

ASHESI UNIVERSITY COLLEGE

**MEASURING THE SYSTEMATIC RISK OF COMPANIES LISTED ON THE
GHANA STOCK EXCHANGE**

By

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DECLARATION

I hereby declare that this dissertation is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:.....

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I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines in supervision of dissertation laid down by Ashesi University College.

Supervisor's Signature:.....

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Date:.....

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ABSTRACT

The Beta of a stock is an index which measures its volatility relative to the market rate of return (Systematic risk). The beta of a stock is a critical component in not just valuing a stock but a company as well. Beta gives investors a fair idea of the risk associated with a particular security relative to the market, as such, enables them make informed decisions. Arguably, the absence of valid beta data of companies listed on the Ghana Stock Exchange (GSE) has partially contributed to the unattractiveness of the stock market as both local and foreign investors are not well informed about the risk of particular stocks. Thus, this research, seeks to provide investors and academicians with valid beta data.

Of the 37 companies listed on the GSE the researcher measured the betas of 36 companies using the Market Model.

Research results revealed that, most companies listed on the GSE would be considered defensive stocks because they have beta values less than the overall market (1). Hence, the returns of most stocks vary less than proportionately than the returns of the entire market. In the words of the average investor, this would mean that stocks listed on the GSE are not risky.

Based on the research findings, it is recommended that, future studies such as, testing the effect of various models of beta estimation in the Ghanaian market be conducted in order to complement this work.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Typically, every investor participating in the capital market in Ghana has to be concerned with two types of risk referred to as unsystematic and systematic risk. Unsystematic risk is that type of risk which is specific to the firm, as such can be reduced to zero by diversification. However, systematic risk measures the riskiness of a security in relation to the market¹. Macro economic variables such as inflation, interest rate, foreign exchange rate and unemployment affect the market as a whole; therefore, each security listed on the Ghana Stock Exchange (GSE) is in one way or the other affected by these forces. The extent to which these securities are affected can be determined by measuring their systematic risk.

In an era which witnessed the financial crisis of the twenty first century where stock markets worldwide including that of Ghana plummeted, investors at least would be very cautious. Interest rate and inflation have reached monthly highs. With the ex governor of the Bank of Ghana, Dr Acquah having admitted at a Monetary Policy Committee press briefing (MPC) that he had no idea what the unemployment rate is, it seems government officials have lost track of unemployment figures (Keelson,2009). During the

¹ GSE All Share Index

same period, the Ghana cedi continually depreciated against its major trading currencies; in essence the market as a whole was in turmoil.

As reported on the official website of the Bank of Ghana, the interbank interest rate during October 2009 stood at about 22.8 percent, whereas in the beginning of the year 2008, interest rate stood at 12.21 percent. The implication of these statistics on the economy is that, both cooperation's and individuals would be deterred to go in for loans simply because it is expensive. As such, firms would not be able to embark on projects that could increase the value of the firm simply because there are inadequate funds. Year on year inflation was 12.8 percent in the beginning of 2008; however, due to the financial crises, a year later this figure has increased to 19.9 percent (Bank of Ghana, 2009). According to the Gold Coast Security Index², year to date depreciation of the Ghana cedi as at October 2009 stood at 24.70 per cent, with the base year-to-date depreciation pegged at 47.73 per cent.

As indicated by Mr. Ken Offori – Attah, Chairman and Co-founder of Data Bank Financial Services, events around the world have also led to the reduction in foreign participation in the Ghanaian Stock Market (Ackah, 2009). Not only has foreign participation declined but in a bid to cushion themselves against the financial losses they have suffered back in their respective countries, foreign participants have resorted to taking cash out of

² It is a composite measure of the value of the Ghana Cedi against the Dollar, Euro, Pound Sterling and the CFA. It is calculated as a geometric weighted average of changes in the four foreign currency rates against the cedi at the Inter-bank market, relative to a base of 100 set at July 2007.

the Ghanaian capital market by selling their stocks. The end result was the downward spiral of stock prices because the rapid selling of stocks led to a case where supply was greater than demand. Nonetheless, though prices have fallen this is the best time to buy because stock prices are relatively cheap. Prior to the global financial crisis, the Ghanaian Stock Exchange had been one of the best performing markets so it is almost certain that the market would improve once economies worldwide begin to exit the recession and enter into growth stages.

In light of these, as rational investors, it is essential to have a benchmark to be able to determine how companies would perform relative to the market in order to be able to determine the best direction to allocate resources. In addition, it can also be argued that the absence of valid beta data for listed companies on the Ghana Stock Exchange has partly contributed to the dormant nature of the stock market as many investors' both local and foreign are not well informed about the risk associated with a particular stock. This indeed provided the stimulus for this study.

1.2 Overview of the GSE and Ghanaian Investment Environment

Like in other emerging markets, the Ghanaian stock market is an important driver of economic growth and the performance of the stock market more often than not is a reflection of the performance of the overall economy. As such, stock markets are often termed as leading indicators of any economy.

The GSE was incorporated in July 1989 with trading commencing a year later (GSE, 2009). Over the years, active participation in the Ghanaian market has

made it one of the world's best performers as it was voted by reputable institutions such as Birinyi Associates, a research Group in the USA and Standard Chartered Bank London Limited as world's best performing stock market (Osei, 2004). The number of companies listed on the exchange since its inception has grown from 11 to about 37(including Standard Chartered Bank preference share) but this cannot be compared with the 200 plus companies listed on Nigerian Stock Exchange. Nonetheless, many more companies both domestic and multinationals are expressing their desire to list on the GSE in order to reap the benefits of the capital market.

Active participation in the stock market has been abysmal over the past few months and this undoubtedly is attributed to the state of the economy. With inflation and interest rates rising, people are not investing as they have less to spend and those that want to invest, do so in relatively safer instrument such as the government bill which averaged a return in the region of 24.26³ (Bank of Ghana, 2009) percent during period of economic downturn. As the Ghana cedi continued to struggle against its major trading currencies such as the US dollar, investors also preferred to invest in foreign currencies rather than stocks. All these factors have contributed to the lackluster performance of the exchange recently.

1.3 Research Problem

Over the past few years, there has been increased activity in the capital market in Ghana. Therefore, it is essential that market participants be able to determine the riskiness of listed companies, however, information regarding

³ 91 Day Treasury Bill Interest rate

beta of companies are not readily available. Ms Agyare, the Public Relations officer of the Ghana Stock Exchange reiterated that point in an interview, when she claimed that the Ghana Stock Exchange as an outfit does not have information regarding beta of companies listed on GSE.

This study therefore is being carried out to calculate how risky companies listed on the Ghana Stock Exchange are relative to the GSE Index⁴. In computing the beta of companies, various factors are used. Amongst those are, ending prices of companies listed on GSE, return of companies listed on exchange as well as return on the market index.

The literature stipulates that the aforementioned factors are the factors needed, but, are those factors nonetheless appropriate in measuring systematic risk of companies listed on the GSE? Are there other factors that could and should be considered in order to have a better estimate of systematic risk?

1.4 Research Objectives

The objectives of this study are to:

- a) Estimate how sensitive companies listed on Ghana Stock Exchange are relative to the market (GSE All Share Index);
- b) Explore whether the factors used in estimating sensitivity are appropriate in the Ghanaian context;

⁴ The initial value of the index was obtained by dividing the total market capitalization by a base period market capitalization and multiplying the result by 100. The base period market capitalization was the average capitalization of the market for the period November 12,1990 to December 30,1993

- c) Explore whether there are any drawbacks in using beta to analyze sensitivity of companies listed on GSE;
- d) Explore what category of stocks market participants actively engage in and its relation to beta levels; and
- e) Explore if there is a relationship between strength of beta and its share price.

1.5 Research Questions

The study seeks to answer the following questions:

How sensitive companies listed on the GSE are relative to the market?

What are the factors that should be considered when estimating systematic risk of companies?

Are the factors used in estimating the beta of a company appropriate in the Ghanaian context?

Are there any drawbacks in using beta to analyze systematic risk of companies?

Do market participants actively engage in low beta or high beta stocks?

Is there a relationship between the strength of a stocks beta and its share price?

1.6 Significance of the Study

This research is particularly important because it measures the risk of a company that cannot be reduced by diversification. It is essential that this

research takes place because valid beta data for listed companies in Ghana are not readily available to the public as well as to potential investors.

Measuring the systematic risk of listed companies is of importance to both investors and investment advisors because investors more often than not channel their resources according to their risk profile. Therefore, if investors are risk averse then you would expect that they invest their resources in companies that are less volatile in relation to the market, that is; companies with low betas or beta values lower than one. Lower than one because, literature states that a company with a beta lower than one implies a relatively less risky share. However, betas greater than one are considered to be aggressive shares, therefore would be recommended for more risk tolerant investors.

Having access to data on beta would also guide investors as to how to move their resources within economic cycles. In a period of economic boom where interest rates as well as inflation is low, it is expected that companies would record higher earnings, as such, resources should be aligned to companies with higher betas because their share prices would rise faster than the market, however, when an economic down-turn is forecasted where macro economic variables such as inflation, unemployment and interest rate are high, it is expected that companies would report a short fall in earnings, as such, potential investors should make investments in companies with lower betas because share prices of these companies would fall slower than that of the overall market.

With the completion of this study, instructors in universities across Ghana would be able to give practical examples in the field of investment or corporate finance in the Ghanaian context in order to make the educational experience more meaningful to students.

This study is also particularly significant because with beta estimates investors as well as potential investors can calculate the expected return they would get as a result of holding onto a particular share. This could be done using a model known as the Capital Asset Pricing Model (CAPM)⁵

This study is significant because in the end, it will determine if the factors used in measuring beta estimated are appropriate in the Ghanaian context and if the study reveals otherwise, then it would mean that stakeholders must devise a new way of estimating systematic risk.

1.7 Scope and Limitation

The scope of this project is measuring the systemic risk of companies listed on GSE as well as determining if the factors used to compute this risk are appropriate in the Ghanaian context.

The limitations to this project are due to the fact that, it relied heavily on secondary data especially in the area of beta estimation. The accuracy of secondary data is however beyond the control of the researcher.

⁵ CAPM states that the expected return on a share is = risk free rate + (risk premium on average share * Beta)

In addition to that, the research data considers only companies listed on GSE due to the fact that they are traded actively and information regarding such entities can be easily obtained.

Due to the period of the project execution, companies such as UT Financial services that listed less than a year ago was not included in the study as it would be nearly impossible to compute accurate estimates of its beta.

1.8 Methodology

In estimating beta, certain variables are used. They include month end prices of companies listed on GSE, return of these companies which is computed as a result of using prices and dividends.

The final variable needed is the GSE All Share Index for the same period which is used in estimating the return of the market.

Both primary and secondary data was used to acquire information to carry out the study. Secondary data contained information regarding dividends, month end prices of companies listed on stock exchange as well as monthly return of GSE All Share Index for the same period. The information gathered was used to run a regression on the return of a company and the market index using Microsoft Office Excel. The information was obtained from licensed dealing members' (LDM) of the stock exchange which includes brokerage firms.

Primary data was obtained by interviewing players such as stock brokers, financial analysts, asset managers and fund managers in the capital market

industry to determine whether the factors used to calculate beta are appropriate in the Ghanaian context and also through such interview's, the study would unearth if there are any drawbacks in using beta to analyze the sensitivity of companies listed on the Ghana Stock Exchange.

The information obtained was analyzed both qualitatively and quantitatively. Quantitative analysis was carried out in order to estimate the systematic risk of companies and also to test if a relationship exists between share price of a stock and its beta level. Qualitative analysis was executed to interpret the results gathered from the field.

Of the 37 companies listed on the Ghana Stock Exchange, 36 were analyzed in order to carry out this study and the period covered is 2005 to 2009. One company (UT Financial Services) was left out due to the fact that it listed less than a year ago, as such, sufficient information is not available to accurately estimate its systematic risk.

1.9 Organization of the Report

The report would be structured in five chapters as shown below:

Chapter one of this study, gives a brief description of the Ghanaian investment environment and also an overview of the GSE. This section also discusses the research problem, research objectives, research question as well as significance of the study, its scope, limitation and methodology.

Chapter two reviews existing literature on other academic works written in line with systematic risk. Thus, this section summarizes other works similar to this research which would aid the researcher complete this study.

Chapter three presents the modus operandi used to accomplish this research. This section explains the methods used in collecting the data as well as the method used in measuring the systematic risk of sampled companies.

In chapter four, the data acquired would be analyzed critically with the use of various statistical techniques such as regression analysis and a correlation matrix.

Chapter five presents the findings of the study based on the analysis done in the prior chapter. This section also includes recommendation by the researcher based on the findings.

CHAPTER TWO

REVIEW OF LITERATURE ON SYSTEMATIC RISK

2.1 Systematic Risk

Most assets (including real and financial assets) that investors choose to invest in have some exposure to risk. In finance, the total risk of a portfolio is the sum of its systematic (non diversifiable risk and unsystematic risk (diversifiable risk)⁶.

Unsystematic risk as defined by Van Horne and Wachowicz (2005, p. 103) is “the risk component that is unique to a particular company or industry, as such, is independent of economic, political and other factors that affect all securities in a systematic manner”. A typical example of this type of risk in a firm includes the quality of management.

By efficient diversification, this type of risk can be totally eliminated as such, is irrelevant when considering the risk of portfolio. The market does not provide extra compensation for bearing this type of risk.

Systematic risk on the other hand is that component of risk that comes as a result of factors that affect the overall market such as; changes in the nation’s economy or a change in world energy situation; for example an increase in oil prices or political factors. Systematic risk is therefore defined as the “variability of return on stocks or portfolios associated with changes in return on the market as a whole” (ibid, p. 103). Investors who hold a well

⁶ Total risk = Systematic risk + Unsystematic risk

diversified portfolio are exposed only to this type of risk, as such would be compensated for bearing this type of risk.

The systematic risk of a security is determined by its beta coefficient, as such, Guilford C. Babcock, (1972) in his article "a note on justifying beta as a measure of risk" defines The BETA COEFFICIENT of an individual security as simply a "measure of its volatility relative to the market rate of return".

Ambachtsheer defines beta as a "statistical proxy for a combination of fundamental company characteristics related to operating and financial risk". (Ambachtsheer, 1974)

William Sharpe⁷ also defines beta coefficient as "the slope term in the simple linear regression function where the rate of return on a market index is the independent variable and a securities rate of return, the dependent variable" (Bowman, 1979).

Though the three academicians (Ambachtsheer, Sharpe and Babcock) define beta differently, a common theme running through all was the fact that beta is a measure of a firm's risk. However, Ambachtsheer in his definition suggests that the fundamentals of a company must be taken into account when measuring its beta. Beta as defined by Babcock and Sharpe is sufficient because the fundamentals of a company would be reflected in its returns. If the fundamentals of a company are poor, its return would fall, on the other hand, if the fundamentals of a company are strong its return would rise.

⁷ William Sharpe is a professor of finance at Stanford University and also a winner of Nobel Prize in economic sciences in 1990

The concept of beta arises because all stocks tend to move to some extent or degree with movements in the overall market⁸. However, the return of some stocks tend to move more aggressively than others when the market moves, hence it is important as academicians and investors to be able to measure the extent to which a stocks return moves relative to the overall market index. This is achieved by measuring a stocks beta coefficient.

According to Brenner and Smith, an accurate estimation of beta is important for at least two reasons. Firstly, beta is important for understanding the risk – return or risk - reward relationship in capital market theory. This theoretical relationship can be established by analyzing the expected return – beta relationship as a reward – risk equation (Bodie et al, 2008). According to Bodie and others, “the beta of a security is the appropriate measure of its risk because beta is proportional to the risk that a security contributes to the optimal risky portfolio”. In the world of finance as in common reasoning, one would expect the reward or the risk premium on individual assets, to depend on the contribution of the individual asset to the risk of the portfolio. If the beta of a stock measures its contribution to the variance of the market portfolio then for any asset or security, the required risk premium or expected return should be a function of its beta, thus the higher the beta of a security the higher risk premium one should expect.

Secondly, an accurate estimation of beta is important because it aids in making investment decisions (Alexander and Chervany, 1980). Due to the

⁸ The market here refers to an index such as GSE All Share Index as in Ghana or S&P 500 as in America

fact that an understanding of a security's beta measures the effect of systematic risk on a particular security, beta is thus, an extremely useful tool for investors to understand how to create their own individual portfolios in accordance with their ability to take risk or in accordance to their risk profile. In addition, beta "is important in investment decision process because it is very useful to a portfolio manager in assessing the downside risk of his portfolio during bear market (Ambachtsheer, 1974)".

Though beta estimates are widely used in estimating systematic risk, research revealed that one of its limitation as argued by critics is that, there is some level of confusion surrounding optimal estimation level interval. However Basel in his article, "on the assessment of risk" concludes that, a forecaster or analyst would be better off using a longer estimation interval such as yearly or monthly interval when calculating or estimating beta as it provides a more stable beta estimate. The beta coefficient of the market model has nonetheless gained wide acceptance as a relevant measure of risk in portfolio and security analysis as such is used to measure the risk profile of companies across different markets.

2.2 Beta: An Index of Systematic Risk

Beta as an index of systematic risk measures the sensitivity of stock's returns to changes in returns on the market portfolio. The beta of a portfolio however, is a weighted average of the individual stock betas in the portfolio.

2.2.1 Adjusted Beta

Over time, there appears to be a tendency for measured betas of individual securities to converge towards the beta of the entire market index or toward the beta of the industry of which the company is part (Van Horne and Wachowicz, 2005, p. 109). This tendency is due to economic factors affecting the operation and financing of the firm and to some extent statistical factors as well (ibid). To adjust for this tendency, an adjusted beta is calculated.

Meryl Lynch⁹ adjusts its calculated beta by taking the sample estimate of beta and averaging it with 1, using weights of two thirds and one – third¹⁰ (Bodie et al, 2008). Regression betas are past and betas do change over time¹¹. Nonetheless, there is a strong correlation between past betas and future betas (Ambachtsheer, 1974). As any forecaster would tend to agree in order to predict the future accurately one has to look at past occurrences.

If a firm becomes very large and begins diversifying its product line, it would behave like the market and its beta would approach that of the market which is one (1). Thus, the future beta of a well managed expanding firm will lie somewhere between past beta and 1. Therefore, to have a correct estimate of its beta it is important to adjust a security's beta.

Due to the fact that different researchers and academicians calculate beta using subjective time periods, different return intervals, different market index, different researchers or services more often than not end up with

⁹ Merrill Lynch is one of the world's leading financial management and advisory firms

¹⁰ Adjusted beta = $\frac{2}{3}$ Sample beta + $\frac{1}{3}(1)$

¹¹ Analysts are more interested in future betas than past betas

different estimates so academicians have often resorted to adjusting a securities beta (Damodaran, 1999).

The problem however is that, the weights assigned in order to adjust beta remains the same for all companies regardless of the size of the firm. The assumption of keeping weights constant does not make theoretical sense because the degree to which various companies converge towards the market should be different because sizes of firms are different. Firms that are huge and tend to diversify aggressively should have their betas converge towards the market faster than firms that are not diversified or those that concentrate on a sole business.

Critics of beta adjustment argue that, since in the end all firms would converge towards one there is no need to adjust beta soon after estimation since in the long run they would eventually converge towards the market. Firms would eventually converge towards one in the long run because as they survive the competition and increase in size over time they would have the capacity to acquire more assets hence becoming more diversified and in the end pushing its beta towards one (Damodaran,1999) .

2.3 Ways of Estimating Beta

2.3.1 Characteristic Line

One way to determine the beta of a security is to find the slope of the line that describes the relationship between an individual security return and return on the market portfolio. The security return is the dependent variable

represented on the y axis where as the return on the market is independent variable, represented on the x axis. Returns on security are calculated as

$$\frac{(\text{Ending Price} - \text{Beginning price} + \text{Dividends})}{\text{Beginning price}}$$

2.3.2 Market Model

For the purpose of this study, this model that estimates beta as the covariance of return on stock and return on market, divided by variance of the market would be employed.

$$\beta = \frac{COV(R_i, R_m)}{Var_m}$$

Cov = covariance

R_i = return on stock

R_m = return on market

Var_m = variance of the market

In order to use this model one needs a historical list of returns for the asset and returns for the market index. These returns can be calculated based on daily, weekly or annual periods. The beta of a stock is then computed using the formula above.

Estimation of beta coefficients over the years and currently has been achieved by running a market model regression (Bradfield, 2003). Using this model (market regression model) however, raises a number of practical

questions because of certain factors inherent in the formula that could lead to several different beta estimates. Some of the issues that have to be considered are “purely measurement related such as, how does one measure returns? What market proxy should be used? How long should the return intervals be? How many data points are needed” (ibid)?

On the other hand, a further set of considerations involve the assumptions and the inferences, such as, is thin trading a problem¹²? Is the market segmented?

“Though investor sentiments and behavior are integral to the performance of any stock exchange, it must be noted that the market model is not based on any assumptions about investment behavior but simply posits a linear relationship between stock returns and the market return” (ibid)

2.3.2.1 Return Measures

One of such important considerations when applying the market model is the measuring of the return series for both the stock and the market index. One has the choice to measure returns either discretely or continuously, however, consistency in the method used must be maintained between the asset returns and market index proxy. According to Bradfield (2003), it is generally accepted that returns are continuously generated through calendar time, but because trading occurs at discrete intervals, observers view returns as if they are generated at discrete intervals (Bradfield, 2003).

2.3.2.2 The Market Index

¹² A condition in which there is little trading activity in a market because of a lack of buy or sell orders to drive up the volume. Thin trading conditions make it difficult for large buyers or sellers to execute orders because their trading activity may move prices. An individual stock, future, or option contract also may be thinly traded.

According to Bradfield, "in theory market capitalization weighted indices are preferred to equally weighted indices because they are superior proxies to the true market portfolio". Hence in Ghana for example, it would be preferred that the GSE All Share Index should be used as the market index. Some critics have argued that market must be segmented and the market index taken from the segmented market. Whichever index one decides to use, the received and accepted theory is that the index used must be comprehensive as possible in representing the entire market.

2.3.2.3 Length of the Estimation Period

The estimation period has always been greatly debated upon because different estimation periods give different values of beta. If beta is estimated based on several years of historical data it could be of little significance because the nature of the business including its risk undertaken by companies more probably than not may have changed significantly over a long period such as ten years (Bradfield, 2003). Bradfield claims that "a five year estimation period is reasonable because research has shown that beta tends to be reasonably stable of five yearly periods". He reasoned that "the selection of a five-year period represents a satisfactory trade-off between a large enough sample size to enable reasonably efficient estimation and a short enough period over which the underlying beta could be assumed to be stable".

2.3.2.4 The Return Interval

Different return interval lengths have different impacts on beta estimates and consequently the potency of their predictive power. Researchers such as Eubank and Zumwalt use monthly intervals over a five year period to compute the returns needed for the estimations process, resulting in sixty (60) data points of monthly returns. In a Ghanaian context however, it would be wise to use monthly intervals over a ten year period because within this interval was a cycle of boom and bust, if the researcher resorted to using 5 year period, the researcher would have been exposed to period where market was mostly was in a slump because of the effect of the global financial crisis on the Ghanaian stock market, so a 10 year period balances out the two extremes.

2.3.2.5 Thin Trading

Beta estimates in markets that do not trade frequently or are thinly traded tend to be biased. "If a stock is thinly traded then it is likely that the month-end price may not arise from a trade on that day but may instead be recorded as the price last traded during the month" (Bradfield, 2003). Thus, the recorded price on the market index at month-end may not be matched to a trade for the stock on the day, hence a mismatch occurs, and this mismatch is often due to efficiency of the stock market (ibid). This disparity impacts the covariance estimate between the stock and the market proxy, and the effect is that it leads to a downward bias in a covariance estimate. Consequently the estimated beta is downward biased due to the presence of thin trading.

Several researchers such as Dimson, Scholes and William have devised techniques for obtaining unbiased estimates for beta in an infrequently traded environment. Two approaches have emerged in the process and they include the "trade to trade" estimator and the Cohen estimators. "The Cohen type of estimators are based on aggregating lagged and leading regression coefficients whilst in the trade-to-trade approach the returns are matched and measured during the last consecutive trading days in each month" (Bradfield, 2003). In the trade-to-trade method, in order to correct for biasness, the returns on the stock and on the index are measured between the times of the last trades in successive months (ibid). Researchers such as Bowie and Bradfield concluded that, the "trade to trade" method was a superior method because standard errors of the "trade to trade" technique was substantially smaller than those of Cohen estimator.

Scholes- Williams technique

The Scholes- Williams technique was developed in order to reduce the biasness due to the biasness in beta estimated from daily return data. According to scholars such as Scholes and Williams the problem in estimating betas from daily returns is embedded in the fact that securities are not traded on a continuous basis as there are periods where trading is halted for the day and also periods where the stock is inactive (Kapoor and Pope, 1997). It must however be noted that, these periods of inactivity are not evenly distributed over time. In addition to that, relative to the average security on an index some securities trade more frequently than others.

These trading issues cause a “lag” effect in the true returns, meaning that observed returns will lag behind true returns and as such betas estimated from such returns are biased downwards (ibid). On the other hand, securities that trade about as frequently as the average security¹³ cause a “lead” effect, and thus the estimated betas are biased upwards (ibid). Scholes and Williams, (1997) determined that, in order to estimate the true beta, both the lead and lag effects must be taken into account. The true beta as referred to by Scholes and Williams is obtained by “calculating, using OLS regression, not only the observed beta during period t (the time frame of interest) but also calculating the beta during $t - 1$ (the lag beta) and $t + 1$ the lead beta”(ibid).

Dimson’s technique

“Dimson's method corrects for non-trading bias by specifying a market model with leads and lags in a time series” (Lian, 2000). Dimson proposed that, “in addition to the current weeks market return, the previous weeks' and subsequent weeks market returns be also included in the beta estimation model” (ibid). Theoretically, in accordance with Dimsons technique, “the annual beta of each individual company is calculated using the time series observations of individual securities returns regressed on the time series observations of market returns; it includes one lag and one lead in a multiple regression equation which adjust the bias of thin trading”(Mollah and Mobarek, 2009).

¹³ The index against which the security’s returns are measured is referred to as average security

Other techniques used in estimating beta which accounts for thin trading include Fowler-Rorke's method. This method weights the betas with serial correlations in the market returns.

2.4 Types of Beta

2.4.1 Implicit Beta

This model was introduced by Andrew Siegel because he believed that the model based on the regression analysis of historical or past data introduced substantial statistical error into estimates of beta that cannot fully reflect current market conditions (Siegal, 1995).

Under this model, the beta of a firm's stock is computed directly from observed option prices. The concept of implicit volatility was proposed by Latane and Redleman who observed that, "the Black Scholes call option revealed the volatility of the underlying asset and because it is based on current market price of an option instead of series of past observation the implicit volatility solves some of the problem associated with historical volatility by providing an up to date volatility measure without the substantial statistical error associated with estimation of a standard deviation from a sample data" (Siegel, 1995).

2.4.2 Consumption Beta

Douglass Breeden developed a model in which a security's risk is measured by its sensitivity to changes in investor's consumption and this is termed consumption beta. The beta for consumption attempts to measure the covariance between an investor's ability to consume goods and services from investments, and the return from a market index.

2.5 Interpretation of Beta

2.5.1 Beta Greater than 1

A stock with a beta of more than one is termed as an aggressive stock. This is because the stock's excess return varies more than proportionally with the excess return of the market portfolio. In essence, this stock has more unavoidable risk than the market as a whole.

2.5.2 Beta less than 1

A stock with a beta of less than one means that, the stock's excess return varies less than proportionally with the excess return of the market portfolio. This type of stock is often termed as a defensive share.

2.5.3 Beta equal to 1

A stock with a beta of one implies that, excess return for the stock varies proportionally with excess return of the market portfolio. This type of stock has the same systematic risk as the market as a whole.

2.5.4 Negative beta

A stock with a negative beta implies that excess return for stock is inversely related with the excess return of the market portfolio.

Research by Shapiro and others indicated that "high-beta firms did significantly better than low-beta firms in a rising market and significantly worse in a falling market, just as the capital asset pricing model predicts" (Lakonishok et al, 1984).

2.6 Uses of Beta

As explained by the capital asset pricing model and security market line, beta is used to determine expected return on security. The higher the beta of a

security, the higher its risk premium and also its expected return. On the other hand, the lower the beta of a security, the lower its risk premium and also its expected return.

2.7 Criticism of Beta

2.7.1 Market Index Bias

This states that beta estimates are distorted due to the fact that indexes are imperfect proxy for overall market. In other words no index applied in the computation of beta comes close to reflecting the sentiments of the overall market (Damodaran, 1999). Most market indexes used to compute beta are merely equity index. Therefore, in Ghana the index representing the overall market would be the GSE All Share Index and in America the S&P 500. The problem however in using equity index as a proxy for entire market is that not all companies are listed on an exchange. In America for example the S&P 500 index includes 500 companies out of thousands of equities traded in us market (ibid). In Ghana the GSE All Share Index consists only of 37 companies and the fact is that there are many companies that are unlisted hence not represented in the market index.

In addition, in the Ghanaian context a few firms dominate the entire index so little changes in them in terms of price can sway the overall market in one direction or the other. The problem here is that regression performed in order to calculate beta may be of individual securities against domineering stocks rather than against the market (ibid).

No single index includes all capital assets, including stocks, bonds, real estate, collectibles, etc. As such, researchers including Pettengil, Sundaram, and Mathur claim that “recent empirical evidence indicates the absence of a systematic relationship between beta and security return” (Mathur et al, 1995).

In addition, the benchmark market index against which individual securities are analyzed must be stable and not suffer from undue fluctuations. The main issue is that the index must collectively represent the collective market sentiment and economic growth.

2.7.2 Model Specification Bias

This model states that beta estimates are distorted because the Security Characteristic Line fails to reveal other important systematic influences on stock market volatility thereby failing to reveal a true beta estimate. Researchers have thus, “argued in favor of measuring systematic risk responsiveness to several macroeconomic variables to determine the specific effect those variables have on systematic risk” (Pettengill et al, 1995). Empirical studies have suggested that, investors may actually be concerned with the total variability of an asset or securities returns, not just its systematic risk (Chan and Lakonishok, 1992)

2.7.3 Data Interval Problem

This highlights the fact that an estimated beta would have its challenges because beta estimates are dependent on data interval analyzed. A securities beta would vary depending upon whether it is estimated on the

basis of daily, weekly or monthly returns (Hawawini, 1983). "In general, the beta of security with a smaller market value than the average of all securities outstanding (the market) will decrease as the return interval is shortened, whereas the beta of securities with a large market value relative to the market will increase" (ibid). This suggests that, betas measured over return interval of arbitrary length will tend to be biased. "In particular, securities with relatively small market value may appear to be less risky than they truly are, whereas securities with relatively large market values may appear to be more risky than they truly are" (ibid).

Though modern financial theory tells us that a security's historical rates of return can be used to estimate its systematic risk, it does not specify if these rates of return should be measured over a day, a week or month or any time frame for that matter, thus leaving the choice very arbitrary.

2.7.4 Non-Stationary Beta Problem

This problem highlights the point that, the challenge to beta lies in the fact that betas are inherently unstable. "A major factor responsible for the shift in estimated beta is the existence of intertemporal noncontemporaneous relationship between the daily returns of individual securities and those of the general market" (Alexander et al, 1980). Securities daily prices do not move in unison as some stocks may lag behind the general market movement whilst others may lead it. Previous research such as Alexander and Chervany's article "On the Estimation and Stability of Beta" has suggested that "the fundamental cause of the intertemporal cross correlation

is friction in the trading process which delays the response of securities prices to new information”.

2.7.5 Other Criticism

Researchers have found empirical evidence that security returns are affected by various measures of unsystematic risk (Pettengill et al, 1995). Bowman in his article “The Theoretical Relationship between Systematic Risk and Financial (Accounting) Variables” reveals that certain fundamental financial accounting variables are highly correlated with a market based measure of risk (beta) and as such are useful in the prediction of future risk. These factors are

- firm size
- low price/earnings,
- price/cash flow,
- sales growth

However, in theory, the systematic risk is not directly related to the earnings variability, dividends, size or growth of firm (Bowman, 1979).

Other criticisms leveled against beta suggest that, because methods of estimating beta consider only the past performance of an individual firm in relation to the market, beta lacks completeness and efficiency as a measure of risk (Pettengill et al, 1995). Due to the fact that it considers past performance and historical data, beta does not address the fact that firms change over time. The regression therefore reflects the firm’s characteristics over a past period of time rather than the firm as it exists currently.

According to Damodaran, firms change over time for three basic reasons. Firstly, they divest existing business operation by investing in new businesses, acquiring new assets and other firms all of which changes a firms business mix which should effect change its beta. Secondly Damodaran argues that, by altering the financial structure by adding to or paying off debt or taking such actions such as payments of dividends or buying back stock a firm financial leverage would change. As such, that change must be accounted in its beta. Finally, firms naturally over time would change as they improve upon their core operations even if they do not diversify.

Though the criticisms against beta are legitimate, evidence suggests that market professionals and academics still think about risk in terms of the market.

The preference for beta is because of the convenience in using a single factor to measure risk and the intuitive appeal of beta. Beta is widely accepted because research by Pettengill lead to the finding that there is a significant and systematic relationship between beta and returns (Pettengill et al, 1995). Further evidence of positive risk return trade off was found when beta was used to measure risk, as such, these results are consistent with the implication that beta is a useful measure of risk (Pettengill et al, 1995).

2.8 Controlling Outliers in Beta Estimation

Chan and Lakonishok argue that, "ordinary least squares estimator of beta is particularly sensitive to the presence of outliers and more generally depart

from normality as such, it is essential to use a robust method of estimating beta risk”.

Chan and Lakoniskok define robust as “sturdy – capable of withstanding the slings and errors of outrageous fortune”.

Another definition of robust which they give is “resilience of conclusion to deviations from assumptions of hypothetical models” (Chan and Lakoniskok, 1992).

Their argument is that, the returns of some companies may be abnormal due to certain informational effect such as cut in dividend or a takeover and not on true performance of the company as such the robust method is meant to take care of such abnormality to give a better estimate of beta.

2.9 Beta Biasness

McInish and Wood, (1986) talk about two sources of beta bias which are trading delays and price adjustment delays. Beta of securities that trade less frequently than the market proxy used in estimation are downward biased and on the other hand beta of securities that trade more frequently than the market proxy used in estimation are upward biased.

Scholars such as Cohen, Hawawini, Maier, Schwartz, and Whitcomb (CHMSW) were among the first to recognize the importance of price adjustment delays as a source of beta bias (McInish and Wood, 1986). “McInish and Wood provided evidence of the potential for price adjustment delays and thin trading delays to affect the results of studies in which segmentation of returns into periods is important”(ibid).

CHMSW describe a number of different sources of price adjustment delays including transactions costs and actions of market makers. These scholars proved that, for a given differencing interval length, a security with more (less) trading delay than the market will have its beta biased downward (upward) which in effect resulted in a similar bias in beta estimates (ibid). Furtherance, it was argued that these two sources of bias are related since prices cannot adjust to reflect a changed market equilibrium without a transaction occurring, hence, the return of the stock in which the delay occurred would be inaccurate since inherent in the prices are the aforementioned biased factors (ibid).

2.10 Share Price Levels and Beta

Though there are two schools of thought as to relationship between share price and beta of a company, Sasson Bar-Yosef and Lawrence D. Brown in their article "Share Price and Beta" (1979) explained that, "if a company experiences an unexpected change in its circumstances that substantially increases the systematic risk of its stock then accepting the capital asset pricing model the prices of its shares would fall, however if the change substantially reduces systematic risk then share price will rise".

In effect therefore, stocks with lower share prices are risky hence would have a higher beta than stocks with higher share prices which according to (Yosef et al, 1979) are less risky.

Accepting the financial theory which states that the higher the risk, the higher the return then those who argue that there is no relationship between

a share price and beta of a stock may be wrong. This is because when a stock's beta rises one would expect a higher return and this inherently means that prices would have to change in an upward direction, creating the relationship between the beta of a stock and its share price.

2.11 The Relationship between Corporate Debt Issuance and Changes in Systematic Risk

One of the most important decisions regarding corporate finance is the financing decision of the firm. Financing decision involves determining the financial structure of the firm (i.e.) is the firm going to be financed using debt, equity or both and if both in what proportion in order to reach optimality. Firms with greater degree of debt are considered riskier than those that are financed heavily with equity because "debt as a source of funds carry interest rate risk, default risk, and the riskiness of the project or investment the firm may be undertaking" (Kapoor and Pope, 1997). Therefore when a firm takes on additional debt, one would expect that the firm's risk as reflected in its beta should also change because of the increased risk associated with the debt. However, research by Kapoor and Pope as documented in their article, "the relationship between corporate debt issuance and changes in systematic risk" revealed that the beta of a security is unaffected by issuance of corporate debt.

Firms are now taking on a higher degree of leverage however; investors nonetheless are increasing their investment in these highly levered firms perhaps because they indeed provide a higher return¹⁴.

¹⁴ Financial theory states that the higher the risk of a security the higher the expected return

CHAPTER THREE

RESEARCH METHODOLOGY AND LIMITATIONS

One of the objectives of this study was to measure the systematic risk of companies listed on the Ghana Stock Exchange. The major goal of this objective was to provide knowledge as to how risky companies listed on the Ghana Stock Exchange are relative to the market as a whole.

3.1 Types of Data and their Source

The research relied on both primary and secondary data, however secondary data was more prominent. A primary source of data refers to the first hand information acquired for a particular research by the researcher.

The primary data was collected with the aid of a questionnaire, designed with the sole purpose of acquiring the required information from selected respondents in the sample size, such as, managers and high profile staff of selected investment companies and finance firms including brokers who work in brokerage firms (Licensed dealing members of the Ghana Stock Exchange).

Secondary data which is already available data was acquired from selected brokerage firms. It comprised mainly of month end stock prices of selected listed companies as well as monthly return of the GSE All Share Index for the same period.

One limitation of the secondary source of data is that, it was expensive to acquire and the researcher has no knowledge on the errors made by the original researcher or those that compiled the data.

3.2 Questionnaire Design

The questionnaire was designed in order to enable the researcher accomplish the research objectives. The information that was needed but could not be obtained from secondary source was translated into a set of questions.

In order to improve the response rate and ensure that respondents feel very comfortable when answering the questions, the questionnaire did not require respondents to reveal the names of the company in which they work.

3.3 Sampling Method

A sample is a portion of the population selected for analysis. For the purposes of this study, purposive or judgmental non- probability sampling technique was mainly used. Two purposive sampling techniques that the researcher used were expert sampling and snowball sampling.

Judgmental sampling was used to select the samples used for this research because the researcher needed to ensure that respondents in the sample have the required knowledge or expertise, as such, would be appropriate for the study and also would ensure a fair representation of the population of interest.

The researcher selected the LDMs based on their market share. Those that have the greatest market share like Databank Brokerage Ltd, IC Securities

Ltd, Cal Brokers Ltd, First Atlantic Brokers and African Alliance Securities Ghana were included in the study and those that have the smallest market share like Gold Coast Securities Ltd were also included in the study. The researcher also included high profile staff and asset managers of selected banks and investment advisory houses such as Standard Chartered Bank, Stanbic Bank, SEM Capital Management Ltd and Canal Capital Ltd. The rationale in doing this was to solicit the expert opinion of those who are considered "big" in the industry as well as the so called "small" ones and also to solicit the view of diverse range of people in the capital market industry in Ghana.

Expert sampling involves the assembling of a sample of persons with known or demonstrable experience and expertise in a specific area (Stasser et al, 1995). The researcher adopted this technique because it was the best way to elicit the views of persons who have specific expertise in the topic area and also to provide evidence for the validity of the report.

Snowball sampling relies on referrals from initial subjects to generate additional subjects (Goodman, 1961). This technique was used in order to reduce search cost and also to ensure that sample includes respondents who are knowledgeable or are experts in the research area.

All but one company listed on the Ghana Stock Exchange would have their systematic risk measured. One company was left out because it listed on the Ghana Stock Exchange not very long ago.

3.3.1 Sample Size

For the qualitative section of this study a sample size of 10 included Licensed Dealing Members of the Ghana Stock Exchange, Licensed Investment Advisors, and selected Banks. Within this sample, heads of brokerage or brokers, financial analysts, asset managers and investment analysts would be interviewed during the data collection process.

The aforementioned sample was used for the purpose of this study because the researcher needed expert opinions on the topic and believed that this could only come from the categories of respondents used for the research.

All companies that listed on the Ghana Stock Exchange before the year 2007 were included in the study. Companies that listed thereafter were not included in the study because the researcher did not have ample information in order to estimate or compute their systematic risk accurately.

Below is a list of sampled companies and their trading names as represented at the Ghana Stock Exchange.

Table 3.1 Sampled Companies and their Trading Names

Banking	Trading Names
<u>CAL Bank Limited</u>	<u>CAL</u>
<u>Ecobank Ghana Limited</u>	<u>EBG</u>
<u>Ecobank Transnational Incorporated</u>	<u>ETI</u>
<u>Ghana Commercial Bank</u>	<u>GCB</u>
<u>HFC Bank</u>	<u>HFC</u>
<u>SG-SSB Limited</u>	<u>SG-SSB</u>
<u>Standard Chartered Bank</u>	<u>SCB</u>
<u>Trust Bank [The Gambia]</u>	<u>TBL</u>
Insurance	
<u>Enterprise Insurance Limited</u>	<u>EIC</u>
<u>SIC Insurance Company</u>	<u>SIC</u>
Consumer Goods	
<u>Pz Cussons Ghana</u>	<u>PZ</u>
<u>Super Paper Company Limited</u> / African Champion Industry	<u>SPL / ACI</u>
<u>Unilever Ghana</u>	<u>UNIL</u>
Energy	
<u>Ghana Oil Limited</u>	<u>GOIL</u>
<u>Total Petroleum Ghana Limited</u>	<u>TOTAL</u>
Trading	
<u>CFAO Ghana</u>	<u>CFAO</u>
<u>Mechanical Llyod</u>	<u>MLC</u>
<u>Produce Buying Company</u>	<u>PBC</u>
Food & Beverages	
<u>Accra Brewery Company</u>	<u>ABL</u>
<u>Fan Milk</u>	<u>FML</u>
<u>Guinness Ghana Breweries</u>	<u>GGBL</u>
Manufacturing	
<u>Aluworks</u>	<u>ALW</u>
<u>Camelot Ghana Limited</u>	<u>CMLT</u>
<u>Cocoa Processing Company</u>	<u>CPC</u>
<u>Pioneer Kitchenware Limited</u>	<u>PKL</u>
<u>Sam Woode Limited</u>	<u>SWL</u>
Mining	
<u>AngloGold Ashanti</u>	AGA

AngloGold Ashanti Depository Shares	AADS
Golden Star Resources Limited	GSR
Information & Comm. Technology	
Clydestone Ghana Limited	CLYD
Transactions Solutions Limited	TRANSOL
Health Care/Pharmaceuticals	
Ayrton Pharmaceuticals	AYRTN
Starwin Pharmaceuticals	SWL
Agri-Business	
Benso Oil Palm Plantation	BOPP
Golden Web	GWEB
Preference Shares	
Standard Chartered Bank	

3.4 Data Collection

The secondary data was collected from historical trading records of the above companies. The information included month end prices of the above equities from 1999 to 2009 representing a period of ten years meaning that the researcher had 120 data points to work with.

The other secondary data collected was the market index for the same period as mentioned above. This information was used to calculate the market returns. Finally the researcher collected information regarding the volume of trade in particularly securities over a period of time.

The primary data on the other hand was obtained from the field through the use of interview administered questionnaires and interviews via (telephone and face-to -face).

The researcher interacted with managers and heads of the brokerage firms in order to seek permission for the questionnaire to be administered. In each of the selected brokerage and financial institution the researcher administered the questionnaire himself in order to clarify any ambiguity.

Respondents were given a summary of the purpose of the study and guaranteed of confidentiality and anonymity. This was done in order to improve the response rate. For respondents who were hard pressed for time, the researcher interviewed them and filled their questionnaire on their behalf. This method of administering the questionnaire directly in the firms was used because it proved to be a reliable means of gathering data.

The public relations officer of the Ghana Stock Exchange and relations officers of selected firms were contacted in order to find out the procedure to acquiring the secondary data.

3.4.2 Survey

A designed questionnaire was the main instrument for data collection, particularly primary data. It was designed to solicit the expert opinions of brokers, asset managers, financial and investment analyst who are primarily involved in matters of finance and stock analysis.

3.4.3 Data Collection Period

A period of eight weeks was used to collect the data needed to accomplish the study. A period of two weeks was used to collect the secondary data (month end prices of selected listed companies and returns of GSE All Share Index)

3.5 Data Preparation for Analysis

The two separate data sets which were used for this research were both prepared and analyzed separately. The qualitative data was arranged in a blank document, coded and categorized prior to analysis. The quantitative data which was used to measure the beta of listed companies was organized into a spreadsheet program in Microsoft excel.

3.6 Data Collection Tools

Two research instruments were mainly used throughout this research. These included (face-to-face) interaction and administered questionnaires.

3.6.1 Questionnaire Design

The questionnaire was designed in order to facilitate acquiring answers to answer the research questions. A draft questionnaire was presented to the thesis supervisor so that any shortcoming or weakness in the questionnaire was corrected before the final version administered.

3.7 Data Analysis

3.7.1 Methods of Data Analysis

In order to achieve the research objectives both quantitative and qualitative research methods were applied. Quantitative research method was used in

order to measure the systematic risk of companies listed on the Ghana Stock Exchange and also to test whether a relationship existed between the share price of a stock and its beta level.

The numerical data in the form of measured beta was interpreted accordingly in order to give meaning to the figures. The qualitative data was summarized by determining the number of observations in each category. The results were then presented pictorially using a number of charts and graphs.

Qualitative research which is unstructured, flexible and exploratory in nature was used to accomplish the other research objectives.

3.7.2 Tools for Data Analysis

Prior to the analysis, the measurements made in different categories were organized before any pictorial presentations made. The tools that were used for analysis included tables and charts. The purpose of applying these tools were to consolidate and summarize the data set so that it became easy to read and understandable.

The relevant data were sorted and categorized to make for easy analysis. Thereafter, the researcher interpreted and summarized the information. This was done in order to read meaning into the results and make sense of the data acquired from the field.

The researcher resorted to using analytical software's such as spss and Microsoft Excel to aid in the analysis.

3.8 Calculating Beta

Valid beta data was calculated using the market model because according to Bradfield, (2003) this is the most popular method amongst analyst. The researcher was also keen on using this method because of its simplicity. Prior to calculating a stocks beta, the researcher calculated its return using the month end share price from 1999 to 2009. Dividends were also accounted for in the years in which it was declared and paid. The researcher then calculated the return of market for the same period.

The formula used to calculate beta was:

$$\beta = \frac{COV(R_I, R_m)}{Var_m}$$

Where: Cov = Covariance; R_I = Return on Stock; R_m = Return on Market

Var_m = Variance of the Market

$$R_I = \frac{(P_t - P_{t-1}) + Dividends}{P_{t-1}}$$

Where: P_t = Current share Price; P_{t-1} = Previous share price

$$R_m = \frac{(All_t - All_{t-1})}{All_{t-1}}$$

Where All_t = Current GSE All Share Index; All_{t-1} Previous GSE All Share Index

The Variance of the market was calculated using a statistical function in Microsoft Excel.

3.9 Limitations

Purposive sampling was mainly used to choose the respondents (financial analyst, investment analyst and brokers). Purposive sampling in itself has its limitations. According to Trochim (2008) a researcher using this method is likely to overweight subgroups in the population that are more readily accessible.

Expert sampling used also has its limitation because the views of the experts sampled could be wrong.

The secondary data used to estimate beta was recorded by people as such it could lack accuracy, thus, its dependability could be questionable.

Finances were a huge hindrance as the researcher had to rely on personal pocket money to fund expenses such as transportation, telephone calls, and printing costs.

The tight schedule of financial analyst, investment analyst and brokers reduced the response rate of the survey.

In addition to that, the research data considers only companies listed on GSE due to the fact that they are traded actively and information regarding such entities can be easily obtained.

Due to the period of the project execution, companies such as UT Financial Services that listed after the year 2007 were not included in the study as it would be nearly impossible to compute accurate beta level of such stocks.

CHAPTER FOUR

DATA ANALYSIS

4.1 The Systematic Risk of Companies Listed on the Ghana Stock Exchange

The systematic risk of a stock as defined in the literature is the variability of returns on a stock or portfolio associated with changes in return on the market as a whole. The beta of a stock which is a measure describing the relation of a stock's return to the returns of the entire market is that index which measures a stock's systematic risk. Of the respondents whom the researcher interacted with as indicated in (table 4.1) 66.7% declared that companies listed on the Ghana Stock Exchange are moderately risky relative to the entire market. Their argument was based on the fact that, though most of the 37 companies listed on the Ghana Stock Exchange have low betas, a significant amount of stocks people engage in varies to some high degree with the entire market.

Table 4.1

On average how sensitive or risky are companies listed on the GSE relative to the market

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very	3	33.3	33.3	33.3
	Moderate	6	66.7	66.7	100.0
	Total	9	100.0	100.0	

While these were the views of experts in the capital market in Ghana, the researcher applying the market index model measured the beta of stocks

listed on the Ghana Stock Exchange, using the GSE All Share index as a proxy representing the entire market. (Refer to table 4.2)

Table 4.2

Banking	Trading Names	Beta	Rank
CAL Bank Limited	CAL	0.90	4
EcoBank Ghana Limited	EBG	0.76	7
EcoBank Transnational Incorporated	ETI	1.47	1
Ghana Commercial Bank	GCB	0.75	8
HFC Bank	HFC	0.71	10
SG-SSB Limited	SG-SSB	1.00	2
Standard Chartered Bank	SCB	0.44	20
Trust Bank [The Gambia]	TBL	0.52	15
Average		0.82	
Insurance			
Enterprise Insurance Limited	EIC	0.42	21
SIC Insurance Company	SIC	0.62	13
Average		0.52	
Consumer Goods			
Pz Cussons Ghana	PZ	0.12	28
Super Paper Company Limited / African Champion Industry	SPL / ACI	0.05	29
Unilever Ghana	UNIL	0.38	22
Average		0.18	
Energy			
Ghana Oil Limited	GOIL	0.49	18
Total Petroleum Ghana Limited	TOTAL	0.16	27
Average		0.32	
Trading			
CFAO Ghana	CFAO	0.19	24
Mechanical Lloyd	MLC	0.93	3
Produce Buying Company	PBC	0.74	9
Average		0.62	
Food & Beverages			
Accra Brewery Company	ABL	0.16	26
Fan Milk	FML	0.47	19
Guinness Ghana Breweries	GGBL	0.84	5
Average		0.49	
Manufacturing			

Aluworks	ALW	0.69	10
Camelot Ghana Limited	CMLT	0.03	27
Cocoa Processing Company	CPC	0.58	12
Pioneer Kitchenware Limited	PKL	-0.01	33
Sam Wood Limited	SWL	0.01	28
Average		0.26	
Mining			
AngloGold Ashanti	AGA	0.00	29
AngloGold Ashanti Depository Shares	AADS	-0.01	32
Golden Star Resources Limited	GSR	0.00	31
Average		0.00	
Information & Comm. Technology			
Clydestone Ghana Limited	CLYD	0.13	23
Transactions Solutions Limited	TRANSOL	-0.04	35
Average		0.05	
Health Care/Pharmaceuticals			
Ayrton Pharmaceuticals	AYRTN	-0.08	36
Starwin Pharmaceuticals	SPL	0.08	25
Average		0.00	
Agri-Business			
Benso Oil Palm Plantation	BOPP	0.47	16
Golden Web	GWEB	-0.02	34
Average		0.23	
Preference Shares			
Standard Chartered Bank	SCB Pref	0.00	30

From the table above, it is evident that only one company (ETI) has its beta above that of the market¹⁵. ETI is thus considered an aggressive stock. Based on the measured beta index, companies such as Pioneer Kitchenware Limited, AngloGold Ashanti Depository Shares, Transactions Solutions Limited, Ayrton Pharmaceuticals and Golden Web have their returns vary inversely with that of the market simply because they have negative betas. On average, companies in the Banking Sector have the highest beta whilst

¹⁵ The beta of the market is 1

companies in the Mining and Health Care / Pharmaceutical industry recording an average beta of 0 have the lowest beta.

4.1.0 Interpretation of beta across Industry's

4.1.1 Banking Industry

An industry average beta of 0.82 means that if the GSE All Share Index moves up by 10%, on an average, shares in this industry would move up by approximately 8%, similarly if the GSE All Share Index falls by 10%, shares in this industry on an average, would fall by approximately 8%.

4.1.2 Insurance Industry

An industry average beta of 0.52 means that when the GSE All Share Index moves up by 10%, on an average, shares in this industry would move up by approximately 5%, similarly if the GSE All Share Index fell by 10%, shares in the industry on an average, would approximately fall by 5%.

4.1.3 Consumer Goods Sector

An industry average beta of 0.18 means that when the GSE All Share Index moves up by 10%, shares in this industry on an average, would move up by approximately 2%, similarly if the GSE All Share Index fell by 10%, shares in this industry on an average, would approximately fall by 2%.

4.1.4 Energy Sector

An industry average beta of 0.32 means that when the GSE All Share Index moves up by 10%, shares in this industry on an average, would move up by approximately 3%, similarly if the GSE All Share Index fell by 10%, shares in this industry on an average, would approximately fall by 3%.

4.1.5 Trading Industry

An industry average beta of 0.62 means that when the GSE All Share Index moves up by 10%, shares in this industry on an average, would move up by approximately 6%, similarly if the GSE All Share Index fell by 10%, shares in this industry on an average, would approximately fall by 6%.

4.1.6 Food & Beverage Industry

An industry average beta of 0.49 means that when the GSE All Share Index moves up by 10%, shares in this industry on an average, would move up by approximately 5%, similarly if the GSE All Share Index fell by 10%, shares in this industry on an average, would approximately fall by 5%.

4.1.7 Manufacturing Industry

An industry average beta of 0.26 means that when the GSE All Share Index moves up by 10%, shares in this industry on an average, would move up by approximately 3%, similarly if the GSE All Share Index fell by 10%, shares in this industry on an average, would approximately fall by 3%.

4.1.8 Mining Industry

An industry average beta of 0 means that, on an average, shares in this category do not vary with the market.

4.1.9 Information & Communication Technology Sector

An industry average beta of 0.05 means that when the GSE All Share Index moves up by 10%, shares in this industry on an average, would move up by approximately 0.5%, similarly if the GSE All Share Index fell by 10%, shares in the industry on an average, would approximately fall by 0.5%.

4.1.10 Health Care Industry

An industry average beta of 0 means that, shares in this category on an average, do not vary with the market.

4.1.11 Agri Business Sector

An industry average beta of 0.23 means that, when the GSE All Share Index moves up by 10%, shares in this industry on an average, would move up by approximately 2%, similarly if the GSE All Share Index fell by 10%, shares in this industry on an average, would approximately fall by 2%.

Thus, it can be observed that all shares listed on the stock exchange on average are defensive shares however the degree to which each responds to the market varies.

4.2 Appropriateness of Factors Used in Measuring Systematic Risk

All the respondents (see table 4.3) the researcher interacted with believed that the following factors; including the return of a stock (Using Share Price & Dividend) and return of the market (GSE All Share Index) are appropriate in estimating the beta of listed companies because it is the underlying theory of risk in finance. Thus, the principles would apply in Ghana as it would anywhere else.

Table 4.3

Item	Responses	
	Absolute (Yes)	Percentage
Are the following factors appropriate in measuring systematic risk of companies listed on the GSE		
Return of the Stock (Using Share price & Dividend)	9	100%
Return of the Market (GSE All Share Index)	9	100%

Source: Survey (March, 2010)

However, considering the nature of the investment environment in Ghana and the fact that investment decisions in this part of the world are rarely made on the back of economic data such as performance of the economy or international events that affect a particular company, respondents argued that other factors should be considered when estimating the beta of companies in Ghana. These factors include; investor sentiment and perception, quality of management composition, macro economic factors market capitalization, factors of growth, frequency of trades and factors affecting demand. Mr. Asiedu, asset manager of Stanbic Bank Ghana, revealed in an interview that 60% of the Ghanaian economy constitutes the informal sector and retail investors purchase shares without any scientific justification. In addition, a large population of the investor community buys and holds onto shares thinking only about dividends, as such, respondents believe that factors affecting investor sentiments, perception and demand must be captured when estimating systematic risk.

Market capitalization not only determines the value of a firm but it is also used in determining the market index. Due to the fact that some firms have

higher market caps than others, the least change in prices of these stocks tends to move the entire market in one direction or the other. As such analysts believe that this factor has an influence on beta estimates, as such, must be considered when measuring a stocks beta.

As stipulated in the literature review, beta estimates in markets that do not trade frequently or are thinly traded tend to be biased (Bradfield, 2003). Interaction with analyst confirmed that the Ghanaian stock market is an illiquid one which suffers from thin trading. As such, respondents declared that, factors which account for frequency of trades in particular companies must be considered when measuring beta.

4.3 Drawbacks in Using Beta to Analyze Beta in Ghanaian Context

Many of the respondents' concern about beta reflects what was discovered in the literature. The fact that beta estimates are measured based on historical data means that the beta index is a measure of past risk and as such, it neither indicates what the future risk of a firm is nor its current situation.

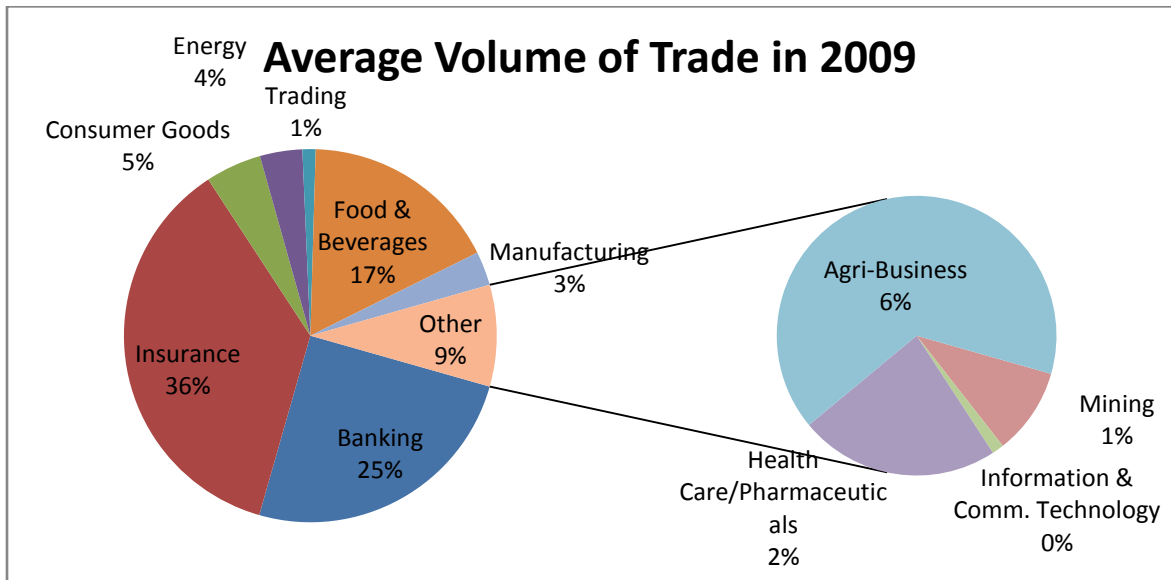
Another drawback which was highlighted is due to the fact that, when estimating and interpreting beta, the GSE All Share Index which is used as a proxy to represent the entire market is debatable. This is because there are only about 37 companies listed on the GSE with many more unlisted companies. In addition to that, majority of the economy cannot be measured because it falls into the informal sector. Thus, measuring risk based on the fact that 37 companies represent the entire market sentiment is indeed stretching the argument too far.

Respondents also made note of the fact that, the impact of relevant information on the share prices of listed companies on the GSE is negligible thus, implying that the Ghanaian market was not very efficient. Share prices of listed companies rarely do change and the market is a very illiquid one because majority of the stocks are not actively traded. Therefore, respondents argued that because of the way in which Beta estimates are measured it would be more accurate in markets that are efficient where prices are constantly reacting to relevant information and not in a market which is illiquid and inefficient.

4.4 The Relationship between Active / Liquid Stocks and Beta levels

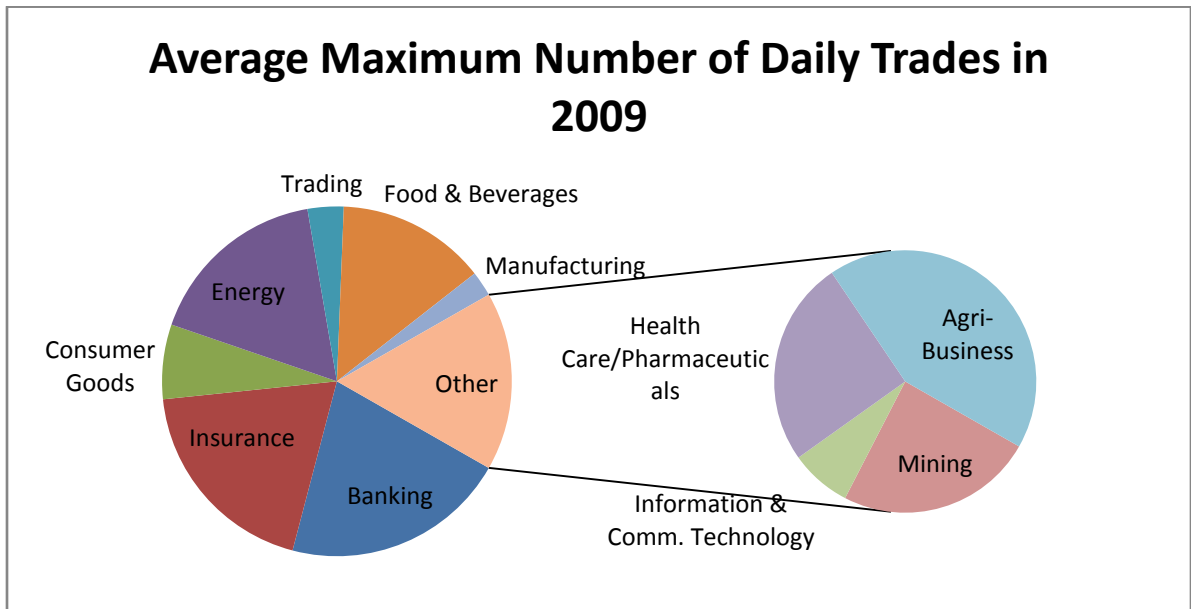
Based on data in 2009, (see figure 4.1) the highest volume of trades occurred in high beta stocks such as Ghana Commercial Bank, Ecobank Transnational Limited, Cal Bank, SIC and Guinness Ghana Brewery Limited representing stocks in Banking, Insurance and Food and Beverage industry, whilst stocks in the Mining industry and others such as Pioneer Kitchen Limited and Sam Wood Limited had lowest volume of trades and apparently lower beta levels. Not only do stocks that have higher volume of trade have the highest beta but those that traded the most during the year (see figure 4.2) also had higher beta levels.(refer to appendix B)

Figure 4.1



Source: Gold Coast Securities Ltd

Figure 4.2



Source: Gold Coast Securities Ltd

Basic financial theory states that, the higher the risk, the higher the returns so even though higher beta stocks are considered relatively risky they have the highest volume of trade because they offer the highest return. Investors are therefore willing to bear the high risk because they would be compensated in the form of higher returns.

Information gathered from the field (refer to appendix C) also confirmed the fact that stocks in Banking, Insurance, Food and Beverage industry are the most actively traded whilst those in the Mining, Pharmaceutical and IT sector are the least active stocks.

4.5 Relationship between Beta and Share price

Though there are two schools of thought as to the relationship between share price of a stock and its beta level an overwhelming percentage of respondents indicated that there is a relationship between a share price and its beta (see table 4.5).

Table 4.5

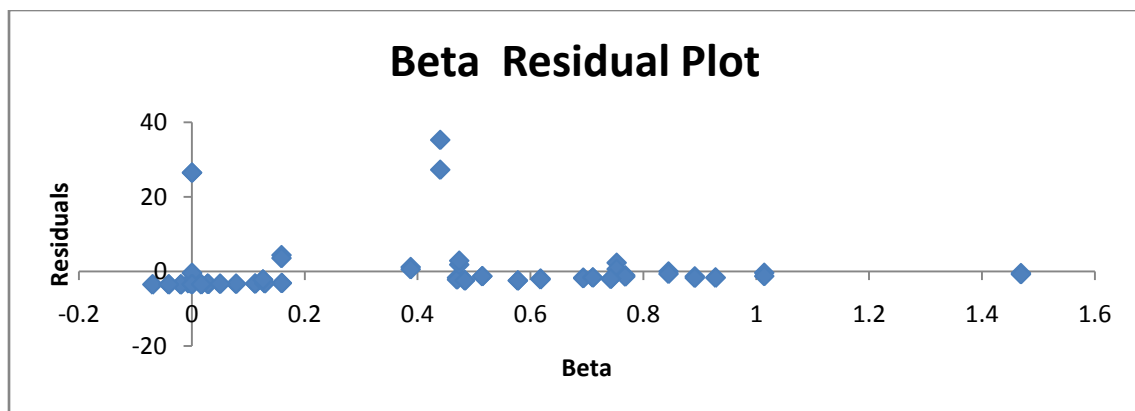
Is there a relationship between the share price and beta of a company					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	8	88.9	88.9	88.9
	No	1	11.1	11.1	100.0
	Total	9	100.0	100.0	

However, a correlation matrix between the two variables indicates that indeed there is no relationship between the share price and beta of a stock listed on the Ghana Stock Exchange because the model produced a

correlation coefficient -0.09. Not only does a correlation coefficient of -0.09 indicate a very weak relationship between beta of stock and its share price but it also indicates an inverse relationship between the two variables.

In addition to a correlation matrix, the researcher performed a regression analysis on the two variables. The summary output from a regression with a 95% confidence interval; revealed that more than 99 % of variation in the dependent variable (share price) could not be explained by the independent variable (beta). Thus, the model is unreliable and therefore unproductive.

Figure 4.3



In analyzing a residual plot, if the regression model represents the data correctly, the residuals should be randomly distributed around the line of $err=0$ with zero mean. If the points (residuals) show a systematic trend, this indicates that the model is inappropriate for predictive purposes. Thus, from the observed positions of the points in the beta residual plot¹⁶ it can be

¹⁶ The residual plot shows the difference between the calculated and measured values of the dependent variable as function of the measured values.

concluded that the model does not define a relationship between the two variable set, as such, there is an absence of a relationship between the share price and beta level.

CHAPTER FIVE

FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Findings

Quantitative analysis of the research results revealed that only one company (Ecobank Transnational Limited) listed on the Ghana Stock Exchange has its beta value above that of the market. SG-SSB is the only stock that has its beta value equal to that of the market. Whilst most companies have beta values between zero (0) and one (1), few stocks such as Pioneer Kitchenware Limited, AngloGold Ashanti Depository Shares, Transactions Solutions Limited, Ayrton Pharmaceuticals and Golden Web have negative betas.

Therefore, in effect most companies listed on the Ghana Stock Exchange are considered defensive shares because they change less than proportionate in response to changes in the market. In a bull market when companies experience persistent increase in share prices because of favorable economic conditions these stocks would tend to rise less than market and on the other hand during a bear market characterized by plummeting share prices, value of these stocks would fall less proportionately than the market.

Only one company (SG-SSB) varies proportionately to the market and in addition to that there is only one aggressive stock (ETI) listed on the GSE.

Table 4.4

Industry	Average Beta Level
Banking	0.82
Insurance	0.52
Consumer Goods	0.18
Energy	0.32
Trading	0.62
Food & Beverages	0.49
Manufacturing	0.26
Mining	0.00
Information & Comm. Technology	0.05
Health Care/Pharmaceuticals	0.00
Agri-Business	0.23

Though the literature reveals conflicting conclusions as to the relationship between share price of a stock and beta levels, in the Ghanaian context however, the researcher using scientific methods in the form of a regression analysis and correlation matrix discovered that there is no relationship between the share price of companies listed on the Ghana Stock Exchange and its beta level. Thus, one cannot predict that rising beta levels inherently means a higher or lower share price.

In conformity to what the literature says about the challenges of using beta to measure risk, the researcher discovered that one of the drawbacks to using beta to analyze risk is the fact that beta is measured based on historical data as such beta estimates reflect past performance and does not provide much in terms of future condition of the firm or even its current state.

The researcher also discovered that using the GSE All Share index as a proxy to represent the entire market is arguable because only 37 companies are listed on the exchange and so it is very debatable to draw the conclusion that these 37 companies represent the entire market sentiments. Furthermore 60% of the entire Ghanaian economy cannot be measured because it lies in the informal sector. This statistic only goes further to strengthen the argument that GSE All Share index in its entirety does not represent the entire market.

In addition to that, the researcher found out that, the capital market in Ghana is very illiquid as shares rarely trade on the exchange mainly because investor population buy and hold on to shares mainly for income purposes through dividends. It was also revealed that, the impact of information on share price of stock is almost negligible, implying that the Ghanaian stock market is not very efficient and this is evident in the dormant nature of majority of the share prices listed on the exchange.

All respondents claimed that the factors as stipulated in financial theory are appropriate in measuring the systematic risk of companies in the Ghanaian context however, they strongly believe that considering the nature of the investment environment in Ghana other factors have to be considered as well.

The other factors they propose that should be considered when measuring beta include frequency of trades in particular securities, quality of

management composition, macro economic factors, investor sentiment (perception), factors for growth as well as market capitalization.

The research revealed that market participants actively engage in stocks represented in banking, insurance, food and beverage industry and these stocks happen to be those that have the highest beta level. On the other hand investors least engage in stocks represented in the mining and pharmaceutical industry and these stocks have the lowest beta level. Banking stocks had their shares traded the most in the year 2009 and this was discovered by collecting data on the number of time trades took place in particular stock for the entire year 2009 (see figure 4.2).

5.2 Conclusion

Using the market index model, the researcher discovered that most stocks listed on the Ghana Stock Exchange are defensive shares because they have beta levels less than the market (one). Hence, these companies would be considered less risky relative to the market. On the other hand, these companies would as well record returns lower than that of the market during an economic boom.

The research revealed that, the GSE All Share Index may not be representative enough for the entire market because not only are there few companies listed on the GSE but majority of the Ghanaian economy is not measurable because it falls in the informal sector.

Discussions with experts in the Ghanaian financial industry revealed that, the factors for measuring beta as stipulated in the literature are appropriate in

the Ghanaian context mainly because the underlying theory is applicable all over other markets. However, other factors such as market capitalization, quality of management composition, frequency of trade, macro economic variables and factors for growth have to be considered because of the characteristics and nature of the capital market in Ghana.

Contrary to the ideology of many of the respondents the researcher interacted with, (refer to table 4.5) there is no relationship between the share price of a stock and its beta level. The researcher discovered this by using various statistical techniques such as regression analysis and correlation matrix. Thus, one cannot predict that share price of a stock would rise or fall if its systematic risk changes.

Finally, the researcher discovered that investors by investing heavily in higher beta stocks are willing to bear the risk because these stocks offer higher returns, confirming the financial theory which states that the higher the risk the higher the return.

5.3 Recommendation

5.3.1 Index Modification

Based on the research results, it was discovered that using the GSE All Share Index as a proxy to represent the entire market is very debatable because only 37 companies are listed on the GSE; hence, this index may not be a true representation of the entire market sentiment. In addition, majority¹⁷ of the Ghanaian economy cannot be measured because it falls within the informal

¹⁷ 60 percent of the Ghanaian economy is made up of the informal sector

sector, therefore based on these findings, the researcher amongst many other things recommends that, stakeholders make the process of listing on the stock exchange more flexible in order to encourage more companies to list so that the GSE All Share Index would be a better proxy for the entire market.

5.3.2 Stock Categorization

Through qualitative analysis of the research results, the researcher discovered that because there is no uniform categorization of stocks across industries, various stock brokerage firms have their own unique categorization style and this makes the process of stock analysis based on data from various licensed dealing members challenging. It is therefore recommended that brokerage firms develop a uniform categorization process so that investors can easily analyze industry performance based on data from various brokerage houses.

5.3.3 Liquidity

Both qualitative and quantitative analysis of the data acquired from the field indicated that, the level of liquidity of the GSE is abysmal. Respondents with whom the researcher interacted with revealed the fact that, beta estimates in markets that are very liquid are more accurate than those that are illiquid. As such, it is highly recommended that stakeholders' device innovative ways in order to improve upon the level of activity in the Ghanaian capital market in order to make the stock market more liquid so as to improve upon the frequency of trades in stocks. As practiced in developed markets, stakeholders in the capital market in Ghana should encourage margin trading,

trading of commodities and establishment of market makers in order to boost the level of activity on the GSE. This would not only help analyst produce more accurate estimates of beta but it would contribute to the enhancement of the Ghanaian capital market and economy at large.

5.3.4 Future Research

The researcher by executing this research has taken a giant leap into analyzing the systematic risk of companies listed on the Ghana Stock Exchange, nonetheless, the researcher recommends that future studies be conducted in order to complement what has been done and these are:

- I. Exploring the effect of thin trading on beta levels in Ghana;
- II. Exploring ways to adjust for beta biasness of stocks listed on the GSE due to static share price and high illiquidity levels;
- III. Testing the effect of various models of beta estimation in Ghanaian market;
- IV. Measuring the effect of different time periods on beta levels in the Ghanaian market; and
- V. Exploring the relationship between corporate debt issuance and beta levels: Using Ghana as a case study.

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Appendix A: Market Share of Licensed Dealing Members

TRADE LEVIES FOR GSE 2010			
	LDM	MKT SHARE	
1	Databank Brokerage Ltd	33.6%	Large
2	EDC Stockbrokers Ltd	17.5%	
3	IC Securities Ltd	10.4%	
4	New World Renaissance Securities Ltd	9.0%	
5	CAL Brokers Ltd	8.2%	
6	African Alliance Securities Ghana Ltd	5.5%	
7	First Atlantic Brokerage Ltd	4.5%	
8	SDC Brokerage Services Ltd	2.0%	
9	NTHC Securities Ltd	1.8%	Small
10	Gold Coast Securities Ltd	1.7%	
11	SIC Financial Services Ltd	1.6%	
12	Merban Stockbrokers Ltd	1.6%	
13	Strategic African Securities Ltd	1.3%	
14	HFC Brokerage Services Ltd	0.8%	
15	Prudential Securities Ltd	0.3%	
16	CDH Securities Ltd	0.1%	
17	Worldwide Securities Ltd	0.1%	
18	Liberty Capital Ghana Ltd	0.0%	

Source: EDC Stockbrokers Ltd

Appendix C: Field Responses on Active Stocks

Industry	Responses							Total	Rank
Banking	1	1	1	1	1	1	1	7	1
Insurance	2	5	2	2	3	2	2	18	2
Consumer Goods	3	4	6	3	4	5	4	29	4
Energy	6	8	7	6	8	7	6	48	6
Trading	7	2	5	7	7	9	11	48	6
Food & Beverages	5	3	3	4	2	3	3	23	3
Manufacturing	5	7	4	5	5	4	5	35	5
Mining	9	11	11	8	6	10	9	64	10
Information Technology & Communication	10	9	10	11	9	11	10	70	11
Health care / Pharmaceutical	8	10	9	9	11	8	8	63	9
Agri – Business	4	6	8	10	10	6	7	51	8

Source: Self Compiled from Responses

1 = highest; 2 = Lowest

Appendix B: Beta Data and Trading Values

Banking	Trading Names	Beta	Rank	Volume of Trades "09	Rank	Max Number of trades 2009	Rank
CAL Bank Limited	CAL	0.90	4	11,411,619.00	3	173	3
Ecobank Ghana Limited	EBG	0.76	7	658,898	12	170	4
Ecobank Transnational Incorporated	ETI	1.47	1	8,473,851	5	155	5
Ghana Commercial Bank	GCB	0.75	8	26,808,659	1	219	1
HFC Bank	HFC	0.71	10	164,300	21	8	24
SG-SSB Limited	SG-SSB	1.00	2	943,109	11	123	7
Standard Chartered Bank	SCB	0.44	20	594,081	15	85	11
Trust Bank [The Gambia]	TBL	0.52	15	20	36	1	34
Average		0.82		49,054,537		117	
Insurance							
Enterprise Insurance Limited	EIC	0.42	21	47,558	23	33	17
SIC Insurance Company	SIC	0.62	13	17,776,864	2	183	2
Average		0.52		17,824,422		108	
Consumer Goods							
Pz Cussons Ghana	PZ	0.12	28	27,514	25	19	20
African Champion Industry	SPL / ACI	0.05	29	181,700	20	6	28
Unilever Ghana	UNIL	0.38	22	3,362,070	7	91	10
Average		0.18		3,571,284		39	
Energy							
Ghana Oil Limited	GOIL	0.49	18	1,792,065	10	152	6
Total Petroleum Ghana Limited	TOTAL	0.16	27	8,234	28	39	15
Average		0.32		1,800,299		96	
Trading							
CFAO Ghana	CFAO	0.19	24	497,850	16	36	16
Mechanical Llyod	MLC	0.93	3	17,524	27	8	24
Produce Buying Company	PBC	0.74	9	325,500	19	12	22
Average		0.62		840,874		19	
Food & Beverages							
Accra Brewery Company	ABL	0.16	26	9,015,798	4	21	19
Fan Milk	FML	0.47	19	417,780	17	114	8
Guinness Ghana Breweries	GGBL	0.84	5	3,211,300	8	97	9
Average		0.49		12,644,878		77	
Manufacturing							

Aluworks	ALW	0.69	10	5,724	30	7	27
Camelot Ghana Limited	CMLT	0.03	27	24,880	26	4	30
Cocoa Processing Company	CPC	0.58	12	3,572,550	6	51	13
Pioneer Kitchenware Limited	PKL	-0.01	33	1,900	32	1	34
Sam Wood Limited	SWL	0.01	28	300	34	2	31
Average		0.26		3,605,354		13	
Mining							
AngloGold Ashanti	AGA	0.00	29	1,700	33	1	34
AngloGold Ashanti Depository Shares	AADS	-0.01	32	647,454	13	44	14
Golden Star Resources Limited	GSR	0.00	31	105	35	2	31
Average		0.00		649,259		23	
Information & Comm. Technology							
Clydestone Ghana Limited	CLYD	0.13	23	4,400	31	6	28
Transactions Solutions Limited	TRANSOL	-0.04	35	55,025	22	8	24
Average		0.05		59,425		7	
Health Care/Pharmaceuticals							
Ayrton Pharmaceuticals	AYRTN	-0.08	36	354,003	18	31	18
Starwin Pharmaceuticals	SPL	0.08	25	645,997	14	16	21
Average		0.00		1,000,000		24	
Agri-Business							
Benso Oil Palm Plantation	BOPP	0.47	16	2,817,490	9	77	12
Golden Web	GWEB	-0.02	34	6,400	29	2	31
Average		0.23		2,823,890		40	
Preference Shares							
Standard Chartered Bank	SCB Pref	0.00	30	46,793	24	12	22

Appendix E: Regression Result for Beta and Share Price

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.09114438
R Square	0.0083073
	-
Adjusted R Square	0.00649409
Standard Error	7.54113554
Observations	69

<i>ANOVA</i>				
	<i>Df</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	31.91765	0.561251	0.456378742
Residual	67	56.86873		
Total	68			

	<i>Coefficients</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	3.52201486	2.713949	0.008445	0.931704409	6.112325318
	-			-	
Beta	1.77417865	-0.74917	0.456379	6.501128282	2.952770985

Appendix F: Correlation Result for Beta and Share Price

Date	Stock	Price	Beta
December '08	ABL	0.1200	0.159127
December '09	ABL	0.1000	0.159127
December '08	AGA	30.0000	0
December '09	AGA	30.0000	0
December '08	AADS	0.3500	-0.00635
December '09	AADS	0.3100	-0.00635
December '08	ALW	0.6100	0.693321
December '09	ALW	0.4400	0.693321
December '08	Ayrton	0.1600	-0.06991
December '09	Ayrton	0.1300	-0.06991
December '08	Bopp	1.0000	0.469573
December '09	Bopp	0.4800	0.469573
December '08	CAL	0.6000	0.89097
December '09	CAL	0.2000	0.89097
December '08	CFAO	0.0400	0.111825
December '09	CFAO	0.0400	0.111825
December '08	CLYD	0.0800	0.129014
December '09	CLYD	0.0800	0.129014
December '00	CMLT	0.0425	0.029078
December '08	CMLT	0.1600	0.027762
December '09	CMLT	0.1600	0.027762
December '08	CPC	0.0500	0.577416
December '09	CPC	0.0300	0.577416
December '08	EBG	4.5000	0.752526
December '09	EBG	2.8000	0.752526
December '08	ETI	0.4500	1.468991
December '09	ETI	0.1500	1.468991
December '08	FML	4.5000	0.473534
December '09	FML	5.5500	0.473534
December '08	GCB	1.1000	0.767727
December '09	GCB	0.7400	0.767727
December '08	GGBL	2.0000	0.844439
December '09	GGBL	1.3500	0.844439
December '08	Goil	0.3200	0.483653
December '09	Goil	0.1700	0.483653
December '08	GSR	3.1000	0
December '09	GSR	3.1000	0
December '08	GWEB	0.0500	-0.01981

December "09	GWEB	0.0500	-0.01981
December '08	HFC	0.6200	0.710296
December '09	HFC	0.6200	0.710296
December "08	MLC	0.2100	0.927753
December "09	MLC	0.2000	0.927753
December "08	PKL	0.0700	-0.00011
December "09	PKL	0.0700	-0.00011
December "08	PBC	0.2100	0.742115
December "09	PBC	0.1900	0.742115
December "08	PZC	1.1200	0.125777
December "09	PZC	1.1000	0.125777
December "08	SCB	38.0000	0.439874
December "09	SCB	30.0000	0.439874
December "08	SIC	0.5000	0.617715
December "09	SIC	0.2600	0.617715
December "08	SPL	0.0500	0.078083
December "09	SPL	0.0500	0.078083
December "08	ACI / SPPC	0.1000	0.049806
December "09	ACI / SPPC	0.1000	0.049806
December "08	SG-SSB	1.3500	1.014084
December "09	SG-SSB	0.4500	1.014084
December "08	SWL	0.0300	0.01644
December "09	SWL	0.0300	0.01644
December "08	TBL	1.3300	0.514446
December "09	TBL	1.3000	0.514446
December "08	TOTAL	7.6000	0.158582
December "09	TOTAL	6.8000	0.158582
December "08	TRANSOL	0.1100	-0.04122
December "09	TRANSOL	0.1000	-0.04122
December "08	UNIL	4.0000	0.387514
December "09	UNIL	3.4000	0.387514
	correlation	-0.09	

Appendix D

Questionnaire

Please, this questionnaire is designed to solicit information about a firm's beta or systematic risk. Information provided will be treated as confidential and used solely for academic purposes.

1. On average how sensitive or risky are companies listed on the Ghana Stock relative to the market.....(*Please tick one*)

Very ☐

Moderate ☐

Not Risky ☐

2. Are the following factors appropriate in measuring systematic risk (beta) of companies in the Ghanaian context.....(*Please tick*)

Return of the Stock (Using Share Price) ☐

Return of Market (GSE All Share Index) ☐

3. Are there other factors that should be considered when estimating the systematic risk(beta) of companies listed on the Ghana Stock Exchange

.....
.....
.....
.....
.....

4. Are there any drawbacks in using beta to estimate the systematic risk of Companies in the Ghanaian context

No ☐

Yes ☐

If yes please explain

.....
.....
.....
.....
.....

5. Is there a relationship between the share price and the beta of a Company

Yes ☐

No ☐

6. What category of stocks do market participants heavily invest in.....(Please rank from highest to lowest)..... 1 being highest and 11 lowest

Banking.....

Insurance.....

Consumer Goods.....

Energy.....

Trading.....

Food & Beverages

Manufacturing.....

Mining.....

Information Technology & Communication

Health care / pharmaceutical.....

Agri- Business.....

Thank You.

