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NAIROBI STOCK EXCHANGE

A Regression of Factors Affecting Stock Prices

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Full Length Research Paper

Nairobi Stock Exchange: A Regression of Factors Affecting Stock Prices

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This paper analyzed factors influencing the market index for the Nairobi Stock Exchange (NSE), taking a time horizon between January 2008 to December, 2010. We posit that money supply, inflation rates, exchange rates, and interest rates are significant covariates affecting the market index. The market index and the macroeconomic covariates data was obtained from the NSE and the Central Bank of Kenya. Multiple regression analysis was used to estimate the effects of the chosen factors that affect stock values, with the market index being the indicator variable for stock values. Regression analysis results revealed that the selected macroeconomic covariates - interest rates, exchange rates and inflation - significantly affect the value of stocks in the NSE. Money supply was not significant even though it had a positive correlation with the stock prices. Factor regression models described the sensitivity of an asset return as a function of one or more factors. Based on our analyses, we conclude that traders should constantly review the prevailing economic conditions, based on the patterns of the determinant macroeconomic factors identified in this study, to model their investment strategies. The scope of our study being limited to NSE and four macroeconomic factors, the findings of this paper may not be directly applicable to other financial markets. We therefore suggest future research directions to extend to other financial markets and include all macroeconomic factors.

Key Words: Nairobi Stock Exchange, Interest Rates, Inflation Rates, Money Supply, Foreign Exchange Rates, Market Index.

INTRODUCTION

According to Monther and Kaothar (2010), stock exchange market indices can be affected by microeconomic factors. Therefore, stock prices normally vary according to the macroeconomic changes. Higher demand than supply for particular socks automatically dictates a rise the associated stock's market price, the converse is true.

Changes in stock prices and the associated trends have always been of keen attention in the investment decision making. The changes, also referred to as volatility by econometricians, impacts stock market stability and affect strategies implemented by traders (Wang, 2010). Understanding why costs shift up and down is imperative to investors. According to prior empirical studies, various factors underlie the stochastic changes in the stock prices normally observed in stock

markets. A plethora of econometric models have been utilized to describe this changes by purely focusing on the stock returns in a technical analysis approach and yet, few studies have considered a conceptual review of those factors considered by fundamental analysis – the macroeconomic and microeconomic factor. Fundamental analysts use prevailing economic information to predict financial market movements while technical analysts use mathematical models. From another perspective, other models like the Arbitrage Pricing Model (APT) suggested by Wang (2010) can be applied to calculate stock prices for describing financial dynamism and yet, the model does not coherently consider the multifaceted nature of stock market environment.

The Arbitrage Pricing Theory (APT) postulates that the expected profits from an economical resource can be

presented as a straight line operation of various theoretical indices of both markets and macro-economic factors. It is believed that the factors considered are sensitive to changes showed by factor-specific coefficients. However, the APT is unlike the Capital Asset Pricing Model (CAPM) which estimates an asset's systematic investment risk using one factor. The major restriction with APT is that the factors used in the model are not known in advance and have to be calculated by mathematical or econometric analysis (Dubravka and Petra, 2010). Chen et al. (2011) examined company factors particularly the microeconomic factors which involve industry beta, company size, and income to explain the dynamics of stock prices. Moreover, they examined the macroeconomic factors to explain stock returns. This study aims at looking into macroeconomic factors that influence the prices of the stock in the NSE using a multifactor regression model. Unlike econometric technical analyses of volatility, APT model and CAPM model, this study fills the research gap of describing how those factors used by fundamental analysts can be regressed to determine their contingent effect on the market index of stock markets. The resultant model can be used to predict market indices based on the prevailing values of the macroeconomic covariates –interest rate, money supply, inflation rates and foreign exchange rates. However, the consideration of efficient market hypothesis is beyond the scope of our study.

Statement of the problem

The stock markets provide important information for traders to enable them create an efficient procedure to trade their equity holdings (Monther and Kaothar, 2010). However, equity traders are confronted with dilemma circumstances when making decisions of either going short or long on their holding position because of risk posed by stochastic stock price movements. Therefore, they are obligated with an onus of consistently assessing the contingent factors affecting their respective equities and the market risk. Accordingly, the information provided by the stock exchange markets provides a firm basis for analysis to determine relative performance for the companies of interest and whole market in general.

Financial security symbolizes an expected payment resulting from the future cash-flows whose value depends on the objectives of the amount of transaction and an assessment of the risks involved. The objectives and assessment indicate both the information available and the conclusions people draw from such information. Investors believe that information has a direct impact on the actual stock prices. A very unstable financial market environment causes uncertainty among capital investors, especially the ones who are risk averse. The changes in stock prices and the pattern of those changes have always been of attention in the investment industry given

their impacts on the stock market balance and techniques implemented by various investors (Wang, 2010).

The NSE, like most financial markets has experiences extreme events of abnormal market movements. A good example is the case such of the last six months of the year 2011. The NSE 20 Share index recorded an abnormal variation from 4495 points to 3733 points with industry capital decreasing from Sh1192.28 billion dollars to Sh1049.56 billion dollars (NSE, 2011). Between the years 2008 to 2010 the NSE 20 Share Index saw a difference of between a higher of 5444 points to a low of 2800 points. The changes in stock prices and the pattern of changes are always acts as the base of interest in the entire financial markets because their impacts affect investment strategies (Wang, 2010). Logical investors will have some attention on tracking the general and specific factors having in mind their investment strategies. This study therefore seeks to investigate and examine the factors that drive the NSE and can be used to provide a basis of making decisions for both individual investors and policy makers.

Research Objectives

The main aim this study was to analyze the macroeconomic factors that impact stock prices in the NSE in view of the following specific objectives;

- 1). To analyze the impact of changes in inflation on the price of stocks listed in the NSE
- 2). To assess the impact of changes in interest levels on stock values for detailed companies
- 3). To analyze the impact of volatility of exchanges rates on the price of stock for companies detailed in the NSE.
- 4). To assess the impact of money supply on stock values for detailed companies.

Literature Review

Investors are always interested in evaluating financial risk through analysis of both unsystematic and systematic risk (Dubravka and Petra, 2010). Systematic risk, also called market risk, pertains to the changes in the macroeconomic environment whereas unsystematic risk is specific to a firm and focuses on the microeconomic factors surrounding that firm such as change of CEO, profits and losses, mergers and takeovers among others. Factors affecting stock prices are usually modeled with the risk which cannot be avoided by diversification, also known as the systematic risk. This is attached to the Arbitrage Pricing Model (APT) which presented several factors that were assumed to affect the stock prices initially.

The reasoning of the APT Model is that there is no single component that explains risk and return connection. The APT theory postulates that the expected return from an economical resource can be presented as a straight line function of various theoretical market and

macro-economic factors. It is regarded that the factors affecting stock prices are sensitive to changes showed by their regression coefficient beta. On the other hand, others have examined firm-specific microeconomic factors such as industrial production, company size, and equity earnings and using their amount and book-to-market equity to describe stock returns. To this end, such are regarded as the fundamental factor of the investment risk. Dubravka and Petra (2010), in their notable work in United States, examined macroeconomic economic factors using monthly data to investigate their effect on US company stock values. The factors used in their research were interest rates, industrial output, term structure, market index and consumption, risk premium, and oil prices. The writers found that the factors had an important effect on stock prices with interest rates showing significant relationship particularly in periods of high movements.

Several researchers have used several factors from twelve developing countries to examine the effects of the macroeconomic factors on stock returns. The research determined that most of the selected factors had the ability to estimate stock prices. In their research, Dubravka and Petra (2010) performed a study in the French capital markets to examine the connection between changes in macroeconomic factors and stock profits using industrial production, market index, inflation rates, interest rates, and oil costs factors. The research determined that market index had the most important effects and inflation had adverse impacts on the stock returns. Interest rates, industrial production and oil costs were also noticed to have a significant effect on the stock returns.

Cheng et al. (2011), in their research covering electronic sectors in Taiwan, determined that the factors of commercial manufacturing, money supply (M2) and return amount were important and that they had a beneficial effect on stock values. However, in a relative research, they noticed that non macroeconomic factors had a stronger predictive power than the macroeconomic factors. The non-macroeconomic factors included in their research were presidential election disputes, natural disaster, financial crisis and epidemic disease. Wang (2010) carried out an empirical research on factors affecting changes in stock prices and found out that such changes are mainly affected by interest rate, exchange rate, macroeconomic prosperity index, corporate goods price index and consumer price index. In the course of the literary review, empirical evidence available for Kenya concerning the effect of macroeconomic factors on stock values for firms trading to NSE was very rare. In this regard, the inspiration for the research was debunked. The paper is purposed to give an understanding into financial commitment and operation strategies for players in the Kenyan economical industry.

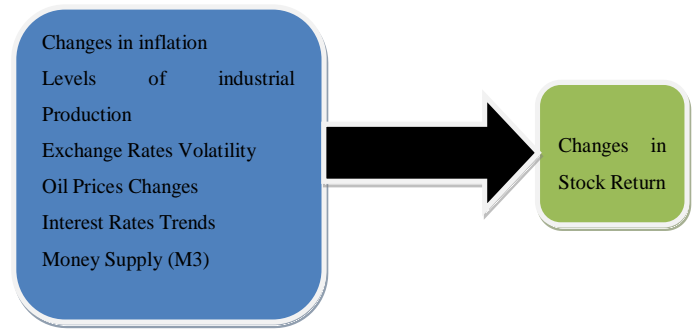


Figure 1: Theoretical framework

Theoretical Framework

Based on the literature review above the following theoretical framework is derived as shown in figure 1.

RESEARCH METHODOLOGY

Research Design

An econometric research design was applied by fitting a liner regression model for the market Index (MI) as a dependent variable and the four chosen macroeconomic factors as independent covariates. This model provided information on the relationship between the selected covariates and the NSE 20 Share Index.

Data Sampling and Sample size

The sample used in the research includes monthly data for the identified factors and NSE 20 Share Indices from Jan, 2008 to Dec, 2010 interval for the companies listed in the NSE. The interval is chosen so as to use the latest information, to make the results more current. This study used secondary data obtained from NSE and the Central Bank of Kenya (CBK). The following are the variables of interest;

Empirical Model

The Multiple Regression Model for the selected macroeconomic covariates and market index is as follows:

$$M_i(t) = \beta_0 + \beta_1 INF_i(t) + \beta_2 EXRATE_i(t) + \beta_3 INT_i(t) + \beta_4 MS_i(t) + \epsilon_i(t)$$

Where:

$M_i(t)$ = return for stock i

β_0 = constant term

β_1 = refers to the stock sensitivity to inflation rate i

β_2 = sensitivity of stock i to monthly change in exchange rate

β_3 = sensitivity of stock i to monthly change in interest rate

β_4 = sensitivity of stock I to monthly change in money

$\epsilon_i(t)$ = the error term

Table 1: Correlation coefficients matrix of the variables

		MI	INF	EXRATE	INT	MS
Pearson Correlation	MI	1.000	.025	-.558	-.345	.076
	INF	.025	1.000	-.531	.723	-.844
	EXRATE	-.558	-.531	1.000	-.501	.587
	INT	-.345	.723	-.501	1.000	-.790
	MS	.076	-.844	.587	-.790	1.000
Sig. (1-tailed)	MI	.	.443	.000	.020	.329
	INF	.443	.	.000	.000	.000
	EXRATE	.000	.000	.	.001	.000
	INT	.020	.000	.001	.	.000
	MS	.329	.000	.000	.000	.
N	MI	36	36	36	36	36
	INF	36	36	36	36	36
	EXRATE	36	36	36	36	36
	INT	36	36	36	36	36
	MS	36	36	36	36	36

Operationalization of Variables

The market index is used in this study belongs to the NSE 20 Share Index. It is made up of shares from twenty companies. The sequence of indices for each month is measured by calculating the daily prices at the NSE for all the twenty companies. The monthly change in NSE 20 Share Index is measured by the using:

$$MI(t) = \log NSE(t) + \log NSE(t + 1)$$

Where MI(t) is the monthly change in market index in thirty days t, NSE(t) is the market index in 30 days t and NSE(t-1) is the market index in the previous thirty days.

Inflation, on the other hand, is the change in the prices of basic commodities defined under the consumer basket as per microeconomic principals. Most studies show that inflation rates effect on stock values significantly. Based on this argument, the study forecasts that the varying of inflation rates will have variable effects on stock prices.

$$INF(t) = \log INF(t) + \log INF(t + 1)$$

Where INF(t) is the monthly change in inflation in thirty days t, INF(t) is the amount of inflation in thirty days t and INF(t-1) is the amount of inflation in the previous days.

Exchange rate is the relative change in the foreign exchange rate between KES and USD. If foreign exchange rate is high, it will have a negative effect of the domestic trade and make imports expensive, thus deteriorating the financial experience being reflected in the local financial markets. Dubravka and Petra (2010) revealed that the stock returns are adversely affected by foreign exchange rates. Cheng et al. (2011) also found that returns had a positive important effect on Taiwan electronic stock return, mainly because of being a trade centered industry, traders saw an opportunity for better profits, in case of favorable foreign exchange rates. Accordingly, the study postulates that higher foreign exchange rates will have a negative effect on stock values, Kenya being a net importer economy.

$$EXRATE(t) = \log EXRATE + \log EXRATE(t + 1)$$

Where; EXRATE (t) is the monthly change in foreign exchange rate in thirty days t, EXRATE (t) is the foreign exchange rate in thirty days t and EXRATE (t-1) is the exchange amount in the previous thirty day period.

High interest rates decrease the present value of future cash flows, thus reducing the attractiveness of investment. Dubravka and Petra (2010) found that an increase in interest rates should lead to a drop in stock prices in the Croatia Market. The accumulated amount for each thirty days is calculated as an average of daily accumulation levels.

$$INT(t) = \log INT(t) + \log INT(t + 1)$$

Where; INT(t) is the monthly change in interest rate in thirty days t, INT(t) is the interest rate in 30 days t and INT(t-1) is the interest rate in the previous thirty days based on Central bank of Kenya rates.

Money Supply is the total sum of cash available in an economy at any particular point in time. Cheng et al. (2011) found that money supply had a beneficial effect in the Taiwan electronic industry. The study estimates that the variation of cash provided above has a beneficial effect on the stock prices.

$$MS(t) = \log MS(t) + \log MS(t + 1)$$

Where; MS(t) is the per month modify in money supply in thirty days t, MS(t) is the money supply amount in thirty days t and MS(t-1) is the money supply in the past thirty days based on main financial institutions in Kenya.

FINDINGS AND DISCUSSIONS

Correlation Analysis

The Pearson correlation coefficient is measured to figure out the level of connection. The outcomes of the Pearson connection coefficients research are provided in table 1.

Table 1 table displays the correlation coefficient matrix of the change showed in the Market Index (MI) and the identified macroeconomic factors. Through the correlation matrix, it is recognizable that EXRATE (-.558) and INT (-

Table 2: Multiple Regression Results of market index on macroeconomic factors

Model	R	R Square	Adjusted R Square	Std. Error of the estimate	R Square Change	F Change	Change Statistics		
							df 1	df 2	Sig. F Change
1	.933 ^a	.870	.854	310.6320	.870	52.072	4	31	.000

a. Predictors: (Constant), MS, EXRATE, INT, INF

Table 3: Table of coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t-stat	Sig.
		B	Std. Error	Beta		
1	(Constant)	14948.100	1153.696		12.957	.000
	INF	27.976	9.306	.369	3.006	.005
	EXRATE	-138.464	11.686	-.951	-11.849	.000
	INT	-335.452	39.614	-.909	-8.468	.000
	MS	1.061	.665	.227	1.596	.121

Table 4: Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	20098015	4	5024503.871	52.072	.000 ^a
	Residual	2991259	31	96492.216		
	Total	23089274	35			

a. Predictors: (Constant), MS, EXRATE, INT, INF

b. Dependent Variable: MI

345) had a high adverse connection with stock prices in relation to other factors. The factors of INF (.025) and MS .076 had less correlation with the changes in market index. The research had however expected a greater correlation for the inflation rates but results revealed less connection. Higher correlation effect for money supply was expected and; therefore, these results verify the findings of Cheng et al. (2011).

The regression coefficients for the covariates of interest result are as shown in the Model Summary table (table 2). They reveal in overall, the factors behind the changes in stock prices among them; foreign exchange rate, interest rate, and money supply. From the value of the R-Squared, the model explained 87% of the variation in the market index (MI) which is reliable and consistent with the results of Cheng et al. (2011). Therefore, based on the value of R-Squared, this model has a powerful prediction power.

Table 3 displays the coefficients for the covariates with their associated standard errors and t-tests statistics. Notably, inflation rate and money supply are positively related to the changes in the market index. Thus higher inflation rates and money supply would imply higher market indices. On the other hand, results indicated that exchange rate and interest rates were negatively associated with the market index. Therefore, increased interest and foreign exchange rates would imply lower market indices in an inverse proportional relationship.

Except for money supply, all the other factors were significant at 5% significance level.

Analysis of Variance (ANOVA) is showed in the AVOVA table 4; revealing the F-statistic values of the whole regression model was 52.075 df (4, 31) p-value < .05. The sig value produced by the model was .000 indicating that the factors were important in impacting the stock values, and therefore we agree to the speculation presented (H1).

CONCLUSION

The variability of the inflation had little significant correlation and was inconsistent with the prediction of market indices. The study showed that in the case for NSE, the actual practice is contrary to the expectation of adverse correlations. Ideally, the rise in the interest rates is expected to decrease the expected cash inflows from investments; hence traders who own some asset are exposed to potential reduction of the real value of the stock due to inflation. The tendency would be to shy away from stock investment strategies as inflation surges.

In general, among all the macroeconomic factors investigated, exchange rate has the most significant effect on stock prices. When the foreign exchange rate improves, it encourages foreign exchange inflows which improve assets holding to more investment strategies, and enhances activity in the stock market. Further,

favorable foreign exchange rates improve investor confidence, hence attracting more foreign exchange inflows, as opposed to irregular movements which subject to market risk. Prospective investors are attracted to other areas where balance can be assured.

The interest rate also had an important adverse effect on the stock values. When the interest amount increases, saving becomes more attractive, leading to some of the income being channeled away from the stock market to bank deposits. This has the effect of depleting requirement for the stock and naturally reduced their values. High interest rates also decrease the present value of future investment strategies, therefore; lowering the attractiveness of an investment option. This study confirms Dubravka and Petra (2010) results. The variability of the money supply had a significant effect which supports the finding of Cheng et al. (2011). When money supply is decreased, interest rates improve; hence traders will save their cash and increase their desire for investing, increasing stock demand leading to higher stock prices. Money supply in the Kenyan economy increased over the period during which the research was carried out. Although the improvement had a mild significant correlation, this was insignificant as confirmed by the regression coefficients result showing sign .121at $P < .05$.

Recommendation

The following are recommended based on the study findings;

Inflation should be maintained at low stages. A rise in the prices for commodities defined under the consumers' basket reduces the expected cash influx from a financial commitment. As result, investors who own fixed income assets are exposed to potential reduction of the real value of the asset they hold due to inflation. To motivate financial commitment and growth of the financial industry, inflation should be kept at the minimum. Although the study showed a positive correlation, this could have resulted from industry impurities.

There should be a deliberate plan structure aimed to create favorable foreign exchange rates to offer stability to the national foreign exchange. This will bolster investor confidence, attract more foreign exchange inflows and with the increased liquidity activity will be enhanced at the stock market. Foreign exchange should have some stage of control to protect the local foreign exchange.

Studies have shown that high costs decrease the present value of future financial investment strategies and therefore decrease attractiveness of financial investment. It is recommended that a plan to manage prices should be put in place. This plan structure will offer for a mechanism to regulate prices with a view to retaining stages attractive to financial investment strategies.

When money supply is decreased prices increase, hence traders will save their cash and decrease the desire to invest. The stage of money supply should be sufficient to motivate financial investment strategies. But there should be a tradeoff because excess offer will trigger inflation which will have a counterproductive effect in the economy.

Limitations and future research

This study considered only four macroeconomic factors that are conceptually associated with the stock prices: money supply, interest rates, foreign exchange rates, and inflation. This study also considered only the financial market experience of the Nairobi Stock Exchange. Accordingly, the findings discussed in this study may not apply to other financial markets with distinct levels of market efficiency and liquidity. Therefore; we suggest future studies to assess more inclusive macroeconomic factors and replicate similar studies in other financial markets to give a universal credence for this empirical study.

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