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**EQUITY RISKS AND RETURN FACTORS ON THE
NAIROBI STOCK EXCHANGE**

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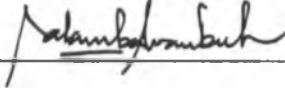


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DECLARATION

This research project is my original work and has not been presented in any other University before.

Signature  _____
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This research project has been submitted for examination with our approval as University of Nairobi supervisors

Signature  13/09/02 _____
Professor NJUGUNA S NDUNG`U

Signature _____
MR ONG`OL ODIDI

DEDICATION

TO MY DEAR PARENTS

NGICHABE & JEANETTE MALAMBA

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However, I take responsibility for any errors, interpretations and omissions in this work,

ABSTRACT

The study looks at risks and factors that affect returns on the Nairobi Stock Exchange. The study identifies sources of such risks; those that can be eliminated through diversification (unsystematic) and those that cannot be eliminated through such (systematic risk).

Systematic or covariance risk is calculated by a standardised measure called Beta, which is a tendency for a company's returns to move together with market – wide returns. Beta and a number of risk factors apparently exert considerable influence on returns on the Nairobi Stock Exchange. The study finds foreign interests rates, domestic (short – term) interests, domestic exchange rates significant in affecting returns.

The study calls for prudent and stable management of the macroeconomic environment coupled with efficient regulatory mechanisms to be put in place. This would be appropriate given that the market has to be competitive in a fully integrated global economy.

LIST OF CONTENTS

DECLARATION.....	.ii
DEDICATION.....	.iii
ACKNOWLEDGEMENTS.....	.iv
ABSTRACT.....	.v
LIST OF CONTENTSvi
CHAPTER ONE	1
1.0 INTRODUCTION	1
1.1 Historical Overview of the Nairobi Stock Exchange.....	3
1.2 STATEMENT OF THE PROBLEM.....	5
1.3 OBJECTIVES OF THE STUDY.....	7
1.4 SIGNIFICANCE OF THE STUDY.....	7
CHAPTER TWO	10
2.0 LITERATURE REVIEW.	10
2.1 Theoretical Literature Review	10
2.2 Empirical Literature Review.....	16
2.3 Overview of the Literature.....	18
CHAPTER THREE	19
3.0 DATA EXPLORATION TECHNIQUES	19
3.1 The Approach for Market Model.....	19
3.2 The Approach for Return Factors Model	20
3.2.1 Domestic Factors	20
3.2.2 Foreign Factors	22
CHAPTER FOUR.....	24
4.0 DATA ANALYSIS AND EMPIRICAL RESULTS:	24
4.1 The Market Model	24
4.1.1 Measures Of Market Risk	26
4.2 The Return Factors Model	27
4.2.1 Stationarity Analysis.....	27
4.2.2 Overparametarised Model.....	35
4.2.3 Parsimonious Model	36
4.2.4 Diagnostic tests	36
CHAPTER FIVE	39
5.1 DATA: Type And Sources.....	39
5.2 The Sample	39
5.3 LIMITATIONS OF THE STUDY.....	40
CHAPTER SIX.....	41
6.0 CONCLUSION AND POLICY RECOMMENDATIONS.....	41
BIBLIOGRAPHY.....	43
APPENDIX.....	50

CHAPTER ONE

1.0 INTRODUCTION

Stock markets as an arm of capital markets are central institutions in long-term financial intermediation and are particularly important in the supply of risk capital and maintain the liquidity and stability of the financial system. (Emenuga 1997)

Developed stock markets are important for promoting the efficiency of investments. According to Popiel (1990), securities markets¹ are focal points in mobilising savings for the purposes of financing-long tenured projects, providing risk capital to investors and thereby encouraging broader ownership of business ventures. They are also an efficient structure of resource allocation through competitive pricing.

The stock market plays an important role in restructuring and development of the economy .A developing stock market brings about other benefits to the economy through: (Demirguc-Kunt and Levine 1993)

- a) Lower cost of equity for firms.
- b) Existence of mechanisms for appropriate pricing and hedging risk.
- c) Increased capital flows to the domestic economy as international capital responds to the thriving stock market. Other objectives of developing the securities segment of the Capital markets are mentioned in the 5th Developing Plan on Kenya as
 - a) To mobilize long-term savings to finance long-term investment.
 - b) To encourage broader ownership of productive assets thereby giving incentive to more savers to benefits from economic growth.

¹ A term used to designate a wide variety of Financial Assets such as stocks, bonds, options and notes. More precisely it encompasses all the documents used to establish ownership of these assets

c) To improve the efficiency of Capital allocation through competitive pricing mechanisms which can contribute to an increased rate of growth.

These benefits of developed stock markets may be lacking in developing stock markets. An empirical assessment of the efficiency of stock markets is aligned to the measures of stock market development. Three measures are distinguishable (Demirguc-Kunt and Levine, 1993) as traditional characteristics; institutional characteristics; and asset pricing characteristics.

Traditional characteristics are the basic indexes of growth, such as market turnover and market capitalization. Institutional characteristics comprise regulatory and legal mechanisms in the markets as well as information disclosure requirements. Asset pricing characteristics encompass the efficiency of the market in pricing risk.

This paper will focus on the asset pricing characteristics particularly on what kind of information the stock market share prices and returns respond to. Portfolio investments occur through the investment in tradable shares and bonds of developing countries². The increasing globalisation of the capital markets and liberalisation of cross border financial transaction has made portfolio investment and management a matter of growing importance to developing countries. According to Alile (1999) as at 1999, about 50 % of total capital inflow to developing countries are in the form of portfolio investment in tradable shares and bonds compared with 15 % in 1990 and 20 % in 1993.

This study will highlight the level of the market's efficiency in pricing risk, development and the implied incentive to domestic and foreign capital.

1.1 Historical Overview of the Nairobi Stock Exchange

The Nairobi Stock Exchange (NSE) is classified as an emerging stock market. It was formally constituted in 1954 as a voluntary organization of stockbrokers with call over system³ of trading markets. This was replaced by the open outcry system of trading in 1991.

At the period after independence, stock market activity declined due to what was perceived as political uncertainty about the future of Kenya. (Muragu 1997). The confidence on the market rekindled in the early 1970s. However this was dampened by the oil crisis and the 35 % capital gains tax in the mid 1970s. (Chacha 1998). The financial system was highly dominated by commercial banks and depositing taking financial sector and this reduced the significance of the securities market (Ndung'u 1997).

The Kenya government realized that the macro policies of controlled interest rates pursued was not sustainable. It set out to enhance the role of the private sector and broadening the ownership in the economy by inducing the measures aimed at promoting the developing of Capital markets for accelerated economic growth. The main specific objectives of developing the capital market were outlined.⁴

Capital Markets Authority was established in 1989 by an Act of Parliament to oversee the operations of the bourse. The principle objectives of the Authority as outlined under Section 11(1) of the Act are:

² See argument in Legal and Other Constraints on access to Financial Services in Kenya. Special Report by KIPPRA, Page 44

³ Call market is a security market in which trading is allowed only at certain specified times. At, those times, persons interested in trading a particular security are physically brought together and a market-clearing price established.-from Investments by Sharpe, Alexander and Bailey 5th edition

⁴ Refer to the introduction section on this Chapter on the objectives enlisted in the 5th Development Plan.

1. Development of all aspects of Capital Markets with particular emphasis on removing impediments to, and creating incentives for, long – term investments in productive enterprises.
2. Creation, maintenance and regulation of a market in which securities can be issued and traded in an orderly, fair and efficient manner.
3. Operation of a compensation fund to protect investors from financial loss arising from the failure of a licensed broker or debtor to meet his / her contractual obligations.
4. Facilitation of the existence of a nationwide system of stock brokerage services so as to enable wider participation of the general public in the stock market. The Act provides for the approval and licensing of securities exchanges, stockbrokers and dealers, investment advisers and unit trusts.

In 1995 the government relaxed restrictions on foreign ownership⁵ in locally controlled companies subject to an aggregate limit of 40 % and an individual 5 % from 29 % and 2.5% respectively to help encourage foreign portfolio investments on NSE. Commission rates were reduced from 2.5 % to between 2 % and 1 % on a sliding scale for scale for equities and 0.05 % for all fixed interest securities. The NSE had 54 quoted companies as of 2000, 18 brokerage firms, one dealer and 18 investment advisors. NSE deals in three types of securities: ordinary shares, preference shares and debentures. It has a capitalization of about Kshs 110 billion and market capitalization ratio of about 15 %, a turnover ratio of about 30 %, and a value traded /GDP ratio of less than 1 %.

⁵ The Capital Market Authority, (Foreign Investors) Regulation No 2 of 1992.

Companies that constitute the NSE 20 share index accounted for about 83 % of market turnover, 56 % of market volume and 79 % of market capitalization. The NSE index has weakened substantially moving from 3115 points (1997), 2965 (1998), 2760 (1999) and to below 1500 points in 2000 Foreign turnover declined by 50 % from Kshs 2.32 billion in 1997 to Kshs 1.16 billion in 1998 and to Kshs 1.12 billion in 1999. The ratio of turnover to the market was 36.2 % in 1997, 35.1% in 1998 and 21.7 % in 1999.⁶ In response to the special requirements of the market, the equity segment has been reorganized into Main Investment Market Segment (MIMS) and the alternative investment Market segment (AIMS). Prices are not allowed to rise or fall by more than 15 % of the previous day's closing price during any trading session. This is to prevent harmful speculative activities and to ensure stock prices are driven by "fundamentals"

1.2 STATEMENT OF THE PROBLEM

The stock market activity is important because the markets set prices that affect the cost of Capital and also because excess market volatility may distort the economy's allocation of capital and lead to financial strains through liquidity crises and macroeconomic instability (Remolona 1991)

Economies characterized by inconsistencies and volatility are usually able to attract little or no funds because they are regarded as risky. Developing economies are perceived high level of risk that international investors shy away from potentially profitable emerging markets.

⁶ The NSE Fact-book; Various issues.

The Nairobi Stock Exchange faces stock price volatility just like other emerging markets. This volatility adds another layer of risk, not only making the pricing of financial assets more difficult but also by generating portfolio flows that are potentially more unstable. (Corrigan 1989, Taylor and Sarno 1997)

The potential for attracting equity inflows to the Nairobi stock market has been hindered by poor economic fundamentals leading to economic risk, ineffective government policies arising from elements of political risk, financial market imperfections leading to financial risks thereby further aggregating financial market imperfections and volatility. The source of such risk is of concern. An adequate asset pricing characteristics and institutional framework should lay the ground for both microeconomic and macroeconomic stability, coping with equity market risks. Thus it will be of interest to investigate the source and determinants of stock prices and their volatility.

Kagume (1991) examined the effect of macroeconomic factors on stock prices, specifically, money supply, real income and inflation. The study was a micro study in the sense that it covered only two of the sector included in the share index and therefore may not be representative of the general market situation. Kibicho (1998) studied the impact of macro economic fundamentals on the NSE, focussing on money supply, exchange rate, real Treasury bill rate and the real GDP. [Kagume. (1991), Olowe (1995) and Kibicho (1998)]. Results appear to show that there are other variables influencing stock returns.

However this study goes beyond identifying the factors that affect the NSE at the share price /index level to examining the impact of such relationships on equity

returns. The study will incorporate risk analysis on 32 equities against the market portfolio. It is therefore important to have a closer look at the factors driving equity investment on the Nairobi stock market. As such the study will highlight impediments to equity inflows to the bourse and spur up further research and knowledge in this area.

1.3 OBJECTIVES OF THE STUDY

The broad objective of this study is to establish the nature of the relationship between the stock market and the macroeconomy. In order to address this broad objective, the following specific objectives will be pursued:

- Examine the pricing characteristics (risk and return) on selected equities
- Identify economic fundamentals that affect the stock market price index and establish the nature of the relationship to the stock market price index.
- Draw appropriate policy measures to enhance and promote development of the Nairobi Stock Exchange.

1.4 SIGNIFICANCE OF THE STUDY.

That the stock market enables the transfer of economic resources to a wider spectrum of the population and increasing the level of allocation efficiency of scarce resource through competitive pricing mechanism cannot be overstated (Jefferies 1995).

Direct and indirect government monetary and fiscal policies affect the stock market. The chain of interaction between the macroeconomic variables and the stock

market was manifested in 1987 and 1997 with the stock market crashes around the world. (Kibicho 1998).

The concept of a stable efficient market that price the various risk factors has implications on the development of the stock market and the economy in general. The measure for risk is usually derived from the capital asset pricing model known as the beta. Estimates of beta⁷ are helpful in calculating the discount rate, which is an important factor in investment selection and evaluation. This study will compute beta for the stocks included in the sample.

The market provides an alternative source of long term funds of investments. It has been attributed to the relatively cheaper terms than bank finance in light of high lending rates. Firms will seek to go public if they are confident that the bourse is efficient in terms of pricing risk of shares.

Equity reforms should improve the allocative efficiency of the market, reduce market risks (through widespread participatory ownership of firms and equity market development) to facilitate market stability and by so doing encourage equity capital investment from both domestic and foreign sources.

Theory is not explicit on the fundamentals that affect the stock price index. A gap exists between the theoretically exclusive importance of the fundamentals (Chen, Roll and Ross 1986). This study will shed some light on which of the fundamentals influence the NSE price index and portfolios.

⁷ Refer to formula for getting the betas in the chapter on Literature Review

Determining risk and return factors influencing stock prices will benefit NSE players (domestic and foreign) to adequately plan diversification of their investment portfolio and better placed to interpret government policy pronouncements and the general economic climate.

CHAPTER TWO

2.0 LITERATURE REVIEW.

2.1 Theoretical Literature Review

There has been substantial interest in the emerging stock markets in the recent years, particularly in the factors determining equity flows into these markets. There has been a distinguishing analysis of the factors into two sets:

Company specific factors “Pull factors” and the country factors “Push factors” (Taylor and Sarno 1997).

The Capital Asset Price Model (CAPM) developed differently by Sharpe (1964) Lintner (1965) and Mossin (1969) recognizes that the only risks that matter are ‘Systematic’ or ‘Covariance’ risks – This is the tendency for a company’s returns to move together with market - wide returns.

These risks are captured in a statistical measure called “beta” i.e. an assets’ covariance with the market as measure by the “beta”, is the appropriate measure of risk for pricing assets.

According to the CAPM, because investors can diversify away unsystematic risks, expected equity premia should only reflect the undivesifiable, or systematic risk of an investment Godfrey and Espinosa (1996).

Mathematically the standard Capital Asset Pricing Model is represented as

$$R_i = R_f + \beta_i (R_m - R_f) + e_i \dots\dots\dots(i)$$

Where

R_i – is expected return on security i

R_f – is return on risk-free asset and is proxied by the 91 day Treasury bill rate of interest.

β_i – is a measure of systematic risks on security i. This represents the risk that cannot be eliminated by diversification and is the relevant measure of risk in determining expected return

R_m – is the return on the stock market index

e_i – is the error term.

Equation (i) describes the expected return for all assets and portfolio of assets in the economy. (Njuguna, 1998)

The procedure for estimating equation (i) involves two steps

(i) Estimates of beta are derived by regressing returns on individual stocks against returns on the stock market index.

(ii) Regress the estimates of beta from each stock, obtained in the first step, against average returns for each stock. The result is a security market line.

Mathematically, the beta is calculated as follows

$$\beta = \text{cov}(r_i, r_m) / \sigma_m^2 = \rho_{i,m} \times \{\sigma_i / \sigma_m\}$$

Where

σ_i Volatility of the asset i

σ_m Volatility of the market

$\text{Cov}(r_i, r_m)$ ----Covariance between the asset and the market

$\rho_{i,m}$ Portfolio of all risky asset. It is the correlation between the asset and the market portfolio.

Many studies have emphasized the importance of other factors other than β in explaining asset returns. Theoretically, these other factors have not been well specified, although the Asset Pricing Theory (APT) allows for any number of risk factors to determine the expected return on assets (Chen, Roll & Ross 1986).

As tenuous as the relationship between β and returns may be, a number of other risk factors apparently exert considerable influence. Fama and French (1992) for example, find strong relationship between equity, returns and market capitalization, earnings/price ratios [E/P], and book – to- market value of equity ratio. Once these factors are included as explanatory variables the relationship between β and returns disappears. [Claessens, Dasgupta & Glen 1998].

Tests of the CAPM typically display poor explanatory power as well as overestimating the risk – free rate and underestimating the market premium (Groenewold and Fraser (1997)). Particularly the use of betas to predict an assets'

return – returns to high beta stocks will tend to be overestimated and vice – versa for low beta stocks.

The Arbitrage Pricing Theory [APT] has the potential to overcome these weaknesses. It may be derived from a simple arbitrage argument for asset returns generated by a multi – index model and its explanatory power is bound to be better since it permits multiple factors. However it cannot explain variation in asset returns in terms of a limited number of easily identifiable factors (Clare, Priestley & Thomas 1997).

Chen, Roll and Ross (1986) identify the factors in the APT with macroeconomic variables they feel ought to influence asset returns. Greenewold and Fraser (1997) link short – term interest rate, inflation rate and the money growth rate. Ariff and Johnson (1990) studying Singapore also find an influence of trade and international payment variables.

APT assumes that observed stock returns are generated as follows (Van, Horne, 1989).

$$\check{R}_i = E[\check{R}_i] + \sum_{j=1}^n b_{ij}F_j + e_j$$

Where

\check{R}_i = Actual return on security i

$E(\check{R}_i)$ = Expected return on security i

F_j = The (uncertain) value of factor j

B_{ij} = Sensitivity to factor j

e_i = Error term assumed to be uncorrelated with the factor capture the unsystematic risk component idiosyncratic to the i^{th} asset.

Under APT in Equilibrium, expected return on security i , $E(\tilde{R}_i)$

Is given by $E(\tilde{R}_i) = R_f + \lambda_1 b_{i1} + \lambda_2 b_{i2} + \dots + \lambda_n b_{in}$

Where

R_f = Risk – free asset

λ_n = Risk premium for the types of risk associated with particular factors.

The risk premium, λ_n is captured as $\lambda_n = E_n - R_f$

Where E_n = Expected return on a portfolio which has unit response (sensitivity) to the n^{th} factor and zero response to other factors (Olowe*).

Variables that have been tested and found to influence stock returns include macroeconomic variables, size, leverage, earnings/price ratio and book – to – market equity.

Used alone, size, earnings/price ratio, leverage and book-to-market equity have explanatory power. Firm size (Banz 1991), Earning yield (Basu 1983) Leverage (Bhanderi 1988).

*Risk Factors in Common Stock Returns on the Nigerian Stock Markets *forthcoming*

However in combinations, size (market value of equity) and book-to-market equity seems to absorb the apparent roles of leverage and earnings/price ratio in average returns (Fama and French 1992).

Fama and French (1993) use a three-step procedure and portfolio of stocks with a model with multiple risk factors written as

$$R_{it} = \gamma_0 + \gamma_1 X_{1t} + \dots + \gamma_k X_{kt} + \epsilon_{it} \quad i = 1, \dots, n$$

Where there are k factors that explain returns of n assets. Of course β may be one of these factors.

The first step involves grouping individual stocks into portfolios on the basis of characteristics believed to be correlated with returns. The betas of these portfolios are then estimated using time – series regression as the second step. Finally, the estimated betas are included in a series of regressions, which include other factors, and the average estimated coefficients are reported.

In evaluating the impact of equity market risks on market returns, Diamorite et al (1996) and Claude B.E et al (1996) consider implications of political risk, economic risk and financial risk for stock market returns.

Claude B.E et al (1996) capture political economic and financial risk elements using a composite risk rating as $CR. = 0.5 (PR + ER + FR)$

Where $PR = \sum PR_i$, - Political Risk

$ER = \sum ER_i$, - Economic Risk

$FR = \sum FR_i$, - Financial Risk

The International Country Risk Guide, Financial risk, captures political risk.

2.2 Empirical Literature Review

An equilibrium framework in which the expected return of an asset is a function of its covariance with the market portfolio is developed under the CAMP. The debate on the efficiency of the CAMP still rages on. Fama and French examined the cross-section of average returns and beta and only find a weak relationship for a 50-year period and no relationship for a 27-year period. The firm size and book – market equity effectively captured cross-sectional variation in average returns over the same 27 years (Banz 1981) (Fama and French 1995).

Kothari et al (1995) support the CAPM in that they find ex-post returns compensation by Fama and French for the same 50 – year period examined.

Fama (1990) finds that changes in the rate of growth of production have a significant impact on returns on the New York Stock Exchange.

He finds in this and earlier work (Fama, 1981) that real economic activity explains larger fractions of the variations in stock market returns for longer returns horizons. Production growth explains only 6% of variation in monthly returns on the New York Stock Exchange (NYSE) during 1953 – 1987; it explains 43% of the variation in annual returns.

The impact of both foreign stock market indexes and domestic economic fundamentals (i.e. Short and Long term interest rates, Industrial production, inflation, and Unemployment) on stock markets in the USA, Japan, the UK, and West Germany

over a period of 30 years to 1987. Bennet and Kelleher (1988) found a significant relationship between these factors.

Studies by Chuhan and others (1993) conclude that domestic factors are at least as important as external factor attraction flows to Latin American Countries, and three to four times more important to East Asian countries. The regional distribution of equity flows reflect an improved ability of investors to disseminate among countries accordingly to the quality of policy, economic performance and equity market risks

Using monthly data for thirty years of USA, UK, Japan and Germany, Bennett and Kelleher(1988) found industrial production and interest rates were found to be statistically for some countries.

Dhakal et al (1993) used seasonally adjusted quarterly data for share prices, narrowly defined money stock, real output as proxied by industrial production, the short term interest rates proxied by the three month Treasury rate and aggregate price level as measured by consumer price index. Their finding were that there is a direct causal impact of changes in money supply on share prices reinforced by indirect channels which are mainly as a result of the causal impact of money supply on interest rate and the inflation rate.

2.3 Overview of the Literature

Most of the literature shows that developing economies face scarcity of capital in the development process. Much of this is due to the nature of the volatility and therefore risks associated with such markets. This calls for concerted efforts to address this problem through empirically well-researched policy undertaking. The above summary indicates that the level of stock market development, the macroeconomic and microeconomic environment significantly impact on the equity market risks which largely determine the quantum of equity flows into a developing country like Kenya.

CHAPTER THREE

3.0 DATA EXPLORATION TECHNIQUES

3.1 The Approach for Market Model

This relates the returns on a share with returns on a stock market index.

This is defined as

$$R_i = a_i + b_i R_m + e_i \dots\dots\dots(i)$$

Where;

R_i is the return on stock I

a_i is the component of stock i's return that is independent of the market's performance

b_i is a constant that measures the expected change in R_i given a change in R_m . It is also known as stock i's beta.

e_i is the error term

Adjusted Beta⁸ Values

The procedure to adjust historical betas involves an implicit prediction equation for future betas. It takes the historical beta for a security and adjusts it by giving it a value closer to 1. Thus historical betas less than 1 are made larger, but will still be less than 1, and historical betas greater than 1 are made smaller, but still greater than 1.

⁸ Meir Statman, " Betas Compared.Merrill Lynch Vs Value Line,"Journal of Portfolio Management, 7, No 2 (Winter 1981): 41 - 44. See also Frank K.Reilly and DavidJ Wright," A Comparison of Published Betas" Journal of Portfolio Management,14, No 3 (Spring 1988)

$$\beta_a = a + b\beta_h \dots \dots \dots (ii)$$

Where a and b are constants.

β_a is the future / forecasting beta

β_h is the historical beta

The adjustments are in these directions because the weights (0.66 and 0.34) are positive and add up to 1. Thus the adjustment procedure is averaging technique.

3.2 The Approach for Return Factors Model

In deciding on the factors to include as possible determinants of expected returns focus will be on those variables found to be important in prior studies as well as those for which there exists a theoretical rationale. The approach will use factors identified in other studies like Chen, Roll and Ross (1986) like interest rates, inflation, changes in money supply and exchange rates. Time series regression will be used to regress monthly returns on stock factors suspected to explain stock returns. The slopes of the time series are factor loadings that have a clear interpretation as risk-factors sensitivities for stocks.

3.2.1 Domestic Factors

(i) Stock Prices and Domestic Interest Rates

Hashemzadeh and Taylor (1988) revealed a unidirectional causality, with the interest rates causing stock prices and not the other way. Ibrahimi, Oxelheim and Wihlborg (1990) expected a negative relationship between the interest rates and the price changes in the stock market since opportunity cost for investors in the equity

markets is represented by the short term interest rate (Campbell, 1987; Solnik, 1984; Aspren, 1989)

In the 1970s, through the 1980s, the policy in Kenya was that of low interest rates. Term structure will be used as the proxy for urea changes in interest rates.

(ii) Stock Prices and Inflation

The influences of unexpected changes in inflation will be investigated Smirlock (1986). In a study of the inflation announcements on financial markets found evidence that markets only respond to unanticipated inflation announcements. Inflation rates will be completed using consumer price indexes.

(iii) Stock Prices And Money Supply

Sprinkle (1971) concluded that changes in stock prices are caused by changes in monetary variables. A strong link has been found between money supply and stock price changes Homa and Jaffe, (1971); Hamburger and Kochin, (1972); Malkiel and Mookerjee (1987); Quandt, (1972); Rozeff, (1974). Money supply may be a factor determining the market rate of return.

Contrary to these findings, however, Feige and Pearce (1976) indicated that money supply does not cause changes in prices. Pearce and Roley (1983) Found unexpected increase in money supply decreases stock prices and vice versa.

3.2.2 Foreign Factors

(i) Stock prices and the Domestic Exchange Rate

The measure of exchange rates to be considered is the average monthly exchange rate expressed in terms of the U.S. dollar per Kenya shilling upon liberalization, exchange rate risk has been of concern to both local and foreign investors. It will be of interest to examine the extent in which this variable is associated with risk factor in stock returns in Kenya.

(ii) Stock prices and Foreign Interest Rates

If an economy is integrated into international capital markets (and thus there is capital mobility), foreign interest rates would be a relevant benchmark since there is no exchange controls

Stock Market Index and Selected Economic Fundamentals

The study develops Dwyer and Hafer's (1990) model of the impact of economic variables on stock market indexes. The model used is:

$$NSEIND = a_0 + a_1 NSEIND_{t-1} + a_2 M1 + a_3 TB.RATE + a_4 EX.RATE + a_5 INFL + a_6 US TB RATE + e_t$$

NSEIND is the stock market index

*NSEIND*_{t-n} is the nth lag of the stock market index

M1 is the money supply ; currency in circulation and demand deposits.,

TB.RATE is the Treasury bill rate of interest on the 91 – day treasury bill.

EX.RATE is the exchange rate - local currency to the US dollar

INFL is the domestic inflation rate

US TB RATE is the foreign interest rates proxied by the U.S. Treasury rate on a three-month Treasury bill.

e_t is the error term

The following approach will be used:

1. Assess the time series characteristics of the variables
2. Test for cointegration in the levels equation using DF and ADF and derive a long-run model, if appropriate.
3. Estimate a short-run model (in first differences), using an error correction approach, if applicable.

CHAPTER FOUR

4.0 DATA ANALYSIS AND EMPIRICAL RESULTS:

4.1 The Market Model

Market risk cannot be eliminated by diversification because it affects all risky assets. The models of risk and return are only useful if risk parameters needed for the models such as the beta coefficient can be estimated.

As a risk index, beta accounts for not only the stock's own standard deviation, but also for all the correlations among other securities available in the market. Beta is calculated using historical rates of returns on the individual asset and the market asset. If the volatility is larger than the market portfolio's volatility, then the stock is riskier than the market portfolio.

Similarly, if the asset's rate of return fluctuates less than the market portfolio's, the stock is considered less risky than the market portfolio.

Market Risk Using Beta Coefficients

Estimates of Market Risk Using Beta Coefficients										
Equity	N	Beta	Adj Beta	Alpha	R ²	Residual St Dev	Standard error		t-ratio of beta	Comment at 95%
							Beta	Alpha		
Brooke Bond	72	0.54	0.6964	-0.001	0.050	0.0972	0.28	0.011	1.93	significant
G Williamson	72	1.275	1.1815	0.024	0.098	0.1625	0.46	0.019	2.76	significant
Sasini	72	0.65	0.769	0.0047	0.018	0.1967	0.58	0.024	1.12	Not signif
Kakuzi	72	0.87	0.9142	0.0034	0.085	0.1189	0.34	0.014	2.56	significant
CMC	72	1.18	1.1188	0.007	0.044	0.2241	0.66	0.027	1.80	significant
K.A	72	0.3	0.538	0.0004	0.028	0.0728	0.21	0.008	1.43	Not signif
Nation Media	72	0.64	0.7624	0.0062	0.035	0.1361	0.40	0.016	1.61	Not signif
Uchumi	72	0.68	0.7888	0.009	0.079	0.0970	0.27	0.011	2.45	significant
Express	72	0.35	0.571	-0.024	0.021	0.0970	0.28	0.011	1.23	Not signif
Baumann	72	0.11	0.4126	-0.016	0.002	0.1078	0.34	0.013	0.34	Not signif
Standard Newspapers	72	0.69	0.7954	0.029	0.012	0.2460	0.73	0.030	0.95	Not signif
Barclays	72	1.22	1.1452	0.008	0.28	0.0920	0.23	0.009	5.26	significant
Diamond Trust	72	0.94	0.9604	-0.008	0.14	0.0984	0.27	-0.77	3.478	significant
ICDC	72	0.87	0.9142	0.018	0.10	0.1095	0.31	0.013	2.813	significant
KCB	72	1.51	1.3366	0.001	0.25	0.1196	0.30	0.012	4.907	significant
NIC	72	1.23	1.1518	0.004	0.18	0.1159	0.31	0.012	3.952	significant
SCB	72	0.86	0.9076	0.011	0.19	0.0770	0.2	0.008	4.17	significant
Pan Africa Ins	72	-0.43	0.0562	-0.019	0.02	0.1183	0.35	0.014	-1.25	Not signif
CFC	72	0.16	0.4456	0.07	0.000	0.7477	2.23	0.09	0.072	Not signif
HFCK	72	1.17	1.1122	0.009	0.04	0.2260	0.660	0.027	1.779	significant
Jubilee	72	0.48	0.6568	-0.007	0.07	0.0725	0.2	0.008	2.326	significant
BAT	72	1.28	1.1848	0.01	0.21	0.1114	0.29	0.012	4.354	significant
Bamburi	72	1.66	1.4356	0.017	0.30	0.1213	0.30	0.012	5.498	significant
BOC	72	0.58	0.7228	-0.001	0.03	0.1228	0.36	0.014	1.61	Not signif
Carbacid	72	1.01	1.0066	0.002	0.15	0.1044	0.28	0.011	3.52	significant
EABL	72	0.56	0.7096	0.013	0.098	0.0727	0.2	0.008	2.76	significant
Firestone	72	1.22	1.1452	0.003	0.21	0.1052	0.27	0.011	4.386	significant
KPLC	72	1.52	1.3432	0.004	0.096	0.1962	0.55	0.023	2.73	significant
Total	72	1.46	1.3036	-0.0003	0.12	0.1639	0.45	0.019	3.20	significant
Unga	72	1.08	1.0528	0.004	0.027	0.2646	0.78	0.032	1.395	Not signif
Portland	72	1.39	1.2574	0.015	0.087	0.1867	0.53	0.022	2.598	significant
Cables	72	1.159	1.1049	0.015	0.043	0.2222	0.65	0.026	1.782	significant

Table1

4.1.1 MEASURES OF MARKET RISK

The betas of equities quoted on the Nairobi Stock Exchange were calculated and are shown in table 1 above. This required the estimation of two variables, the returns on an individual asset and the movements in returns on the market as a whole.

The beta is a standardized measure of systematic risk based upon an assets covariance with market portfolio. For a stock with a beta of 1.5, when the market portfolio's price rises by 1 %, the stock price is expected to increase by 1.5 %. Conversely if the market prices decrease by 1 %, the change in the stock's price is expected to be -1.5%.

Of the 32 equities studied, 15 were found with beta values of over 1 and therefore more volatile than the market portfolio. Such securities are referred to as aggressive stocks. Only one stock (Pan Africa Insurance) had a negative beta value. This suggests that the market portfolio out performed it. The betas of 22 equities were found to be significant at 5 %.

To correct for the impact of using historical beta values for the purpose of forecasting only 15 stocks have adjusted beta values greater than 1, which means it is riskier than the market portfolio. Only one stock (Carbacid) has an adjusted beta value of 1.00 and therefore classified as neutral. Similarly, if beta is less than 1, the stock will fluctuate less than the market and therefore considered relatively safe- a defensive stock. Such a stock will defend an investor from big losses, but will not provide large gains.

Alpha values provide measures of performance of an asset. Specifically it is the average rate of price appreciation / depreciation by a share when investors in the market as a whole earned or lost nothing. The low alpha values (averaging 0.006606 for the 32 equities) signify a decline in the market as a whole during the period under study.

The average R^2 of the 32 equities was found to be 0.097284. This suggests that 9.728 % of risk (variance) in shares comes from market sources (domestic interest rate risk, foreign interest rates, domestic inflation risk, money supply, exchange rate risk etc) and the balance 90.27 % of the risk, come from firm specific components. This firm specific risk (unique risk) can be eliminated through diversification.

4.2 RETURN FACTORS MODEL

4.2.1 STATIONARITY ANALYSIS

A stochastic process $\{X_t\}$ is said to be stationary if the means and variances of the process are constant over time and if the value of the covariance between two periods depends only on the gap between the periods and not the actual time at which this covariance is considered. If one or more of the conditions above are not fulfilled, the process is non-stationary (Cheremza and Deadman 1992)

A non-stationary series which can be transformed to a stationary series by differencing d times is said to be integrated of order d , denoted as $I[d]$

Dickey - Fuller Unit Root Test

An appropriate method for testing whether a variable is integrated of order one is the DF test proposed by Dickey and Fuller[1979]. The DF test is generated as

$$Y_t = Y_{t-1} + e_t \dots \dots \dots (i)$$

Where e_t is the error term and is assumed to be a white noise process

Rewriting equation I

$$Y_t = \alpha Y_{t-1} + e_t \dots \dots \dots (ii)$$

If $\alpha = 1$, it is a pure random walk variable. The DF test is unit root test - a test of the hypothesis that $\alpha = 1$ in equation (ii). The test is based on the estimation of an equivalent regression equation to (ii) as

$$\Delta Y_t = \beta Y_{t-1} + e_{t-1} \dots \dots \dots (iii)$$

Rewriting equation (iii) to resemble equation (ii)

$$Y_t = (1 + \beta) Y_{t-1} \dots \dots \dots (iv)$$

Thus $\alpha = (1 + \beta)$. If $\beta < 0$ in equation (iii), then $\alpha < 1$ in equation (ii).

The DF test consists of testing the negativity of the β in the OLS regression of equation (iii) i.e.

$$H_0: \beta = 0 (Y_t \sim I(1))$$

$$H_1: \beta < 0 (Y_t \sim I(0))$$

Rejection of the null hypothesis in favor of the alternative implies that α is less than 1 and that Y_t is integrated of order zero.

Under the DF test, a stochastic process with drift and / or deterministic trend can be tested by the inclusion of a constant and / or time trend in estimation of Equation (iii).

Augmented Dickey - Fuller Unit Root Test

The DF model may suffer from autocorrelation in the residual process if Ordinary Least Squares (OLS) regression technique is applied since the errors may not be normally and identically distributed (NID). The residual variance estimates will be biased.

The ADF solves this problem by involving lagged left-hand side variables as additional explanatory variables to approximate the autocorrelation.

The equivalent of equation (iii) is given as

$$\Delta Y_t = \beta Y_{t-1} + \sum \Pi \Delta Y_{t-1} + e_{t-1} \dots \dots \dots (v)$$

The hypothesis being tested is

$$H_0: \beta = 0$$

$$H_1: \beta < 0$$

The test can be used to test the order of integration for a variable generated as a stochastic process with a drift and / or deterministic trend.

For the case of ascertaining if stock prices follow a random walk, accepting the null hypothesis means that stock prices follow a random walk and any shocks to the system will be explosive. This confirms that future stock prices cannot be predicted from past stock prices, which means that the stock market is weakly efficient.

Alternatively, rejecting the null hypothesis implies that stock prices do not follow a random walk and economic agents can predict future prices from prices from price from past prices. The conclusion in the case is that the market is not weakly efficient.

TESTING FOR STATIONARITY

UNIT ROOT TESTS IN LEVELS

VARIABLE	Lag Length	DF	ADF	ORDER OF INTEGRATION
LNSE	2	0.63553	-2.3409	I > 0
LM1	2	-1.5937	-4.8643	I > 0 ⁹
TB.RATE	2	-1.6551	-2.4940	I > 0
LEX.RATE	2	-0.6433	-2.6688	I > 0
INFLATION	2	-1.1732	-2.5760	I > 0
US TB RATE	2	-0.35304	-0.93947	I > 0
Critical values at 5%		-2.904	-3.475	
Critical values at 1%		-3.528	-4.095	

NOTES

1. Regression equations for the DF test included a constant while the ADF test included a constant and trend
2. The ADF test included two (2) lags
3. All the variables are non- - stationary (integrated of order greater than zero) both at 1% and 5% levels of significance.

⁹Refer to the graphical representation in the appendix

On further investigations on the graphical representation in the appendix, money supply (M1) rate is found to be an $I > 0$ process. On the other hand, NSE Index, Exchange Rate, Domestic and Foreign interest rates are non-stationary series in levels. This is because the t -calculated is less than t -critical

The null hypothesis of non-stationarity is accepted at 5 %. In order to ascertain the actual level of integration of these variables, unit root test was performed on the first differences of the non-stationary variables and the results are given below. The DF test shows that the first differences of these variables are stationary at both 1% and 5 % levels of significance. The ADF tests show similar results. Since differencing once produces stationarity, we can conclude that these variables are of order one ($I \sim I(1)$). From the results these variables are confirmed to be integrated of order 1

UNIT ROOT TESTS OF THE FIRST DIFFERENCES

VARIABLE	Lag Length	DF	ADF	ORDER OF INTEGRATION
DLNSE	2	-6.3745	-6.8462	I (0)
DLM1	2	-7.3410	-7.4966	I (0)
DLTB.RATE	2	-3.8900	-3.8588	I (0)
DLEX.RATE	2	-4.2827	-4.2485	I (0)
DINFLATION	2	-5.3935	-5.4992	I (0)
DLUS TB RATE	2	-2.7828(-3.9227)	-3.3303(-4.1413)	I (0)
Critical values at 5%		-3.528	-3.476	
Critical values at 1%		-2.904	-4.097	

NOTES

1. Regression equations for the DF test included constant. The ADF test included a constant and trend
2. The DF and ADF tests included two (2) lags except for US TB Rate equation which had lag 1 with corresponding critical value in parenthesis

Testing for Cointegration

The concept of cointegration implies that if there is a long - run relationship between two or more non-stationary variables, deviations from this long - run are stationary. Variables are said to be cointegrated if they are integrated of the same order and if a linear combination of these variables assumes a lower order of integration.

Testing for Cointegration involves two steps:-

- I. Testing for the order of the variables involved in the postulated long - run relationship. If they appear to have a unit root, then a model based on these variables (Non - stationary) in levels is estimated by OLS to obtain the residuals.
- II. Testing for stationarity (order of integration) of the residuals generated in the step (I) above. If stationary is not rejected, formulate an error correction model (ECM)

The DF and ADF test procedure for evaluating the order of integration of the residuals is the same as explained before. The tests are based on estimation of the equation below

$$\Delta e_t = \beta e_{t-1} + V_t$$

In both cases, the hypotheses to be tested are:

$$H_0: \beta = 0 \text{ (No Cointegration)}$$

$$H_1: \beta < 0 \text{ (Cointegration)}$$

The t static of the coefficient of e_{t-1} using both version of DF and ADF test to determine whether the variables are cointegrated or not. If the computed t- value is less than the critical t, then cointegration is accepted.

Cointegration Results

$$\text{NSEIND} = \alpha_0 + \alpha_1 \text{TBRATE} + \alpha_2 \text{EX.RATE} + \alpha_3 \text{US TB RATE} + \alpha_4 \text{INFLATION} + e_t$$

Was estimated and the residual tested for stationarity. Here,

$$e_t = \text{NSEIND} - \alpha_0 - \alpha_1 \text{TBRATE} - \alpha_2 \text{EX.RATE} - \alpha_3 \text{US TB RATE} - \alpha_4 \text{INFLATION}$$

Secondly, since money supply and exchange rate should move together according to theory, there is a chance of cointegration between the two variables. Money supply, (M1) was regressed on exchange rate i.e.

$$M1 = \alpha_0 + \alpha_1 \text{EX.RATE} + u_t$$

$$\text{Where } u_t = M1 - \alpha_0 - \alpha_1 \text{EX.RATE}$$

The residual (u_t) was also tested for stationarity and results obtained are given as below:

Unit root test for the residuals

VARIABLE	Lag Length	DF	ADF	Accept / Reject Cointegration
e_t	2	-2.2482	-2.9120	Reject
u_t	2	-2.9324	-3.0775	Reject
Critical values at 5%		-3.527	-3.475	
Critical values at 1%		-2.904	-4.095	

The residuals are not significant at 5 % depicting that there is no long-term relationship among NSE index, Domestic TB rate and U.S TB rate. Likewise money supply and the exchange rate have no long-term relationship. Therefore the error correction model is not adopted with the residual term u_t used as Res1.

The specified error correction model that includes the Res1 is written as follows:

$$DNSEIND = \alpha_0 + \alpha_1 DNSEIND_{t-n} + \alpha_2 DM1_{t-n} + \alpha_3 DTB.RATE_{t-n} + \alpha_4$$

$$DEX.RATE_{t-n} + \alpha_5 DINFL_{t-n} + \alpha_6 DUS TB RATE_{t-n} + DINFLATION_{t-n} + e_t$$

4.2.2 OVERPARAMETERISED MODEL

Modelling DLNSE_IN by OLS

The present sample is: 1996 (6) to 2001 (12)

Variable	Coefficient	Std.Error	t-value	t-prob
Constant	-0.013416	0.010799	-1.242	0.2219
DLNSE_IN 1	0.10140	0.15942	0.636	0.5287
DLNSE_IN 2	-0.0045730	0.15789	-0.029	0.9771
DLNSE_IN 3	-0.12691	0.13760	-0.922	0.3623
DLNSE_IN 4	0.20200	0.14577	1.386	0.1741
DLM1	0.14941	0.19980	0.748	0.4593
DLM1 1	0.062482	0.26984	0.232	0.8182
DLM1 2	0.48596	0.24737	1.964	0.0570
DLM1 3	-0.033548	0.27799	-0.121	0.9046
DLM1 4	-0.32246	0.27771	-1.161	0.2530
DTB RATE	-0.28666	0.49484	-0.579	0.5659
DTB RATE 1	0.37503	0.51662	0.726	0.4724
DTB RATE 2	-1.1197	0.53251	-2.103	0.0424
DTB RATE 3	0.50407	0.58196	0.866	0.3920
DTB RATE 4	0.24661	0.42899	0.575	0.5689
DEX.RATE	-0.00056	0.0036	-0.154	0.8787
DEX.RATE 1	0.0054	0.0045	1.198	0.2385
DEX.RATE 2	-0.0027382	0.00451	-0.607	0.5474
DEX.RATE 3	0.0013	0.004	0.295	0.7697
DEX.RATE 4	-0.0014311	0.0047	-0.303	0.7639
DINFLATI	-0.28900	0.29450	-0.981	0.3328
DINFLATI 1	0.16378	0.29326	0.558	0.5799
DINFLATI 2	0.42994	0.31434	1.368	0.1796
DINFLATI 3	0.33918	0.31143	1.089	0.2832
DINFLATI 4	-0.057041	0.34152	-0.167	0.8683
DUS TB R	-0.43108	3.3705	-0.128	0.8989
DUS TB R 1	3.1248	3.6560	0.855	0.3982
DUS TB R 2	-2.8135	3.5987	-0.782	0.4393
DUS TB R 3	-0.033018	3.2318	-0.010	0.9919
DUS TB R 4	0.10030	2.9537	0.034	0.9731

$R^2 = 0.497101$ $F(29, 37) = 1.2612$ [0.2504]

$\hat{\alpha} = 0.0381636$ $DW = 2.05$

RSS = 0.0538890012 for 30 variables and 67 observations

AR 1- 5F(5, 32) = 0.40268 [0.8433]

ARCH 5 F(5, 27) = 0.5021 [0.7719]

Normality Chi²(2) = 1.7821 [0.4102]

RESET F(1, 36) = 3.7055 [0.0622]

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25

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4.2.3 PARSIMONIOUS MODEL

Modelling DLNSE_IN by OLS

The present sample is: 1996 (6) to 2001 (12)

Variable	Coefficient	Std.Error	t-value	t-prob
Constant	-0.013745	0.0047849	-2.873	0.0056
DLNSE IN 4	0.19904	0.10952	1.817	0.0742
DLM1 2	0.51250	0.14252	3.596	0.0007
DTB RATE 2	-0.56126	0.24468	-2.294	0.0254
DTB RATE 4	0.67975	0.23906	2.843	0.0061
DEX.RATE 1	0.0017097	0.0024922	0.686	0.4954
DINFLATI	-0.39430	0.21022	-1.876	0.0657
DUS TB R 1	1.8279	1.8914	0.966	0.3378
$R^2 = 0.357754$ $F(7, 59) = 4.695$ [0.0003] $\hat{\sigma} = 0.0341534$ DW = 1.71				

AR 1- 5F(5, 54) = 0.49009 [0.7822]
 ARCH 5 F(5, 49) = 0.44697 [0.8134]
 Normality Chi²(2)= 4.678 [0.0964]
 Xi² F(14, 44) = 0.72188 [0.7412]
 Xi*Xj F(35, 23) = 0.59302 [0.9204]
 RESET F(1, 58) = 1.0314 [0.3140]

The diagnostic tests whether the model tracks the data or not among the tests considered include autocorrelation (AR), Autoregressive Conditional Heteroscedasticity (ARCH), the Jarque-Bera normality of the distribution of the residuals and functional form mis-specification (Ramsey's RESET test).

From the above tests, the model tests are not significant starting with AR for autocorrelated residuals. This shows that there is no autocorrelation as F-

The **ARCH** (Autoregressive Conditional Heteroscedasticity Test) indicates absence of heteroscedasticity that is it does not reject the hypothesis that conditional variance of the estimated model is not related to the size of its past errors. Heteroscedasticity is absent at 5% significance level as F-calculated is less than F-critical (2.37) and (3.34) at 1% level of significance.

Normality Test indicates that the error term is normally distributed is less than chi-square critical (5.99) at 5 % significance level and Normality of the error is necessary for the efficiency and consistency of the OLS estimates to hold.

Reset shows that the model is correctly specified as linear. F-calculated is less than F-critical (4.00) and (7.08) at 1% level of significance.

The test outcomes are satisfactory and consistent with the equation estimated. We now proceed with discussion of results under assumption of best linear unbiased estimates with residuals being white noise process.

The results above show that the variables account for about 36 % of variations in returns on the Nairobi Stock Exchange between 1996 January and 2001 December. The issue of efficiency is important as it has implications on the behavior of stock prices. The stock price movements show some evidence of randomness and that future information inflow is random. $DLNSE_IN_1$ is not significant in determining stock returns in the subsequent period $DLNSE_IN$. This means that consistently good predictions will only be possible on the basis of access to information prior to other economic agents.

A priori, as it is expected that the stock market index is positively related to the exchange rate and foreign interest rates (US TB₁) and negatively related to the domestic interest rates (TB₂). This means that economic agents seek arbitrage between the differing rates of return on equities and the risk free rates of return available. For the exchange rate, a rise (depreciation) will boost the profitability of domestic producers of tradeables (exports and import substitutes) Vis - a - Vis foreign competition.

Higher interest rates are typically expected to depress the stock market index whether through a substitution effect (the improved attractiveness of interest bearing instruments vis -a - vis shares), an increase in the discount rate - hence a reduced present value of future expected profits-or a depressing effect on future expected profits through investment. This is shown by the negative coefficient of the Treasury bill rate on the share prices on the NSE.

Changes in money supply relate positively to the stock prices. This is because it affects the equilibrium position in the portfolio of assets held by investors. Inflation measures the yield forgone on physical assets, which have a positive relationship with inflation. Since shares represent ownership of income generating real assets, they act as a hedge against inflation and the empirical evidence confirms that share prices appreciate with inflation.

CHAPTER FIVE

5.0 DATA: TYPE AND SOURCES

This study uses time-series data, covering the period 1996-2001 on a monthly basis. Some of the main variables used in the study include the NSE 20 share index, stock prices, inflation rates and other economic variables relevant for the study.

Sources of the data include the NSE, Capital Markets Authority, Central Bank of Kenya, and International Finance Corporation Statistics.

5.1 THE SAMPLE

The study focuses over the period 1996 – 2001. The choice of this period for analysis is that the previous periods are characterized by incomplete price observations.

The study will use monthly data to analyze risk and return factors.

A sample of 20 companies from the total of 56 companies quoted in the case of capturing the variables that affect the NSE 20-share index on the Nairobi Stock Exchange will be studied. In the case of variables affecting return factors, 32 shares will be used. The shares of these companies must have been actively traded over the sample period to give precise results for the various tests. Another criterion for the selection of these companies is that the company must have been quoted on the bourse by June 1996 to December 2001.

5.3 LIMITATIONS OF THE STUDY

One of the limitations of the study relates to sample size. The study uses sample size of 20 stocks due to the low number of companies quoted on the Nairobi Stock Exchange, especially on testing the sensitivity of the index to economic fundamentals.

A more comprehensive analysis would have involved the use of data of a long period of time and included dividend payment streams and foreign shareholders business plans. However this would be an expensive endeavor given the high cost of obtaining information.

The NSE index has been observed to have some statistical anomalies and this may bias the results of this study. Re-computing the index is outside the scope of this study.

CHAPTER 6

POLICY RECOMMENDATION AND CONCLUSIONS

Based on the conclusions of the study the following policy recommendations are suggested.

The stock market is sensitive to changes in macroeconomic variables and any adverse changes in these variables causes imbalances in the stock market and influences its efficiency. The study finds foreign interest rates, domestic interest rates and money supply as variables with the largest impact on stock prices. This calls for a stable macroeconomic environment should be maintained through appropriate demand management practices.

The government should build financial infrastructure to attract international portfolio investment and must be clear about the importance of creating some basic preconditions for viable capital markets.

There is a need to integrate the NSE with the global financial system by the regulatory authorities enforcing the various regulations on securities to raise domestic and foreign confidence. This should include reviewing primary and secondary market regulations on new issues including disclosure, accounting, listing standards, surveillance and supervision to maintain high global standards.

The government should provide fiscal incentives such as differential taxation in favor of listed companies. Such incentives would help increase the number of listed companies on the exchange and improve liquidity of the market. The establishment of a centralized clearing and settlement system sooner than later to

improve substantially the present system and cut costs of transactions on the exchange.

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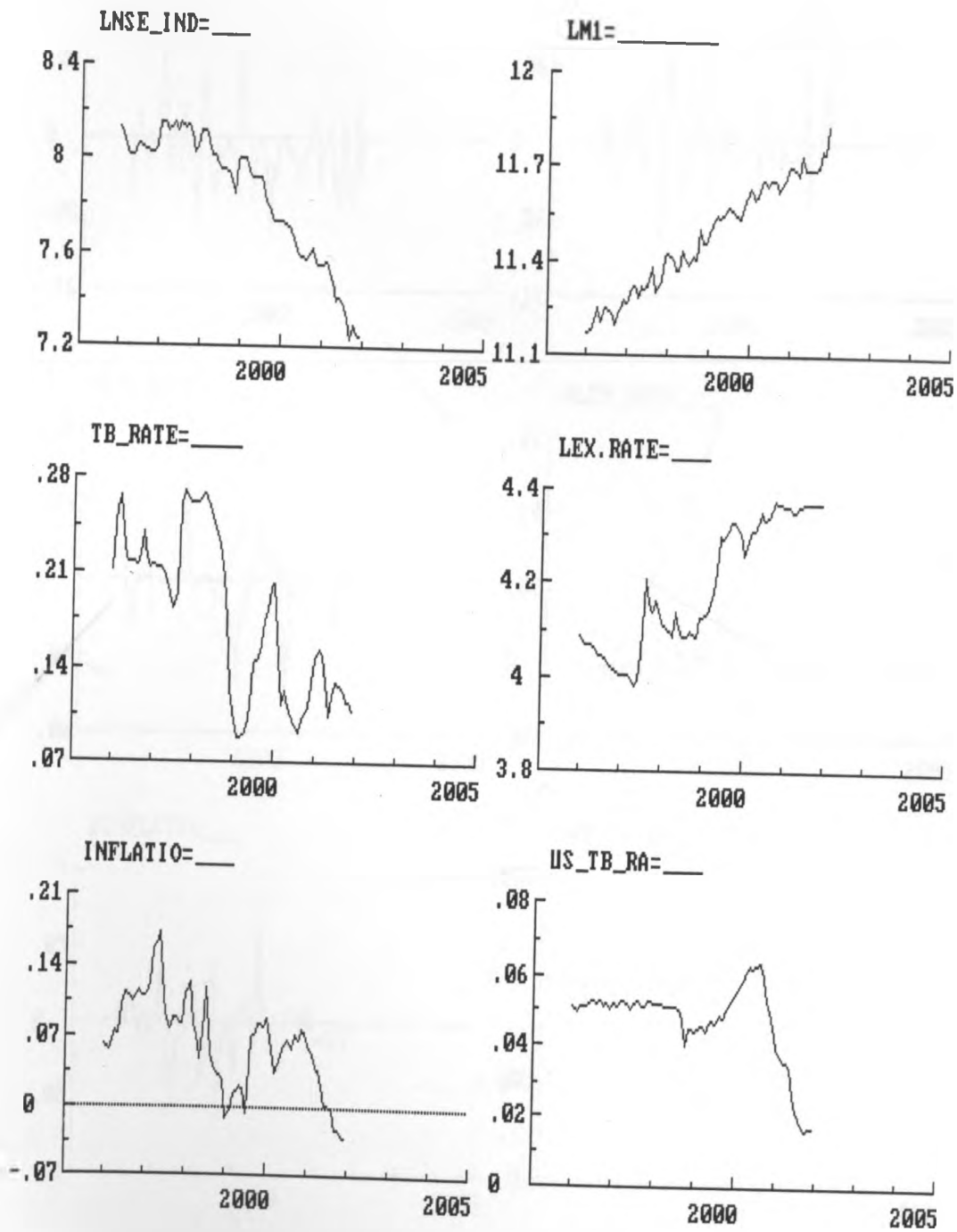
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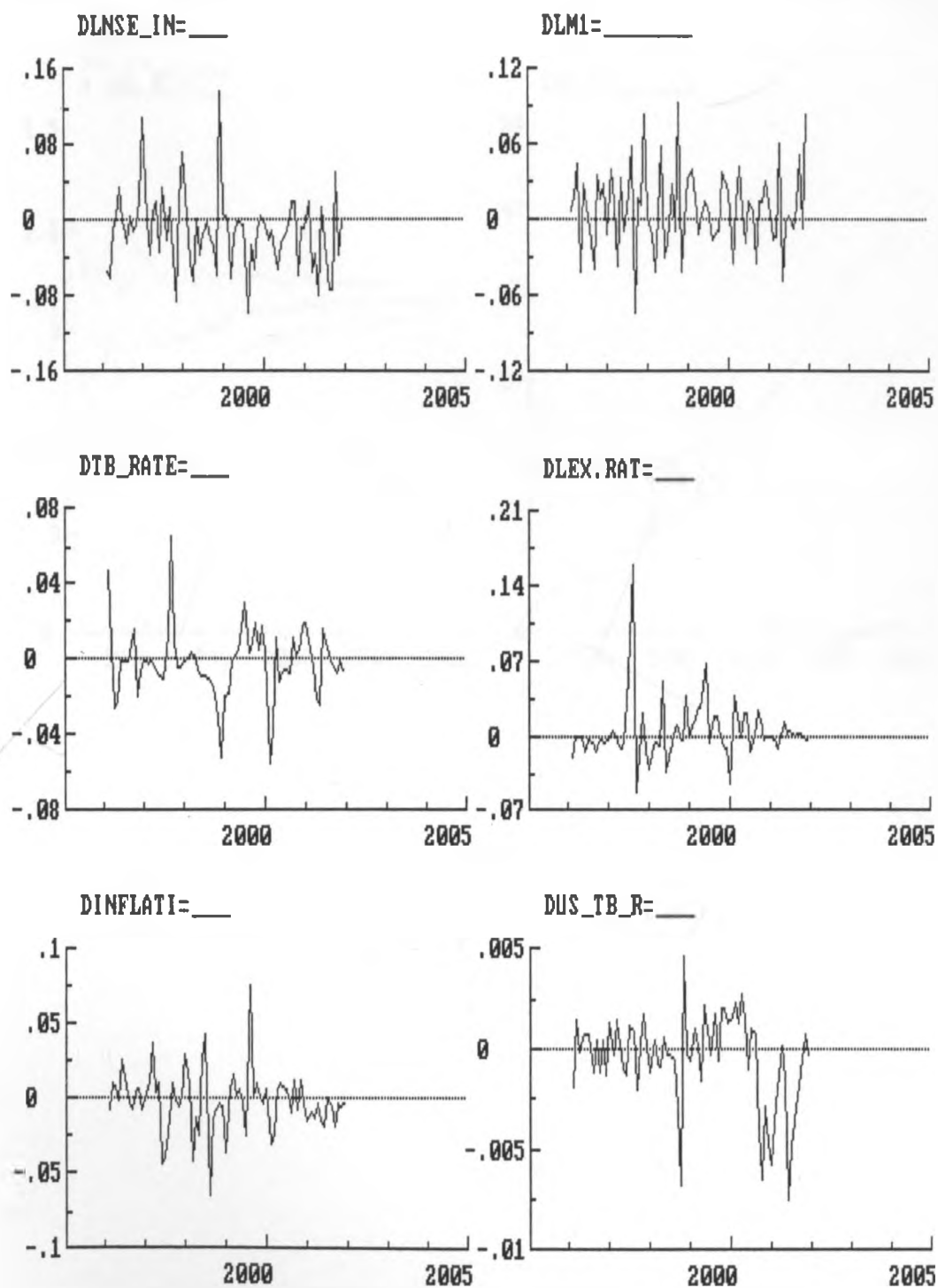
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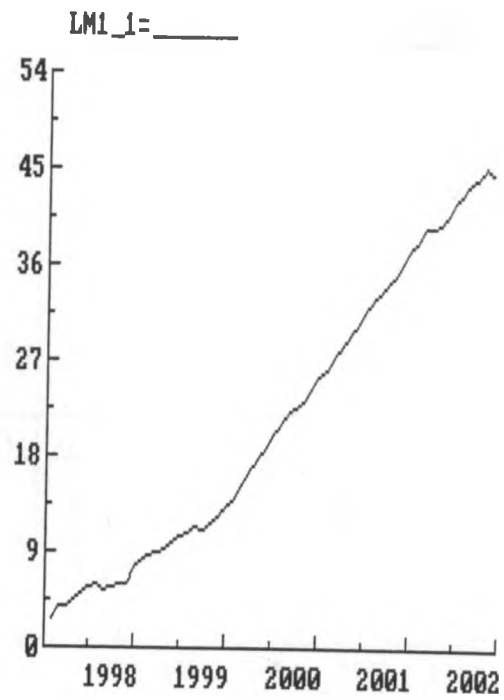
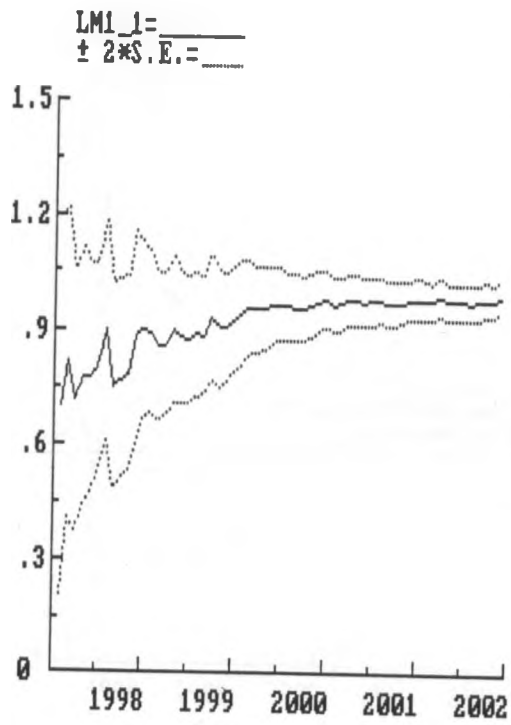
GRAPH 1: VARIABLES IN LEVELS



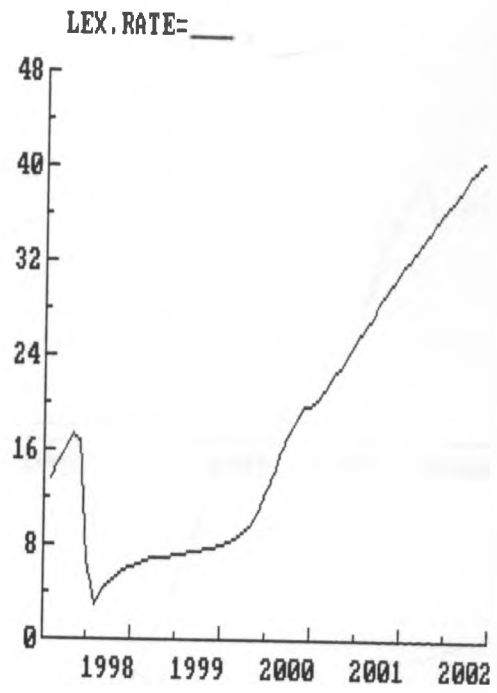
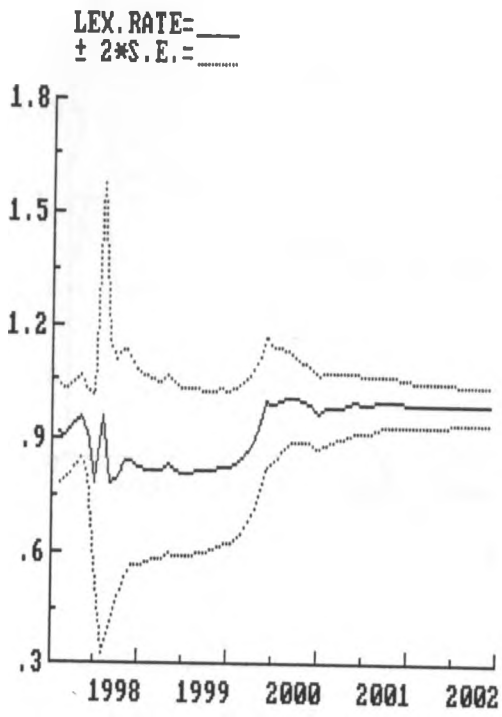
GRAPH 2: VARIABLES IN FIRST DIFFERENCES



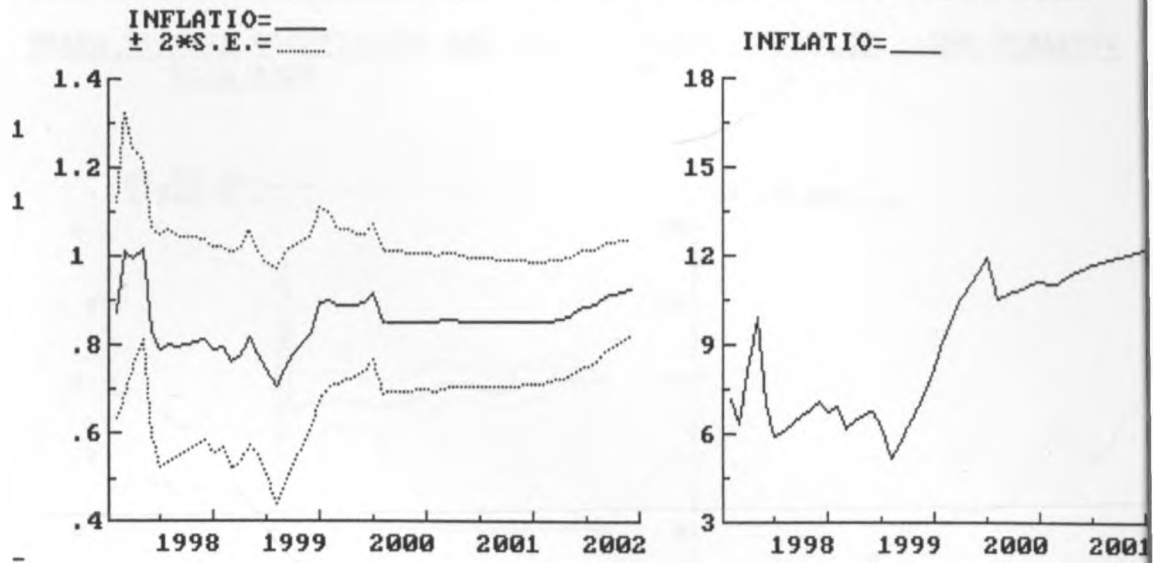
GRAPH 3: BETA COEFFICIENTS AND BETA t VALUES FOR MONEY SUPPLY - M1



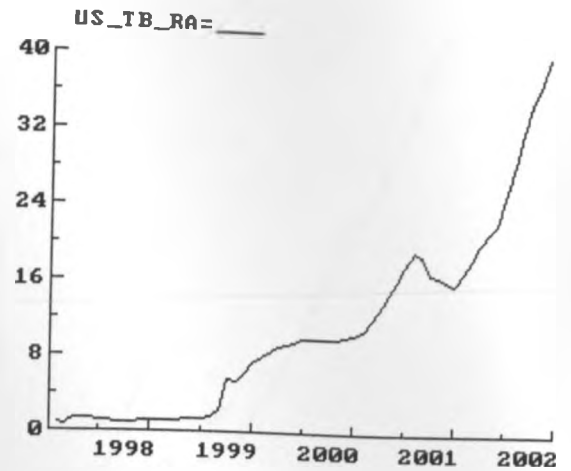
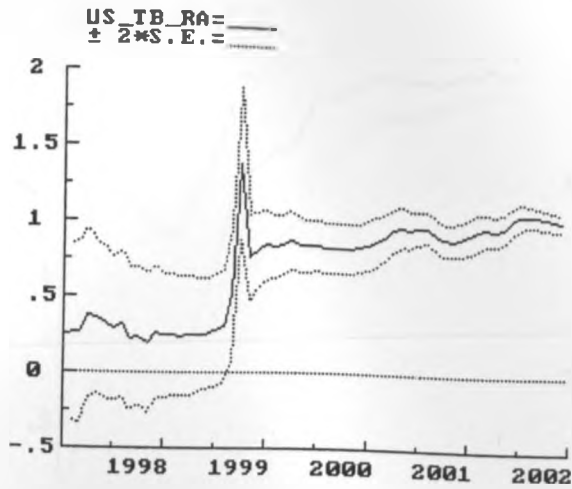
GRAPH 4: BETA COEFFICIENTS AND BETA t VALUES FOR EXCHANGE RATE



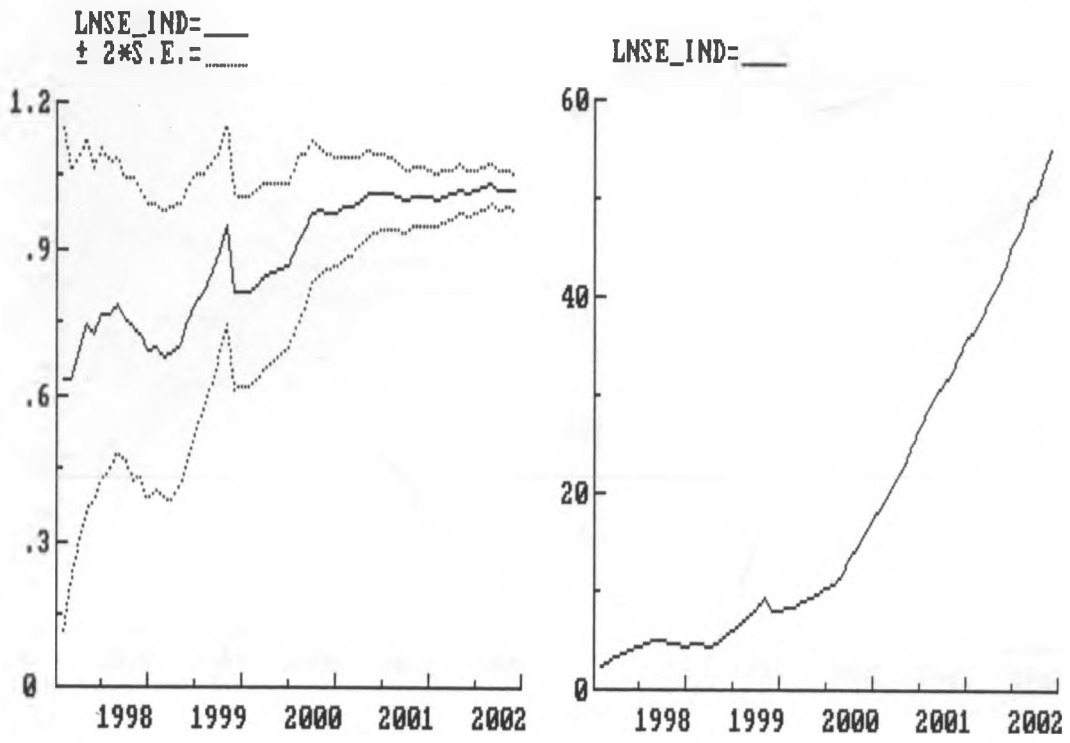
GRAPH 5: BETA COEFFICIENT AND BETA t VALUES FOR DOMESTIC INFLATION



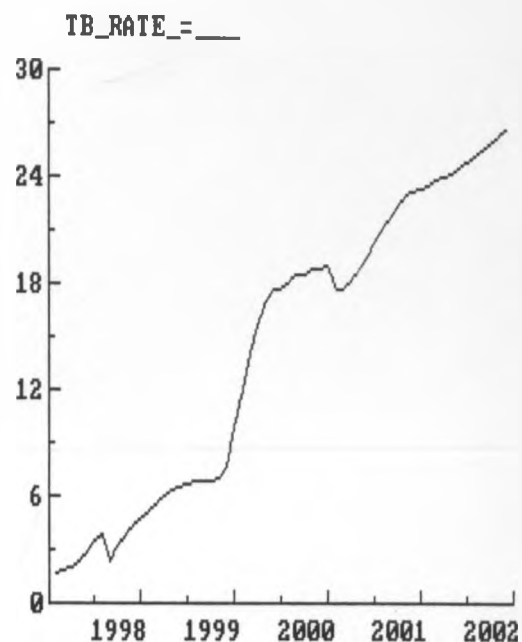
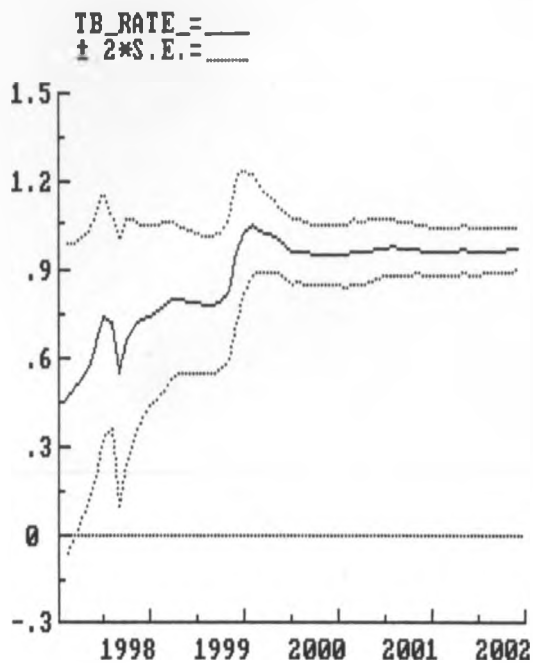
GRAPH 7: BETA COEFFICIENT AND BETA t VALUES FOR US 90 - DAY TREASURY BILL RATE



GRAPH 8: BETA COEFFICIENT AND BETA t VALUES FOR NSE INDEX



GRAPH 9: BETA COEFFICIENT AND BETA t VALUE FOR DOMESTIC 91 - DAY
TREASURY BILL RATE



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