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THE EFFICIENCY OF UGANDA'S STOCK MARKET

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A DISSERTATION SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES TOWARDS PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF ARTS (ECONOMICS), DEGREE OF MAKERERE UNIVERSITY

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DECLARATION

I Ssemuyaga Emmanuel hereby declares that the work I have presented here is solely the result of my efforts apart from the work cited by other authors and that it has never been submitted to any university or institution of higher learning for the award of a degree.

Signed …… Date ……..

CERTIFICATION

This certifies that the under-signed supervisors have read this thesis in the process of guiding the author and thereby recommend it for submission to the Directorate of Research and Graduate Training Makerere University in partial the partial fulfillment of the requirements for the award of Masters of Arts in Economics, Degree of Makerere University.

Signed …….……. Date ……..

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Signed ……. Date ……..

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DEDICATION

This work is dedicated to my beloved mother sister Sylvia Nanyanzi who gave me parental guidance to pursue this course. May the lord reward you with meaningful life.

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ABSTRACT

This study explored the efficiency of Uganda's stock market and under this; the study focused on determining the degree of efficiency and estimation of the liquidity level and derived implications towards market efficiency. This was due to high volatility and puzzle in the debate of efficient market hypothesis. Finding the nature of stock market efficiency is important for investors who seek to find out whether they can get an opportunity of making excess returns from the market.

The study used the GARCH model to determine the randomness of the distribution of the stock returns with a combination of tools that were used to analyze the results. Secondary data were obtained from Uganda securities exchange and Uganda bureau of statistics from the year 2006 to 2010. For determination of the degree of efficiency, the study used daily observations and for liquidity the study used annual data. Among the tools that were used for analysis include the Auto correlation test, Runs test, Kolmogrov – Smirnov (K – S) goodness of fit test and Jarque-Bera test.

The results from the GARCH Model rejected the randomness of the distribution and indicated high volatility in the expected returns and this was again confirmed by low levels of liquidity. These indicated inefficiency of the market at weak form. This was also again confirmed by other tests mentioned above. Much as ALSI and NIC results were randomly distributed, the USE was still inefficient at weak form and thus the EMH was rejected. It was noted that New Vision printing company limited was weak form efficient. This study calls for use of modern technology like instant sending of SMS to market participants, increasing trading sessions and general awareness to improve on the flow of information.

LIST OF ACRONYMS

ALSI	All Shares Index
ARCH	Autoregressive Conditional Heteroscedasticity
BATU	British American Tobacco Uganda
BOBU	Bank of Baroda Uganda
BTTB	Background to the Budget
CMA	Capital Markets Authority
DSE	Dar-es -salaam Stock Exchange
DFCU	Development Finance Company of Uganda
ESMID	Efficient Securities Market Institutional Development
EMH	Efficient Market Hypothesis
GARCH	General Autoregressive Conditional Heteroscedasticity
GDP	Gross Domestic Product
IFC	International Finance Cooperation
NIC	National Insurance Cooperation
NSE	Nairobi stock Exchange
NVL	New Vision printing and Publishing Company limited
RM	Random Walk
SBU	Stanbic Bank Uganda
SCD	Securities Central Depository
SIDA	Swedish International finance Development Agency
UBOS	Uganda Bureau of Statistics
UCL	Uganda Clays Limited
USE	Uganda Securities Exchange

CHAPTER ONE

INTRODUCTION

1.1. Background to the study

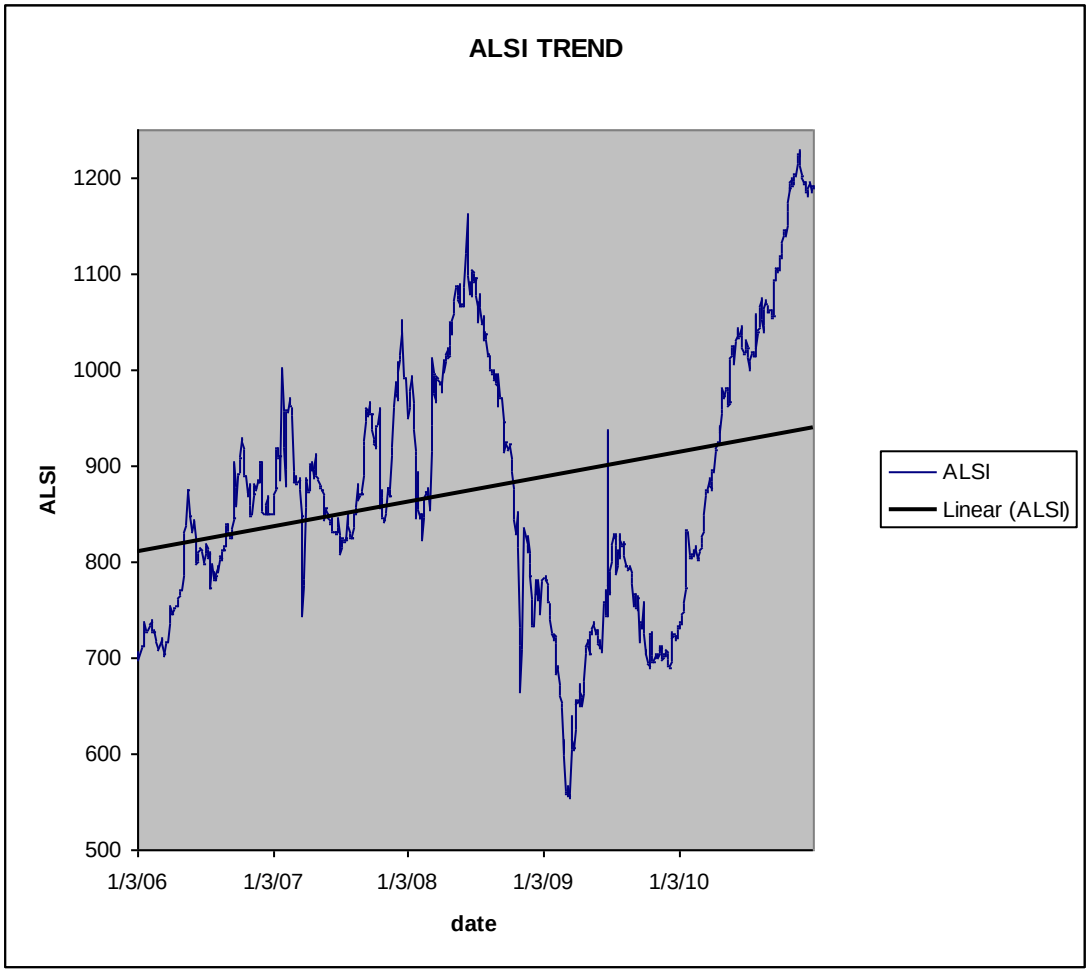
Stock markets all over the world are meant to provide alternative financial options for strengthening of the financial sector. Financial sector development and operation requires an efficient stock market to complement resources mobilized by the banks (Rocks, 2008). Stock market efficiency at its lowest degree of weak form in this case, is where security prices fully reflect the available information and as a result, security prices follow a random walk (Fama, 1970). In theory, the stock market is expected to speed up economic growth by providing a boost to domestic savings and increasing the quantity and the quality of investment (Singh, 1997). In this regard, the capital market authority (CMA) was set up in 1996 with the aim of promoting market efficiency, developing, regulating capital markets and also investors' protection in Uganda. Under the capital market, securities are traded at Uganda securities exchange (USE) which started trading in 1998.

Uganda's Stock market influences growth by encouraging saving amongst individuals through buying of shares in listed companies, speeds up firm growth through raising of the required capital. Although stock market is seen as an avenue of raising up the required capital, it is doubtful whether stock markets can perform efficiently in developing countries given the shallowness of the financial sectors, huge costs and the poor financial structures (Singh, 1999).

The major goal of the USE is to develop and manage securities that matches the international standards in the most effective and efficient way. It also promotes partnership with general public and foreign investors (USE annual report, 2002). In order to achieve this, a number of measures were put in place namely; introduction of securities courses programme in 2002, public

education in investment in shares through road shows, seminars, workshops, visits to institutions of higher learning, and introduction of quarterly bulletin to the public to get more information. In furtherance to its stake holders in timely and efficient manner, USE designed a new website in 2002. This was also expected to reduce volatility in prices and build confidence among investors since volatility is stumbling block to investment (Rajni and Mahendra, 2007). However, inspite of the said reforms, no clear trend has been achieved from them as the market still experiences high volatility as reflected in Figure 1.1 with so many observations below the trend line.

Figure 1.1: Trend of the all share index (2006-2010)



Source: www.use.co.ug

From the Figure 1.1, it is clear that there is a lot of inefficiency in the trading system and this may question the reliability of the strategies that were undertaken to address the issue of high volatility. More so, with the view of achieving market efficiency, CMA approves all public offers of securities and right players to the stock exchange. It also introduced a formula for calculation of opening prices for each trading session to avoid pumping up the prices plus revision of entry fees for new members (USE annual report, 2009).

In line with the continued improvement of efficiency of the process of trading and reduction of risks, technological innovations remain paramount; the securities depository system (SCD) Act was passed by Parliament in 2008 however, implementation started in 2009. Among other developments and innovations included Efficient Securities Market Institutional Development (ESMID), which brings together the International Finance Cooperation (IFC), Swedish International finance Development Agency (SIDA) and World Bank to develop well functioning markets, capital markets university challenge on savings and investment in capital markets, registration of financial literacy foundation in 2004, launch of communication strategy to involve all players in the market from 2004 to 2006 aimed at increasing public awareness and understanding of capital markets with a view of enhancing a vibrant and efficient market (USE, various annual reports).

Well-functioning financial markets are key to efficient resource mobilization and allocation in a capitalist economy (Mauboussin, 2002). In this regard, the government of Uganda also introduced both fiscal and non fiscal measures intended for capital markets developments and these comprised of; sale of minority shares, allowing initial public offering to be tax deductible

and exempting taxes on shares traded on USE (Capital markets authority, 2009). Whereas the above efforts were done, much is still desired to bring the Ugandan capital market to internationally competitive standards.

The innovations have, however, registered some progress For example; the stock market has grown in terms of market capitalization, and shareholder growth and activity turnover. Currently the USE has 14 listed companies, 6 corporate bonds and 30 government bonds. In the fiscal year 2011/2012, USE increased the number of trading days from three to five (Republic of Uganda, 2012). Despite the many innovations that have taken place, there is still low demand of stocks in Uganda and the stock market is seen as being inefficient due to high volatility (Raju and Ghosh, 2004). This can be attributed to factors such as limited deliberate policies aimed at capital market development, lack of long-term investment capital and government privatization drive, reluctance of private firms to go public for fear of loss of control and high yielding securities.

1.2. Statement of the research problem

Due to high volatility in prices of securities and thinness of the market that were impediments to market efficiency and investment, the capital market authorities together with the government put a number of measures such as designing a new website to deliver information in a timely and efficient manner, and introduction of quarterly bulletin, among others. These reforms were expected to achieve efficiency and increase the growth of the stock market. However, the stock market still experiences volatility (refer to Figure 1.1) and a decline in growth as reflected in Table 1.1. In the period between the financial year 2007/08 and 2008/09, the stock market experienced a decline in growth in terms of market capitalization by 9%, 48% in volumes trade and 45% in turnover all this may be due to inefficiency and volatility of stock prices. This does

not only hurt personal and financial lives of the investors, but also the economy at large. It is not clear whether the market is efficient or otherwise. That's why this study was embarked on determining the degree of efficiency of the stock market.

Table 1.1.Trends in the market activity at the USE (2005/06-2008/09)

	2005/06	2006/07	2007/08	2008/09	Growth
Vol. shares (million)	11	273.9	302.6	158.8	-48%
Turnover(million)ushs	7,752	48,425	83,398	46,264	-45%
Cap (billions) ushs	4,369.80	4,569.4	6,206.6	5,631.7	-9%
All share index	875.5	846.76	1026.61	729.80	-29%

Source: Uganda Securities Exchange Market reports. Note cap is capitalization and growth is computed using the last two financial years.

Also as a result of global financial crisis that retarded the stock market and the world, the capital markets industry in Uganda experienced a decrease in volume turnover and market capitalization resulting in lower levels of trading from financial year 2007/08 to 2008/09 (Republic of Uganda, 2010).

1.3. General objective of study

The objective of this study was to determine the degree of efficiency of Uganda's stock market based on efficient market hypothesis.

1.4. Specific objectives of the study

i. To determine the degree of efficiency of the USE.

ii. To determine the degree of liquidity for the market and derive implications towards efficiency of the USE.

1.5. Hypothesis of the study

i. The market is efficient and Stock returns on USE are randomly, independently and normally distributed for a given period of study.

ii. The market is efficient with constant volatility in the expected returns.

1.6. Significance of the study

Stock markets act as an intermediary that channel funds from savers to firms who utilize them to carry out investment projects. EMH is a necessary condition if the desired funds are to be allocated to the projects that yield highest values and this is only possible if the prices are efficient. The study will provide knowledge to the authority in designing appropriate policies that will help in the growth of the market and the economy at large. The study will also be useful in guiding investors on portfolio selections since many investors prefer to invest in securities that have been performing well in previous periods; to the government in drawing up appropriate policies towards improvement on the efficiency of the stock market, to accounting standard setters to design appropriate standards basing on market information. In the field of academia it may be a platform for other researchers in related fields. It is hoped also that the study will contribute to the debate of EMH by providing evidence from a new emerging market.

1.7. Scope of the study

The content scope of the study was on determining the degree of efficiency of USE. Under this, the study investigated the degree of efficiency of the USE with the new market developments

such as SCD security trading and clearance systems. Also the study determined the degree of liquidity for securities traded and derived its implications towards efficiency of USE. This was achieved by incorporating firms that were listed during the period of study in comparison with the all the shares index. The study concentrated on efficiency mainly because other studies on USE have ignored this area. The study covered five years from 2006 to 2010. This was mainly because many of the developments were within this period. Geographically the study was carried out at the headquarters of USE which is located at workers' house - Kampala city. This was intended to make use of the data relating to the securities transactions made at the USE.

CHAPTER TWO

STOCK MARKET PERFOMANCE AND PATTERNS IN UGANDA

2.1. Stock market: Origin and performance

In Uganda, the concept of stock market is not a new phenomenon although it is not so much pronounced among the public and the entire financial sector. The USE was approved by CMA in 1997 and started trading in 1998. It is a major component of CMA in Uganda and serves as an organization that handles the country's stock exchange.

USE is an example of a young African stock market that experienced significant growth with market capitalization of $1.4 billion as of April 2010 (Afristock, 2010). However this is a small figure relative to the global capitalization of $46.634 trillion with Africa sharing only $13.549 trillion (Langsdorf, 2010) and Nairobi stock exchange (NSE) which is the best performing in East Africa with a market capitalization of $13 billion and is ranked 5th in Africa while Dar- es - Salaam stock exchange (DSE) had $1.3 billion capitalization as of January 2010.

The USE as of October 2010 had six locally listed companies which included; Development Finance Company of Uganda (DFCU), Uganda Clays Limited (UCL), Bank of Baroda (BOBU) , British American Tobacco Uganda (BATU), New Vision Printing and Publishing Company Limited (NVL), National Insurance Cooperation (NIC) and Stanbic Bank Uganda (SBU). USE also has six cross listed companies. However, the number of listed companies is still small compared to other stock exchanges in the region and this market size may be an impediment to market efficiency.

Table 2.1 East African listed companies for three countries

	Number of locally listed firms		
Year	Kenya	Tanzania	Uganda
2004	47	6	5
2005	47	6	5
2006	51	6	5
2007	51	7	5
2008	53	7	6

Source: www.Trading economics.com

2.2. Stock market developments

The USE has been using a manual system for trading and clearance with settlement taking five to six days since 1998 up to 2009. Worse still the share certificate is obtained a month after trading. The USE implemented the Securities Central Depository (SCD). This aimed at improving efficiency, speeding up transaction, boosting liquidity, pricing of shares, reduce price volatility as reflected in Figure 1.1, allow more transparency, reducing administration costs, enhance investors confidence, strengthen regulation and reducing possibility of bad deliveries and settlement. However, there are still challenges such as low trading volumes, low technology levels and collective participation of all market participants (Capital markets annual report, 2009). In addition to the above, USE increased the number of trading days from three to five days in a week in March 2011.

It is expected that the new system will increase volume by 20% but this is still very low compared to NSE which realized 40% increase in volume as a result of implementing such a

system in 2006. Due to application of computer technology, USE anticipates increase in trading volume and cross listing on its stock exchange. Over the past three years, the East African Capital Market Authorities and the East African Securities Exchange Association have been working to integrate the stock markets in the region. It is projected that East Africa will have a common stock market before 2012 to capture larger market and increase investment in the region.

2.3. Technical and Fundamental analysis

Technical analysis is the evaluation of securities by means of studying statistics generated by market activity, such as past prices and volume. Technical analysts do not attempt to measure a security's intrinsic value but instead use stock charts to identify patterns and trends that may suggest what a stock will do in the future. Technical Analysis operates on the theory that market prices at any given point in time reflect all known factors affecting supply and demand for a particular market. Consequently, technical analysis focuses, not on evaluating those factors directly, but on an analysis of market prices themselves. This approach theorize that a detailed analysis of, among other things, actual daily, weekly and monthly price fluctuations is the most effective means of attempting to capitalize on the future course of price movements Fundamental analysis is a method of evaluating securities by attempting to measure the intrinsic value of a stock. Fundamental analysts study everything from the overall economy and industry conditions to the financial condition and management of companies. Earnings, expenses, assets and liabilities are all important characteristics to fundamental analysts, whereas technical analysts could not care less about these numbers. Fundamental Analysis is based on the study of factors external to the trading markets which affect the supply and demand of a particular market. It is in stark contrast to technical analysis since it focuses, not on price but on factors like weather,

government policies, domestic and foreign political and economic events and changing trade prospects. Technical analysts try to exploit the market by using charts, moving averages as depicted by figure 2.1 and 2.2. These are always against the EMH and believe in making excess returns from the market (Blume, et al, 1994).

2.3.1. Moving averages

These are mainly used by technical analysts to predict the direction of the trend of stock prices and base on the observed trend to make excessive profits. A moving average is an average of a number of consecutive prices updated as new prices become available and old ones are dropped. The formula for moving average for observations $x_1, x_2 \ldots\ldots\ldots\ldots x_i$ is given by the equation 2.1

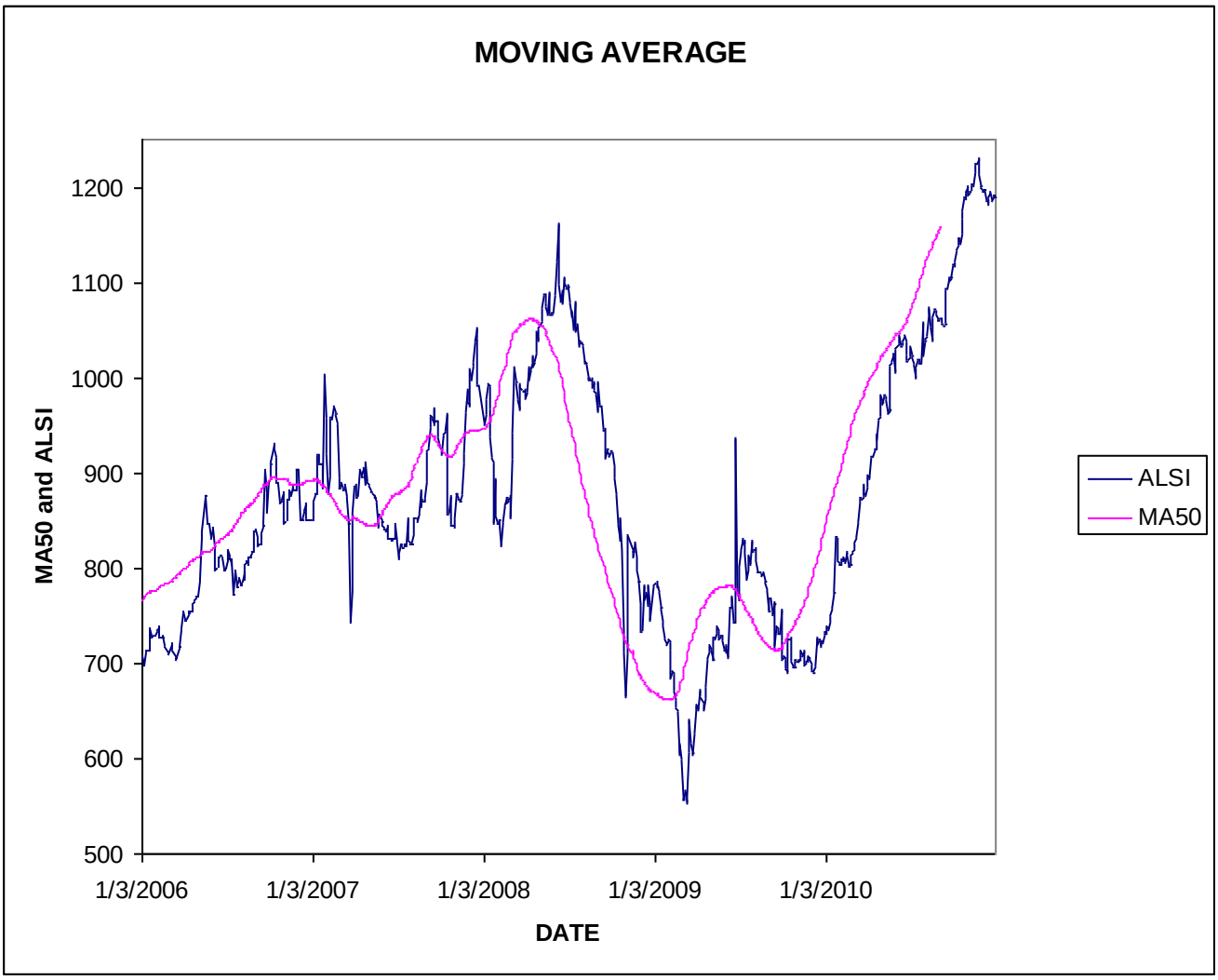
$$MA_i = (x_1 + \ldots x_i)/i \quad \ldots\ldots 2.1$$

Where MA_i is the moving average for the number of observations. In the case of MA50 and MA10 i is kept constant at 50 and 10 respectively and then drop one first observation for every new observation. Moving averages are tools that help technical analysts to detect the trend of the market prices. They are used to identify buying and selling positions. They measure buying and selling pressures under the assumption that no commodity can sustain an upward trend or downward trend without consistent buying and selling pressure. Trading with moving averages will never position one in the market at precisely the right time. They are intended to help one take profits from the middle of the trend and hold losses to a minimum. When the price trend line cuts the moving average line from above, it indicates falling trend of the prices and thus implies a selling point. Also when the price trend line crosses the moving average line from below it indicates an increasing trend of the prices thus determining entry points and buying point. Once such short and long term positions exist in the market it signifies inefficiency in the prices and

this is against the EMH. It can be observed that the moving average of ten is not very far away from the all share index trend.

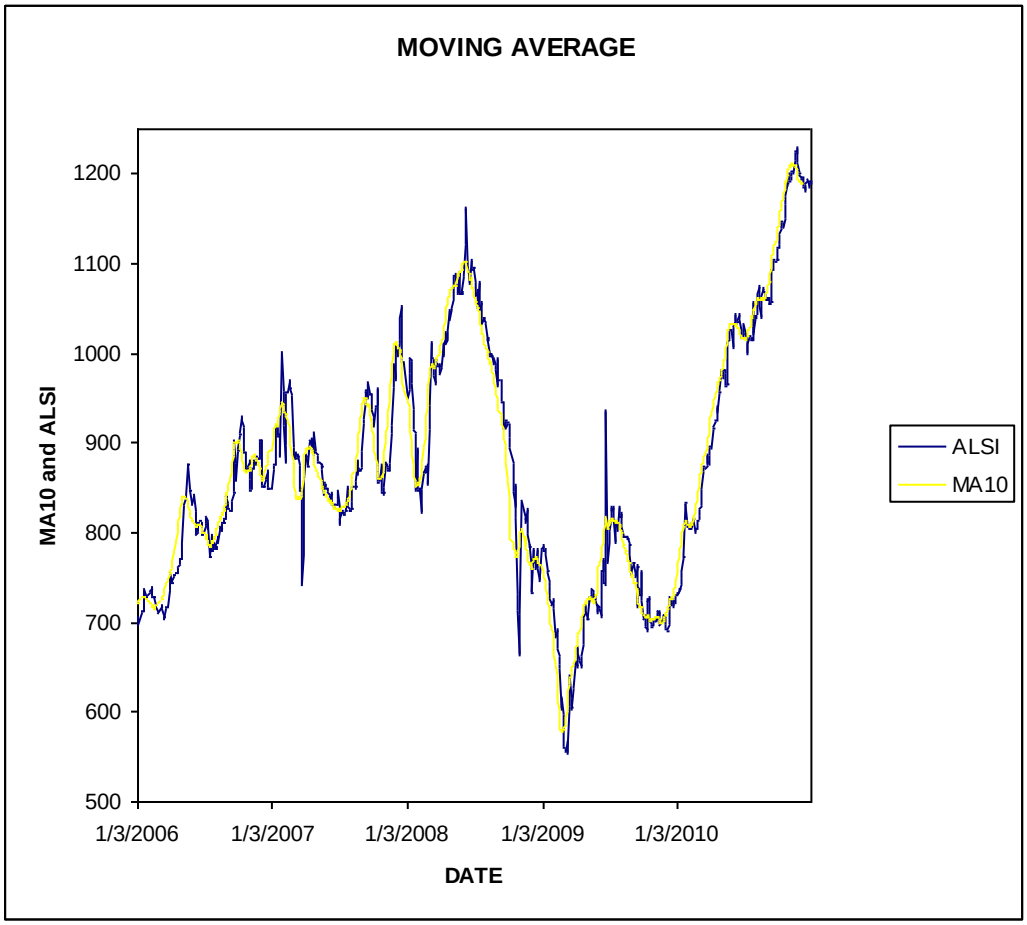
The risks and the magnitude are intrinsic to the speed of the moving averages. Professional traders lean toward the faster averages and portfolio managers generally prefer slower signaling moving average approaches. Moving averages are a simple way to gauge the direction that the tide is flowing in a commodity market. Although they are not always right, they at least provide a wide variety of possible uses. Figures 2.1 and 2.2 show moving averages of 50 and 10 days respectively which can are used to detect the trend of prices. Long-term investors prefer long moving averages such as MA50 and above while, short term investors prefer short term moving averages such as that of MA10 and below.

Figure 2.1: Moving averages of MA50



Note data source: www.use.co.ug

Figure 2.2: Moving averages of MA10



Note data source: www.use.co.ug

Figures 2.1 and 2.2 indicate many cross over between the MA10, MA50 lines and ALSI. This implies that there is a possibility of making excess returns from the market and therefore, prices do not follow a Random Walk theory which states that stock price movements are unpredictable, so there is no way to know where prices are heading. These cross over observed in the two figures could be an indication that the market is highly inefficient and does not respond quickly to changes in the current situation. This can be brought about by try “of” many unknowledgeable

investors that are not active in analyzing and trading stocks, information that is not widely spread to all investors freely among others.

2.3.2. Calendar Effects

Many technical analysts who want to test the efficiency of the market always use calendar effects where Stocks Prices may be closely tied to the time of year or time of the week. For example "January effect" or "weekend effect". However, the profitability of trading basing on such information may be questionable due to existence of trading costs.

2.4. Stock market challenges

For a stock market to function well it requires an effective domestic demand of stocks. According to Raju and Ghosh (2004), there is low demand of stocks at the USE compared to East African countries. The current situation across the East African region shows that investors are not as informed as they should be on how the securities markets work, the risks and rewards of investing; and these may be impediments to stock market efficiency. Markets also have few market participants, limited technology and less skilled investment analysts as compared to developed markets (Mubiru, 2003). All these may be due to the fact that capital markets in Africa are of recent origin with majority of the African stock markets emerging in the late 1980s and early 1990s (Mlambo and Biekpe, 2001).

The demand for stocks in Uganda is limited by inefficient information flow, lower liquidity levels, preferences for short term returns to stocks, low income levels, preferences for other competing investments, perceived rigidity of the buying process, perceived entry costs, inadequate education levels in understanding stock market information, lack of sufficient number of products to attract the public interests and inadequate market for the products and these are

indicators of market inefficiency (Kakooza, 2007). However, the degree of efficiency with the current reforms remains unknown.

2.5. Structure of Uganda's Economy

The performance of the stock market and its operational efficiency depends on the growth and performance of the economy. Well-performing economies also reflect good performing stock markets. The Ugandan economy has been growing at around 6.5% for the last ten years though inflation has reached highest level of 18.7% in the period 2000 to 2010 (Republic of Uganda, 2011). Uganda's economy is considered to be an emerging market representing a fast growing part of the world economy. It is an attractive investment destination with superior investment returns, representing growing markets with diversified portfolios within the purview of the regional markets and East African Common Market. Like most emerging markets, the Ugandan economy experiences market constraints such as inadequate liquidity, and heavy reliance on private sector as source of capital (Republic of Uganda, 2005). It experiences institutional weaknesses like regulatory bureaucracies, corruption and inequities in resource allocations. The private sector in Uganda has spontaneously grown from 10,569 registered enterprises in 2001-2002 to 17,088 in 2006-07, growing by 60% (Republic of Uganda, 2008).

CHAPTER THREE

LITERATURE REVIEW

3.1. Introduction

This section presents a brief view of the literature relevant to the study. It aimed at identifying the areas that have been adequately tackled while identifying the gaps which were unanswered. The section gives theoretical review, conceptual and the empirical literature relating to studies that have been under taken. The actual literature is arranged in line with the objectives.

3.2. Theoretical review

Fama (1970) identified three forms of efficiency namely, weak, semi and strong form. Weak form efficiency which assumes that the current stock prices fully reflect all security market information including the historical sequence of prices, rates of return, trading volume data and other market generated information such as odd-lot transactions, block trades and transaction by exchange specialists. The semi strong form efficiency asserts that security prices rapidly adjust to the release of all public information. This encompasses the weak form. Public information also includes none market information such as earnings, price earning (P/E) ratio, and dividend yield ratios. The strong-form contends that stock prices fully reflect all information from public and private sources. This means that no group of investors has monopolistic access to information relevant to the formation of prices and this is in contrast with the technical analyst who thinks that they can consistently beat the market (Elton and Gruber, 1995).

The Random Walk (RW) model is composed of two hypotheses, that is, economic and statistical hypotheses. From the economic point of view, security prices are assumed to be efficient such that no single investor can outperform the market in making excess returns. From the statistical

point of view, changes in prices of any security are independent random variables. Therefore, an investor cannot earn more than a simple buy and hold strategy. This strategy is optimal since it minimizes transactional costs (Cheng and Deets, 1971).

General Auto Regressive Conditional Heteroscedasticity model (GARCH (1, 1)) has become the workhorse of the industry. This model is very popular in modeling stock returns, interest rates and foreign exchange. The model is a good measure of volatility even if the rescaled variable is neither Gaussian nor independent (Hansen and Lee, 1994). Still GARCH and Auto Regressive Conditional Heteroscedasticity (ARCH) models have been successful in modeling financial time series and financial decisions are based on risk and return trade-off (Engle, 2001).

3.3. Conceptual review

Beyond the normal utility maximizing agents, the EMH requires that agents should have rational expectations. EMH asserts that when faced with new information, investors may react differently but all that is required by the EMH is that, investors' reactions are random and follow a normal distribution so that the net effect on market prices cannot be reliably exploited to make abnormal profits especially when considering transaction costs. Thus, any one person can be wrong about the market but the market as a whole is always right (Malkiel, 1987).

When daily returns are used to assess EMH at weak form, on average stock prices adjust to the arrival of new information. There is always a response to investment decisions, dividend changes, capital structure changes and corporate control transactions. This makes firms respond to specific conditions and become efficient. Daily returns are the cleanest evidence on measuring

efficiency: it gives the second order consideration and takes into account for large effect on prices (Fama, 1991).

The sharp rise in frequency trading causes trade horizons to fall as traders attempt to exploit inconsistency in prices and this is based on the volume traded. This brings in issues of excess volatility, whether the playing field is leveled for all market participants. There is a close link between market efficiency and high trading volumes which is positive.

Volume is positively correlated with absolute price changes. It requires a lot of volume to make prices move (Walter, 2003). A small volume is usually accompanied by a fall in price and vice versa. A large increase in price is usually accompanied by a large price change. A large volume is usually accompanied by a large price rise. If the volume has increased (decreased) five straight trading days, price will tend to rise (fall) over the next four trading days.

Investors' confidence is about trading skills and trading volume. One's confidence may also be caused by self attribution to vary with market past returns. Trading is a major indicator of investors' confidence. One's confidence is more pronounced in small capital stocks and in earlier periods when investors held greater proportion of shares (Statmam, Thorley and Vorkink, 2004).

Many emerging economies require an efficient capital market if they are to achieve their objectives. Among the factors that determine the development of capital markets developments include, income levels, domestic investment, capital flows in the private sector, level of development of the banking sector and stock market liquidity. At early stages of development,

the banking sector helps in complementing resources in financing investment. This also creates a competitive environment to improve efficiency of the stock market. Among the factors which include; institutional factors such as political risk, law and order, domestic accountability and bureaucratic quality. These are fundamentals into stock market development and operation towards efficiency in emerging capital markets. Such a conclusion was drawn basing on South Africa's stock market (Yartey, 2008).

If financial managers are to achieve their corporate goals, they require well developed financial markets where a transfer of wealth from savers to borrowers is efficient in both pricing and operational costs. There is information efficiency which aims at information adjustment into the share prices. Investors will always compete on fair basis which is called a fair game and all investors will have equal chances of success. In an efficient market, it is impossible to outperform the market consistently except by luck for the case of technical and fundamental analysts. Greater market efficiency can be achieved by stock market deregulation and computerized dealing to adjustment of share prices in response to the global information (Bill and Pike, 2009).

It is always easier for a firm to raise capital if EMH is met. Based on the Pakistan's economy, there was an increasing trend of most market indicators such as market capitalization, turnover and average daily turnover. Using the GARCH model also the results indicated that the market was still inefficient at weak form using daily closing prices for a period between 1998 and 2006 (Hameed and Hammad, 2009).

3.4. Empirical review

3.4.1. Determination of the level of efficiency of the USE with the current market developments

In Uganda, security prices do not fully reflect the available information; there was dependency between the current prices and the previous security price based on the RW model using data from 2004 to 2007. The instantaneous adjustment property of an efficient market implied that successive price changes in the individual securities were not independent of each other. The study found the USE to be inefficient (Birakwate, 2008). In such a study, there was a contradiction with EMH. Still the study used linear time series yet financial time series is non linear (Beja and Goldman, 1979). The study also applied random walk model yet this model is criticized by Marcus (2011) because it assumes that returns are constant with constant volatility which is not always the case. Therefore this study adopts GARCH Model which addresses the above issues. The study also used a sample of only five locally listed companies and the time scope used raises a question of reliability of such results. GARCH model is proven to be successful in predicting variances in stock returns thus such a model needs to be applied (Engle, 2001).

Many stock markets in Africa were becoming efficient such countries include; South Africa, Egypt, Nigeria and Mauritius. These showed lower trend towards elimination of inefficiencies. However, other countries studied showed tendencies of achieving it and such countries include; Kenya and Zimbabwe. Such a study was based on EMH at weak form. The study made its analysis basing on GARCH model and also considered the institutional characteristics and market capitalization (Jefferis and Graham, 2005).

Awad and Daraghma (2009) examined the weak form efficiency of the Palestinian security market used daily observations from the year 1998 to 2008. After the application of both parametric and non parametric tests with the random walk model, the results indicated that the market was still inefficient. The stock returns observed were not normally distributed for the whole sample of 35 stocks tested. All the tests that involved; Runs, ADF, Serial correlation, Phillip-Perron and Unit root tests rejected the hypothesis of the stock returns being randomly observed.

Basing on the entire shares index as a proxy for monthly return, the Nigerian Stock Market was efficient at weak form and share prices followed a RW. Basing on data from 1985 to December 2008 a conclusion was made. Such an empirical study was based on the RW and the GARCH models (Rapuluchukwu, 2010). The study was in agreement with the EMH and other studies such as that of Chiogozie (2010), Olowe (1999) who also used monthly price index and monthly returns respectively. Jefferis and Graham (2005) also made the same conclusion in the same country.

According to Brown and Easton (1989), the London market for 3 per cent Consol from 1821 to 1860 was weak-form efficient. The market also exhibited particular institutional characteristics such as insignificant brokerage costs, insignificant taxation and a six-day trading week. The results of this study indicated that, the market exhibited a degree of weak-form efficiency which is at least comparable to other countries in the region. The study based its conclusion on Runs and serial correlation tests.

Bahrain stock exchange is one of the emerging markets that work efficiently at weak form (Asiri, 2008). Such a conclusion was drawn based on RW model and daily prices. Such finding could be beneficial to other stock markets that are emerging. The results indicated no autocorrelations between 1990 and 2000. The weakness from such a model is that the author used linear time series instead of non linear time series (Beja and Goldman, 1979).

Basing on Middle Eastern emerging markets, there was limited support for RW model. However, tel100 stock market for Israel supported it using the RW, Unit root, and Ordinary least Square estimation. Also Morocco behaved consistently with RW model. The countries studied include Egypt, Morocco, Israel, Jordan, and Turkey. Much of the analysis was based on one methodology. There were possibilities of predictabilities of stock prices and excess returns could be generated by fundamental and technical analysts. Inefficiencies were associated with limited trading (Orman and Farrar, 2006). This study was in agreement with other studies on Morocco like that of Jefferis and Graham (2005). This therefore, calls for investigation of USE efficiency since it is also classified as emerging.

Financial institutions are crucial for economic development. Based on the largest 8 stock markets in Africa such as South Africa, Egypt, Morocco and Nigeria met the criteria for the EMH using the random walk model (Magnusson and Wydick, 2002). Results were favorably comparable with other developed countries and other studies such as Olowe (1999). However, they were in contradiction with other studies like Mlambo and Biekpe (2005) for all countries in that study. However, such by contradiction with the other countries supports the EMH. Among 10 countries studied including Botswana, Ivory Coast, Egypt, Ghana, Mauritius, Morocco, Namibia, Tunisia

and Zimbabwe. Majority of the markets including the first five rejected the random walk during the period of study (Mlambo and Biekpe, 2007). Other countries were efficient at weak form other than the first five. Such a conclusion was consistent with Magnus (2008) for Ghana and this was contrary with Morocco, Egypt and Mauritius (Jefferis and Graham, 2005). However, that contradiction may be due to different methodologies undertaken, that is, random walk for the study in (2007) and GARCH model for the other studies. Also Magnus (2008) used a linear approach of the model, this call for the use of non linear approaches to be tested to Uganda since it is also classified as emerging market and also they never considered all the share indices for market.

Bulkley and Tonks (1989) found the UK stock market to be efficient at weak form though the variance ratio bound was violated. This is because variance bound test is a necessary but not a sufficient condition to reject the excess volatility theorem. Though the stock prices met the amended variance bound, still some investors could make excess returns using the available data. Some investors in the market could exploit a simple "buy low sell high" trading rule.

Basing on various models such as the GARCH, dynamic relations between stock returns and trading volume were found. This implied that forecast of one of these can only be improved by knowledge above other. Also there was return volatility that contained information about upcoming trading volume (Medeiros and Doornik, 2006).

It is impossible to use trading volume in making investment strategies. Trading volume is not a significant component of volatility like it may be in any other emerging stock market. Basing on

Autocorrelation analysis and returns of Mauritius, stock prices could be predicted using previous returns and therefore the market was not weak form efficient (Naragada and Nowbutsing, 2009).

Price change is not only affected by the information flow, but also market micro structure factors. Clearing mechanism has an impact on price which in turns affects returns from the market (Amihud and Mendelson, 1991). Daily open-to-open returns are more volatile and exhibits more negative Auto correlations with close-to-close returns and this was consistent with the earlier results in U.S. stocks. The mid way clearing mechanism was efficient based on variance ratio test. Such results based on Tokyo Stock Exchange market suggested for the globalization of trading that may have a beneficial effect on value discovery. The results suggested that, the clearing mechanism is not inferior and it is superior in terms of its volatility and efficiency when instituted during the trading day concurrently with continuous trading.

Using the daily data, the two stock exchanges tested rejected the EMH. Model comparison of the standard variance ratio test and NAÏVE model for ex-post forecast proved wrong the EMH (Darrat, 2000). The NAÏVE model was compared with other models such as GARCH, Artificial Neutral Net work (ANN). Such a conclusion was reached on an emerging market but contradicted with the theory.

Griffin, Kelly and Nardari (2006) examined the ability of stock prices to incorporate new information that is contained in the local market return, individual stocks, and portfolio returns. Surprisingly the results indicated that emerging markets incorporated market Information better than developed markets. Such emerging markets had similar Autocorrelations in firm and

portfolio returns. This indicated that there was neither under reaction nor over reaction by firms and therefore they behaved consistently with the market. This study was undertaken for fifty six stock markets in fifty six countries which included thirty three emerging markets in the world. However, Uganda was not among the countries under the analysis. Emerging stock markets showed higher transactional costs than developed markets. The study used daily data from the period 1994 to 2005, applied variance ratio method and other standard tests such as market model R^2.

Melvin, Muzafar and Kian-Ping (2009) asserted it that, at times information is not fully adjusted into the stock prices. However, if one takes into thin trading, the results support EMH. These results were based on the Shanghai and Sherizen stock exchanges. Such markets responded to the influences that came from political, economic, social and institutional changes. The study adjusted its model to take care of the thin trading and the results followed a random walk model over a long period of time. The findings from the study contradicted with other studies using autocorrelation tests. Comparing linear and non linear dependencies they concluded that it is always unreasonable to expect the stock market to be efficient at all times. There was evidence of serial correlation in the adjusted rates of returns in both markets and non linear dependencies occurred more frequently than the linear dependencies. Both markets were found to be efficient chide but not all the time and the two markets followed each other after 1997.

Due to high returns that are generated as a result of investment in stock markets, many investment analysts try to beat the market as a result of exploiting some inefficiency (Agwuegbo, Adewole and Maduegbuna, 2010). Basing on the study carried out in the Nigerian stock market

and using the random walk model, the market was still inefficient though it followed a random walk model. These results were in contrary with Olowe (1999) using the same methodology. This implies that a market cannot be efficient at all times. However, Olowe (1999) never used much of the econometric tools in making its analysis and removing the non linear properties of time series data.

3.4.2. Determination of the liquidity level and its implications towards market efficiency

One of the commonly used measures of liquidity is the total value of the shares traded on countries stock exchange as a share of gross domestic product. The ratio does not directly measure the cost of buying and selling securities at posted prices. More liquidity implies more efficiency (Levine, 1995) since thin trading is a bias of weak form efficiency (Barnes, 2006). Another measure of liquidity is value traded shares over total market capitalization. Markets that are liquid should have trading with less wide swings and allows capital flow from traditional sector to industrial sector (Verdier, 2001) and this allows investment in huge businesses (Grazian, 2008). Levine (1995) basing on liquidity ratio for 38 countries, found out that countries that had relatively liquid stocks in 1976 grew faster than those with illiquid stock.

Stock market liquidity encourages strong forecasts and corporate investments even though much of this investment is financed through retained earnings, bank loans, and bonds rather than equity issues. Liquidity allows efficient allocation of capital. Legal regulatory, Accounting, tax and supervisory systems are among the factors that influences stock market liquidity. Stock market affects economic activity through liquidity creation since many profitable investments require long term capital.

Liquidity is the ability to sell an asset at a minimum loss of value with no significant loss in prices. Tightness and depth are indicators of liquidity in the market ability toward absorbing large volume flows without significant impact on prices. Liquidity is approximated by volume quote size. When they raise concerns about the decline in market liquidity, they refer to reduced ability to deal without having prices move against them that is about reduced market depth (Muranaga, 2001).

Among the countries studied, small markets which were illiquid were also characterized by information and allocative inefficiencies. Twenty four African countries studied were less efficient irrespective of the test undertaken and never followed a random walk model (Ntim, Oppong, Danbolt and Dewotor, 2008). However, they registered significant improvement in the information efficiency of sight national stocks structured and these stocks were weak form efficient. Countries studied include Botswana, Egypt, Ghana, Kenya, Mauritius, Morocco, Nigeria and Tunisia. All these rejected the EMH basing on the market indices. This raised a contradiction with other studies such as Olowe (1999) in Nigeria, Jefferis and Graham Morocco (2005) for countries like Egypt, Morocco and Mauritius. However, Olowe (1999) was in line with other studies for Ghana such as Magnus et al (2008). USE liquidity level as of 2008 was approximated to be less than 2% (Birakwate, 2008) but Birakwate used turnover ratio and yielded a figure of about 2% and this raises a question of reliability of the results that were obtained and call for use of other ratios.

According to Ravi (2003), there are four measures to curb stock price volatility which include price limits, circuit breakers, margins and transactional taxes. Margins are initial deposits that ensure that traders are well capitalized to handle their exposure to stock market. Transactional taxes are used to curb the instinct of wide speculators. These taxes will increase for all traders due to failure to distinguish traders. Price limits are used in future contracts. Circuit breakers are mainly used on stock index; for example, volume induced circuit breakers are used to clear volume for any given price change. These measures were adopted to curb high volatility that existed in the year 2000 in the Indian stock market that went higher than in other stock markets in that period. This high volatility was reflected in the daily returns. Once such volatile exists in the market they can trigger a chain reaction in the financial intermediaries and ultimately cause the collapse of financial institutions. Excess volatility also affects the liquidity of the market adversely since more volatile is associated with greater information asymmetry between the informed traders and market makers plus other liquidity providers. The above measures help in market stability and prevent it from breaking down. Such measures help in improving efficiency.

Berglund, Wahlroos and Ornmark (1983) basing on Scandinavian stock exchange, concluded that the market was weak form efficient using daily data from a period 1970 to 1981 combined with volume from 1977 to 1981. Serial correlations and Runs tests were performed in order to aid their conclusion. The study concluded that it is impossible to benefit from any trading strategy because of higher transaction costs. The results supported EMH on thinly traded stocks though they have a slower adjustment process with a positive correlation. It can also be noted that though it is not profitable by speculators, it may be profitable to careful timing of buy and sell orders on the basis of the information contained in the previous returns. This is mainly

because the information contained in the previous price is too high to be compensated by the small returns obtainable from optimal timing on a small exchange.

According to Magnus, Oteng-Abayie and Fosu (2008), research on Ghana stock exchange indicated that it was still weak form inefficiency after employing various techniques such as random walk and GARCH (1, 1) a conclusion was made. The study used daily market returns for a period of five years. The implication from such a study is that you can easily find a big number of securities that are either under or over priced and it is not wastage of time for interested experts to analyze the market in order to benefit from such inefficiencies. It can give a chance to hard working analyst to benefit from under priced securities and people who have more insider information can do better than the average market returns. The major causes of inefficiency were more attributed to high degree of ignorance, conservatism and or indifference on corporate financial matters which were so high as to defy the usefulness of theoretical postulations. Such conclusion from the findings of that paper was justified by the firms in Ghana that preferred to use traditional institutions especially banks to raise capital than stock market. Also they are interested in high capital productivity which is short term rather than higher capital accumulation which is otherwise needed for long run economic growth.

Rouwenhorst (1999) noted that there is no difference between developed and emerging stock markets with regard to the factors that drive stock returns such as momentum. Small stock outperforms large stock and value stock outperforms growth stock. There is also a strong correlation between return factors and share turnover. The study examined twenty emerging economies using data on return and the return factors were similar.

Demirguc-Kunt and Levine (1996) noted that market capitalization as a ratio of gross domestic products is different for different countries and some are less than 0.1 while other are greater than one. Large stock markets are characterized by high liquid, less volatility and more international integration than smaller markets. Countries with stronger information disclosure laws, internationally accepted accounting standards and unrestricted international capital flows tend to be with larger and more liquid capital markets. Countries with few stocks tend to be small, less liquid and less integrated. Using GARCH model, the results indicated that the Arab Stock markets were inefficient at weak form. There were no significant improvements towards efficiency. The countries under the study were Egypt, Morocco, Bahrain, Tunisia and other countries in the area. Market showed greater development regarding their size and liquidity.

There is a strong correlation between price changes and trading volume which is positive. This is due to significant relation between trading volume and price information. Trading volume has its own information content. Increasing concentration of trading should not be interpreted as indication of poor market efficiency; it is only an indication of uninformed investors basing on the study undertaken (Majoni, 2001).

A small liquid market will have a higher turnover ratio but low value traded ratio. More liquidity improves capital allocation leading to growth and this also improves efficiency of stock market. Graham (2008) pointed out that liquidity is an important factor for a market to be efficient. This conclusion was reached in investigation of weak form efficiency of eleven African stock markets that included Egypt, Ghana, Nigeria, Kenya, Mauritius, Tunisia, Morocco, Cote d'voire,

Botswana, Zimbabwe and South Africa. Using the variance ratio test for a period of seven years from 2000, the random walk model was rejected. It was also noted that illiquid markets were very inefficient.

Higher transparency reduces information asymmetry faced by market participants in real time. Also automatic trading lowers the cost of equity for the listed firms due to improvements in liquidity of stock markets. The findings are robust to the inclusion of several control variables such as market size, financial liberalization, enforcement of insider trading laws, levels of economic development, world market returns, time trend in returns and time varying betas and risk factors. These factors were more pronounced in emerging markets than in developed markets. Electronic trading improves liquidity, informativeness, valuation of the listed stocks and these reduces the cost of equity **(**Pankaj, 2005**).**

According to Ngugi, Murinde and Green (2003), three forms that contribute to efficiency which include: (a) revitalization which aims at improving micro market structure via increasing levels of investment and a shift to electronic trading, regulation to strengthen the market, (b) modernization of trading systems and (c) relaxation on restriction of foreign investors. The study showed that markets that had comparative trading technology, tight regulatory systems also had greater efficiency and lower market volatility but this varied across markets. The reforms in emerging markets in Africa that had been undertaken reduce volatility, reap higher efficiency however, they concluded that the reforms were too recent to draw up meaningful conclusions.

Much as there are many studies that have been taken aiming at measuring market efficiency in both developed and emerging stock markets, a conclusion has been reached in developed markets in favor of the EMH. However in emerging markets we have mixed results. Previous studies on USE did not address the issues of volatility and inefficiency thus why this study was embarked on to address that issue. Uganda has not been put under consideration and at the same time no clear conclusion that has been reached about the EMH in emerging markets. This makes this study different from previous studies. Therefore, this research provides further evidence to the debate on the EMH from new emerging stock market.

CHAPTER FOUR

METHODOLOGY

4.1. Introduction

This chapter presents the methodology that was used to determine the degree of efficiency of the Uganda's stock market, data source and type, quantitative research design and tools that were used in making the analysis. Among the tools that were used in making the analysis include descriptive statistic, unit root test, auto correlation test, Runs test and Kolmogrov – Smirnov (K – S) goodness of fit test.

4.2. Research design and Data source

The study used quantitative research design and applied data of firms that were locally listed on the USE between 2006 and 2010. This was mainly because of data availability. The study focused on seven locally listed companies out of the current thirteen companies since six were cross listed. Daily logarithmic returns were computed from daily closing prices and All Shares Index (ALSI) for the market returns. Only trading days were considered because it showed how investors responded to the release of new information. These closing prices and index show much of the information and reaction by investors. For liquidity, the study used annual capitalization, Gross domestic product (GDP) and annual value of traded shares as approximates. This study also applied secondary data that were obtained from the USE and Uganda Bureau of Statistics (UBOS). The main variables were closing prices on individual securities, value traded, and all shares index from the year 2006 to 2010 plus GDP. The variables were daily observations except for GDP, value traded, and market capitalization that were collected on annual basis. Daily returns were calculated from daily closing prices. Daily returns

were chosen other than monthly or weekly because they can eliminate the joint hypothesis problem that market efficiency must be tested with asset pricing model. Also the announcement of an event can be tested by day to day data. Daily returns also allow precise measurement of the speed of the stock price which is the central issue for market efficiency (Fama, 1991). Among other variables for market performance indicators that were used included liquidity level as measured by total volume traded as a percentage of GDP. In order to achieve objective two, the study determined the level of liquidity level and derived its implications towards efficiency.

4.3. Model specification

In choosing the methodology, a number of approaches that could be used to test whether the market is efficient or not were compared and then choice was made. These include the technical analysis which tests whether excess returns can be generated basing on any trading strategy, if they exist then the market is inefficient and in this case the EMH is not true. Alternatively the EMH can be tested to find out whether security prices fully reflect the available information and if this is the case, then no trading strategy that can be used to outperform the market (Goldberg and Schulmeister, 1988). In this study, EMH was adopted due to its simplicity and under this, the level of efficiency of the Uganda's stock market was determined using the GARCH model. The GARCH model was used to capture the main characteristics of financial time series such as stationarity and volatility clustering of financial time series data. The model was chosen since it is seen as the best (Laplante, Desrochers and Prefontaine, 2008). GARCH (1, 1) is the best in financial forecast of volatility since it drops the assumptions of constant returns and constant volatility which are assumed under Random Walk model (Engle, 2001). Volatility is the measure

of how far the current price of an asset deviates from its average past prices. Bigger dispersion indicates greater volatility. Volatility plays an important role in risk and return trade off.

Due to the non linearity characteristics of financial time series data (Beja and Goldman, 1979), prices were transformed into natural logarithms. By definition return is given by the equation 4.1

$$r_{i_t} = p_{it} - p_{i_{t-1}} \quad \text{..... 4.1}$$

Where r_{it} is the daily return on common stock of a company in period t, p_{it-1} is the end of the period t-1 price that is transformed into logarithms, p_{it} is the price of the common stock of a company at the end of period t that was also transformed into logarithms. This was also mainly because the change in log prices is the yield under continuous compounding from holding that security. Secondly, the variability of simple price changes for a given security is an increasing function of the price of the security (Brown and Easton, 1989). Since dividend is paid annually it was ignored in the above equation. In the derivation of the GARCH model, the study extended the ARCH model that was derived from the equation 4.2

$$r_{i_t} = \mu + \alpha_1 r_{i_{t-1}} + \varepsilon_{i_t} \quad \text{..... 4.2}$$

Where ε_{it} is a random error term and is assumed to be identically independently normally distributed with mean of zero and constant variance and no serial correlation, and $r_{i_{t-1}}$ is the return in period t-1. The study also extended the above equation to cater for all significant lagged error terms. The Null hypothesis $\alpha_1 = 0$ was tested for EMH and the market is efficient if the hypothesis is true otherwise the market is inefficient. Also $\mu \neq 0$ was put under consideration. In order to generate the ARCH (p) model, the study used the error term from equation 4.2. The

ARCH model expresses the variance of the appropriate equation form of 4.2 as a function of its square of its lagged error terms. Gujarati, (2004) asserts that since the variance is unknown, then it can easily measured by the equation 4.3.

$$\varepsilon_{it}^2 = \alpha_2 + \alpha_3\varepsilon_{it-1}^2 + \alpha_4\varepsilon_{it-2}^2 + ...+ \alpha_p\varepsilon_{it-p}^2 + \nu_{it} \quad \text{..... 4.3}$$

This model was used to test the presence of Auto correlation in the error term. Joint hypothesis that all coefficients are zero was tested against the hypothesis that not all coefficients are zero. The model postulates that volatility in the current period is related to its values in the previous periods plus a white noise error term. If α_4 is positive, it suggests that if volatility was high in the previous period, it continues to be high in the current period, indicating volatility clustering. This model suggests that volatility in the current period is related to volatility in the past *p* periods. Here the study tested the joint hypothesis of the significance of the overall coefficients of the model. Therefore the null hypothesis was that all individual coefficients are zero against the alternative that not all coefficients are zero. In order to derive the GARCH (1, 1) model, the study assumed ARCH (1) and used the equation 4.4

$$\varepsilon_{it}^2 = \alpha_2 + \alpha_3\varepsilon_{it-1}^2 + \nu_{it} \quad \text{..... 4.4}$$

The above model postulates that volatility in the current period is related to one previous period.

In order to determine the efficiency level, the study used GARCH (1, 1) model which uses the variance equation and is an extension of the ARCH (1) model and was derived using equation 4.2 and it is a combination of equation 4.2 and 4.5.

$$\sigma_{it}^2 = \alpha_2 + \alpha_3\varepsilon_{it-1}^2 + \alpha_4\sigma_{it-1}^2 + \nu_{it} \quad \text{..... 4.5}$$

$\alpha_3 \geq 0$, $\alpha_4 \geq 0$, α_2 ϕ 0 and if $\alpha_3 + \alpha_4 \leq 1$ then this means that the model is weakly stationary. Where: σ_{it}^2 is the variance of the random error term and σ_{it-1}^2 is the lagged variance and ε_{it-1}^2 is the square of the residual error term. In the evaluation of EMH, if the parameter of the exogenous variable α_4 in the mean equation for GARCH model is insignificantly different from zero, that is $\alpha_4 = 0$, we accept EMH otherwise we reject the hypothesis that the market is weak form efficient. Also, if $\alpha_3 + \alpha_4 = 1$ then this means a high persistence in volatility clustering and this implied inefficiency in the market.

Due to difficulty in liquidity estimation, the study used the equation 4.6 as its approximation. The study also computed capitalization as a percentage of GDP for comparison with other countries that are efficient.

Liquidity = (traded value /GDP)*100…….…….…….4.6

In order to make meaningful conclusions from the GARCH (1, 1) model and liquidity level, the study analyzed the results using a number of tools. These tools are also related to market efficiency. The results from the model were analyzed using the following tools.

4.3.1. Descriptive statistics

The study used descriptive statistics to find the nature of the distribution taken by the securities traded on the USE. These include; mean, Skewnes, Kurtosis and the Jarque- Bera that was used to test for the normality of the distribution. This was used mainly because in EMH market returns are assumed to be normally distributed.

4.3.2. Unit root test

The unit root test was conducted for the stationarity of the distribution of the observed price and returns using Dickey-Fuller (DF) and Augmented Dickey- Fuller test (ADF). The null hypothesis of the RW with drift was tested against the stationary Autoregressive process with both time trend and intercept for prices. If the null hypothesis is rejected then it means that the market is inefficient and the prices are predictable at least with some degree. In order to choose the appropriate lags to be included in the model, Schwert's principle that is $P_{max}= 12(N/100)$ ^.25 was adopted. For N representing the number of observations. This is the starting point for the unit root test. The test is performed repeatedly until you obtain the lowest Schwarz value and this gives the appropriate lags to be included (Schwert, 1989).

4.3.3. Auto correlation test

Auto correlation tests were performed for appropriate number of lags to test for the presence of serial correlation over a period of time using Box-Pierce statistics and graphical analysis of the correlogram. If there is no serial correlation then the market is efficient otherwise it is not.

4.3.4. Runs test

The study employed the Runs test to determine the statistical randomness of the observations. This was mainly because statistical randomness could not be determined by Autocorrelation test. The null hypothesis which states that the observations are random against the alternative the observations are non random was tested. A run is an uninterrupted sequence of one symbol say positives only or negatives only (Gujarati, 2004). Runs are computed as changes in prices. The length of a run is equal to the number of observations in that run. When the expected number of

runs is statistically significantly different from the observed number of runs then we reject the null hypothesis; otherwise we fail to reject the null hypothesis. Poshakwale (1996) stated that any deviation from the expected number of runs indicates a possibility of existence of excess returns from the market. The Run test converts the total number of runs into the Z statistics. The Z statistics gives the probability of differences between the actual and the expected number of runs. If the calculated Z value in absolute terms exceeds critical value then we reject the null hypothesis of randomness otherwise we fail to reject the hypothesis.

4.3.5. Kolmogrov – Smirnov (K – S) goodness of fit test

The K- S test is the test used to test the nature of the distribution based on empirical distribution function for any continuous data points (Wood, 1978). The test was chosen because it can be used with small sample sizes and it is more powerful (Lilliefors, 1967). The test was used to test for normality of the distribution. The hypothesis of normality is rejected if the computed value of exceeds the critical value from the table. This is one of the non parametric tests for normality that was applied.

CHAPTER FIVE

PRESENTATION AND DISCUSSION OF THE FINDINGS

5.1. Introduction

This chapter presents and discusses the results of the study and analyzes them with the set objectives. Before the study presents the results of the studied objectives, the study first presents the descriptive statistics of the variables that were studied and then presents the results for the unit root test, then followed by results of the studied objectives and finally presents the analysis and discussion of the findings. These objectives were establishment of the degree of efficiency and determination of liquidity of Uganda's stock market.

5.2. Descriptive statistics results

Table 5.1: Descriptive statistics for returns of listed firms and market index

	Mean	Max	Min	Skewnes	Kurtosis	JB	Std.dev	P.value
ALSI	-0.0007	0.1901	-0.2324	-0.7287	23.4966	12455.97	0.0249	.0000
BATU	-0.0012	0.5439	-0.7520	-4.1291	110.435	342509.2	0.0509	.0000
BOBU	0.0007	2.1776	-0.0211	23.2982	595.248	10411408	0.0855	.0000
DFCU	-0.0010	0.0180	-0.1719	-0.4244	23.9682	12991.33	0.0220	.0000
NIC	-0.0013	0.0800	-0.1542	-1.0329	11.3871	360.6184	0.0291	.0000
NVL	-0.0012	0.2302	-0.2151	-0.5688	25.7931	15364.23	0.0289	.0000
SBU	-0.0005	0.5754	-0.1603	4.0783	58.5827	76269.03	0.0434	.0000
UCL	0.0082	4.3905	-3.741	6.1629	181.928	948932	0.2800	.0000

Note: All companies' initials above were defined on page 8, P .value is probability value, and Std. dev is standard deviation

Table 5.1 presents a summary of descriptive statistics from the series of returns. It can be observed that the mean return is negative for the market as measured by ALSI. The mean return

of the market is -0.0007 and this is very small almost close to zero basing on economic perspective. The mean return ranges from -0.0232 to a maximum value of 0.1901. The mean has a standard deviation of 0.0249 and this value is too high compared to the mean which approaches zero. Such value of standard deviation is an indication of high volatility in the expected returns and it implies that the market is very risky. The market index has a negative Skewnes of -0.7287 and this is an indication of much probability of a fall in market returns than it is expected to rise. The degree of excess returns as measured by Kurtosis which has a value of 23.4966 is extremely very big as compared to a normal value of three. The calculated Jarque-Bera (JB) statistic which is 1245.97 and its corresponding probability of 0.0000 was used to test the hypothesis the returns are normally distributed. The probability of 0.0000 is an indication that the returns are not normally distributed. This is due to the fact that the probability value is smaller than the 1% level of significance.

The companies that behaved in the same way as the market with negative mean values of returns these include; BATU, DFCU, NIC, NVL, and SBU all these had the mean values of -0.0012, -0.001, -0.0013, -0.0012 and -0.0005 respectively. All the values are almost close to zero. These have their corresponding standard deviations of 0.0509, 0.0220, 0.0291, 0.0289 and 0.0434 respectively. All these five companies with these values of standard deviation are relatively high which means that the market is risky due to high variability in the expected returns arising from investment in such companies. The corresponding values of Kurtosis in these companies are all too high exceeding 3 implying that the returns in such companies are not normally distributed since such values exceeds the normal value of three. Five companies with negative mean returns also have negative skewnes apart from SBU that has a positive value of 4.07825. This implies

that there were greater chances of returns falling than rising for the four companies. BATU had greater chances of returns rising than falling. In contrary to the above only two companies have positive mean returns and these companies are BOBU and UCL and all these have positive values of skewnes which is an indication of greater chances of returns rising in these two companies than falling. UCL recorded the highest standard deviation and highest range compared to its mean which is an indication of high volatility in the expected returns to investors in such companies. All the companies had higher JB statistics and very low probability of zero which is an indication of no single company that had returns that were normally distributed. All companies recorded minimum values of returns that were negative and maximum values that were positive and from the above observations the range in mean returns for every company is quite big compared to the mean of returns that are almost zero for every company. Also DFCU recorded the lowest standard deviation as compared its mean this means that there is less variability in such a company. BATU, BOBU and SBU have their standard deviation values exceeding the market standard deviation value.

5.3. Test results of stationarity

The study tested for stationarity of the results for both prices and the logarithmic returns. The study tested for the presence of unit root for both prices and returns for time trend and intercept. The study also tested for the presence of Autocorrelation and included appropriate number of lags as suggested by the Schwarz formula of P_{max}= 12(n/100) ^0.25 and also considering the lowest Schwarz value for all companies that were studied and the market index. The results from stationarity test for returns are summarized in Table 5.2 and the unit root test results for prices are appended in Table 5.8.

Table 5.2: Test results of stationarity

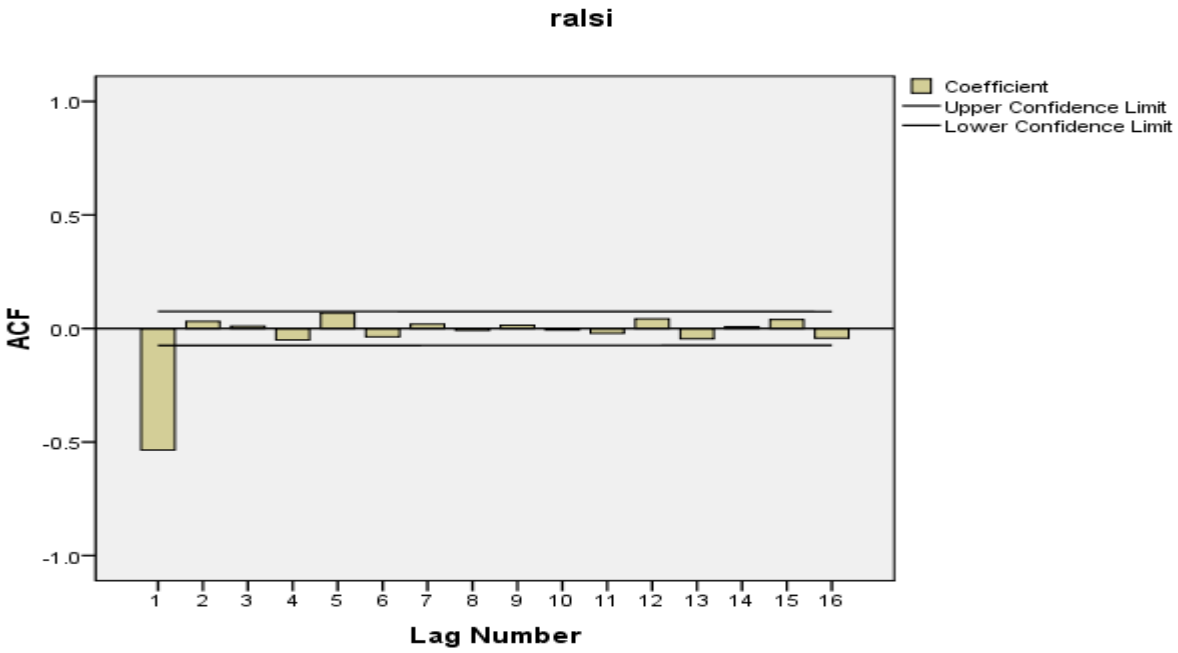
Model	Observations (n)	ADF computed	ADF critical (1%)	Schwarz	Lags
ALSI	709	-29.33792	-2.568237	-4.54545	0
BATU	709	-7.073617	-2.568279	-3.17708	9
BOBU	709	-27.74317	-2.568237	-2.07302	0
DFCU	709	-30.28293	-2.568237	-4.79788	0
NIC	117	-21.48909	-2.585225	-4.64797	0
NVL	709	-12.64763	-2.568246	-4.25160	2
SBU	581	-16.44416	-2.568976	-3.46349	2
UCL	709	-23.48030	-2.568242	0.222969	1

The results from Table 5.2 confirm the characteristics of time series data that they are non stationary in the original form. Thus the first differences of prices (returns) are stationary. Results for unit root test for prices show that were non stationary for all companies. Since prices are not stationary, it implies that prices do not move in a random order and do not have constant mean and variance which is an indication of inefficiency.

5.4. Auto correlation results

The study tested for the presence of serial correlations of the returns observed at the stock market and the results from the test are presented in the Figure 5.1 for the market share index and for the individual analysis the figures have been appended for more details.

Figure 5.1: Correlogram



The correlogram above was used for measuring auto correlation

From the Figure 5.1, it can be observed that there is a negative correlation for the first lag and then followed by a positive correlation for the next two lags. However, it is only the first lag that is significant in explaining the current returns. This implies that there is first order Auto Correlation. It also implies that, the observations are not randomly distributed due to the presence of a negative Auto correlation in the first lag that is outside the bands. The study extended the lags but others were within the confidence limits. This means that information in the stock market may be available from the previous period but, other periods may not give enough information to predict the current prices. Thus based on the Figure 5.1 the study concluded that there was serial dependence of observations and therefore, the observations were not randomly distributed. The above results were based on ALSI shares index in the market. Basing on the individual analysis, all the companies showed that there was Autocorrelation apart

from SBU which had no significant lags and its observations were randomly distributed. All other companies had the first lag very significant and other companies had more than one significant lag at the first difference. BATU recorded the highest number of significant lags which was six followed by DFCU with four significant lags and others had only two significant lags apart from BOBU which had only the first lag significant. Thus, this explains the overall observation of the significant lag observed in ALSI. This means that almost in all companies information can be readily available for predicting future returns. The figures for the auto correlation function results are provided in the appendix.

5.5. Randomness of the distribution of the expected returns

The study tested for the randomness of the distribution. The results from the test for the randomness of the distribution for both the mean and median are summarized in the Table 5.3. The ALSI had 351 runs for the mean and 357 runs for the median since the computed Z value is less than the critical then the null hypothesis of randomness couldn't be rejected. This also applied to NIC that seemed to be randomly distributed. Other companies had Z values that are greater than the critical hence the hypothesis of randomness was rejected since the computed values exceeded the critical values. Once a variable has either many or few runs, it is said to have serial dependence thus most of the companies' results indicated higher runs from 81 to over 350 run these indicated presence of serial dependence and the hypothesis of the observation being randomly distributed was rejected. This test also complemented the earlier tests such as the Auto Correlation test for the six companies and a small variation in one company that is NIC and also ALSI.

Table 5.4: The runs test for the mean and median returns

	Mean results							
	ALSI	BATU	BOBU	DFCU	NIC	NVL	SBU	UCL
Runs	351	81	145	209	19	199	248	150
Z[a]	-0.056	-11.476	-3.928	-1.839	-0.166	-5.344	2.77	-2.726
P. value	0.956	0.0000	0.000	0.066	0.868	0.000	0.006	0.06
	Median results							
Runs	357	81	230	209	19	199	258	227
Z[a]	0.172	-11.476	-4.473	-1.839	-0.166	-5.344	2.116	-2.649
P. value	0.864	0.000	0.000	0.066	0.868	0.000	0.034	0.008

5.6. Normality of the distribution

The normality of the distribution is the underlying assumption of most of the capital asset pricing models. The study applied K-S test which is a good test for the goodness of fit. Test results are provided in Table 5.3. This test was performed to find whether the stock market returns follows a normal distribution. All the computed Z values exceeded the maximum critical value of three and had probabilities of 0.000 implying that none of the companies had its returns that were normally distributed thus; the hypothesis of normal distribution was rejected.

Table 5.4: K-S test results

	ALSI	BATU	BOBU	DFCU	NIC	NVL	SBU	UCL
K-S. Z	3.581	10.589	9.713	8.537	4.653	8.132	9.312	9.799
Absolute	0.135	0.398	0.365	0.321	0.432	0.306	0.386	0.368
Positive	0.119	0.386	0.365	0.319	0.413	0.306	0.361	0.368
Negative	-0.135	-0.398	-0.333	-0.321	-0.432	-0.290	-0.386	-0.356
P. value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

5.6. ARCH model estimation results

Results from autocorrelation are presented in Table 5.5 with the number of ARCH terms for those that were found to be significant in explaining the current variability in the expected returns. These results are for equation 4.3 in the methodology. All the models reported results that contained ARCH terms that were significant. Most of the models had week effects thus, recorded ARCH terms of three since trading at USE has been for three days until this year 2011 when it started operating five working days. This implied that there were Autocorrelations among the expected returns. These results were in agreement with the first test of correlogram apart from that of SBU.

Table 5.5: ARCH results to test for the presence of autocorrelation

Models	α_1	μ	Constant	ARCH terms
RALSI	0.00054	-0.0009	0.00459	2
RBATU	-0.19855*	0.00587*	0.00062*	3
RBOBU	-0.01014	-0.00097	0.00029*	2
RDFCU	-0.01566	-0.00033	0.0003*	3
RNIC	-0.61499*	-0.0018	0.00026*	1
RNVL	0.06031	-0.00139	0.00062*	5
RSBU	-0.31175*	-0.00330*	0.00040	4
RUCL	-0.28020*	0.00097	0.04992	2

The values with asterisks plus the ARCH terms are significant at 5% critical value

5.7. GARCH (1, 1) estimation results

Table 5.6 presents results that were estimated for all the models. In order to make the analysis both the individual companies and market index results were computed. This was mainly because the study intended to make analysis on the firms that have been listed on stock exchange when it is operating a new trading system that is SCD and also compare them with other firms. The conditional mean as indicated by μ in the mean equation was significantly different from zero in ALSI, BATU, BOBU and SBU. However, in the other four companies it was not significantly different from zero as it is indicated in the table 5.6. In order to evaluate the EMH, the values of $\alpha_3 + \alpha_4$ were computed that measured volatility clustering. In the ALSI, the value was 0.999053 and this was very close to one and it indicated a presence of high volatility in the market and this also applied to other companies such as BATU with a value of 1.137159, DFCU with a value of 0.84153, NIC with a value of 0.8671 and SBU that had a value of 1.027124. All

these indicated high volatility in their expected returns. It was only UCL that had its value slightly below one but above 0.5. Much as this value was small, the company recorded a mean return and a coefficient that was explained by the lagged returns very significant. Among the companies that had their returns explained by previous returns, include; BATU, BOBU, NIC, SBU, and UCL all these had significant coefficients on their conditional mean equation for their logarithmic returns. There were only two companies plus the market index that had their current returns not being explained by previous returns. Also the individual coefficients of α_4 for NVL and UCL were negative and this didn't make sense since all the coefficients are expected to be positive. It was only NVL that satisfied the conditions of the GARCH model for EMH however still the results were not randomly distributed and it has serial correlation of its returns thus the study could not confirm its efficiency at weak form. Basing on the NIC Company that was listed on the SCD system, the results for randomness test were randomly distributed but did not satisfy the conditions of the GARCH model to conclude for the efficiency of the new trading system.

Table 5.6: GARCH (1, 1) estimation results

MODELS	μ	α_1	α_2	$\alpha_3 + \alpha_4$	DW
ALSI	-0.0013*	-0.0542	0.0000914*	0.999053	2.097042
	(0.0005)	(0.0517)	(0.0000144)		
BATU	0.0077*	-0.0306*	0.000197*	1.137159	1.6222598
	(0.0015)	(0.0721)	(.0000168)		
BOBU	-0.0019*	-0.2320*	0.000156*	1.740382	1.645654
	(0.0005)	(0.0654)	(0.0000042)		
DFCU	-0.0005	-0.0391	0.000125*	0.841533	2.183294
	(0.0008)	(0.0606)	(0.0000117)		
NIC	-0.0003	-0.4768*	0.000102*	0.86711	2.385005
	(0.0015)	(0.1838)	(0.000024)		
NVL	-0.0012	0.1025	0.000819*	0.135024	2.276645
	(0.0012)	(0.0560)	(0.00000274)		
SBU	-0.0029*	-0.0247*	0.000031*	1.027124	1.830241
	(0.0010)	(0.0495)	(0.0000045)		
UCL	-0.0028	-0.3782*	0.098800*	0.527991	1.877939
	(0.0172)	(0.109905)	(0.011417)		

The values with asterisks are significant at 5% critical value and the values in brackets are standard deviations.

5.8. Estimation of liquidity level

The liquidity level was estimated by traded value as a percentage of GDP and the results are provided in Table 5.7 and Figure 5.1.Figure 5.2 shows the liquidity level since 2006 up to 2010. Generally the liquidity level has increased from 0.0625% in 2006 up to 0.17% in 2010. The

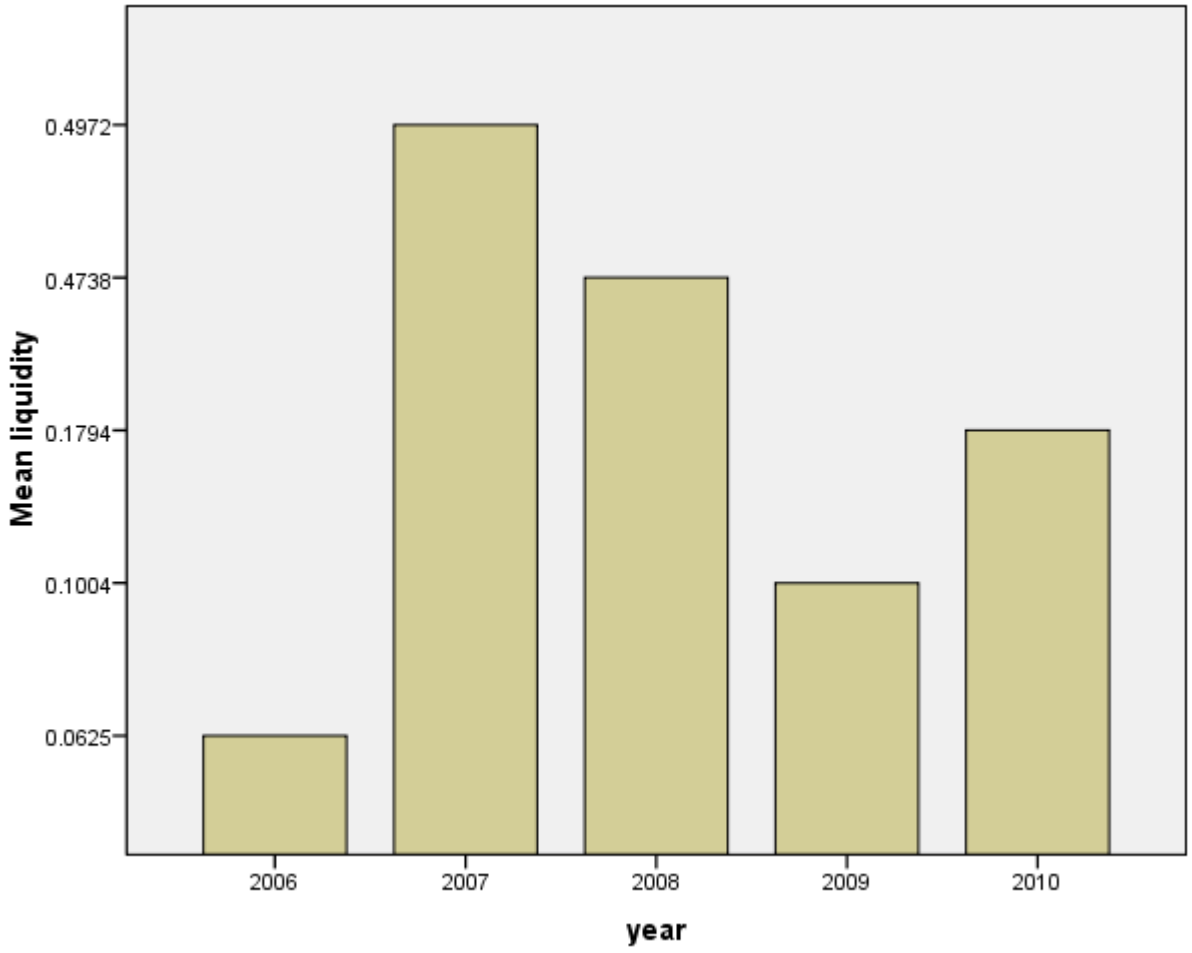
liquidity level reached its peak in 2007 in the period studied with the value of 0.49%. However, these values are very small compared to other emerging stock markets such as South Africa with liquidity level above 10% as of 2005 (www.uncea.org/aria3/chap7). This lower level of liquidity is an association of market inefficiency since it implies less trading and inefficiency in the flow of information that in turn leads to no participation in the market. Infrequent trading was observed in many of the trading days by many of the listed securities but, was mainly in the cross listed securities. When such conditions exists in the market, it implies inefficiency and as result there will be low ask and offer bids in the market and such prices based on low bids will yield inefficient prices. Such a market with few listed firms and securities, limits investors' chances of making portfolio selection. The capitalization level (cptlevel) was computed as market capitalization as percentage of gross domestic product. All the values since 2006 up to 2010 are less than 100 percent and therefore, these values are so small compared to other countries with capitalization levels that go beyond 100%.

Table 5.7: liquidity estimation using GDP, market capitalization (Market Cap) and traded values

Year	GDP	Market cap.	Traded value	Traded value as percentage of GDP	Market cap as percentage of GDP
2006	15989	203	9.91	0.062479	1.26877
2007	17138	1567	85.2	0.497176	9.143424
2008	18924	1395	89.7	0.47379	7.371592
2009	19665	1251	19.7	0.100357	6.363539
2010	20771	1968	37.3	0.179422	9.474652

Note: Values for capitalization GDP and traded values are in billions

Figure 5.2: liquidity level of USE (2006- 2010)



5.9 Discussion of the findings

In evaluation of the EMH, GARCH (1, 1) model was adopted and a number of tests were performed to test whether excess returns could be generated by any investor who invests time in searching for under priced and over priced securities through using trading strategies such as drawing charts or using moving averages. The results from Jarque-Bera test rejected the normality of the distribution of the expected returns and this was again confirmed by K-S test for the goodness of fit. Jarque Bera test was rejected by all the listed firms in this study in the period

2006-2010. Birakwate (2006) also applied a similar test on five locally listed companies for a period of 3 year but also the test results rejected normality of the distribution. Also in testing the randomness of the distribution of the expected returns using the Runs test, all of the models apart from ALSI and NIC were not randomly distributed. But it was still too early to confirm the randomness of NIC due to the fact that it was listed to the stock exchange recently in 2010 under the new trading system of SCD and had very few observations. In testing the independence of the observation still two tests were applied that is the correlogram and the ARCH model both of them confirmed serial dependence in the expected returns and came to an agreement apart from UCL which had mixed results. It was only SBU that has its observation that were independently distributed. Basing on the GARCH results are presented in Table 5.3, most of the companies recorded high volatility in the expected returns. All these are in contrary with the efficient market hypothesis thus the assumption of no excess returns that can be generated by serious investors was rejected. It is only NVL that recorded constant volatility and therefore, such a firm confirms the EMH. These results can be attributed to high levels of inflation, thin trading that was observed in the market among others. These results are slightly different from earlier study by Birakwate in 2008 using random walk model for the case of new vision and ALSI and NIC. They are also in agreement with many other studies in emerging markets such as Magnus et al (2008) in Ghana basing on RW and GARCH (1, 1), (Jefferis and Graham, 2005) in Kenya and Zimbabwe using the same model in this study. All these studies found markets were emerging to be inefficient at weak form and had low levels of liquidity. Also the market has low levels of liquidity as it has been approximated by the traded value as a percentage of GDP this low level also confirms the inefficiency in the information flow. This low level of liquidity is always characterized with a lot of inefficiency and most of the African countries still have a problem of

liquidity apart from South Africa that has liquidity level that is above 10%. Still, the market is still characterized by lower capitalization levels. It was also observed that, the market still is characterized by thin trading mainly on securities that were cross listed and this may be due to lack of enough information about such securities.

CHAPTER SIX

SUMMARY AND POLICY RECOMMENDATIONS

6.1. Introduction

This chapter presents a summary of the findings and draws conclusions on efficiency of Uganda's stock market based on the findings. It also includes policy recommendations and areas for further research.

6.2 Summary of findings

This study explored the efficiency of Uganda's stock market and under this; the study focused on determining the degree of efficiency and estimation of the liquidity level and derived implications towards market efficiency. This was due to high volatility and puzzle in the debate of efficient market hypothesis. The study used the GARCH model to determine the randomness of the distribution of the stock returns with a combination of tools that were used to analyze the results. Secondary data were obtained from Uganda securities exchange and Uganda Bureau of Statistics from the year 2006 to 2010. For determination of the degree of efficiency, the study used daily observations and for liquidity the study used annual data. The results from the GARCH Model except for NVL rejected the randomness of the distribution and indicated high volatility in the expected returns and this was again confirmed by low levels of liquidity that was below 0.5%.

6.3. Conclusion

Understanding the nature of stock market efficiency is of much importance to investors who seek to find whether they can get an opportunity of making excess returns. If the market is efficient,

then no arbitrage opportunities can be obtained by using any trading strategy such as drawing charts or calculation of moving averages to find short and long positions. Based on the results and a variety of various tests that were performed, there was serial dependence of returns and the results from GARCH model indicated that the returns are not randomly distributed. Also the K-S test rejected the normality of the distribution. All these results imply that the market was still inefficient and thus, it is not wastage of time in looking for under or over priced securities. This indicates that it is more profitable to technical analysts who apply trading rules for making excess returns. But also technical analysts must take care of trading costs in order to make moves of generating excess returns. The inefficiency of the USE is not surprising because of its low levels of liquidity and other performance indicators such as capitalization as a percentage of GDP. This confirms its inefficiency since such characteristics are always associated with a lot of information inefficiencies. This kind of inefficiency also implies that such listed firms will not find it easy to raise the required capital due to the fear of the true values of the traded shares among the public who cannot easily analyze the stock prices. The USE is therefore, still inefficient at weak form and thus the EMH is rejected though NVL is weak form efficient.

6.4. Policy Recommendations

Basing on the results above, there is still a lot of inefficiency in the flow of information to investors. This implies that, there is need for expanded general awareness campaigns like sending messages to individuals to improve on the flow of information to investors. This will also help to increase on the levels of liquidity and capitalization.

To the government to put up more policies to control major economic macro variables such as inflation since performance of firms, is derived from the macroeconomic indicators. These can improve operational efficiency and reduce the observed variability in prices.

The stock market authority needs to introduce measures to curb stock price volatility such as margins, transactional taxes, more new financial products in the stock market to encourage more participation. Margins are initial deposits that ensure traders are well capitalized. Transactional taxes are used mainly to reduce speculators. This will help in raising up market participants and more competition in the market that will help to improve efficiency.

There is also need for to increase the number of trading session for example afternoon session in order to reduce the interval between trading sessions and this can help improve information flow.

6.5. Areas for further research

This study examined the efficiency of the stock market at weak form and found it to be inefficient at its lowest level of weak form. It was also found that, the market has low levels of liquidity and capitalization with only seven locally listed companies with all the companies that are operating in the country. Future studies are encouraged to find out the impediments to the listing of companies on the stock exchange. Also it was found out that there are few market participants in the cross listed companies. Therefore, further studies need to find out why such participation is still limited in the cross listed companies.

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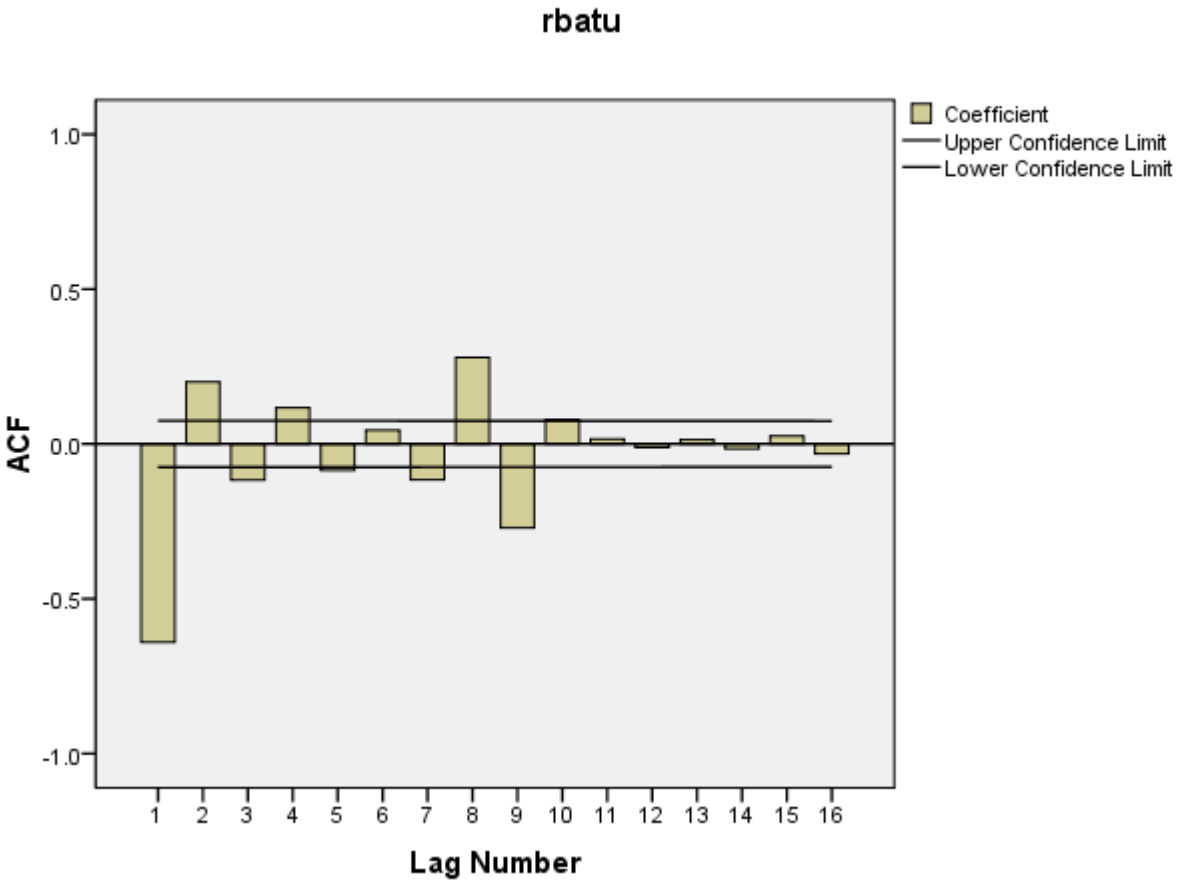
APPENDICES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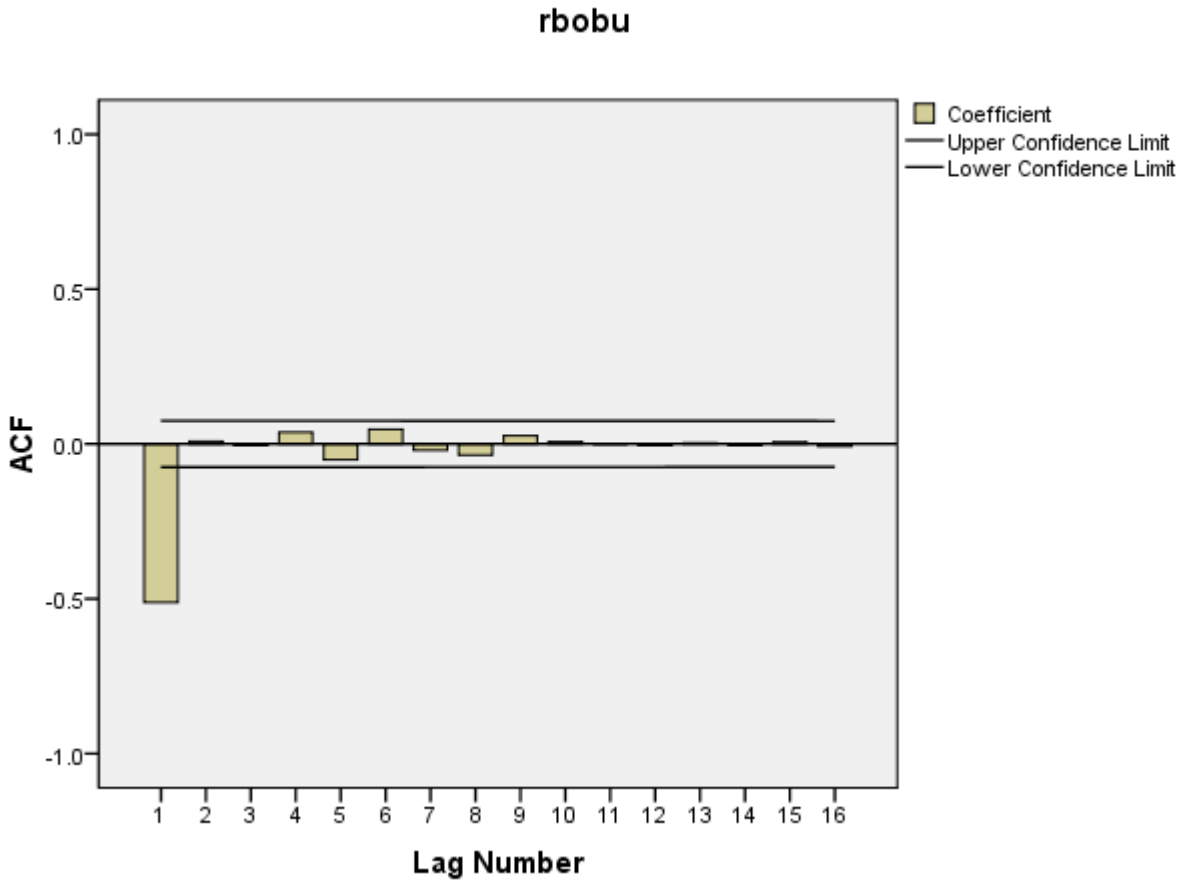
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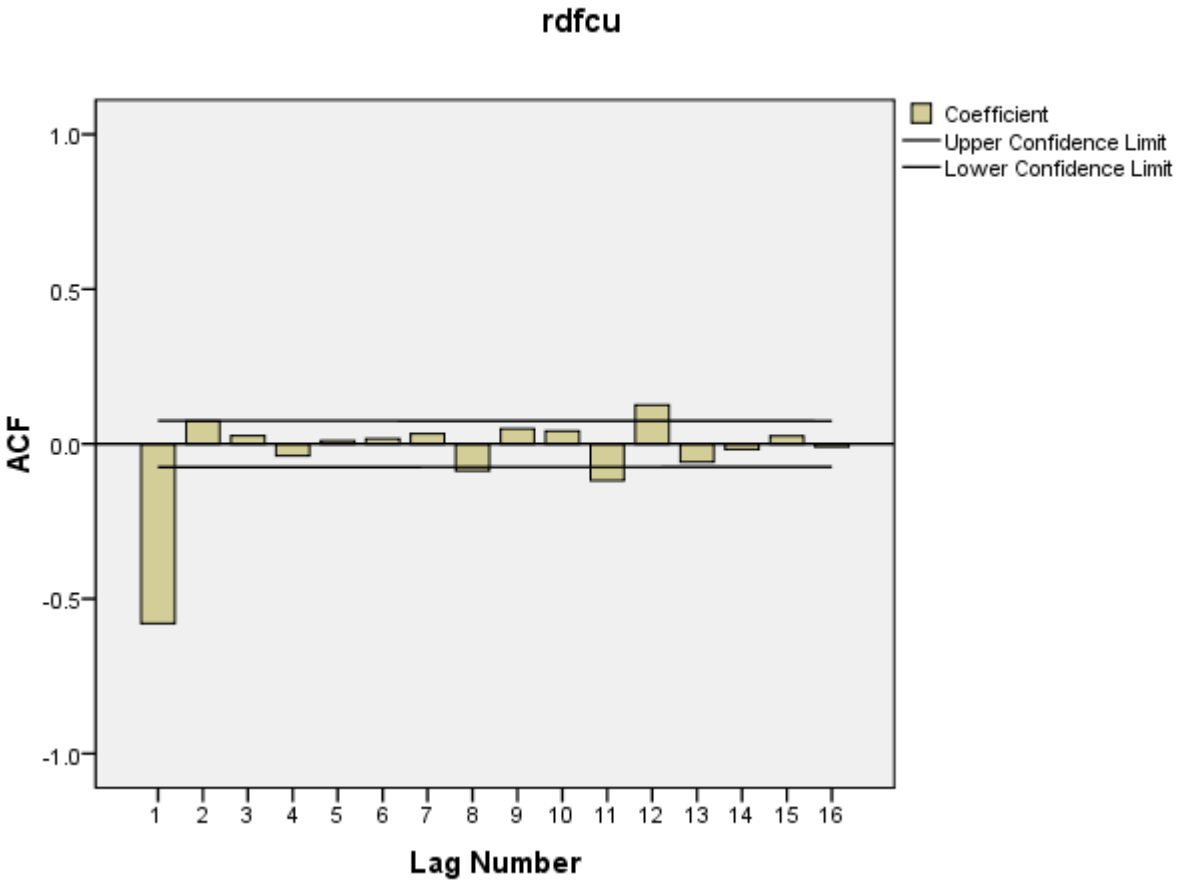
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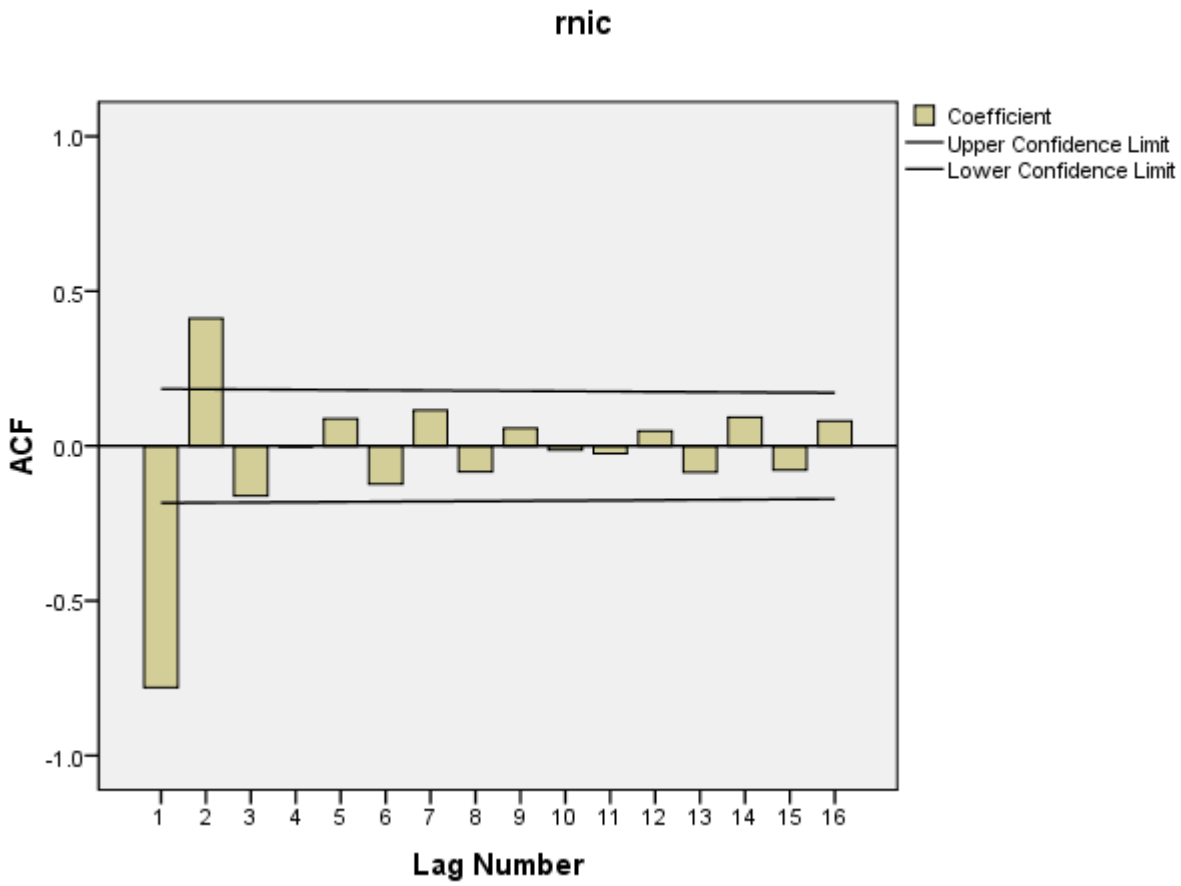
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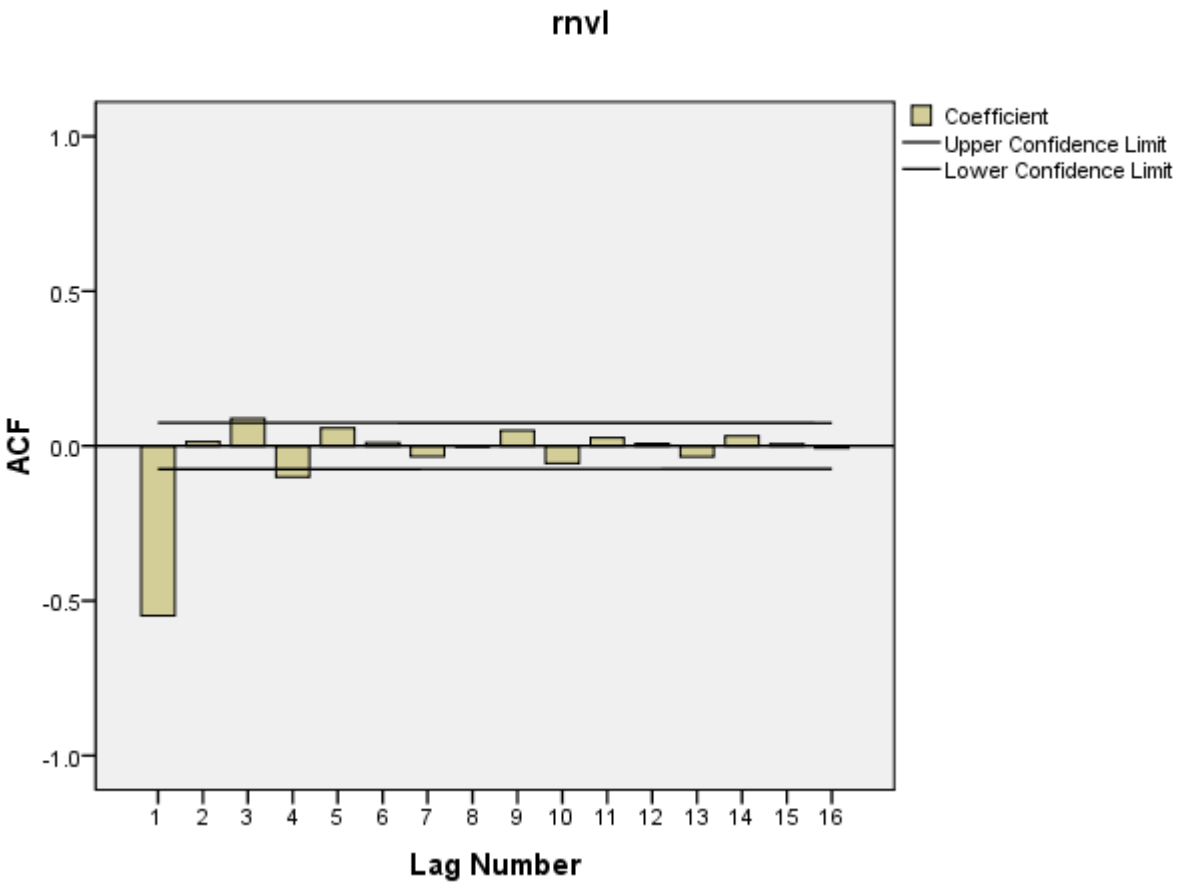
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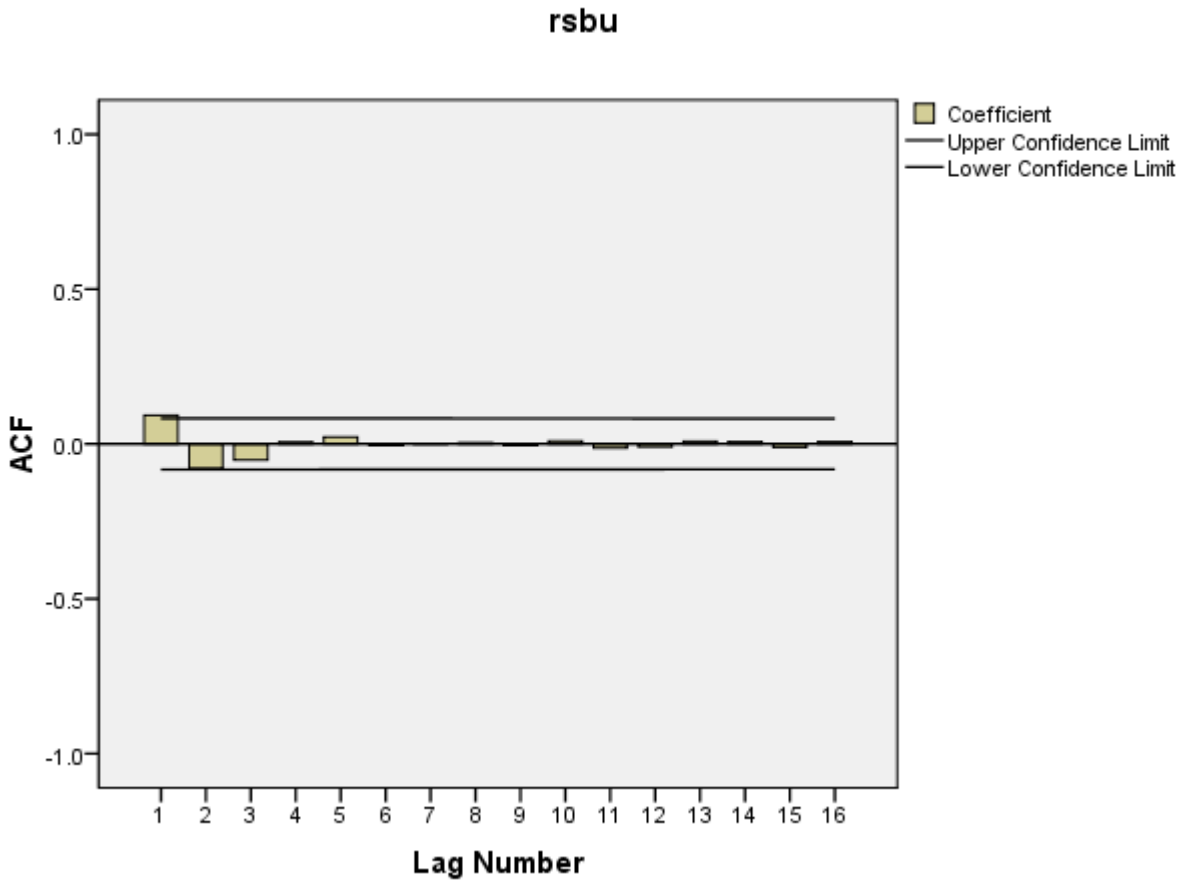
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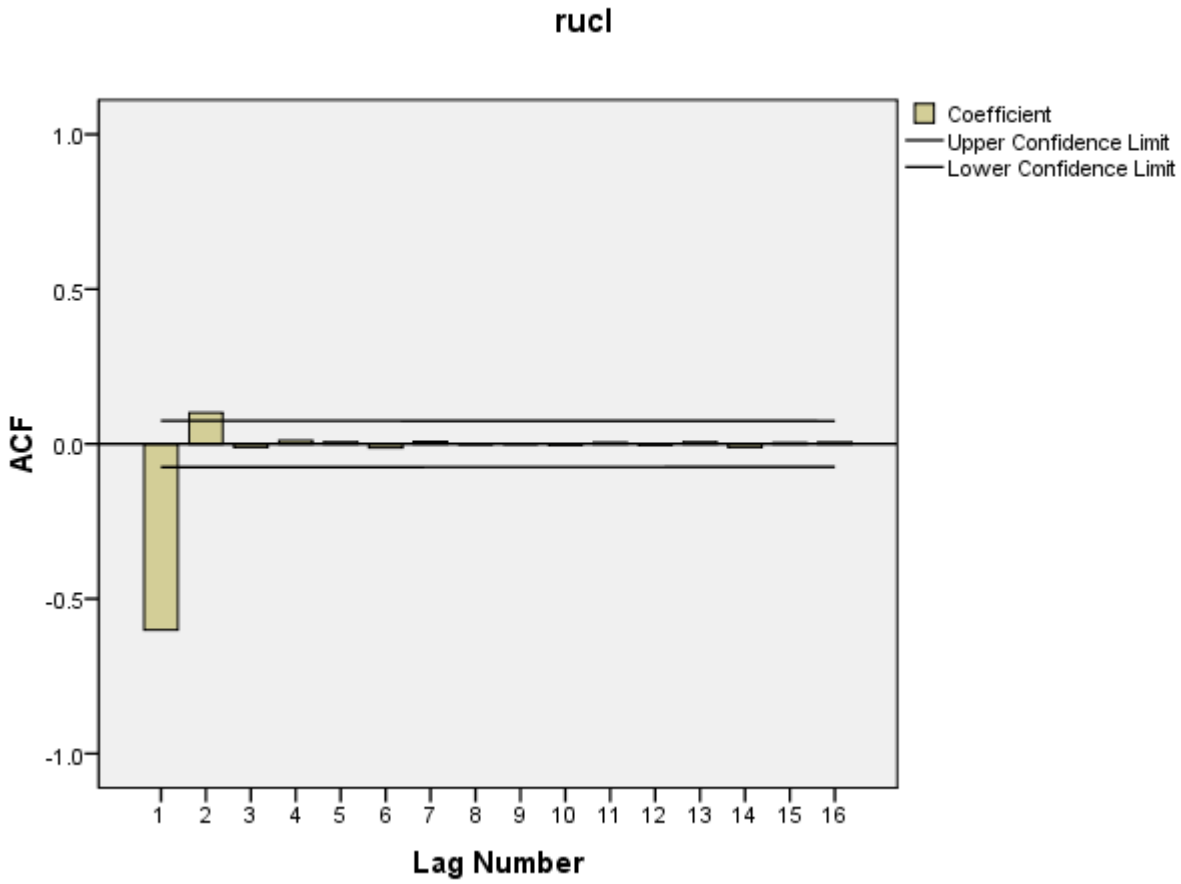
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TABLE 5.8 UNIT ROOT TEST FOR PRICES

Model	Observations (n)	ADF computed	ADF critical (1%)
ALSI	709	-1.3608	-2.5686
BATU	709	-2.2007	-2.5686
BOBU	709	-1.4720	-2.5686
DFCU	709	-1.4572	-2.5686
NIC	117	-0.6236	-2.5834
NVL	709	-0.5008	-2.5686
SBU	581	-0.9049	-2.5692
UCL	709	-1.0991	-2.5686