active companies quoted on the exchange in the last six years. Among those ignored are such active stocks as Barclays Bank and the Standard Chartered Bank. The index also gives equal weight to all companies irrespective of the number of shares quoted. In addition, on a stock market there is usually need for alternative performance measures to give interested parties a wide range of choice in order to meet their diverse needs.

The index arrived at in this study was a 23-share index made up of the most actively traded stocks in 1991. It had the period of January-June, 1975 as the base period and the base value was set at 100 in this period. The index is weighted by the number of shares outstanding in the base period. The prices used were the geometric means of the bid and offer prices. The index was computed using a laspeyres type formula. The weights were adjusted for changes in capitalization for example through bonus, rights issues or new issues.

CHAPTER 1. INTRODUCTION

1.1 Background

A stock exchange is a market which deals in the exchange of shares of public quoted companies and government and municipal stocks for money. It is a place where investors register their opinion on the future of the economy.It ,thus, follows that the stock market is a barometer that reflects important economic changes. The Nairobi Stock Market is everybody's discounting of the Kenyan economic outlook.

The stock exchange as a market remains something of a mystery to some people. Unlike ordinary markets where the producers sell and the consumers buy, the Stock Exchange is a two-way market in which stockbrokers are just as likely to be sellers as buyers, and the wares which are dealt in are abstract. Stockbrokers are members of the stock exchange who act as financial advisors to their clients and carry out their orders (NSE Publication, 1990).

Stocks and shares confer the right to receive interest on part of a loan and the repayment of that particular part of the loan, if and when repayment is made, or to receive a share of profits of a company. The stock or share certificate is merely the evidence of the title to that right and it is these abstract things, the rights to shares in capital and income, which are

dealt in on the Stock Exchange, the bits of paper being merely incidental (Berman,1963).

The stock market is of vital importance to government and industry for it is there that new long-term capital can be raised voluntarily from the public and on a large scale and in a short space of time. It bridges the gap between governments, municipalities and companies which need to borrow money for long periods or to raise permanent capital, and investors who only wish to put up money for a comparatively short time.

The Stock Exchange embodies much of the mechanism for raising money for great enterprises and for arranging for those who have put up the money to get it back when they want it by selling their holdings to fresh investors. If the facilities for getting their money back were lacking, they would probably never venture to put up the money in the first place and without that money, many well-known enterprises could never have come into being.

The stock market in a developing country like Kenya must facilitate, in addition to performing traditional functions, the implementation of government policies which derive from conditions generally peculiar to developing countries. These include, among others :

(i) The stock exchange should facilitate the transfer of the economy to the citizens.

(ii) The stock exchange should facilitate the gradual replacement of foreign national capital with local debt.This is important because the objective of most developing countries which have attained political independence is the attainment of economic independence.

(iii) The stock exchange should facilitate as wide ownership of national tools of production as is possible by stimulating investment in securities by as many people as possible (Munga,1974).

The Nairobi Stock Exchange

The Nairobi Stock Exchange (NSE) was constitutionalised in 1954 as a voluntary organization of stockbrokers and currently it is one of the most active capital markets in independent Africa.The administration of the Stock Exchange is now under a fully operational Secretariat.

The NSE is made up of six stockbroking firms. These stockbrokers transact business mainly on the Nairobi market and owing to Exchange Control regulations, only a comparatively small proportion of business is conducted in foreign stocks through overseas agents.

The business of buying and selling investment securities on the market is carried out in the following way : potential customers contact stockbrokers either by mail, telephone, personal visits or through registered agents and give their buying or selling orders. The stockbrokers through their authorised representatives take the customer orders to the trading floor where the deals are transacted by way of an open out-cry auction.

The Stock Market investors are drawn from institutions, individuals or registered agents. The registered agents are drawn from professionals like lawyers and bankers and they play an important role in advising clients, placing orders and raising claims on their behalf.

As a capital market, the NSE has three main functions. Firstly, it helps mobilise domestic savings thereby bringing about the reallocation of financial resources from dormant to active agents. Secondly, it facilitates the transfer of securities from one shareholder to another. Thirdly, the Exchange assists companies to engage local participation in their equity thereby giving Kenyans a chance to own shares. It also helps companies to raise extra finace essential for expansion and development.

The NSE deals in two types of securities: variable income securuties and fixed income securities. Variable income securities are the ordinary shares which have no fixed rate of dividend payable as the dividend is dependent upon both the profitability of the company and and what the Board of Directors decide. The fixed income securities include preference shares, debenture stocks, municipal and Government Stocks. These securities have a fixed rate of interest which is not dependent on profitability.

Performance Measures

In relation to its functions, economists and other interested parties would like to know how the stock market is performing. For example investors are interested in knowing whether "the market" was up, down or unchanged. They also want to know how far the general price movement proceeded (i.e magnitude of change). To measure the performance of the stock market, one needs a simple, succinct figure to describe what happens on the market (Miller and West, 1967). This simple figure is usually an index.

An index is a device which shows by its variation the changes in a magnitude which is not capable of accurate measurement in itself or of direct valuation in practice (cited, Gupta and Gupta 1989 : 310). Though originally developed for

measuring the effect of change in prices, there is hardly any field today where index numbers are not used.They are used to feel the pulse of the economy and infact they are described as barometers of business activity. The purpose of an index is to give a quick, overall picture of changes taking place.

An ideal stock-price index is one that can measure the fluctuations at the stock market more satisfactorily.It is especially desirable that the index should compare, with as great a degree of scientific accuracy as is practicable, the current level of the market at any time with past levels.

1.2 Statement of the Problem

The Nairobi Stock Exchange (NSE) provides a market place where large and small investors in Kenya buy and sell shares and other securities. It permits fair price determination and performs other functions such as accurate and continuous reporting on sales and quotations, releasing information on listed companies and protecting security holders by strict regulations among other functions.

Now that the government has decided to sell off its interests in a number of business enterprises to the private sector, it is expected that a large percentage of these will be sold to the public through the Exchange.As an example the Government has already offered its shares in East Africa Oxygen

for sale through the Exchange. Other offers are expected to follow. With such attractive investment opportunities coming up on the Exchange, the measure of the NSE performance will be more critical. At present the NSE stock price movements are measured by the NSE (17-share) daily index which excludes most of the active stocks (see Appendix 1).For instance, the index excludes all companies which have been listed over the past six years, irrespective of their contribution to the mart's activity (Daily Nation, October 14, 1991). Among those ignored are such active stocks as Barclays Bank of Kenya and the Standard Chartered Bank Kenya. The latter has the largest number of shares offered on the floor and was among the leading firms in terms of volumes of shares transacted in 1991.These two companies contributed to over 15% of the mart's activity in terms of value of shares transacted in the same year (see Appendix 3). In addition, the NSE daily index includes companies such as E.A. Portland Cement, Elliot's Bakeries Ltd, Express Kenya Ltd and Kenya National Mills which when combined contributed only 1% of the mart's activity in terms of value of shares transacted in 1991 (see Apendix3).Thus one problem with the NSE daily index is the sample included.

Another problem is that of weights.Equal weight (100) is given to all companies in the index except for the then E.A.

Breweries and E.A. Power and Lighting ordinary which are given higher weights (250 each).Equal weighting implies equal relative importance of shares included which is not realistic.The price used in the index is the arithmetic mean of the bid and offer prices. The arithmetic mean has an upward bias. As an alternative, the geometric mean could be used to see how a geometric mean index performs vis-a-vis the arithmetic one.

It was in view of the above problems with the NSE daily index that this study endeavoured to construct an alternative index for the NSE.

1.3 Objective of the Study

The objective of this study was to construct an alternative ordinary stock price index for the Nairobi Stock Exchange. It was hoped that the index so computed would measure changes or movements in the aggregate value of ordinary stocks as produced solely by transactions of the market.

1.4 Importance of the Study

The study would be of interest to the following groups of people: 1. Brokerage firms

These may find the index constructed useful within their own organizations for technical research and analysis. Technical analysis is one of the approaches to the problem of timing the purchase and sale of securities. It focuses on the supply and

demand conditions that affect a stock or the stock market.A stock-price index is used in this respect to analyse stock market trends. Most technical analysis is based on the premise that price movements of stock can be used to predict future price movements.

2. Investors

Investors would be interested in the movements of the index as it reflects the up and down movements of the general price level on the NSE.If the index goes up that implies that the general price level has improved and hence investors are likely to gain from their investment in stocks.If it goes down then they may incur loss on their investment.

3. Scholars

These may find the index useful for studies such as those of correlating common stock prices and other economic indicators such as money supply. The common stock prices are presented as an index.

CHAPTER 2. LITERATURE REVIEW

2.1_ HISTORY OF INDEX NUMBERS

One of the earliest references to index numbers appears in a book published in 1707 by the then Bishop of Ely, who was concerned with the consequences of the fall in the value of money since the days of Henry VI some 250 years previously.At about the same time, authors in France, Massachusets and Italy were exercised over the same problem, the effect on prices in Europe of the large quantities of bullion imported as a result of the Spanish conquests of Central and South America being of particular concern. During the nineteenth century, references to the subject became more frequent and progressively more sophisticated applications of index numbers were introduced (Ashford, 1977).

In the early 1900s, Irving Fisher laboured for many years on the theory and construction of index numbers.He was not concerned with fluctuations of the stock market , but was trying to develop the best method and the most effective formula to be used for the measurement of changes in any general price levels. He recommended a formula ,which he named ideal, as the best type of index number for general purposes (Molodovsky, 1967).

Other economics greats connected with the development of index numbers theory and practice include Paasche and Laspeyres (1864), Bowley (1899), Walsh (1901) and Pigou (1912).

2.2 KINDS OF INDEX NUMBERS

The usefulness of any index number lies in the types of questions it can answer.Each index number is designed for a particular purpose, and it is this purpose that determines its method of construction.Some basic types of index numbers include the following:

(i) Value index

This is the simplest kind of index number. It compares total value in some period with the total value in the base period. This index is a component of price and quantity. It is seldom used because it is difficult to determine just what changes it measures.

(ii) Price index

This measures changes in prices while holding measures of quantity constant.

(iii) Quantity index

This measures changes in volume of goods produced, bought or consumed. For almost every formula for the price index, there is a corresponding one to measure changes in quantities.

(iv) Diffusion index

A diffusion index is a simple measure that summarizes changes in a group of economic series. It expresses, for a given group, the percentage of the series that has risen over given spans of time. The turning points in such an index tends to lead turning points in the aggregate business cycle, and the index foretells how widespread the change will be.

2.3. DEVELPOMENT OF PRICE INDICES

(i) Weighted Relative Price Index

(a) Simple Aggregative Price Index

This is the simplest method of constructing index numbers.In general, the simple price index for a period k is given by

$$I_k = \frac{\sum_{i=1}^{n} P_{ki}}{\sum_{i=1}^{n} P_{0i}}$$

where P_{ki} is the price of share i in period k and P_{0i} is the price of share i in the base period.

Merit

The index is easy to compute.

Limitations of this index

The main defects of the simple aggregative index are that :-

(i) It is unduly influenced by the price variations of high-priced shares.

(ii) No consideration is given to the relative importance of shares in the stock market.

(iii) The units of prices of the shares will affect the price index.

(b) Simple Average of Price Relatives

The price relatives are obtained for the various items (stocks) included in the index and then an average of these relatives is obtained by using any one of the measures of central tendency. When the arithmetic mean is used for averaging relatives, the formula for computing the index is :-

$$I_k = \frac{\sum_{i=1}^{n} \left(\frac{P_{ki}}{P_{0i}} \right)}{n}$$

where n is the number of stocks (items) whose price relatives are thus averaged.

Merits

The index has the following advantages over the simple aggregative price index :-

(i) Extreme items do not influence the index. Equal importance is given to all the items (stocks).

(ii) The index is not influenced by the units in which prices are united or by the absolute level of individual prices.

Limitations

(i) Difficulty is faced with regard to the selection of an appropriate average.The use of the arithmetic mean is considered as questionable sometimes because it has an upward bias. The use of the geometric mean involves difficulties of computations.It also has a downward bias.

(ii) The relatives are assumed to have equal importance. This is a kind of concealed weighting system that is highly objectionable since economically some relatives are more important than others.

(c) Weighted Price Relative Index

The question here is the kind of weight that will provide the relative importance of the commodities. This index is given by the formula :-

$$I_k = \frac{\sum_{i=1}^{n} \left(\frac{P_{ki}}{P_{0i}} \right) w_i}{\sum_{i=1}^{n} w_i}$$

where w_i is the appropriate weight given to each item (share).

Merits

The following are the special advantages of the weighted average price relative index over weighted aggregative indices discussed later.

(i) When different index numbers are constructed by the average of price relatives method, all of which have the same base, they can be combined to form a new index.

(ii) When a new item (stock) is introduced to replace the one formerly used, the relative for the new item may be spliced to the relative for the old one, using the former value weights.

(iii) The price or quantity relatives for each single item in the aggregate are , in effect, themselves a simple index that often yields valuable information for analysis.

(i) **Weighted Aggregative Price Indices**

These indices are of a simple aggregative type with the fundamental difference that weights are assigned to the various items included in the index.They include the followig.

(a) Laspeyres index : Base year weights

In general, for period k, the index is given by :-

$$I_k = \frac{\Sigma P_n q_0}{\Sigma p_0 q_o}$$

This is the weighted aggregative price index. P_0 and P_n are the base and given year prices. The q_o is the base year quantity.

(b) Paasche index : Current year weights

In general, for period k, the index is given by :-

$$I_k = \frac{\Sigma P_n q_n}{\Sigma P_0 q_n}$$

This formula uses the current year quantities q_n instead of base year quantities in the Laspeyres formula.This formula is usually not used because the price index of a given year can be compared only with the base year and not with other years of the index (Yamane,1964).

(c) Marshall - Edgeworth Index

In an attempt to avoid the distortions caused by taking the base period or given year weights, the Marshall-Edgeworth index is defined by "splitting the difference" and taking the average of the volumes in the base and given periods, $1/2(q_0+q_n)$. For any period k, the index is defined as

$$I_k = \frac{\Sigma P_n(q_0+q_n)}{\Sigma P_0(q_0+q_n)}$$

(d) Fisher's Ideal Index

Prof. Irving Fisher has given a number of formulae for constructing index numbers and of these he calls one the " ideal" index.Fisher's Ideal Index is given by the formula :-

$$I = \sqrt{\frac{\Sigma P_n q_0}{\Sigma P_0 q_0} * \frac{\Sigma P_n q_n}{\Sigma P_0 q_n}}$$

From the formula it can be seen that Fisher's Ideal Index is the geometric mean of the Laspeyres and Paasche indices.

The formula is known as " ideal " because of the following reasons :-

(i) It is based on the geometric mean which is theoretically considered to be the best average of constructing index numbers (Gupta and Gupta, 1989).

(ii) It takes into account both current year as well as base year prices and quantities.

(iii) It satisfies both the time reversal test as well as the factor reversal test as suggested by Fisher.These two tests are discussed later.

(iv) It is free from bias. The two formulae (Laspeyres' and Paasche's) that embody the opposing types and weight bases, are, in the ideal formula, crossed geometrically, i.e, by an

averaging process that of itself has no bias. The result is the complete cancellation of biases of the kinds revealed by time reversal and factor reversal tests. (NB : Laspeyres index has an upward bias while the Paasche index has a downward bias).

(iii) **Criteria For Choosing Between Index Number Formulae**

(a) Units Test

This requires that an index be independent of the units in which, or for which, prices and quantities are quoted.The simple aggregative index fails this condition.

(b) Time Reversal Test

This expresses the intuitive idea that if an index number for 1991 with 1990 = 100 is 200 percent, the same index for 1990 with 1991 = 100 should be 50 percent. Symbolically,

$$I_{0,n} * I_{n,0} = 1$$

where both index numbers must be given as proportions. In the words of Fisher, " The test is that the formula for calculating the index number should be such that it will give the same ratio between one point of comparison and the other no matter which of the two is taken as the base. " (Cited Gupta and Gupta, 1989, pg.331)

The time reversal test is not satisfied by many of the major index numbers. Fisher's ideal index satisfies this test.

(c) Factor Reversal Test

This requires that the product between a price index and the corresponding quantity index be equal to the value index. Thus ,

$$V = \frac{\Sigma P_n q_n}{\Sigma P_0 q_0}$$

In the words of Fisher, " Just as each formula should permit the interchange of the two times without giving inconsistent results, so it ought to permit interchanging the prices and quantities without giving inconsistent result , i.e , the two results multiplied together should give true value ratio. " (Cited Gupta and Gupta , 1989, p.332)

The factor reversal criterion, formulated originally by Irving Fisher, is satisfied only by the Fisher's Ideal Index.

It is erroneous to assume that the criteria mentioned above provide an absolute yardstick by which one can measure the relative merits of index numbers. All such tests should be considered only as supplementary to practical considerations that arise in the construction of an index. When practical advantages clash with theoretical considerations , practical needs are usually given the most attention.

2.4. PROBLEMS OF INDEX NUMBER CONSTRUCTION

Before constructing index numbers careful thought must be given to the following problems.

1. The Purpose of the Index

At the very outset the purpose of constructing the index must be very clearly determined. There is no all - purpose index. Every index is of limited and particular use. Failure to decide clearly the purpose of the index would lead to confusion and waste of time.

2. Choice of the Base Period

One of the problems in the construction of indices is the selection of a base period. When selecting a base period , it is necessary that it is not an irregular year - that is , it should be a normal year. A normal year is one in which there is economic equilibrium (Yamane , 1964). This is a situation where the economy is not at the peak of a boom or at the trough of a recession.

In addition , the base period should not be too distant from the present. The farther away we move from the base period , the less we know about the economic conditions prevailing at that time. Consequently , comparisons with these remote periods lose significance and become rather tenuous. Furthermore ,it is desirable to shift the base from time to time because a period

previously thought of as normal or average may no longer be so considered after a long lapse of time.

Other considerations may also be involved in choosing a base period for an index. If a number of important existing indices have a certain base period , then newly constructed indices may use the same period for ease of comparison. Moreover, as new stocks are issued and indices are revised to include them , the base period may be shifted to a time interval that reflects the newer economic environment.

While selecting the base , a decision has to be made as to whether the base shall remain fixed or not , i.e , whether we have a fixed base or a chain base index. In the fixed base method , the year or period of years to which all other prices are related is constant for all times. On the other hand , in the chain base method the prices of a year are linked with those of the preceding year and not with the fixed year. The chain base method gives a better picture than what is obtained by fixed base method , however , much would depend upon the purpose of constructing the index.

3. Selection of Stocks to be Included

The purpose for which the index is being computed is basic in determining the stocks (items) to be included. A sufficiently large number of relevant stocks must be selected to obtain a reliable index.

The choice of the stocks to be included in a price index is ordinarily not determined by normal sampling procedures. Each stock cannot be considered a random sampling unit that is representative as any other unit. An attempt is made to include practically all the most important stocks. The aim is to capture the present overall stock market conditions representing a very broad range of economic indicators. Samples are used because of cost considerations. The cost of computing a comprehensive index from the entire common stocks is prohibitive. In addition there are many dormant stocks which need not be included in the index.

4. Price Quotations

After the stocks have been selected , the next problem is to determine which prices to use. The constructor has four alternatives : actual prices , bid prices , offer prices or an average of bid and offer prices. Although actual prices are more technically acceptable, on small exchanges like the Nairobi Stock Exchange , few transactions take place and so transaction prices may not be available for the majority of stocks. Consequently

most people prefer to use the bid price. Other people have preferred an average of bid and offer prices.

5. **Selection of an Average**

Since index numbers are specialized averages a decision has to be made as to which particular average should be used for constructing the index. Basically a choice has to be made between arithmetic mean and geometric mean.There are other means such as the harmonic mean but these two are most commonly used.

Theoretically , geometric mean is the best average in the construction of index numbers because of the following reasons :-

(i) In the construction of index numbers we are concerned with ratios or relative changes and the geometric mean gives equal weights to equal ratio of change.

(ii) Geometric mean is less susceptible to variations as a result violent fluctuations in the values of the individual items, and

(iii) Index numbers calculated by using this average are reversible and , therefore , base shifting is easily possible.

The geometric mean index always satisfies the time reversal test.

Despite theoretical justification for favouring the geometric mean , the arithmetic mean is more popularly used for

constructing index numbers. This is because it is more simple to compute than the geometric mean.

6. **Weights**

A realistic price index must be a weighted index. The stocks comprised by an indicator must be combined to construct the index or average. Each stock should be assigned some relative weights. There are four main ways in which weights can be assigned :-

(i) weighting by number of shares transacted ,

(ii) weighting by number of shares outstanding ,

(iii) weighting by the price of the company's stock , and

(iv) weighting each company equally , regardless of its price or value.

A price-weighted market indicator is an average of the prices included in the indicator after making adjustments for stock splits (eg the Dow-Jones Industrial Average).

Number of shares outstanding as a weight is more attractive than " shares traded ".One of the advantages of using shares outstanding is that the weights naturally stay quit constant over the years, thus avoiding the problem of continuously changing the weights.The weighting using the number of shares outstanding also reflects the importance of each stock used.The stock of each company represents the company's entire market value at any given time. A price change in a firm with millions of shares has more

impact on the index than an identical price change in a corporation having few shares (Widicus and Stitzel, 1980).

In addition , the weighting by the number of shares transacted gives the index the character of a "value in exchange" measure. This method gives greater influence to the more actively traded stocks.Such is a "blue-chip" index instead of a measure of the overall market (Molodovsky , 1967).

Another form of weighting is also suggested in the literature , that is , weighting by the number of shares traded as a percentage of the number of the shares outstanding. The resulting turnover ratio is an indicator of activity independent of the price factor and the number of outstanding shares.

7. Selection of an appropriate formula

A large number of formulae have been devised for constructing index numbers. The problem very often is that of selecting the most appropriate formula. The choice of the formula depends not only on the purpose of the index but also on the data available. Prof. Irving Fisher has suggested that the appropriate index is that which satisfies time reversal test and factor reversal test. Theoretically , Fisher's method is considered as " ideal " for constructing index numbers. However , from a practical point of view the formula is not frequently used because of its limitations.One limitation is that the index is difficult to compute.

No particular formula can be regarded as the best under all circumstances. On the basis of his knowledge of the characteristics of different formulae an investigator will choose technical methods adapted to the data available and appropriate to the purpose of the index.

Some authors suggest the Paasche type formula (Snyder , 1955) while others prefer the Laspeyres type.

2.5. PROBLEM OF CHANGES IN CAPITALIZATION

Makers of stock - price averages and indexes have the problem of eliminating price changes that are a result of alterations in capitalization of a company rather than of a rise or fall in the inherent price or value of the stock. Stock splits, stock dividends, and the issuance of rights occur repeatedly in security markets (Snyder , 1955).

A stock dividend is a distribution to shareholders of additional shares of stock of the corporation. It does not change the assets, liabilities , or total shareholders' equity of the issuing corporation , nor does it change the proportionate ownership of any common shareholder. It causes the transfer of an amount from Retained Earnings to the permanent capital accounts. The number of shares outstanding increase when a stock dividend is issued.

A stock split consists of increasing the number of outstanding shares and reducing the par or stated value per share in proportion.It serves to reduce the market price of the stock. For example a 2 for 1 stock split doubles the number of shares outstanding and reduces the market price approximately to half.

Stock rights are frequently issued by corporations and they provide the holder with an option to acquire a specified number of shares of capital stock in the corporation under prescribed

conditions and within a stated future period of time. The value attached to these rights depends upon the proportionate increase in the stock outstanding, and the difference between the market price and the price at which the new stock is offered.These rights are bought and sold in the market until the stock sells ex-rights, at which time their value is deducted from the market price of the stock.

Index constructors necessarily make adjustments for any change in capitalization that changes the current price of a stock in the index .In addition , some adjusts for the issuance of stock to absorb another corporation not in the index and weghting factors are revised to include small stock issues , such as those for stock sold to employees.

Adjustments made for changes in capitalization that do not directly cause a change in the price of the stock are more in the nature of bringing up-to-date the weighting factor of each stock, rather than preventing price distortions in the index.

Treatment of stock splits

The makers of stock-price averages have met this problem in different ways. Dow Jones Company originally introduced multipliers to correct the price distortion due to capitalization change ; e.g , in the case of a 4 for 1 split , multiplying the market price by 4 after the stock sells ex dividend. Later they

adopted a divisor method whereby the sum of the prices of 30 stocks , for example , is divided by a smaller number than 30 so the average will not be changed by the change in capitalization.

There are several important results of the divisor method. A shs. 1.00 change in the averages does not signify an average shs. 1.00 change in the ticker prices of the stocks. Also , each revision of the divisor to prevent a distortion of the price average " distorts " the implicit weighting pattern and , paradoxically , the number of shares of the split stocks is reduced and the number of shares of the unsplit stocks is increased. This results in a downward bias (Schellbach , 1967). However , Cohen and Carter (1967) argue that

" bias (whether upward or downward) will be present only as a result of the interraction among

(1) the way the adjustment is made ,

(2) the price changes in the split stock and

(3) the price changes in the unsplit stocks. "

The New York Herald Tribune handles a stock split by substituting another stock at the same price so that the average per share ticker price is not changed.If a satisfactory stock selling at the same price is not available , the dollar gap created by retaining the split stock is filled by another stock

or by simply adding the amount of the dollar gap to the group total.

The New York Times applies a multiplier to the price of stock to compensate for stock splits. When a stock dividend of less than 100 percent is declared , they usually find it necessary to remove two or more stocks to permit the substitution of " representative " issues with exactly the same value.

The method of handling stock splits is only one of the statistical complications of a simple average of stock prices. When such an average is first started , the stock with the highest price enjoys the position of the greatest relative importance , or weight.

The stock-price measures of other corporations are indexes rather than averages. The price of each stock is weghted in importance by the number of shares outstanding.

The calculating procedure for popular indexes may be expressed as follows :-

$$P = \frac{\Sigma P_1 q_0}{\Sigma P_0 q_0}$$

where P_1 refers to the market price in the current period and

P_0 to the price in the base period ;

q_0 to the number of shares outstanding in the base period as modified from time to time by subsequent capitalization changes , and

where P_0q_0 (group value) is also modified when necessary to prevent the distortion of the index by capitalization changes. In the case of a stock split , the decline in the current price (P_0) when the stock sells ex-dividend is compensated for in the numerator of the formula by the increase in the number of shares (a modified q_0). When the capitalization of a company is increased by the sale of additional shares offered to shareholders through " rights " the base value of the group of stocks is revised upward by muliplying it by the same ratio that the current value of the group is increased. (Current market value of the shares including the new stock divided by the current market value of the shares pior to issuance of the new stock). A similar method is applicable to a capital distribution or to the substitution or addition of a new stock to the index. The guiding principle is that the index number reflecting the change is the same as that which would have prevailed had there been no change.

CHAPTER 3. RESEARCH DESIGN

3.1 Population

The population for the study constituted all the ordinary shares quoted on the NSE as at 31st December, 1991. As at that date, 49 ordinary shares were quoted.

3.2 Sampling Plan

1. The companies on the exchange were classified into the following industrial groupings (sectors):

Brewers
Commercial and General
Construction Materials
Finance and Investment
Foods
Gas, Energy and Allied
Hotels
Motor & Transport
Plantations and
Printing, Publishing and Papers.

This is the classification adopted by the NSE and it was found appropriate for the purpose of this study.

2. Sectors contributing less than 1% of the volume and value of 1991 trading were eliminated.

3. Of the remaining sectors, stocks contributing 1% or more of volume or value of 1991 trading were selected subject to the condition that the stocks selected from each sector (grouping) contributes at least 65% of the trading in that sector(group).Both volume and value of trading criteria were used to cater for stocks which may have few shares transacted but are significant in terms of value.

3.3 Data Collection

The data required for each company was collected from the Nairobi Stock Exchange for a period of 8 years from 1984 to 1991. For each company the following data was collected : number of shares outstanding, offer price, and bid price . The above period was chosen because most business people are interested in the market trend in the recent past as opposed to many years ago.

3.4 Data Analysis

The LOTUS 1-2-3 computer package was used to calculate the aggregate value of all issues in the sample.The aggregate value (total) was then related to a base value and expressed as an index.The relative importance of the sampled stocks in the market was set by multiplying the price by the number of shares outstanding.Number of shares outstanding as the weighting factor is popularly used. For example the Standard & Poor's Corporation

and the Securities and Exchange commission (SEC) weight their indices by the number of shares outstanding.Same applies to NYSE common stock indexes.

The Lasperes formula was used to compute the index.

$$I = \frac{\Sigma\, p_1 q_0}{\Sigma\, p_0 q_0}$$

where p_1 is the middle market price in the current period and

p_0 is the price in the base period.

q_0 is the number of shares outstanding in the base period as modified from time to time by subsequent capitalization changes, and

where $p_0 q_0$ (group value) is also modified when necessary to prevent the distortion of the index by capitalization changes. The middle market price was the geometric mean of the offer and bid prices.

<u>Treatment of Changes in Capitalization</u>

<u>Stock Dividends and Split-ups</u>

No company on the NSE is on record as having paid its shareholders dividends on form of stocks.Also no stocksplits have been recorded. If these had occured, they would have been handled by simply changing the weighting factor to equal the number of shares outstanding after the stock dividend or split-up becomes

effective. The new weighting factor would have been introduced when computing the first index after the stock sells ex-dividend, or the stock of new par value is traded.

Stock Rights

Again no company on the NSE has successfully carried out a rights issue . The only company which tried a rights issue was ICDC Investment Company in 1989. The company proposed a rights issue of " 9000000 new ordinary shares of 5/= each ranking pari passu with the existing ordinary shares of the company be offered at a premium of 9/= per ordinary share above par to the existing shareholders on the company's capital in Register of Members at the close of business on 14th August 1989 " (See Prospectus). The proposed issue is said to have failed miserably.

If there was a successful rights issue, it could have been treated as follows. A weighting factor equal at all times to the shares outstanding would have been maintained but the base value for the index would have been increased.The old weighting factor of the stock would have been increased by the number of shares of stock actually sold to form a new weighting factor.The old group value (p_1q_0) would have thereby been increased by an amount equal to the value of stock sold, and hence a proportionate increase would have been made in the old base value of the group to offset any change in the index because of this change in group value.

The introduction of the new weighting factor for the stock and the corresponding change in the group base value would have been made made when computing the first index that involves the ex-rights price of a stock.(This method is used by Standard & Poor's Corporation.)

Bonus Issue

Bonus issues are very common on the NSE .About 12 companies in the selected sample had bonus issues at one time or another during the period 1984 to 1991 in which the index was computed. These included B.A.T., Car and General, E.A. Cables, Barclays Babk, Credit Finance Corporation, Diamond Trust, ICDC Investment Jubilee Insurance, National Industrial Credit, Kenya Breweries, CMC Holdings and Nation Printers & Publishers.

Bonus issues are free shares given to shareholders by a company in a given ratio.For example a 1 : 2 bonus means that a shareholder on record at a particular date would get a free share for every two held. Bonus issues have inflatory effects on share prices but when the stocks sell ex-bonus, the prices go down considerably.

Bonus issues were handled by changing the weighting factor to equal the number of shares outstanding after the bonus has become effective. The new weighting factors were introduced when computing the first index after the stock sold ex-bonus.

Consolidation and Acquisitions

These have also not occured on the NSE. However the treatment of these would have been as follows in the index. The consolidation of two or more corporatons, when the consolidation is effected by an exchange of common stocks, would have required only the substitution of a new weighting factor to be used with the price of the stock of the resulting corporation.

Where a corporation absorbs another, wholly or in part through the issuance of ordinary shares , or where a consolidation involves one or more corporations that are not already part of the index, the weghting factor would have been changed to agree with the shares of stock outstanding and a new base value determined. The computation here would have been the same as that of treating rights issues except that that part of the stock issue added to the old weighting factor must be valued using the current market price of the stock. This , likewise , results in an increase in the size of the new base value.

Other Rights

Rights to ordinary stockholders to subscribe to preferred stock issues, bonds, or to stocks of subsidiary companies, produces an arbitrary downward price fluctuation at the time the stock sells ex-rights. This situation has no effect upon the weighting factor for the stock involved. It does, however,

necessitate a new base value for the group that will be smaller than the old base value. The method of computation is similar but opposite in sign to the treatment for rights, in correction in group value being based upon the market value of rights when the stock is first sold ex-rights. However, no such rights were found to have existed in the sampled companies and so no adjustments were made.

Adding or Dropping Stocks

The addition of new stocks to the group involved only an increase in the base value. The new base value was obtained by dividing the old base value by the old group's market value; the resulting quotient was then multiplied by the sum of the old group (market value) value plus the market value of the stock or stocks added. This procedure was used in incorporating new companies in the index as there were only 17 companies in the index in the base period (see appendix 6). The reverse operations were employed when stocks were dropped from the group for example when Car & General was temporarily suspended in 1991.

After the index was computed, it was plotted alongside the NSE daily index to see how it performs.The results are discussed in the following chapter.

CHAPTER 4

FINDINGS AND INTERPRETATION

4.1 Introduction

This study set out to construct an alternative ordinary stock price index for the Nairobi Stock Exchange. It was hoped that the alternative index so constructed would measure changes in the aggregate value of ordinary stocks as produced solely by transactions of the market.

4.2 The Constructed Index

The index arrived at in this study was a weighted aggregative index weighted by the number of shares outstanding. The base period, stocks included and price quotations are described below.

The Base Period

The base period selected was January-June, 1975. This period is currently being used by the Central Bureau of Statistics as the base period in computing the consumer price indices. The selection of this period was found appropriate for the stock price index as it is not too distant from the present. Literature supports the use of such a base period because if the base period is too distant from the present, comparison with such remote periods lose significance and become rather tenous. It is also desirable that when a number of existing indices have a certain

base period, then newly constructed indices may use the same period. The base period remained fixed.

The base value was arrived at as follows. The bid prices were geometrically averaged over the base period and the same was done for offer prices. The resulting mean bid and offer prices were again geometrically averaged to arrive at middle market prices (p_0) for each company in the base period. The prices computed above were then multiplied by the number of shares outstanding in that period and then summed. The resulting figure was the base value . This base value was later modified to include new stocks and accommodate other capitalization changes.

Stocks Included in the Index

The stocks making up the index were selected using the criteria mentioned earlier. Foods and Hotels sectors (groupings) which contributed less than 1% of the volume and value of 1991 trading were eliminated. Of the remaining sectors, 23 stocks qualified for inclusion in the sample (see appendix 2). The percentage contribution of the sectors (groupings) to the total trading in 1991 are shown in the table overleaf.

PERCENTAGE CONTRIBUTION OF THE SECTORS TO THE TOTAL TRADING IN 1991 - VALUE AND VOLUME

Sector (grouping)	Percentage Contribution	
	Volume (%)	Value (%)
Brewers	12.3	14.3
Commercial and General	39.9	29.4
Construction Materials	3.3	1.1
Finance and Investment	27.4	35.9
Foods	0.8	0.2
Gas, Energy and Allied	4.6	5.9
Hotels	0.1	0.1
Motor and Transport	4.7	5.8
Plantations	4.9	6.6
Printing, Publishers and Papers	2.0	0.9

The sample selected was quite represenative of their respective sectors as evident from the following table :

PERCENTAGE CONTRIBUTION OF THE SELECTED STOCKS TO THE TOTAL TRADING OF THEIR RESPECTIVE SECTORS (GROUPINGS) IN 1991.

Sector (Grouping)	Percentage Contribution	
	Volume (%)	Value (%)
Breweries	100.00	100.00
Commercial and General	97.62	98.18
Construction Materials	78.55	88.89
Finance and Investment	95.15	98.88
Gas, Energy and Allied	72.92	77.44
Motor and Transport	84.57	85.51
Plantations	80.51	89.51
Printing, Publishers & Papers	93.14	75.00

Overall, the stocks included in the index accounted for 93.7 % of volume and 95.6 % of value of trading in 1991. In terms of total capitalisation (number of shares quoted), the sampled stocks represented 78.69 % of the total market capitalisation. (See Appendix 5)

From the above anlysis, it can be seen that the sample is quit representative of the whole market.

Price quotations

The prices used in the index were the geometric means of the bid and offer prices. Where one price was missing the other was used, that is, where there was only the bid price, the same was used and same for the case where only the offer price was available.

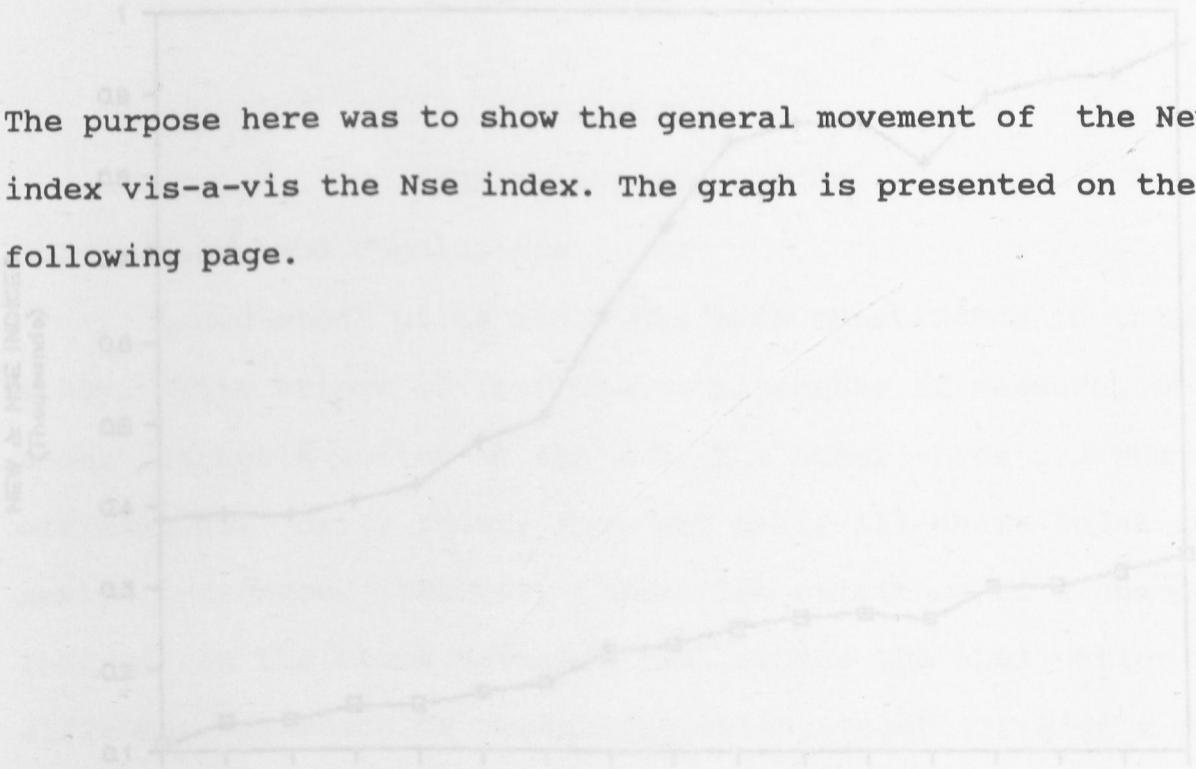
The weights used were the number of shares outstanding. The formula used was the laspeyres type.

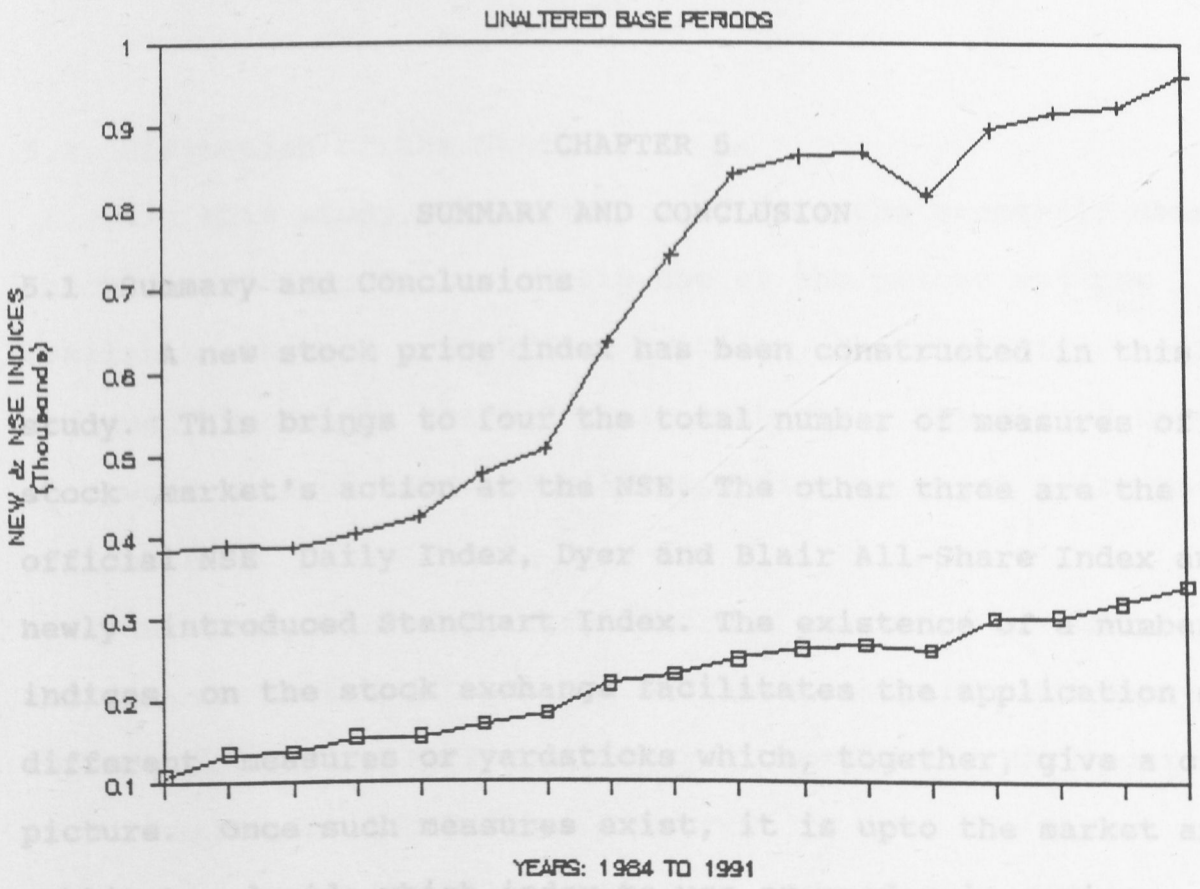
4.3 Performance of the Index vis-a-vis the NSE Index

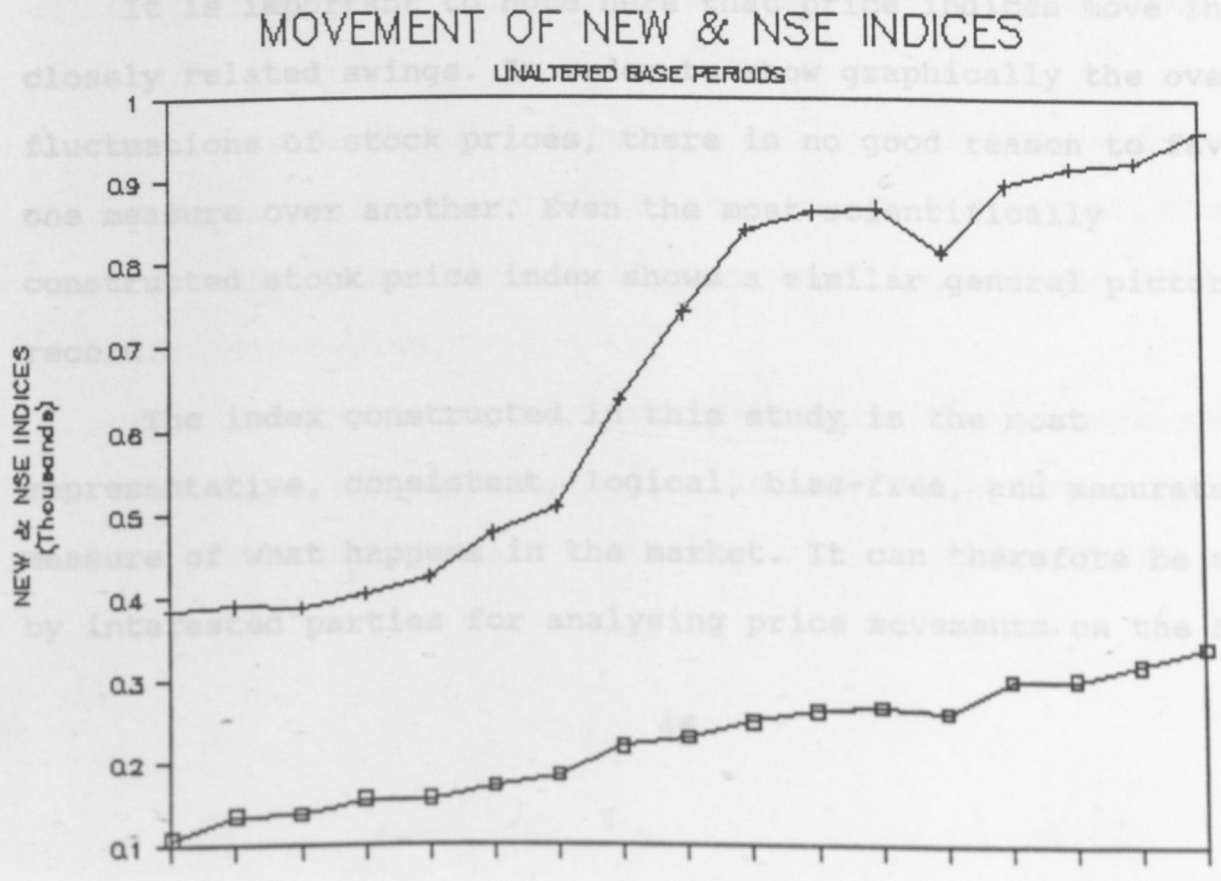
The index was computed weekly from 1984 to 1991. The values of this index and the corresponding NSE index values are presented in appendix 6. Missing values are due to public holidays and some other days when there was no trading on the NSE.

The new index was plotted alongside the NSE index. In plotting the gragh, two index values were used in each year : the index of the first week and that in the middle of the year. For 1991, the index value at the end of the year was also included. This resulted in a total of 17 data points for plotting the graghs.

The purpose here was to show the general movement of the New index vis-a-vis the Nse index. The gragh is presented on the following page.




MOVEMENT OF NEW & NSE INDICES
UNALTERED BASE PERIODS
NEW & NSE INDICES (Thousands)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
YEARS: 1984 TO 1991


MOVEMENT OF NEW & NSE INDICES
UNALTERED BASE PERIODS
NEW & NSE INDICES (Thousands)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1

CHAPTER 5

SUMMARY AND CONCLUSION

5.1 Summary and Conclusions

A new stock price index has been constructed in this study. This brings to four the total number of measures of the stock market's action at the NSE. The other three are the official NSE Daily Index, Dyer and Blair All-Share Index and the newly introduced StanChart Index. The existence of a number of indices on the stock exchange facilitates the application of different measures or yardsticks which, together, give a clearer picture. Once such measures exist, it is upto the market and the public to decide which index to use or prefer in a given situation.

It is important to note here that price indices move in closely related swings. In order to show graphically the overall fluctuations of stock prices, there is no good reason to favour one measure over another. Even the most scientifically constructed stock price index shows a similar general pictorial record.

The index constructed in this study is the most representative, consistent, logical, bias-free, and accurate measure of what happens in the market. It can therefore be used by interested parties for analysing price movements on the NSE.

5.2 Limitation of the Study

In this study, the prices used were the geometric means of the bid and offer prices. Where one of the prices was not available, that is , no offers or bids , the one available price was used to compute the index. In such cases the prices used had an upward bias or downward bias depending on which price was available.

Currently there are three indices measuring market performance on the NSE but out of these, only the NSE daily index values were available for plotting alongside the New index.

5.3 Suggestios for Further Research

1. In this study, the laspeyres type formula was used in computation of the index. Further research could be carried out using other types of formulae to see how these others could perform.
2. The number of shares outstanding was used as the weighting factor in computing the index in this study. Further studies could be carried out using different weighting methods discussed in literature review.
3. Apart from the index constructed in this study, there are other measures on the NSE namely : the NSE daily index, Dyer and Blair All-Shares index and the newly introduced StanChart index.

A study could be carried out to compare the movement of these indices. They could be correlated with economic parameters such as GDP, money supply , Inflation rates etc.

Appendix 1

LIST OF COMPANIES THAT MAKE UP THE NSE DAILY INDEX

1. B.A.T. Kenya
2. Brooke Bond
3. Car & General
4. CMC Holdings Ltd.
5. Consolidated Holdings
6. Diamond Trust
7. Kenya Breweries
8. E.A. Portland Cement
9. Elliot's Bakeries Ltd.
10. Express (K) Ltd.
11. Jubilee Insurance Co.
12. Kakuzi Ltd.
13. Kenya National Mills
14. Kenya Power and Lighting
15. Motor Mart Group
16. National Industrial Credit
17. Sasini Tea & Coffee

Appendix 2

LIST OF COMPANIES THAT MAKE UP THE NEW INDEX

1. B.A.T. (K) Ltd
2. Bamburi Portland Cement
3. Barclays Bank
4. Brooke Bond
5. Car & General
6. Consolidated Holdings
7. CMC Holdings
8. Credit Finance Corporation
9. Diamond Trust
10. East Africa Cables
11. ICDC Investment Company
12. Jubilee Insurance
13. Kakuzi Ltd
14. Kenya Breweries
15. Kenya Commercial Bank
16. Kenya Finance Corporation
17. Kenya Power & Lighting Co.
18. Motor Mart Group
19. National Industrial Credit

20. Nation Printers & Publishers Ltd

21. Sasini Tea & Coffee Ltd

22. Standard Chartered Bank

23. Total Oil Products

Appendix 3

ORDINARY SHARES QUOTED ON THE NSE WITH THEIR PERCENTAGE CONTRIBUTION TO THE MART'S ACTIVITY IN TERMS OF VOLUME AND VALUE OF SHARES TRANSACTED IN 1991.

Company (share)	Volume(%)	Value(%)
Brewers		
1. Kenya Breweries	12.3	14.3
Commercial & General		
2. A. Bauman & Co. Ltd.	0.2	0.1
3. B.A.T. Kenya Ltd.	3.3	14.8
4. Car & General (K) Ltd.	34.4	12.1
5. Dunlop (K) Ltd.	0.02	0.01
6. Hutchings BiemerLtd.5/= ord.	0.01	0.004
7. Jubilee insurance Co. Ltd.	1.2	1.9
8. Pan African Insurance Co. Ltd.	0.2	0.2
9. Pearl Drycleaners Ltd. 5/= ord.	0.5	0.2
10. Phillips International Ltd.	0.02	0.02
Construction Materials		
11. Bamburi Portland Cement Ltd.	2.6	0.8
12. E.A. Portland Cement Ltd.	0.7	0.1
Finance and Investment		
13. Barclays Bank of Kenya Ltd.	3.6	8.3

14. Credit Finance Corp. Ltd.	3.6	3.7
15. City Brewery Investments Ltd.	0.3	0.2

Appendix 3 continued	Volume (%)	Value (%)
16. Diamond Trust of Kenya Ltd.	2.9	5.2
17. I.C.D.C. Investments Ltd.	3.6	2.7
18. Kenya Commercial Bank Ltd.	3.5	5.7
19. Kenya Finance Corp. Ltd.	2.2	1.4
20. National Industrial Credit Ltd.	1.1	1.3
21. Sofar Investments Ltd.	0.05	0.01
22. Standard Chartered Bank Ltd.	6.5	7.3
23. Unga Group Ltd.	0.7	0.2
Foods		
24. Elliots Bakeries Ltd 10/= ord.	0.03	0.004
25. Kenya National Mills Ltd.	0.8	0.2
26. Kenya Orchards Ltd. 5/= ord.	0.002	0.001
Gas, Energy and Allied		
27. Carbacid Investments Ltd.	0.5	0.7
28. E.A. Cables Ltd	0.9	1.1
29. E.A. Oxygen Ltd.	0.5	0.6
30. Kenya Oil Co. Ltd.	0.3	0.04
31. Kenya Power & Lighting 20/= ord.	1.1	1.7
32. Total Oil Products (E.A.) Ltd.	1.5	1.8
Hotels		
33. African Tours & Hotels	0.12	0.07

Appendix 3 continued	Volume (%)	Value (%)
Motor and Transport		
34. CMC Holdings Ltd.	2.3	1.5
35. Express Kenya Ltd.	0.7	0.8
36. Marshalls (E.A.) Ltd. 5/= ord.	0.03	0.03
37. Motor Mart Group Ltd. 5/= ord.	1.7	3.4
Plantations		
38. Brooke Bond Kenya Ltd.	0.3	1.2
39. Eaagads Ltd.	0.01	0.003
40. George Williamson	0.5	0.5
41. Kakuzi Ltd.	1.1	1.0
42. Kapchorua Tea Co. Ltd	0.06	0.07
43. Limuru Tea Co. Ltd	0.03	0.1
44. Ol Pajeta Ranching Ltd.	0.07	0.01
45. Sasini Tea & Coffee Ltd.	2.4	3.8
46. Theta Group Ltd.	0.3	0.02
Printing, Publishers & Papers		
47. Consolidated Holdings Ltd 5/= ord	1.0	0.2
48. E.A. Packaging Industries Ltd.	0.14	0.2
49. Nation Printers & Publishers Ltd.	0.9	0.4

Appendix 4

DATA COLLECTION FORM

Company	Volume	Buyers	Sellers
Sales			
B.A.T. (K) Ltd			
Bamburi Portland Cement			
Barclays Bank			
Brooke Bond			
Car & General			
Consolidated Holdings ord 5/=			
CMC Holdings			
C. Finance Corp.			
Diamond Trust			
E.A. Cables Ltd			

ICDC Investment Co.				
Jubilee Insurance				
Kakuzi Ltd				
Kenya Breweries				
Kenya C. Bank				
Kenya Finance Corp				
Kenya P & L Co. Ltd. ord 20/=				
Motor Mart Group ord 5/=				
National Industrial Credit (NIC)				
Nation P & P Ltd				
Sasini Tea & Coffee				

Standard Chartered Bank				
Total Oil Products				

Appendix 5

LIST OF COMPANIES IN THE INDEX AND THE CORRESPONDING NUMBER OF SHARES QUOTED AS AT 29th MAY, 1992

COMPANY	SHARES	PERCENTAGE
B.A.T. (K) Ltd	37500000	7.19
Bamburi Portland Cement	40316100	7.74
Barclays Bank	27000000	5.18
Brooke Bond	24437500	4.69
Car & General	16878236	3.24
Consolidated Holdings Co.	8541239	1.63
CMC Holdings	9998168	1.91
C. Finance Corporation	12000000	2.30
Diamond Trust	21100000	4.05
E.A. Cables Ltd	10800000	2.07
ICDC Investment Co.	15000000	2.87
Jubilee Insurance	20000000	3.83
Kakuzi Ltd	13066666	2.50
Kenya Breweries	42657040	8.18
Kenya Commercial Bank	16500000	3.16
Kenya Finance Corp.	9000000	1.72
Kenya Power & Lighting Co.	8792000	1.68
Motor Mart Group	21253692	4.08

National Industrial Credit	14062500	2.69
Nation P & P Ltd	9507368	1.82
Sasini Tea & Coffee	84466500	1.62
Standard Chartered Bank	21000000	4.03
Total Oil Products	2700000	0.51

TOTAL		78.69
		==========

Appendix 6

LIST OF COMPANIES EXISTING DURING THE BASE PERIOD, BASE YEAR PRICES AND NUMBER OF SHARES OUTSTANDING.

Company	Base Prices	No. of Shares
B.A.T. (K) Ltd	34.05	7,500,000
Bamburi Portland Cement	10.30	12121691
Brooke Bond	14.90	24437500
Car & General	3.39	5429460
Consolidated Holdings	3.29	8541240
CMC Holdings	3.41	7080000
C. Finance Corp	9.54	2500000
Diamond Trust	2.96	2500000
E.A. Cables Ltd	10.37	1600000
ICDC Investment Co.	10.45	4435000
Kakuzi Ltd	5.85	6533333
Kenya Breweries	12.38	29622944
Kenya p & l Co. Ltd	18.72	7850000
Motor Mart Group	4.40	13505507
National Inustrial Credit	9.37	3000000
Nation p & p Ltd	5.34	3503684
Sasini Tea & Coffee	6.72	4223250

Appendix 7

NEW INDEX VALUES

WEEKS	1984	1985	1986	1987
1	108.91	137.91	158.03	183.19
2	111.26	136.30	155.48	184.37
3	110.70	137.43	156.69	186.45
4	115.66	136.83	158.42	185.04
5	118.77	139.61	162.33	188.26
6	124.43	141.50	163.23	189.43
7	126.13	143.79	163.98	191.15
8	125.04	143.06	164.93	190.02
9	129.83	142.93	167.00	193.66
10	130.13	142.28	164.00	197.36
11	131.84	144.11	158.36	200.00
12	127.86	150.23	160.98	196.98
13	129.51	149.26	153.01	197.46
14	128.69	145.81	164.26	198.69
15	122.48	146.17	159.48	198.78
16	126.30	145.84	158.56	199.72
17	142.25	145.26	157.69	201.52
18	125.77	146.88	158.56	200.38
19	126.00	146.86	158.07	200.72
20	128.22	149.18	161.17	200.03

21	127.32	150.28	162.53	203.40
22	127.54	151.34	164.72	203.32
23	127.44	153.25	162.46	202.56
24	128.56	153.28	165.50	208.72
25	129.19	153.87	166.62	209.54
26	128.45	152.30	164.22	207.59
27	132.69	154.43	164.05	208.85
28	133.89	154.38	169.98	209.60
29	135.46	154.27	172.39	210.24
30	135.08	154.89	171.23	218.70
31	135.97	154.43	172.90	219.82
32	131.85	154.89	173.32	216.14
33	136.59	154.46	172.56	216.13
34	137.84	155.36	177.30	216.81
35	139.28	155.57	180.81	216.55
36	139.99	155.68	179.15	217.06
37	139.44	155.92	182.76	222.17
38	138.99	157.97	186.24	222.83
39	142.31	160.81	191.73	223.13
40	142.02	159.82	191.93	227.95
41	142.01	164.09	192.55	234.24
42	144.14	163.71	194.19	223.26

43	144.90	162.27	191.02	222.27
44	137.94	158.21	192.84	222.12
45	136.58	155.58	194.18	219.38
46	135.88	158.83	194.68	222.89
47	134.04	155.89	194.20	220.27
48	136.72	160.38	181.79	224.59
49	137.78	158.07	181.45	224.54
50	137.90	155.74	181.70	225.32
51	137.72	154.08	186.24	226.82
52	141.11	154.55	183.52	228.26

Appendix 7 continued

NEW INDEX VALUES

WEEKS	1988	1989	1990	1991
1	230.45	262.18	259.77	---
2	233.52	263.85	257.18	301.19
3	232.79	263.66	262.69	295.89
4	236.14	259.54	258.60	301.55
5	237.96	261.98	260.07	302.98
6	236.68	262.63	262.24	302.47
7	237.03	264.71	265.51	299.86
8	240.22	265.86	276.26	325.17
9	236.33	264.80	283.01	344.73
10	240.39	265.93	289.70	344.55
11	244.57	264.36	295.59	342.06
12	234.87	260.54	286.27	332.61
13	239.95	259.53	284.07	324.43
14	239.96	258.29	295.86	329.32
15	235.06	261.29	298.04	323.97
16	236.79	260.49	298.08	329.46
17	242.33	261.60	---	328.78
18	243.62	257.54	292.69	329.70

19	240.65	259.01	295.81	330.81
20	243.49	257.75	295.58	324.94
21	243.43	258.76	290.83	328.42
22	245.85	---	289.14	329.14
23	245.02	258.71	299.13	327.52
24	245.39	260.73	301.95	328.95
25	242.65	268.25	302.16	327.96
26	244.49	268.88	298.68	328.83
27	246.11	269.98	299.03	315.50
28	247.89	266.42	300.32	325.08
29	249.23	261.40	300.55	318.06
30	248.96	266.30	300.65	319.14
31	250.37	264.92	297.21	315.92
32	251.30	268.13	298.92	316.64
33	250.07	270.36	299.19	320.20
34	256.58	269.68	302.97	314.79
35	258.31	271.86	302.42	319.18
36	258.46	272.56	303.40	320.09
37	256.03	270.25	299.87	325.99
38	256.65	263.54	297.76	337.08
39	258.70	268.09	---	326.84
40	259.28	274.73	300.91	327.71
41	261.11	271.51	303.94	---

42	261.63	268.48	304.95	327.95
43	255.66	272.09	306.11	331.00
44	261.00	271.92	306.35	330.56
45	259.19	269.82	306.09	336.39
46	259.35	263.58	297.63	336.71
47	260.79	261.12	305.93	340.43
48	264.02	259.10	302.52	328.37
49	263.65	266.17	253.93	339.90
50	263.25	268.48	---	---
51	267.15	266.35	---	---
52	267.29	---	---	---

BIBLIOGRAPHY

Ashford John ,Statistics for Management,The Whitefriars Press Ltd , 1977.

BermanH.D., The Stock Exchange : An Introduction for Investors,Pitman Publishing, 1963.

Carter E.E. and Cohen K.J., " A Discussion of Stock Averages , Stock splts,and Bias ", Financial Analysts Journal , May-June ,1967.

Caswell Fred , Success in Statistics , John Murray , 1990.

Clark C.T. and Schkade L.L., Statistical Analysis for Administrative Decisions , South-Western Publishing Co.,1974.

Collins C.J. , " The Dow-Jones Industrial Average : Its Virtues and Idiosyncrasies , Financial Analysts Journal , March-April ,1961.

Ekebland F.A. , The Statistical Method in Business , Applications of Probability And Inference to Business and Other Problems , John Willey & Sons , 1962.

Fabozz F.J. and Kipris G.M. , Stock Index Futures ,Dow Jones-Irwin , 1984.

Freud J.E. and Williams F.J., Modern Business Statistics , Prentice-Hall, Inc.,1958.

Gupta S.P. and Gupta M.P. ,Business Statistics, Sultan Chand & Sons,1989.

Hamburg M. ,Statistical Analysis for Business Decision Making, Hercourt Brace Javonorich, Inc. , 1983.

Kariithi N. and Bologna M.," Nairobi Stock Exchange Gets Trading Floor", Daily Nation , Oct. 14 ,1991.

Kekish B.J., " Moody's Averages ", Financial Analysts Journal , May-June 1967.

Levin R.J., Statistics For Management , Prentice-Hall Inc., 1987.

Mills F.G., Statistical Methods , Henry Holt And Company , 1955.

Molodovsky N.," Building a Stock Market Measure - A Case Story", Financial Analysts Journal, May-June 1967.

Munga D.M., The NSE - Its History , Organization , And Role In Kenyan Economy, Unpublished MBA Thesis , 1974.

NSE Publication : How to Invest Though the NSE, October 1990

Rudolf J.A., "The Money Supply and Common Stock Prices", Financial Analysts Journal , March-April ,1972.

Schellbach L.L., " When Did the DJIA Top 1200? ",Financial Analysts Journal, May-June 1967.

Schwert G.W.," Indexes Of U.S. Stock Prices From 1802 to 1987", The Journal of Business, July 1990.

Shoomer B.A. , " The American Stock Exchange System ", Financial Analysts Journal, May-June 1967.

Snyder M.R., Measuring Business Changes , John Wiley & Sons,Inc. 1955.

West S. and Miller N., "Why the New NYSE Common Stock Indexes " , "Financial Analysts Journal", May-June 1967.

Widicus W.W.and Stitzel T.E. , Personal Investing , Richard D.Irwin , Inc., 1980.

Wonnacott T.H. and Wonnacott R.J., Introductory Statistics for Business and Economics, John Wiley and Sons , 1984.

Yamane D., Statistics , An Introductory Analysis , Harper and Row Publishers ,1964.

Willett R.E.,Fundamentals of Securities Markets, Appleton-Century-Crofts, 1971.