THE PREDICTIVE ABILITY OF CLOSED-END VALUE-AT-RISK MODEL ON CHANGES TO PORTFOLIO COMPOSITION FOR SELECTED INVESTMENT INTERMEDIARIES IN KENYA.

OKWACH G.O

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DECLARATION

This management research project is my own original work and has not been presented for a degree in any University.

Signed: _____ Date: 22/10/2001

Okwach George Omondi

This project has been submitted under my supervision.

Signed: _____ Date: 24/10/01

Mr. M. Anyangu
Department of Accounting

DEDICATION

To my son Eugene. The challenge to unearth new frontiers by articulating beyond this is clear.

ABSTRACT

Managers are confronted with the need to continuously shift resources among competing uses. The interest is to ensure allocation to the best venture. A good risk measurement tool affords meaningful estimation of exposure of earnings to lose among competing venture hence facilitating strategic resource allocation. A proper risk measurement tool also aids in evaluation of management performance and competencies- indirectly providing an index on efficient resource management

Modern portfolio theory suggests that the risk in a portfolio can be proxied by the portfolio standard deviation. This means the latter is all that one needs to;

i) encapsulate all the information about risk that is relevant and
ii) construct risk- based rules for optimal risk "management" decisions.

However, in reality, managers think of risk in terms of dollars of loss, not deviations. Standard deviation is therefore not intuitive.

Value at Risk methodologies present information about the distribution of possible future losses on a portfolio. From such distribution, the loss exposure of a portfolio at any time can be calculated and used by management to make decisions on the propriety of portfolio composition. This study attempted to test the predictive ability of one such model among Kenyan financial Intermediaries and in the process to also establish the methods used by those institutions to determine the timing for portfolio composition changes.

The study found that internally developed models are the most popular means by which management decides on portfolio composition. These models are unstructured and change from time to time. The methods applied are tailored to conform to the regulatory framework within which these institutions operate.

Value at Risk models are little known among Financial Intermediaries in Kenya. The study found Closed end VaR model to be a good predictor of portfolio composition changes among financial intermediaries in Kenya. Most companies however tend to continue applying own tailor made approaches which tend to be rule of thumb based in determining portfolio composition.

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Risk management is at the heart of good corporate governance. Organizations are part of an open system where their operations experience complex interaction with other forces in the business environment. Ignorance of this co-existence leads to sub optimal decisions about resource allocation as negative forces fail to be interpreted correctly. Conscious and continuous evaluation of the environment facilitates prompt decision making on the impact of resource deployment on competing risk ventures.

Investment managers act in fiduciary capacity in relation to the funds they hold for their clients. They are bound to invest the monies in such mix of assets as meets stated investment objective(s). Monitoring of trends in markets and interpretation of their implication on portfolio composition is crucial for this success. The accuracy with which this is done determines their efficiency and the level of return on the funds invested.

Risk management therefore becomes the central focus of sound management of investment returns since return on investments depends on the accuracy with which events in the wider macro economic environment are identified, captured, documented, analyzed and interpreted in understanding their implication on investment risk and return. The latter can be loosely referred to as risk management.

Accurate interpretation of the implication of external forces on the resulting portfolio mix will determine whether the investment manager continues to meet the stated investment objectives. An effective tool that facilitates accurate monitoring, identification, capture, measurement and evaluation of risks involved is imperative. The model must make the process efficient and effective. It is only then that decisions on asset composition in portfolio and the impact of risk on other segments of business can be accurate and optimal resource allocation achieved.

Increased global competition means that fast, accurate decision making is crucial for competitive success. Economic factors that drive risk and return are in perpetual motion to reflect the dynamic nature of market forces. This increases the need for proper tools for risk management so that environmental issues that impact on productivity of resources are properly interpreted.

Literature in finance tend to focus on the efficient frontier determined on a risk return plane as the basis for determining optimal portfolio composition.

"***The efficient frontier represents the best possible alternative for all risk averse investors***" (Levy 1999).

Markowitz (1952), Sharpe (1964), Copeland *et al* (1988), Elton *et al* (1981) and Fama (1976), had similar conclusions. According to Copeland, so long as investors have homogeneous expectations, they will all perceive the same minimum variance opportunity set. This means that the frontier that offers minimum variance for a given level of return is the efficient one preferred by all rational investors.

Determination of such a frontier requires knowledge of individual asset risk and return characteristics and the correlation of return between those assets. This would be historical information about performance of those assets in the financial markets. Modeling the frontier from historical variables makes it a *post-event* based model with little use among *active* investment managers and generally waters down its usefulness as a tool for proactive decision making. Levy (1978) noted that, "*... there is a high degree of abstraction from reality in developing the portfolio selection theory in this manner.*"

Active portfolio managers believe they can out-perform the index (Gruber *et al* 1995). This means they base their decisions on factors beyond those already assimilated by the market in its pricing mechanism. From the theory of perfect markets, they are fundamentalists as opposed to chartists. They pore the market for trends and implication of movements in diverse parameters to arrive at correct judgment about true information

upon which decision making is based. By basing their decisions on expected changes in market parameter that drive risk and return they are pro-active as opposed to *passive* managers who base their decisions on changes that have already occurred.

The challenge for "*active*" managers is to formulate models that define the process in a dynamic market environment much like the efficient frontier conceptualizes the theoretical thought. No universal consensus has been reached on one model that fits all cases. According to Schachter (1997), the whole area of risk management is still an evolving paradigm with experimentation encouraged to merge conceptual thought with practice. Risk measurement tools are therefore diverse and each manager, presumably chooses a model that best captures the variables in his decision making environment. Every tool must however facilitate efficient resource management.

1.1.1 Risk Control and Resource Management

Managers are confronted with the need to continuously shift resources among competing uses. The interest is to ensure allocation to the most profitable venture. A good risk measurement tool affords meaningful estimation of exposure of earnings to lose among competing venture hence facilitating strategic resource allocation.

A proper risk measurement tool also aids in evaluation of management performance and competencies- indirectly providing an index on efficient resource management. Yet studies on performance measures tend to leave out risk indices as important measures. Osewe (1998) in "*The Choice of performance measures used in divisionalized companies...*" for example evaluated the applicability of conventional financial models viz. accounting profit, return on investment and residual income as key tools used by management in evaluating performance of divisionalized companies.

There was a conspicuous absence of risk indices as performance measures especially since banks were part of the population of study- the latter have significant activities that are exposed to risk; their performance rely too on sound risk management. This bias may

be due to the fact that risk measurement and control is seen only as an internal managerial working tool with no means of conveying organizational performance (hence management performance) like accounting numbers do.

Failure to see risk as a performance evaluator is also blamed on regulatory authorities like the Central Bank, the Nairobi Stock Exchange, Capital Market Authority and the Accounting standard setting bodies. There is a critical lack of guidelines from these institutions on disclosure of risk inherent in balance sheet assets in company financial reports or risky off balance sheet positions (especially for organizations that leverage massive resources in risky ventures e.g foreign exchange forwards). Yet this would be the information that potential investors would be willing to have about such organizations.

Indeed other performance measures such as profit and earnings are based on how well managers are able to assess and control risk through use of carefully selected models. It can therefore be argued that risk indices are ingredients in performance measurement that complement (or incorporated in) other indices.

To measure performance, one requires a tool that will relate input to output in a causal relationship showing efficiency. Managers are entrusted with resources, which they deploy in competing risk ventures in order to earn return to the principal. They need proficiency in risk evaluation in order to determine the best alternative among competing ventures. A measurement tool that captures this ability is appealing as it is devoid of manipulation like accounting numbers. It is the view in this paper that risk indices be exclusively used as performance measures to convey at source the efficiency and effectiveness of management in controlling use of resources.

1.1.2 Portfolio versus Individual Asset Risk and Return Characteristics

A portfolio is a combination of several securities or assets with the object of risk diversification and return optimization.

Portfolios exhibit profit/loss distributions that are different from the profit/loss distributions of the individual assets held therein. There is an aggregating effect that results in smoothening out of individual asset risk and return characteristics whenever several assets are combined in a portfolio.

One asset is exposed to limited market risk. A retail outlet for example may be sensitive only to inflation and government policy on commodity prices. A portfolio that combines investments in retail and say manufacturing will be sensitive to such factors and others such as movements in foreign currency rates (where manufacturing involves significant foreign trade), taxation legislature at corporate and individual level, government monetary policy implications on borrowing costs etc.

A market force, even though pronounced at individual asset level e.g. commodity prices sharply affecting retail, would be moderated at portfolio level because of the opposite effect of the force on the other businesses. Regulation of commodity prices may have opposite effect on manufacturing that relies on raw material from the regulated commodities segment.

Holding assets in a portfolio results in diversification of risk- lower risk is achieved without undue sacrifice of return. Portfolio return becomes a result of multiple sources of market risk. Depending on the composition of the portfolio, the sources of risk it is exposed to will differ accordingly.

Because of its exposure to diverse market risks, a measure of portfolio risk must recognizes this fact and convey the risk as a single index. A suitable model will be based on the profit/loss distributions for the portfolio as a whole and not limited to a single asset category or a single source of market risk. Since portfolios are diverse, such model must derive their power in risk measurement from their generality in application so that every conceivable situation can be modeled to determine portfolio risk.

Modern portfolio theory suggests that the risk in a portfolio can be proxied by the portfolio standard deviation. This means the latter is all that one needs to;

iii) encapsulate all the information about risk that is relevant and

iv) construct risk- based rules for optimal risk "management" decisions.

However, in reality, managers think of risk in terms of dollars of loss, not deviations. Standard deviation is therefore not intuitive. In addition, in trading portfolios, deviations of a given amount below expected return do not occur with the same likelihood as deviations above especially as a result of positions in options and option like instruments whereas standard deviation for risk measurement assumes symmetry.

1.1.3 The Lack of Intuitive Appeal for Theoretical Risk Measures

The emphasis of standard deviation as the sole measure for risk and the determination of efficient portfolios from a framework that relies heavily on the assumption of efficient markets where a distinct "market" portfolio and a risk less asset can be identified, has been heavily criticized by scholars as unrealistic and waters down the appeal for these theoretical approaches to practical situations.

".. ***there is a high degree of abstraction from reality in developing the portfolio selection theory in this manner***" (Levy, 1978).

This is because securities' market is a complex mechanism incorporating thousands of decision variables all with complicated interaction between market participants, government policy and economic indices. Moreover theory assumes that securities are traded in a hypothetical "**perfect**" capital market in which;

(i) there are no transaction costs or taxes

(ii) all relevant information regarding securities is freely available to all investors simultaneously.

(iii) all investors can borrow or lend any amount in the relevant range without affecting the interest rate, and there is no risk of bankruptcy.

(iv) there is a given investment period which is uniform for all investors.

(v) investors are risk averse and reach their decision using the mean-variance rule.

In reality, complex interaction of diverse factors in capital markets means that non of the above assumptions hold.

In addition to the limitation imposed by its restrictive assumptions, the theoretical approach finds little applicability in practical circumstances for three reasons:

(i) One has to have a utility function that express the investors preferences over present and future consumption. No guidance exists on how this can be done in practice.

(ii) It requires determination of probable future states of the market and to allocate accurate probabilities to each state and estimation of probable asset prices. These involve estimates which could be subjective and inaccurate.

(iii) It views risk in terms of standard deviation only i.e with standard deviation one can construct risk-based rules for optimal risk management decisions. In practice however,

   (a) Managers think of risk in terms of dollars (or shillings) of loss, not deviation. Standard deviations is therefore not intuitive.

   (b) In situations of trading portfolios, portfolios on stock indices, option positions and option like instruments, deviations of a given amount below expected return do not occur with the same likelihood as deviations above yet standard deviation for risk management assumes symmetry.

In addition the optimum portfolio and efficient portfolio models do not solve the problem of determining how and when amount invested in a portfolio should be reviewed in the light of prevailing market risk. It ignores the risk element in the determination of optional portfolio size.

A marked gap between theory and practice therefore emerges. Theory has not addressed the practical nature of business, investment behaviors and market dynamics. No best practice can as yet be identified (Schatcher, 1997). This is mainly due to the difficulty of conceptualizing practice in a dynamic World.

For this reason, modern researchers have noted that a paradigm in financial risk management in general is still evolving and experimentation and research is encouraged to define a practice that will merge the significant gap that exists with conceptual thought. Value at risk modeling is seen as a quest to this end.

1.1.4 The concept of Value-at-Risk

According to contemporary authors on the concept (see for example Schatcher 1997), value at Risk presents information about the distribution of possible future losses on a portfolio. It is a random variable (or statistic) just like sample mean is in reference to population mean which conveys portfolio risk as a single measure based on expected distribution of return for the portfolio.

It presents potential loss (in shillings or % deviation from normal return) in portfolio earnings from an unlikely, adverse event in a normal, everyday market environment in such manner that say *there is a 1 in 100 chance that the portfolio will lose shs. 2million in 1 month.* (or whatever horizon decision making is based).

According to the proponents, calculation of value at risk involves estimation of true value at risk just like calculation of sample mean is an estimate of population mean. Confidence intervals are applied in estimation because this tells how accurate one is. A 95%

confidence interval is normally considered reasonable as it is not very far away in the tail. Usually it is considered difficult to accurately estimate a point further out in a tail distribution since there is less observable data to use in the estimation.

In *standard normal* distribution, the risk measure is found as a constant (the Z score for the chosen confidence interval) times the standard deviation of the return expressed thus;

$$VaR = Z(\delta)$$

For purposes of time horizon within which the statistic is estimated, Scatcher (1997), suggest horizons that best fits a portfolio's characteristics. For example a portfolio composed of short term debt instruments would be evaluated over short time horizons because of their sensitivity to time value of money.

1.1.5 Value at Risk models

The calculation of value-at-risk involves using historical data on market prices and asset return rates, the current portfolio position and a model for pricing those positions. [1] These inputs are then combined in different ways to derive an estimate of a particular percentile of the loss distribution. The method of analysis depends on the assumptions about the distribution function that best describes the earning profile of the portfolio in question. The methods include;

i) Monte Carlo Simulation

If the distribution of portfolio market prices and rates of return is normal, this method allows one to use collected market data to estimate parameters of the distribution. Monte Carlo uses these assumptions to give successive sets of possible future realizations of changes in those rates. For each set the portfolio is re-valued to give a set of portfolio

[1] For a complete understanding of the various models refer to http://www.gloriamundi.org from where this section has been extracted.

revaluations corresponding to the set of possible realization of rates. From such a distribution, one can compute expected loss at any confidence level as the value at risk.

ii) Historical Simulation

This is similar to Monte Carlo but does not make assumptions about the distribution of changes in market prices and rates. Instead it assumes that past patterns of those prices and rates can be used to forecast future values. Past changes in those values are applied to the current data set of rates and prices- hence revaluing the portfolio. When several runs are performed one gets a set of portfolio revaluation corresponding to possible rates and prices from which distribution one can determine at any confidence limit value at risk.

iii) Delta-gamma value at risk

These are applicable in situations where price sensitivity for a portfolio are non linear in relation to market forces. (this assumption underlies the closed-end method discussed below). Such portfolios experience *gamma* or *convexity* risk. They adopt a quadratic assumption there by bringing second-order sensitivities into the analysis. By orthogonalizing the co-variance matrix, one can express the random variable for the portfolio's future value as a sum of chi-squared random variables plus a normal random variable and a constant term from which value at risk for the portfolio can be determined.

iv) **The Closed Form Model**

This is a applicable to simple portfolios and assumes that the portfolio's profitability is normally distributed and depends linearly upon applicable risk factors i.e there is no convexity relation ship as in the case of the delta-gamma method. Such portfolios include those of equities, spot or forward exchange or commodity positions and short term debt instruments. These are the kind of portfolios held by most financial intermediaries in Kenya hence the selection of the closed form model for testing.

For other portfolios containing options, structured notes and mortgage- backed securities other methodologies for estimating VaR (e.g Monte Carlo simulation) are applicable.

Computation of closed form value at risk.

A normal distribution is fully described with two parameters: the mean (μ) and standard deviation (δ). If changes in portfolio value is normally distributed, then to measure value at risk, we need estimate μ and δ for the normal distribution.

At the 95% confidence interval, this becomes;

$$VaR = 1.65\delta - \mu$$

μ -the average, one-period return on a portfolio- is the risk-free return plus a spread of any systematic risk the portfolio may be taking. Where VaR is computed over short horizons of a day or so, μ is small and typically equated to zero giving

$$VaR = 1.65\delta \quad \text{.....(i).}$$

Estimate of δ requires portfolio historical price data. Because the composition of the portfolio changes from minute to minute as trades are made, a relevant model for decision making would be one based on how risky the portfolio is at the time of calculating VaR. Such a model requires estimation of portfolio standard deviation based on its current composition.

If a portfolio has n contracts, each of which will experience a profit/loss of Δci and ΔP reflects change in the portfolio's value over time then;

$$\Delta P = \Sigma \Delta ci$$

The statistical characteristics of ΔP can be determined from those of Δc*i* because Δ*P* depends on Δ*c*. Specifically, if estimates exist for standard deviations (δ) and correlation ρij for each contract's profit/loss Δc*i*, those estimates can be combined to form an estimate of δ using the general formulae for standard deviation thus;

$$\delta = \sqrt{\sum (\delta i)(\delta i) + 2\sum\sum(\delta i)(\delta j)\rho ij} \quad \text{.....(ii)}$$

for i>j

Equation (ii) incorporates standard deviations and correlation of returns of those contracts that are held by the portfolio at the time the calculation is performed- hence is a timely measure of risk.

The two equations (i & ii) represent a closed end VaR model.

The Normality Assumption about distribution of Portfolio return.

Empirical studies on the statistical properties of financial asset prices suggest that the assumption of normality (or lognormality) is a reasonable approximation to observed price behavior (Moles, 1998).

"***The behavior of asset prices has been noted to follow a random walk***" (Mole 1998).

This is similar to saying their returns obey normality in distribution. French (1980) and Roll (1986) had similar observations.

Most models designed to study asset prices have an underlying normality assumption[2].

[2] A refinement of the Markov Process, the Weiner Process, sees the change in price for a given period to be "r" such that $r = \Phi\sqrt{\Delta t}$ where Φ is a random variable drawn from a normally distribution with mean of zero and a standard deviation of one. "t" represents time period. The geometric Brownian motion, a variant of the Weiner process, also assumes normal distribution of asset prices. See Moles pages 7/21-7/22.

VaR models too assume market prices exhibit a stochastic behaviour as it is believed that prices and returns of assets are not predictable otherwise market forces would come to play to remove information that causes this predictability.

1.1.6 Value at Risk and Portfolio risk management.

In America, the Orange County lost $ 11.6 billion in December of 1994. Non use of value at risk estimates of the portfolio of the investment pool and lack of disclosure of the same was blamed on the loss. Jorion (2000) showed how value at risk could have been applied to prevent the county treasurer from creating a huge exposure of the portfolio returns to market movements.

There are also questions as to whether value at risk could have prevented Barings bank disaster (Schachter, 1997) or liquidity crisis in Russia in 1998 (Dunbar, 2000).

1.1.7 Value at Risk and Financial Regulation

Disclosure of value at risk in portfolios and other trading instruments plays an important role of helping supervisory authorities reinforce risk management practices and foster financial sector stability.

Improved disclosure benefits banks and securities firms by enhancing their ability to evaluate and manage their exposures to other counter parties and reduces the likelihood that they become susceptible to market rumors and miss-understandings during periods of financial stress. Disclosure equips the market with tools for evaluating companies' trading activities. This way, market forces are able to communicate proper signals to regulate the sector – "*...well informed investors do impose strong market discipline on an institution to manage its activities and risk exposures*" (Basle committee 1999).

In their survey of disclosures about trading and derivatives activities of banks and securities firms in 1996 (published November 1997), the Basle committee on Banking

supervision (an association of regulatory institutions in Europe, America and Asia; formed to formalize regulation in the financial services sector in the three continents with the object of boosting investor confidence and promoting trade) found that "*..in 1996 50 institutions provided value at risk disclosures and compared with 36 in 1995 and 4 in 1993*". The survey found that there was a large increase in the number of institutions that provided quantitative disclosures drawn from their internal value-at-risk methodologies and of the major assumptions underlying their value-at-risk models.

In Canada, the office of the superintendent of financial institutions or OSFI (equivalent of the Banking Supervision unit of the Central Bank of Kenya) in a paper entitled *Capital Adequacy Requirements – Market Risks* (published November 1997) gave general criteria for selection of internal risk management models that institutions may use. The office recognized that "adequate capital" is best determined on daily basis based on value at risk in an institution's investment portfolio. The office stated in part that "*...capital requirements be expressed as the higher of the previous day's value-at-risk number and an average of the daily value-at-risk measures on each of the preceeding 60 business days multiplied by 3.*" OSFI Capital Adequacy Requirement (1997)

The Securities and Exchanges Commission's (SEC) *"market risk disclosure rule"* (finalised Jan 1997) requires firms to disclose quantitative information about market risk. It issues three alternatives for disclosing the latter among them value at risk for derivative and financial instruments. Firms are required to express the potential loss in fair values, earnings or cash flow of market-risk sensitive instruments that might arise from the market movements of a given likelihood of occurrence over a time interval.

In their recommendations for public disclosure for Trading and Derivatives Activities for Banks and Security firms, the Basle committee in conjunction with the Technical Committee of the International Organization of Securities Commissions (IOSCO) encouraged banks to consider qualitative disclosures such as on:

i) **Risk and management controls:**

Institutions should provide an overview of their central risk management and control process. They should describe how these risks arise and the method used for controlling them for instance an institution should discuss its limit policies for exposures to market and credit risk and explain how value at risk measures, are used to manage market risk.

ii) **Market risk :**

Institutions should include "*...discussion of the structure of the independent market risk management/ control units, internal controls, risk limits (e.g value at risk limits)...*" which "*...will help understand the nature of the control environment...*".

It continued to propose that

"Qualitative disclosures on market risk should be supplemented with information on...the parameters used by internal models. In the case of value at risk, the model, the portfolio covered...models parameters such as holding period, confidence level and the observation period should be disclosed''.

The developments in Europe and America give a broad guideline on the move towards definitive approach on risk management and disclosure practices and its effects on regulation. Simple value-at-risk models emerge as gaining acceptance by practitioners and regulators (Gardener *et al* 1999) and are comprehensive new approaches to risk management.

1.2 STATEMENT OF PROBLEM

One of the major reasons for failure of financial intermediaries is lack of proper systems to support decision-making. This is evident from the absence of definitive approach to risk management particularly impacting on portfolio change decisions. Portfolio change is inevitable whenever markets indices shift affecting risk- return priorities of investors. New innovations in risk management with greater relevance to practical (as opposed to theoretical) situation will guide the way in defining a paradigm in risk management which is currently lacking, Schatcher (1997).

This paper recognizes this deficiency in Kenya's financial system and the fact that it is a common feature of potential failure for banks (as Bett 1992 also noted).

Regulatory institutions like the Central Bank and the Capital Markets Authority lack tools to enforce disclosure about risk in investment positions of financial institutions. The role of regulatory authorities through their supervisory units to ensure adequate disclosure of the risks and potential losses of investment instruments is in-effectively exercised if standard tools are not defined which can be used to capture the items needed for disclosure.

In addition, as the derivatives market in form of forward exchange covers take shape, special authorities to monitor trading and limit risk exposures will be established and will need a tool for use in imposing disclosure requirements. This study, if successful, will provide framework for establishment of the requisite tools.

In general, rule of thumb still permeates practice in the important area of portfolio change decisions. Practitioners lack scientific methods for evaluating investment risk leading to sub optimal performance of portfolio funds and investment firms. The study hopes to define the current practice and to fit a scientific model to predict portfolio change decisions.

1.3 OBJECTIVES OF THE STUDY

The primary objective of the study are to;

i) establish the methods used by risk managers in making decisions regarding change in portfolio contents.

ii) test the validity of value at risk closed end model in predicting changes to portfolio composition by financial intermediaries in Kenya.

1.4 IMPORTANCE OF THE STUDY

Portfolio managers will benefit from a definitive approach to portfolio risk evaluation, control and decision making on portfolio composition. As noted above there is currently a lack of scientific models to use in the process.

If found accurate, the model (or similar ones) can be applied by regulators in enforcing requirements about risk disclosure in trading portfolios and other investment positions as the study will provide a frame work for the development of models applicable to any sub sector.

Disclosure is an important facet of a strong financial system. Well informed investor, depositors, customers and creditors can impose strong market discipline on an institution to manage its activities and risk exposures in a manner that is both prudent and consistent with its stated business objectives. Market discipline too reinforces the objectives of supervision by rewarding institutions that manage risk effectively and penalizing those whose risk management is weak or ineffective.

Non financial firms with significant trading in securities and derivatives e.g. agricultural sector firms will also find the study useful when a method of enhancing disclosure of risk inherent in securities is found. Special authorities to monitor trading and limit risk

exposures in these sectors will benefit from a framework for establishing risk disclosure methodologies.

CHAPTER 2: LITERATURE REVIEW

2.0 Summary of Key Concepts and Variables

Key concepts implored in this study include

i) Risk diversification. This is defined as reduction in variability of overall investment return arising from combining various instruments in a portfolio to investing in only one.

ii) Efficient portfolio. This is the portfolio that comprises a combination of securities that offer the best risk-return trade off than any other combination available to investors.

iii) Financial intermediation is defined as the systems that link willing lenders and willing borrowers in an arms length transaction.

The key variable under study is portfolio composition. This is under the control of financial intermediaries that carry out risk diversification.

2.1 An Overview of the Portfolio Management Process

According to Reilly *et al* (1994), this proceeds in four steps;

(i) construction of a policy statement, which specifies the types of risks, the investor is willing to take and his/her investment goals and constraints. All investment decisions are required to be consistent with the investor's policy statement.

(ii) the investor looks for strategies that offer the best possibility of meeting the policy statement guidelines by studying current financial and economic conditions and attempts to forecast future trend.

(iii) construction of portfolio.

(iv) continuous monitoring of investors needs (which might change over time) and capital market conditions.

It is the fourth step that requires skill and tact in studying capital markets as well as proficiency in the choice and application of the right management tools in order to achieve objectives of the policy statement.

Developments in portfolio theory in the early 1960s showed investors how to quantify and measure risk in terms of variability of returns. See Reilly *et al* (1994). No single measure combined both return and risk requiring the two to be considered separately as had been the focus by researchers in earlier studies.

2.2 Risk Diversification- A Theoretical Framework

Copeland *et al* (1946) held that optimal portfolio decisions are about what securities to hold in a portfolio. The investor is split between how much wealth to consume today (utility) and how much to invest for consumption at end of a specified period (invest)- i.e decide between current utility and investment. They used the *Langrarian* multiplier to solve a utility/ investment maximization problem in determining how much wealth to invest in a portfolio for future consumption.

2.2.1 The efficient portfolio

The efficient portfolio lies on the efficient frontier which is the frontier on the risk return plane that offers the best combination of risky and risk less asset to investors. In theory, such portfolio represents the best possible alternative for risk averse investors.

By assuming existence of a risky and a risk less asset, investors are confronted by choice of either investing in risky securities or the risk less asset each promising different return levels commensurate with the risk taken.

Traditional theory on portfolio selection analyzes the effect of opportunities for borrowing and lending available to investors. This makes it possible for investors to

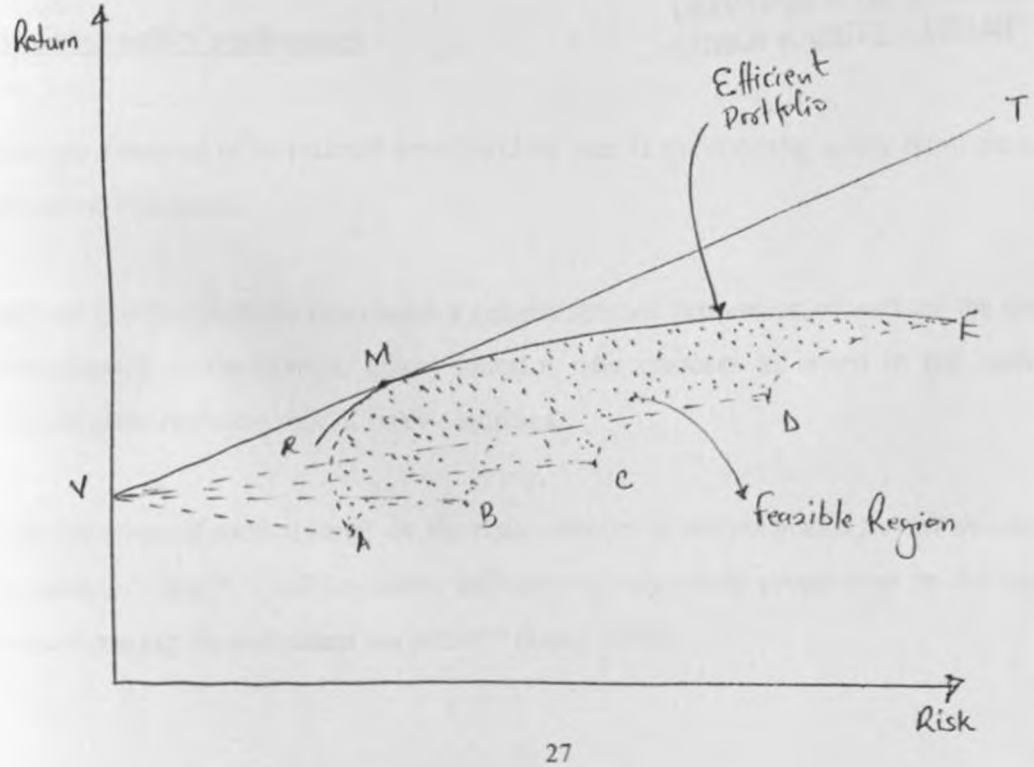
invest in more than one security i.e create portfolios in order to tap the benefits of diversification i.e risk reduction without undue sacrifice of return.

In the wider context of a capital market where a market portfolio- a portfolio containing optimal combination of securities in the market-, is seen as an option to the investor against a risk-less asset e.g. government treasury bills, the efficient portfolio is derived as a combination of the risk less asset and the market portfolio.

2.2.2 The Market Portfolio

This is a portfolio containing combination of securities in the market the construction of which begins with identification of risky securities in the market.

A framework for construction such a portfolio, requires hypothesis about opportunities for investment available in the market. If the market had on offer five securities with different risk-return trade off, one could through evaluating the alternatives available derive the optimal set (efficient set) as comprising those combinations in the outmost part of the expected return axis in the feasible region thus;



Through experimentation, the investor finds that there are various combination of assets (all reflected in the feasible region) that he can achieve. The curved nature of the lines connecting the individual asset reflect the investors risk aversion so that faced with a choice between *A* and *B* he would prefer a portfolio with as much low risk-high return trade off as he can find. He will try to move towards line *VB* from *A* in such a manner that he prefers lower risk but high return combinations given opportunities by the risk less asset *V*.

The curve *ME* sets out all the combinations of expected return and standard deviation which can be obtained by freely building a portfolio of risky asset using securities available in the market.

The point *M* also provides optimum rate of risk-return substitution between efficient, risky market portfolio and the risk less asset. Hence the line *RMT* offers investors the best combinations of market portfolios and risk less assets whether they are borrowing (combinations MT) or lending (combinations RM).

2.2.3 Investor utility preferences

Investors are assumed to be rational and therefore aim at maximizing utility from the use of their scarce resources.

The optimal market portfolio represents a certain optimal proportion of each of the risky securities floated in the market. Every investor who chooses to invest in the market portfolio chooses the same mix of risky securities.

" *...the proportion of each security in the risky portion of the portfolios for all investors are the same...*" also "*... all investors will diversify the risky proportion in the same proportions among the individual securities.*" (Levy 1978).

This combination is a linear function in the earnings variance plane and yields the Capital Market Line upon which one of the foremost valuation models in finance, the Capital Asset Pricing Model is based.

Investors' in difference curves becomes operative in determining at what point along the capital market line their portfolio selection will actually lie. Indifference curve reflect the risk return trade-off for which an investor is indifferent. The portfolios could be either levered i.e in the region *MT* or mixed risk and riskless securities *(RM)* or pure risk (Point *M*).

An optimum portfolio is attained when the marginal utility of current consumption equals the marginal utility of wealth in a state, divided by the price of pure security in that state; the latter ratio should also be constant in all states.

Alternatively the optimum portfolio can be derived from the point of intersection of the capital market line and the efficient frontier. This was called the efficient portfolio.

Markowitz (1952), Sharpe (1964), Levy (1978), Roll et al (1984) heavily documented this conceptual framework and Fischer (1995) among others authors.

2.3 Financial Intermediation- An Overview

Anerbach (1988) described financial intermediaries as the vital connection between saving and investment in reproducible capital.

The intermediaries carry on business of obtaining funds through selling financial assets with low pecuniary (money) yields, which they create and for which they are liable and use these funds to buy financial assets issued by others and yielding higher pecuniary returns.

Among the many types of business carried out by the intermediaries risk reduction stands out as the main one and is the underlying reason why these institutions exist in the first place.

Pooling assets in large portfolios reduces the risk of default by a borrower. The borrower is able to invest these assets in various other assets and markets, each with different patterns and seasonality of returns. The institutions are able to sell the financial assets they create at a cheaper price because included in the sale is a group of services that makes the assets more valuable than is indicated from the money income of an asset taken individually.

2.3.1 Types of financial intermediaries

Financial intermediaries are either

(i) depository
(ii) contractual or
(iii) investment

In nature

2.3.2 Depository intermediaries

These issue deposit instruments either payable on demand or on maturity (time deposits). They are also authorized to offer checkable deposits. They comprise commercial banks, saving and loan institutions (co-operative societies) and savings banks.

2.3.3 Contractual institutions

Comprise insurance and pension fund companies. These create instruments that form a contractual relationship with the buyer e.g. a pension or an annuity. A contract is entered

into between the buyer and the issuer of the instrument which specify the term of payments by the buyer and the obligation of the issuer.

Conditions are also specified which fix the times these instruments can be converted to money or other form of financial assets e.g. loan or shares the aim being to provide the buyer (holder of claim against the intermediary) with an asset at a distant date.

They hold portfolios comprising shares, real estate, bonds e.t.c. wherein most of the buyer funds are invested. Examples include;

a) Insurance companies

Apart from life and property insurance businesses, Insurance companies also offer pension and annuity plans and money market funds making them partly investment intermediaries.

Premiums require to be invested in such manner that allows a sufficient spread between the return on their portfolio and the return they pay on the financial assets viz the policies they create.

The industry is characterized by stringent regulation which affect their portfolio. They invest in residential and commercial mortgages and own substantial real estate in addition to shares and preferred stock in pension funds and established corporations.

b) Private Pension Funds

These are managed under the provisions of the Retirement Benefits Authority Act by elected trustees who define the manner in which the funds should be invested in order to provide a desirable stream of retirement benefits to contributors. Lacking expertise on financial/investment issues, the trustees appoint investment managers to look for suitable

investment instruments and combinations thereof which conform to the provisions of the trust establishing the fund.

c) Trust funds

These comprise assets print in the care of administrators. Agreements stipulate payments to individuals or heirs a certain event e.g. retirement or death.

2.3.4 Investment intermediaries

These are finance and investment companies. They comprise money market funds which specialize in buying short-term, low default- risk debt instruments e.g. like government treasury bills and certificates of deposits offered by commercial bank.

a) Investment companies

Investment companies issue shares of ownership in their investment portfolio. The latter is represented by different types of financial assets viz corporate stocks, bonds, government securities and derivative positions (applicable in countries where these exist).

They sell shares to their customers and purchase income earning financial assets issued by others such that each shareowner has a proportionate share in the investment company's assets.

The income earning portfolios of financial assets that these companies create may be limited to the particular asset(s) in which the company specializes or they may be diversified with several types of financial assets.

They do not acquire equity with the objective of ownership or control of other forms like holding companies do. Rather the aim is to acquire such investment that offers a return

that averages the best returns available in the macro economic setting. Hence they are found to purchase financial assets as;

- Shares in a single industry e.g. agricultural or mining
- Government and municipal bonds
- Equities in companies offering steady dividends
- Equities paying little or no dividend if the objective is to obtain income arising from low capital gains tax (not applicable in Kenya)

They are either;

(i) fixed trust investment companies offering certificates for a proportionate part of their portfolio (called a unit of the portfolio) which portfolio is selected by the promoters and remains intact over time.

(ii) open end or mutual fund investment companies that constantly offer to sell new shares. The shares are sold directly by the companies themselves (or by brokers). In addition, their portfolio of assets is continually adjusted to reflect changing market conditions or

(iii) closed end investment companies that issue a limited number of ordinary shares which are traded in regular financial market. They may also issue marketable bonds or borrow limited amounts from other firms.

b) Money market funds

Money market funds are mutual funds that specialize in portfolio of very liquid short-term debt instruments such as treasury bills and certificates of deposits from domestic and foreign banks. Customers purchase shares in these funds subject to some minimum amount say Ksh. 50,000 or Ksh. 100,000. The same funds can be withdrawn by cheque or through electronic fund interchange.

These funds have thrived a great deal especially in economies where the financial sector infrastructure is well developed. In the United States for example, they grew from USD 3billion in 1977 to USD 15billion in 1982 – a 400% increase a 5-year period. This massive achievement was contributed by the high spread between the yields they offered and those offered by savings accounts in thrift intermediaries (savings & societies).

The funds can either be institutional funds- available only through institutional investors-, non institutional available to all investors through stock brokers and dealers or non institutional available to all investors also called general purpose money market funds.

c) **Finance Companies**

Finance companies hold portfolio of loans to their clients and from which they earn their income. To raise funds they sell debt securities, and shares just like other companies to raise funds.

They raise funds by borrowing from other financial intermediaries or through selling shares and other financial instruments in the money markets. Their line of business is lending to other corporate and individuals with acceptable credit rating.

2.4 Performance of Financial Institutions in Kenya

Non-disclosure of losses and deterioration of loan portfolios were noted by Bett (1992) as some of the common features of potential failure banks. Loan portfolio is created based on poor diversification of lending leading to a significant proportion of a bank's loans being held by a few big borrowers.

The role of regulatory authorities through their supervisory units to ensure adequate disclosure by institutions of the risks and potential losses of their investments is in

effectively exercised if standard tools are not defined which can be used to capture the items needed for disclosure.

"... ***a supervisory unit is effective if the regulatory system gets proper disclosure of information and have an effective and efficient means of verifying the true position as reported*** .." (Bett 1990)

There would be lacking effective supervision if models to aid in quantify information and verification of the same are not themselves understood and defined.

2.5 Studies on Portfolio Risk and Diversification

In a study entitled "*Portfolio diversification- a case of commercial banks in Kenya*" Bugo (1995) sort to find factors that affect commercial bank portfolio composition. The study sought to find the strength of several explanatory variables in determining portfolio composition.

He hypothesized several factors perceived to have an influence and proceeded to use these to develop an empirical model to ascertain the required portfolio composition- in effect capturing the rule of thumb (thought to be prevalent) in a model.

The model (a multiple regression equation that sought to explain the strength of each factor in determining whether management would consider restructuring their portfolio) was found to be relatively weak in addressing the problem necessitating a conclusion that there could be other factors not taken up in the analysis and which could be "*..responsible for the variation of the number of securities held by commercial banks.*" (Bugo 1995).

The study by Bugo came up with what is *prima-facie* seen to happen in the financial services sector in Kenya i.e a multitude of techniques are used by managers to decide on portfolio composition. There could be as many methods as there are portfolio managers.

Scholars have found the methods "*..intuitive and subjective*" Bugo (1995), Gitari (1990) and Matata (1996). To conceptualize the practice into a definitive model is an area of study that continue to provide a challenge.

Matata (1996) studied the reason for poor investment portfolios by development financial institutions (DFIs) in Kenya. The portfolios for these institutions were designated poor because they posted lower returns and had higher doubtful accounts provision compared to other firms in the financial sector.

The major causes for poor investment portfolios highlighted were impediments in monitoring exercise, engagement in risky business and weak research department or lack of the same. (Matata 1996))

A host of other factors (14 in total) most relating to human rather than technical were listed as possibly contributing to the low performance. The above 3 emphasize the fact that proper tools for control of project risk and monitoring the same is lacking and is a major cause of poor performance of investment portfolios.

The focus of the study by Matata was to identify factors leading to low investment returns by the institutions in question and not to identify models or tools that could be used to increase efficiency in risk monitoring and control (one of the reasons for poor performance).

Gitari (1990) noted that a criterion for selecting the best portfolio is still a research problem because opinion is still divided as to whether the process is;

(i) fundamentally psychological and personality based with each person having a distinct criteria for selection (similar to Bugo's (1995) view)

or

(ii) guided by economic or financial modeling

Whichever the school of thought "*..complicated portfolio selection criteria do not necessarily lead to superior portfolio returns.*" (Gitari 1990). This means that the vital factor in portfolio performance is not the selection criteria but the **composition**. The concern of portfolio managers should then be "when" and not "how" to change composition. However the answer to this question was not part of Gitari's work.

Like other scholars Gitari noted the gray area that portfolio selection is in every business. One of the fundamental reasons why understanding of portfolio selection process in elusive is because there are no guidelines or models to act as benchmark for initiating the process of selection itself.

Management may not know they need to create or change a portfolio. The mist may be removed if a way of initiating the process would be formulated. That is the subject matter of this paper.

CHAPTER 3: RESEARCH DESIGN

3.1 Research Population

This was taken from the latest publication available from regulatory authorities governing the sub sectors under consideration. Only those sectors under statutory regulation and for which public information about the registered institutions is available were considered. The Central Bank of Kenya (CBK) directory of financial intermediaries (available from the Supervisory division of CBK) up dated up to end of August 2000 comprised the population space for Banks, Financial Institutions, Mortgage Finance companies and Building Societies while the Commissioner of Insurance's Report on Insurance companies for the year ended 31.12.98 was used as the population space for Insurance companies.

The Pension and Provident fund sub sector was left out for reasons that the regulatory institution (the Retirement Benefits Authority) could not divulge information on the registered schemes because registration was on going and no official publication existed on registered schemes.

Appendix 1 shows the research population.

3.2 Sample Design

Most studies in financial modeling emphasis applicability of results to specific sectors like banking, insurance, mortgage companies etc. This study is set out to find a model for predicting changes to portfolio composition by estimating value at risk in expected returns of funds invested in those portfolios.

It is recognized that portfolios are created by institutions in various sectors. To effectively address the research problem therefore, it is important to cover firms that create diversified portfolios irrespective of which sectors they may be in. The sample must

include firms that undertake active portfolio management as it is these that are associated with the research problem and are at the forefront of looking for effective tools for portfolio risk management.

To narrow down on one sector would superficially limit the relevance of the study. It would be tantamount to requiring multiple, similar other studies in other sectors merely to test the expanse of applicability of the model.

The population space classified the firms in terms of their peer groups. A firms peer group refers to the level of assets/ deposits/or income a firm holds/realized vis a vis other firms in its sub sector. Appendix 1 shows the peer group definitions.

Stratified sampling technique was chosen to ensure representation of all firms in the five sub sectors under consideration. Stratification was based on the weight of each sub sector (in terms of number of firms) relative to the total population.

After stratification, firms were selected based on their strength (in terms of asset size or income) as defined by their peer group class. Where selection was required of firms in the same peer group we performed random sampling using random numbers allocated to the affected sub population.

3.2.1 Sample size

Statistical literature suggest minimum sample size of 30 if generalization about a population has to be acceptable.

It was decided to use a high sample size to ensure the final responses received can afford a reasonable basis of conclusion regarding the research problem. The sample of 60 represented 67.4% of the population- well above statistical minimum. The table below shows the sample distribution.

Table 1: Sample Distribution

Sector\Group	1	2	3	4	5	Population	Sample Distribution
Commercial Banks	8	8	11	15	9	51	34
Financial Institutions	0	1	0	1	6	8	5
Mortgage Finance Companies	1	0	1	0	0	2	1
Building Societies	0	1	0	0	3	4	2
Insurance Companies	1	1	0	4	18	24	18
Total						89	60

Appendix 2 shows the 60 firms comprising the sample.

3.3 Data Collection

Data was collected via structured questionnaires. Management in the selected institutions was asked to specify the time horizon, which they consider critical when making value at risk decisions.

To ensure as accurate a response level as possible, the questionnaires were served personally to the respondents to allow them to indicate any variations from the structure presented that they hold.

3.4 Data Analysis

Collected data was analyzed as follows;

i) standard deviation of returns for each asset held in the portfolio was computed. The model derives credibility for estimating "current" VaR by including current mix of assets in the portfolio. This was done using average return of individual

assets over the last one year. The returns were obtained from the secondary data compiled by market authorities where the assets are traded.

ii) Portfolio variance was then computed using the formulae (ii) under section 1.1.5.

iii) Portfolio VaR was then computed using the closed end model formulae.
Where VaR is computed over short periods, the model used was

$$VaR=1.65d$$

However, where consideration of value at risk is over long periods (over 1 month), we factored in the average return over the period. This was taken as the lending rate by commercial banks in Kenya. The formulae used was

$$VaR=1.65d-u$$

iv) we compared computed VaR with respondents' loss tolerance limits for each portfolio. A portfolio's loss tolerance limit (established directly from the respondents via questionnaire) was defined as the maximum loss a portfolio would tolerate before change in composition was instituted. This is different from changes occasioned by availability of investment opportunities which investment managers take advantage of to maximize portfolio returns. It is the highest loss tolerable before change in composition can be instituted. In such cases a firm will radically redesign its portfolio to ensure the loss is avoided. VaR models aim at warning firms when their portfolio looses approach this limit.

The comparison between computed VaR and respondents' portfolio loss tolerance limits was carried out using Spearman's rank correlation coefficient. Spearmans index was considered appropriate because it is the best statistically for drawing a relationship between paired data.

v) we then performed a significance test for the computed rank index and tested the hypothesis that there is no relationship between computed VaR and firms' allowable maximum portfolio loss before change in composition can be effected.

CHAPTER 4: DATA ANALYSIS AND FINDINGS

4.0 Methods used by Firms to Determine Portfolio Changes

20 out of the 60 firms sampled responded to the questionnaire. 12 firms indicated that they used internally developed methods to determine portfolio composition. Most of these methods were unstructured and did not fit into a defined model. All these respondents said the methods they apply are within the broad guidelines of the regulatory institutions that govern investment in their sectors. 8 respondents did not specify the methods they used.

One firm indicated its methods were ad hoc (not pre determinable i.e varying from time to time), while another cited client advise as the basis for determining portfolio composition. Only one firm used a value at risk method to a small extent- it blends it with other tailor made alternatives.

The above shows that Value a Risk methodologies are little known among financial institutions in Kenya.

4.1 Model Test.

12 firms filled details of their portfolio holdings and risk characteristics as demanded by the questionnaires. The firms were given opportunity to indicate details of up to two portfolios. One firm indicated details of two portfolios while the others showed attributes of only one. This brought the total portfolios to be analyzed to 13.

Each portfolio was analyzed as follows.

For each portfolio's asset composition, we extracted information on asset return between 1999 and 2000 from secondary data viz;

- Central Bank of Kenya statistical bulletin dated Dec. 2001, for information on the returns of treasury bills and bonds, loans and other instruments on offer by financial institutions, term deposits etc.
- Nairobi stock exchange investors handbook for information on the return of shares.
- We also used statistics from Dry Associates Ltd. on returns from Commercial Papers. Dry Associates Ltd. keep track and publish in the financial journals in the *Daily Nation* and the *East African* the yield on all commercial papers on offer.

We used the information on returns to compute portfolio variances for each respondent. The findings are summarized (leaving out details of assets and percentage thereof held in each portfolio) in the table below.

Table 2 : Computed Portfolio Variance.

Respondent	No. of Securities in portfolio	Portfolio variance
1	15	0.0017
2	3	0.0004
3	9	0.0034
4	7	0.0081
5	9	0.0015
6	12	0.0523
7	10	0.0084
8	8	0.0007
9	8	0.0970
10	6	0.0364
11	12	0.0202
12	9	0.0008
13	8	0.0001

For reasons of anonymity most respondents did not indicate their identity hence the use of numbers to identify them. The findings show, in majority of the cases, low portfolio risk indices for higher levels of diversification. This was found to be consistent with the diversification theory by contemporary Finance authors. The co-variance term in

particular approached zero the higher the number of securities. The following assumptions were made in arriving at the above values;

i) in those cases where firms did not specify which particular company shares/ stocks they invested in (where they merely indicated that they held shares) the variance for that investment in the portfolio was assumed to be the average of the stock market.

ii) term deposits were put in two groups; those maturing between 1 to six months were treated similarly and assumed to exhibit return characteristics as 3 month deposits while those maturing between 6 to 12 months were assumed to exhibit return characteristics as 1 year deposits. The same was done for t bills between 3 to 12 months.

The μ factor in equation (i) (i.e the average one period return on the portfolios) was inferred from the average return of the portfolios under consideration as 9.78%.

With individual portfolio variance and μ, we determined VaR for individual portfolios and multiplied the same with current portfolio values to arrive at an estimated Value at Risk. These are summarized in the table below against respondents' portfolio loss limits (PLL).

Table 3: Estimated versus Respondents' portfolio Loss Limits.

Port.	Computed VaR	Portfolio Loss limits
1	68,766,036	296,666,000
2	6,226,824	9,500,000
3	4,798,494	23,000,000
4	68,131,622	95,794,032
5	3,833,694	4,508,000
6	628,876,470	28,125,000
7	153,732,098	35,940,000
8	5,605,092	17,659,231
9	293,199,996	14,760,646
10	46,663,680	47,886,657
11	49,312,682	33,972,257
12	92,986,004	126,254,541
13	8,175,802	6,743,848

Appendix 4 shows details of the computations for individual firms.

4.2 Spearman's Rank Correlation Coefficient.

This measures the degree of association of paired sets of data through the formulae

$$R = 1 - (6\Sigma(d*d))/n((n*n)-1)$$

Where d is the difference in ranks and n is the number of pairs of data.

Computed VaR was captioned under *Rank 1* while respondents' (PLL) was captioned under *Rank 2*. The two ranks together with the results of computed R index were as under.

Table 4: Paired VaR ranks and Computed Spearman's rank index

Rank 1	Rank 2	d	d sqd.
7	14	-7	49
1	1	0	0
1	3	-2	4
7	10	-3	9
1	1	0	0
21	3	18	324
12	4	8	64
1	2	-1	1
14	2	12	144
5	5	0	0
5	4	1	1
10	11	-1	1
1	1	0	0
			597

$$R = 1-((6*597)/13(169-1))$$

$$R= -0.6401$$

Computed R shows an inverse correlation relationship between Computed VaR and individual firm portfolio loss limits. This seems to be as a result of lack of popularity of VaR model. Most companies tend to use own tailor made approaches that tend to be rule of thumb based in determining portfolio composition. Hence the tolerable portfolio losses per managers may not have been accurate and hence fail to show positive correlation with the computed. We carried out significance test to determine how close computed R was in predicting relationship between the two sets of data.

4.3 Significance of Computed Rank Correlation Coefficient.

We tested the hypothesis

Ho : $\rho s = 0$ ← Null hypothesis: there is no correlation in the ranked data of the population

H1 : $\rho s \neq 0$ ← Alternative hypothesis: there is a correlation in the ranked data of the population.

at the 5% significance level i.e $\alpha = 0.05$.

The critical values at n = 13 for a two tailed test read from the attached table (applicable for cases where n< 30) are +/- 0.5549. Compared to R = -0.6401 this results in rejection of the null hypothesis and acceptance of the alternative hypothesis which states i.e there is a correlation in the ranked data of the population.

CHAPTER 5: SUMMARY AND CONCLUSION

5.1 Summary of findings

The study was set to;

iii) establish the methods used by risk managers in making decisions regarding change in portfolio contents.

iv) test the validity of value at risk closed end model in predicting changes to portfolio composition by financial intermediaries in Kenya.

From the data found, It is apparent that Value at Risk models are little known among Financial Intermediaries in Kenya. Most firms apply tailor made approaches to determine portfolio composition. This lack of definitive description of a general model applied leads most scholars to describe the empirical practice as rule of thumb based.

From the data analyzed a rank correlation coefficient of -0.6401 indicates an inverse correlation between VaR computed from the model and individual firm portfolio loss limits. A two tailed significance test on the rank index indicates that the alternative hypothesis (H1 : $\rho s \neq 0$: there is a correlation in the ranked data of the population) is acceptable leading us to statistically conclude that the VaR model is a good predictor of portfolio composition changes among financial institutions in Kenya. There however seems to be a lack of popularity of VaR models. Most companies tend to use own tailor made approaches that tend to be rule of thumb based in determining portfolio composition. Hence the tolerable portfolio losses per managers may not have been accurate causing the negative correlation noted in the study.

5.2 Conclusion

The study established that

i) internally developed models are the most popular means by which management decides on portfolio composition. These models are unstructured and change from time to time. The methods are applied within the broad framework of the regulatory requirements within which these institutions operate.

Value at Risk models are little known among Financial Intermediaries in Kenya.

ii) the VaR model is a good predictor of portfolio composition changes among financial intermediaries in Kenya.

5.3 Limitations of the study

The major limitation was the lack of adequate response by the interviewees to the questionnaires. Follow up on the respondents showed that due to the economic depression experienced in the economy at the time, financial and other markets upon which portfolio investments were made experienced very low activity and volatility. This reduced investment alternatives available to firms. Most firms were faced with limited investment options and reverted to simple portfolios in government instruments. Most of their investments experienced the same correlation characteristics to underlying economic fundamentals and hence created little opportunity for diversification to minimize risk.

Active portfolio management was sidelined with some organizations consolidating that function with general treasury management. The focus of most fund managers changed from active management to monitoring of administrative overheads in order to sustain some minimum level of margin. The success of future similar studies should be timed

with improved economic performance especially of the financial sector when most organizations will undertake active monitor of the performance of their investments.

5.4 Suggestions for further studies

New studies should explore the possibility of modeling a tool that takes into account the exact distribution behavior of portfolios under study. Stress testing to the normality assumption can be introduced to capture the effect of unpredictable events that impact on security returns.

Other non-normal distributions and their precision in describing price movements e.g.

(i) The time independent models where volatility of prices is seen as not conditional on past price behavior e.g. (finite variance class) compound normal distribution, students distribution, mixed diffusion jump distribution or paretian distribution (infinite variance class)

(ii) Time dependent models where volatility is seen as conditional on past price behavior.

Should be studied in order to arrive at conclusion about the correct distribution about asset price behavior.

Appendix I: Population of Study

	A. COMMERCIAL BANKS	GROUP			GROUP
1	ABN- Amro Bank N.V	1	50	Universal Bank Ltd.	5
2	African Banking Corporation Ltd.	4	51	Victoria Commercial Bank Ltd.	3
3	Akiba Bank Ltd.	4			
4	Bank Of Baroda (K) Ltd	3		**B FINANCIAL INSTITUTIONS**	
5	Bank of India	4	1	Bank of India Finance (K) Ltd.	5
6	Barclay Kenya Ltd	1	2	Consolidated Bank Finance	5
7	Biashara Bank of Kenya Ltd	4	3	Consolidated Bank Mortgage	5
8	Bullion Bank Ltd	5	4	Devna Finance Ltd.	5
9	CFC Bank (K) Ltd	2	5	Fortune Finance Ltd.	5
10	Chase Bank	5	6	Glad – AK Finance	5
11	Charter House Bank Ltd	4	7	Kenya Commercial Finance Co. Ltd.	2
12	Citibank N/A	1	8	Prime Capital and Credit Ltd.	4
13	City Finance Bank Ltd	5			
14	Commercial Bank of Africa Ltd	1		**MORTGAGE FINANCE**	
15	Consolidated Bank of Kenya Ltd.	3	1	Housing Finance	1
16	Co-Operative Bank of Kenya Ltd.	1	2	Savings and Loan (K) Ltd.	3
17	Co-Operative Merchant Bank	3			
18	Credit Agricole Indosuez	2		**D. BUILDING SOCIETIES**	
19	Credit Bank Ltd.	4	1	East African Building Society	2
20	Daima Bank Ltd.	5	2	Equity Building Society	5
21	Development Bank Of Kenya Ltd.	3	3	Family Finance Building Society	5
22	Diamond Trust bank Kenya Ltd.	2	4	Prudential Building Society	5
23	Equatorial Commercial Bank Ltd	4			
24	Euro Bank Ltd.	4		**E. INSURANCE COMPANIES**	
25	Fidelity Commercial Bank Ltd.	4	1	ALICO	2
26	Fina Bank Ltd.	3	2	Apollo	5
27	First America Bank of Kenya Ltd.	2	3	Blue Shield	5
28	Guardian Bank Ltd.	3	4	British American	4
29	Giro Commercial Bank Ltd.	3	5	Cannon	5
30	Habib Bank A. G. Zurich	3	6	Cooperative	5
31	Habib Bank	4	7	Corporate	5
32	Imperial Bank Ltd.	4	8	Fidelity Shield	5
33	Industrial Development Bank Ltd.	4	9	Geminia	5
34	Investments & Mortgages Ltd.	2	10	Heritage AII	5
35	Kenya Commercial Bank Ltd.	1	11	ICEA	1
36	K-Rep Bank Ltd.	5	12	Jubilee	4
37	Mashreq Bank P.S.C.	5	13	Kenindia	4
38	Middle East Bank Kenya Ltd.	3	14	Kenyan Alliance	5
39	National Bank of Kenya Ltd.	1	15	Madison	5
40	National Industrial Credit Bank Ltd.	2	16	Mercantile	5
41	Paramount Bank Ltd.	5	17	Occidental	5
42	Prime Bank Ltd.	4	18	Old Mutual	5
43	Reliance Bank Ltd.	5	19	Pan African	5
44	Southern Credit Banking Ltd.	4	20	Pioneer	5
45	Stanbic Bank Kenya Ltd.	2	21	Stallion	5
46	Standard Chartered Bank (K) Ltd.	1	22	The Monarch	5
47	The Delphis Bank Ltd.	3	23	Union	5
48	Trans-National Bank Ltd.	4	24	United	5
49	Trust Bank	2			

GROUP DEFINITION

	Nexus	1	2	3	4	5
Commercial Banks	Assets (millions)	>10,000	5,000- 9,999	3,000-4,999	1,000-2,999	0-999
Financial Institutions	Assets (millions)	>10,000	5,000- 9,999	3,000-4,999	1,000-2,999	0-999
Mortgage Finance	Assets (millions)	>10,000	5,000- 9,999	3,000-4,999	1,000-2,999	0-999
Building Societies	Deposits (millions)	>1,000	500-999	100-499	<100	-
Insurance Companies	GDPI* (millions)	>1,000	751-1,000	501-750	251-500	0-250

*GDPI ⇒ Gross Direct Premium Income.

Appendix 2 Institutions Sampled For Testing

	A. COMMERCIAL BANKS	GROUP		B. FINANCIAL INSTITUTIONS	
1	ABN- Amro Bank N.V	1	35	Bank of India Finance (K) Ltd.	5
2	Bank Of Baroda (K) Ltd	3	36	Consolidated Bank Mortgage	5
3	Barclay Kenya Ltd	1	37	Fortune Finance Ltd.	5
4	CFC Bank (K) Ltd	2	38	Kenya Commercial Finance Co. Ltd.	2
5	Citibank N/A	1	39	Prime Capital and Credit Ltd.	4
6	Commercial Bank of Africa Ltd	1			
7	Consolidated Bank of Kenya Ltd.	3		MORTGAGE FINANCE	
8	Co-Operative Bank of Kenya Ltd.	1	40	Housing Finance	1
9	Co-Operative Merchant Bank	3			
10	Credit Agricole Indosuez	2		D. BUILDING SOCIETIES	
11	Credit Bank Ltd.	4	42	East African Building Society	2
12	Development Bank Of Kenya Ltd.	3	42	Equity Building Society	5
13	Diamond Trust bank Kenya Ltd.	2			
14	Equatorial Commercial Bank Ltd	4		E. INSURANCE COMPANIES	
15	Fina Bank Ltd.	3	43	ALICO	2
16	First America Bank of Kenya Ltd.	2	44	Apollo	5
17	Guardian Bank Ltd.	3	45	British American	4
18	Giro Commercial Bank Ltd.	3	46	Cannon	5
19	Habib Bank A. G. Zurich	3	47	Corporate	5
20	Habib Bank	4	48	Geminia	5
21	Imperial Bank Ltd.	4	49	Heritage AII	5
22	Industrial Development Bank Ltd.	4	50	ICEA	1
23	Investments & Mortgages Ltd.	2	51	Jubilee	4
24	Kenya Commercial Bank Ltd.	1	52	Kenindia	4
25	Middle East Bank Kenya Ltd.	3	53	Kenyan Alliance	5
26	National Bank of Kenya Ltd.	1	54	Madison	5
27	National Industrial Credit Bank Ltd.	2	55	Mercantile	5
28	Prime Bank Ltd.	4	56	Old Mutual	5
29	Stanbic Bank Kenya Ltd.	2	57	Pan African	5
30	Standard Chartered Bank (K) Ltd.	1	58	Pioneer	5
31	The Delphis Bank Ltd.	3	59	Stallion	5
32	Trans-National Bank Ltd.	4	60	Union	5
33	Trust Bank	2			
34	Victoria Commercial Bank Ltd.	3			

Appendix 3: RESEARCH QUESTIONNAIRE

Dear Sir/Madam,

RE: Questionnaires for a Research Project on Portfolio Risk Management

Risk measurement and control is one of the central issues in effective management of portfolios. It is surprising therefore that little research literature exist (especially in Kenya) that explains the meeting line between conceptual thought and practice about the models and tools for portfolio risk measurement and control.

It is this fact that motivated this study that seeks to test the effectiveness of one model in risk measurement. The model is founded on the theoretical framework for portfolio risk as it is set in finance literature but also has intuitive appeal due to its practicality.

Value at risk methodologies gauge exposure of risky positions vis a vis a firms risk tolerance guidelines/policy so that decisions of whether to reduce or insure the exposures can be made

Attached please find the questionnaire. Please fill it as accurately as you can to facilitate correct inference about the findings of the study.

The question are framed with the wish to preserve the anonymity of the business of your organization and clients. The questions are open ended that only require you to specify figures about your management of portfolios and not to attach details about clients or third parties on the figures. The data will be combined with others from other firms and statistical analysis carried out to afford a basis for generalization. Hence the findings will be on the accuracy of the model being tested and not on one organization.

A stamped envelope is attached for purposes of mailing back the questionnaire. My telephone number in case of any clarifications is 864424.

Let me take this early opportunity to thank you very much for your input and to inform you that the outcome of the project will be mailed to you for your reference.

Yours faithfully,

George Okwach

QUESTIONAIRE ON INVESTMENT RISK MANAGEMENT

Date of completion _____ Questionaire No._____

1.0 PORTFOLIO CREATION

1.1 From the methods listed below indicate the one(s) you apply in making changes to portfolio composition. (Use numbers 1,2 or 3 in the space provided to indicate the order of priority).

		1,2,3
(i)	Value at Risk models	____
(ii)	Advised by our clients the composition to adopt	____
(iii)	Models internally developed by us	____
(iv)	Others (please specify)	
	_____	____
	_____	____
	_____	____
	_____	____

1.2 What reliance do you place on your number one choice above. (tick)

a) absolute
b) much
c) it is somewhat blended with the others
d) it is very much blended with the others

1.3 If you use a value-at-risk methodology, please identify the type below (tick)

a) Closed-end
b) Monte Carlo Simulation
c) Historical Simulation
d) Delta Gamma
e) Other (please specify)

_____
_____

For purposes of the questionnaire, please identify any two portfolios you manage with alphabetical letters A & B. Actual portfolio description is not required. Note however that the same letter describes a particular portfolio throughout the questionnaire.

1.4 For each portfolio, please indicate the period over which you evaluate their performance. This will be the period over which you compute for example the risk indices e.g variance of returns, correlation coefficient etc. for you to consider making composition changes.

Portfolio	**Period**
A	_____ (days, weeks months, years- tick one)
B	_____ (days, weeks months, years- tick one)

2.0 INVESTMENT CHOICE

2.1 For each portfolio please indicate the composition (as a fraction or percentage) of assets it currently holds in the table below.

Asset type	**A**	**B**
Treasury bills 3 months		
6 months		
9 months		
1 Year		
Other		
Treasury bonds (state term).....		
.....		
.....		
Commercial papers		
Issued by..... .....Ltd		
.....Ltd		
.....Ltd		
Fixed deposit-1 month		
-2 months		
-3 months		
-6 months		
-9 months		
- 1 year		
Other		
Ordinary shares		
Issued by .....Ltd		
.....Ltd		
.....Ltd		

Preference shares		
Issued by .....Ltd		
.....Ltd		
Loans and overdrafts		
Savings account		
Real estate-residential		
-commercial		
-agricultural (state type)		
Other (please state nature)		
TOTAL (1 0R 100%)		

2.1 What is the market value of the portfolios as at the time of filling the questionnaire? If no active market exists for valuation, please impute you own fair estimate as accurately as you can.

Portfolio	**Value Kshs**
A	
B	

2.2 For the last 4 times you changed the composition of each portfolio please indicate for each investment type, before the change was effected, the dates the asset was held in the portfolio.

For example for 3 months t/bill

Asset type	**Current Period**	**Previous Period**	**2 periods ago**	**3 Periods ago**
T/bill- 3 months	3/3/01-	15/11/00-15/2/01	12/7/00-13/10/00	2/2/00-3/5/00

Portfolio A

Asset type	Current Period	Previous Period	2 periods ago	3 Periods ago
Treasury bills 3 months				
6 months				
9 months				
1 Year				
Other				
Treasury bonds (state term)……				
……				
……				
Commercial papers				
Issued by…… ……Ltd				
……Ltd				
……Ltd				
Fixed deposit-1 month				
-2 months				
-3 months				
-6 months				
-9 months				
- 1 year				
Other				
Ordinary shares				
Issued by ……Ltd				
……Ltd				
……Ltd				
Preference shares				
Issued by ……Ltd				
……Ltd				
Loans and overdrafts				
Savings account				
Real estate-residential				
-commercial				
-agricultural (state type)				
Other (please state nature)				

Portfolio B

Asset type	Current Period	Previous Period	2 periods ago	3 Periods ago	4 periods ago
Treasury bills 3 months					
6 months					
9 months					
1 Year					
Other					
Treasury bonds (state term).....					
.....					
.....					
Commercial papers					
Issued by..... .....Ltd					
.....Ltd					
.....Ltd					
Fixed deposit-1 month					
-2 months					
-3 months					
-6 months					
-9 months					
- 1 year					
Other					
Ordinary shares					
Issued by .....Ltd					
.....Ltd					
.....Ltd					
Preference shares					
Issued by .....Ltd					
.....Ltd					
Loans and overdrafts					
Savings account					
Real estate-residential					
-commercial					
-agricultural (state type)					
Other (please state nature)					

2.3 For any one asset ticked under each portfolio in 2.2 above, please indicate its value in the previous period portfolio and the total value of the portfolio in that period.

Portfolio	Investment type	Value of asset in previous period	Total portfolio value
A			
B			

2.4 For each portfolio please indicate as accurately as you can the highest loss in return or Ksh you would tolerate before you decide to change composition.

Portfolio	% maximum loss in expected return tolerable	Kshs loss tolerable
A		
B		

Thank You Very Much For Sparing Your Time. Now put the questionnaire into the attached already stamped envelope for mailing.

APPENDIX 4: COMPUTED Value at Risk for Individual Portfolios.

	STD DEV	VAR	Weight	eight sqd	AR* WHT	PORT. COV. Term	PORT. VARIANCE	PORT STD. DEV.	V	COMP. VaR-1.65d-v	PORT. VALUE	COMPUTED VaR	ACTUAL
PORTFOLIO 1													
T/BONDS-2YRS	0.0489	0.00239	0.0618	0.0038192	9.124E-06								
T/BONDS-3YRS	0.032	0.00102	0.0151	0.000228	2.333E-07								
COMM. PAPERS	0.0306	0.00094	0.0154	0.0002372	2.221E-07								
MABATI R/MILLS													
ATHI R. MIN													
SHELTER AFRIQ													
CALTEX OIL KEN													
F/DEP.- 3 MTHS.	0.0166	0.00028	0.2418	0.0584672	1.614E-05								
SHARES Note 1													
EABL	0.952	0.9063	0.01217	0.0001481	0.0001342								
CFC	0.612	0.37454	0.01217	0.0001481	5.547E-05								
NIC	0.718	0.51552	0.01217	0.0001481	7.635E-05								
LIMURU	1.28	1.6384	0.01217	0.0001481	0.0002427								
KN.MILLS	1.7	2.89	0.01217	0.0001481	0.000428								
BAMBURI	1.51	2.2801	0.01217	0.0001481	0.0003377								
SASINI	1.45	2.1025	0.01217	0.0001481	0.0003114								
AF. LAKES	0.0243	0.15576	0.01217	0.0001481	2.307E-05								
RESI. PROPTY.	0.0108	0.00012	0.008	0.000064	7.489E-09								
COMM. PROPTY.	0.017	0.00029	0.5219	0.2723796	7.917E-05								
MORTGAGE LOA	0.0108	0.00012	0.0486	0.002362	2.764E-07								
TOTAL			100996		0.0017141	2.564E-05	[illegible]	[illegible]	0.09796	-0.029134	2,360,351,466	- 68,766,036.50	296,666,000
PORTFOLIO 2													
T/BILLS-1 YEAR	0.0376	0.00141	0.3	0.09	0.0001273								
F/DEP.-3 MONTH	0.0166	0.00028	0.4	0.16	4.417E-05								
F/DEP.-1 YEAR	0.0151	0.00023	0.3	0.09	2.065E-05								
TOTAL			1		0.0001921	0.0001937	[illegible]	[illegible]	0.09796	-0.065546	95,000,000	- 6,226,824.84	9,500,000
PORTFOLIO 3													
T/BILLS-3 MONT	0.0344	0.00119	0.2	0.04	4.745E-05								
T/BONDS -2 YRS	0.0489	0.00239	0.05	0.0025	5.973E-06								
COMM. PAPERS	0.0306	0.00094	0.01	0.0001	9.366E-08								
TPS SERENA													
F/DEP.-3 MTHS.	0.0166	0.00028	0.05	0.0025	6.902E-07								
ORD. SHARES No	0.3801	0.14451	0.15	0.0225	0.0032514								
COMM. PROPTY.	0.017	0.00029	0.4	0.16	4.651E-05								
MORTGAGE LOA	0.0108	0.00012	0.1	0.01	1.17E-06								
CURRENT ASSET	0.0344	0.00119	0.04	0.0016	1.898E-06								

TOTAL			1		0.0033552	7.126E-05	0.0604284	0.0585129	0.09796	-0.001371	3,500,000,000	- 4,798,494.56	23,000,000
PORTFOLIO 4													
6 month t-bills	0.0344	0.00119	0.03	0.0009	1.068E-06								
9 month t-bill	0.0376	0.00141	0.084	0.007056	9.982E-06								
t-bond 2yrs	0.0489	0.00239	0.15	0.0225	5.375E-05								
comm. Paper	0.0306	0.00094	0.113	0.012769	1.196E-05								
2 mth/term depts	0.0166	0.00028	0.064	0.004096	1.131E-06								
ord. Shares(mkt A	1.27	1.6129	0.07	0.0049	0.0079032								
real estate-read	0.0108	0.00012	0.489	0.239121	2.798E-05								
		0		0	0								
Total		0	1	1	0.0080091	9.709E-05	0.0061061	0.0060034329	0.09796	0.050601	1,346,447,273	68,131,622.23	95,794,032
		0		0	0								
PORTFOLIO 5		0		0	0								
		0		0	0								
t-bills	0.0344	0.00119	0.305	0.093025	0.0001103								
2yr- t bonds	0.0489	0.00239	0.0703	0.0049421	1.181E-05								
1 month fd deposi	0.0166	0.00028	0.36	0.1296	3.578E-05								
3 month deposit		0		0	0								
shares- BBK	0.599	0.3588	0.013	0.000169	6.064E-05								
- BAT	0.886	0.785	0.005	0.000025	1.962E-05								
- EABL	0.952	0.9063	0.036	0.001296	0.0011746								
- DIA. TRST	0.652	0.4251	0.013	0.000169	7.184E-05								
LOANS/OV DRAF	0.017	0.00029	0.1997	0.0398801	1.159E-05								
		0		0	0								
Total		0	1.002	1.004004	0.0014962	1.753E-05	0.0015133731	0.0019906704	0.09796	-0.03376	113,558,805	- 3,833,694.70	4,508,000
		0		0	0								
PORTFOLIO 6		0		0	0								
		0		0	0								
T- Bills 3 Months	0.0344	0.00119	0.05	0.0025	2.966E-06								
T- Bonds 2 yrs	0.0489	0.00239	0.16	0.0256	6.116E-05								
T- Bonds 5 yrs	0	0	0.09	0.0081	0								
Fixed Dpts- 1 mth	0.0166	0.00028	0.04	0.0016	4.417E-07								
- 2 mth		0		0	0								
SHARES-EABL	0.952	0.9063	0.12	0.0144	0.0130508								
- STD BNK	0.917	0.84089	0.08	0.0064	0.0053817								
- BBK	0.599	0.3588	0.08	0.0064	0.0022963								
- Other(propert	1.27	1.6129	0.14	0.0196	0.0316128								
BOND/ DNTURES	0.017	0.00029	0.02	0.0004	1.163E-07								
Real est - read	0.0108	0.00012	0.01	0.0001	1.17E-08								
- comm.	0.017	0.00029	0.2	0.04	1.163E-05								
policy /mort Loan	0.0108	0.00012	0.01	0.0001	1.17E-08								
		0		0	0								
Total		0	1	1	0.052418	-8.62E-05	0.0523314796	0.2287613373	0.09796	0.2795007	2,250,000,000	628,876,470.88	28,125,000
		0		0	0								
PORTFOLIO 7		0		0	0								
		0		0	0								
T- Bills 3 Months	0.0344	0.00119	0.08	0.0064	7.592E-06								
6 months	0.0344	0.00119	0.01	0.0001	1.186E-07								
T- Bonds 2 yrs	0.0489	0.00239	0.22	0.0484	0.0001156								
T- Bonds 5 yrs	0	0	0.08	0.0064	0								
Fixed Dpts- 1 mth	0.0166	0.00028	0.24	0.0576	1.59E-05								

- 2 mth		0		0	0								
- 3 mth		0		0	0								
- 6 mths		0		0	0								
SHARES-EABL	0.952	0.9063	0.08	0.0064	0.0058003								
- carb acid	0.835	0.69723	0.05	0.0025	0.0017431								
- KAKUZI	0.715	0.51123	0.04	0.0016	0.000818								
- EQ	0.097	0.00941	0.03	0.0009	8.468E-06								
Real est - resd.	0.0108	0.00012	0.02	0.0004	4.681E-08								
- comm.	0.017	0.00029	0.14	0.0196	5.697E-06								
		0		0	0								
Total		0	0.99	0.9801	0.0085148	-9.229E-05	[illegible]	[illegible]	0.09796	**0.053472**	2,875,000,000	153,732,098.21	35,940,000
		0		0	0								
		0		0	0								
		0		0	0								
PORTFOLIO 8		0		0	0								
		0		0	0								
T- Bills 6 Months	0.0344	0.00119	0.15	0.0225	2.669E-05								
1 months		0		0	0								
9 Month	0.0376	0.00141	0.1038	0.0107744	1.524E-05								
1 YR		0		0	0								
T- Bonds 2 yrs	0.0489	0.00239	0.3	0.09	0.000215								
		0		0	0								
Comm. Paper	0.0306	0.00094	0.1662	0.0276224	2.587E-05								
loans & o/d	0.017	0.00029	0.0412	0.0016974	4.934E-07								
savings ac/(cur. Ac	0.0344	0.00119	0.03	0.0009	1.068E-06								
Real est - resd.	0.0108	0.00012	0.0788	0.0062094	7.266E-07								
- comm.	0.017	0.00029	0.13	0.0169	4.912E-06								
		0		0	0								
Total		0	1	1	0.00029	0.0003669	[illegible]	[illegible]	0.09796	**-0.055664**	100,694,809	- 5,605,092.33	17,659,231
		0		0	0								
PORTFOLIO 9		0		0	0								
		0		0	0								
3 MTH T/BILL	0.0344	0.00119	0.04	0.0016	1.898E-06								
6 MTH T/BILL		0		0	0								
9 MTH T/BILL	0.0376	0.00141	0.09	0.0081	1.146E-05								
1 YR T/BILL		0		0	0								
2 YR T/BOND	0.0489	0.00239	0.1	0.01	2.389E-05								
COMM PAPER	0.0306	0.00094	0.005	0.000025	2.342E-08								
F/DEP - 1 MTH	0.0166	0.00028	0.26	0.0676	1.866E-05								
F/DEP - 6 MTH		0		0	0								
ORD SHARES	1.27	1.6129	0.245	0.060025	0.0968143								
LOANS & DRAFT	0.017	0.00029	0.15	0.0225	6.54E-06								
REAL ESTA- COM.	0.017	0.00029	0.11	0.0121	3.517E-06								
		0		0	0								
Total		0	1	1	0.0968803	0.0001688	[illegible]	[illegible]	0.09796	**0.4160642**	704,699,000	293,199,996.12	14,760,646
		0		0	0								
PORTFOLIO 10		0		0	0								
		0		0	0								
T/BILLS 3 MTHS	0.0344	0.00119	0.1121	0.0125664	1.491E-05								
1 YR	0.0376	0.00141	0.118	0.013924	1.97E-05								
COMM PAPER	0.0306	0.00094	0.0249	0.00062	5.807E-07								
6 MTH DEP	0.0166	0.00028	0.118	0.013225	3.651E-06								

SHARES	1.27	1.6129	0.15	0.0225	0.0362903								
COMM. PROP	0.017	0.00029	0.48	0.2304	6.697E-05								
		0		0	0								
Total		0	1	1	0.0363961	1.698E-05	0.036413659	0.436923908	0.09796	0.2169007	215,138,453	46,663,680.91	47,886,657
		0		0	0								
PORTFOLIO 11		0		0	0								
		0		0	0								
T/BILLS-3 MTHS	0.0344	0.00119	0.035	0.001225	1.453E-06								
- 1 YR	0.0376	0.00141	0.063	0.003969	5.615E-06								
2 YR T/BONDS	0.0489	0.00239	0.18	0.0324	7.74E-05								
FIXED DEPOSITS	0.0166	0.00028	0.17	0.0289	7.978E-06								
SHARES- UCHUM	0.833	0.69389	0.17	0.0289	0.0200534								
- KQ	0.097	0.00941		0	0								
- KCB	0.834	0.69556		0	0								
- ICDC	0.59	0.3481		0	0								
- AFR.LAKE	0.0243	0.00059		0	0								
		0		0	0								
LOANS DRAFT	0.017	0.00029	0.08	0.0064	1.86E-06								
Real estate- resd.	0.0108	0.00012	0.23	0.0529	6.19E-06								
-comm	0.017	0.00029	0.072	0.005184	1.507E-06								
		0		0	0								
Total		0	1	1	0.0201564	3.824E-06	0.020159224	0.141083101	0.09796	0.1363166	361,751,015	49,312,682.15	33,972,257
		0		0	0								
ORTFOLIO 12		0		0	0								
		0		0	0								
T/BILLS-6THS	0.0344	0.00119	0.013	0.000169	2.005E-07								
-1 YR	0.0376	0.00141	0.03	0.0009	1.273E-06								
T/BONDS- 2YR	0.0489	0.00239	0.495	0.245025	0.0005854								
COMM. PAPER	0.0306	0.00094	0.1331	0.0177156	1.659E-05								
F/DEP.- 6 MTHS	0.0166	0.00028	0.0625	0.0039063	1.078E-06								
- 9 MTHS				0	0								
Loans & O/D	0.0108	0.00012	0.0637	0.0040577	4.748E-07								
RES. PROP	0.0108	0.00012	0.12	0.0144	1.685E-06								
COMM. PROP	0.017	0.00029	0.08	0.0064	1.86E-06								
				0	0								
Total			0.9973	0.9946073	0.0006085	0.0001537	0.000762253	0.027908823	0.09796	-0.052401	1,774,512,000	- 92,986,004.25	126,254,541
				0	0								
PORTFOLIO 13				0	0								
				0	0								
3 MTH T/BILL	0.0344	0.00119	0.167	0.027889	3.308E-05								
2YR BONDS	0.0489	0.00239	0.0049	2.401E-05	5.736E-08								
3YR BONDS	0.032	0.00102	0.0334	0.0011156	1.142E-06								
3 MTH DEPOSIT	0.0166	0.00028	0.3864	0.149305	4.122E-05								
SHARES-CFC	0.612	0.37454	0.0002	4E-08	1.498E-08								
- BAT	0.886	0.785	0.00094	8.836E-07	6.936E-07								
- KQ	0.097	0.00941	0.0285	0.0008123	7.642E-06								
COMM. PROP	0.017	0.00029	0.3786	0.143338	4.166E-05								
Total			0.99994		0.0001255	-1.049E-06	0.000115627	0.010725017	0.09796	-0.080259	101,867,418	- 8,175,802.19	6,743,848

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