

**EXTENT OF COMMERCIAL BANKS EXPOSURE TO FOREIGN
EXCHANGE RISK**

BY

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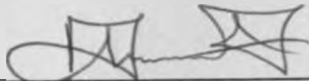
**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
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Declaration

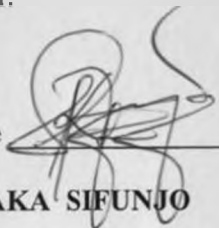
This Thesis is my original work and has never been presented for a degree in any other university.

Signature 

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Dedication

The thesis is dedicated to my wife Mrs Caroline Cherutoi, my children Evangeline, Sally, Jedidah and Samuel who have been a source of great inspiration in achieving my goal. Thank you for loving me and supporting me throughout the course of my studies

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I would like to acknowledge the contributions of the following people and institutions who played a major role in ensuring that this work was completed; my supervisor Mr. Kisaka Sifunjo who provided constant guide in every step, my colleagues in the office who assisted in typing the work, Central Bank of Kenya, Nairobi Stock Exchange and the commercial banks which provided the data used in the thesis and lastly my family for their never ending support and encouragement throughout my studies.

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List of Abbreviations and Acronyms

ARIMA	:	Autoregressive Integrated Moving Average
FOREX	:	Foreign Exchange
MNCs	:	Multi-National Corporations
NSE	:	Nairobi Stock Exchange
SOEs	:	State-Owned Enterprises

ABSTRACT

The increasing dealing in foreign exchange by commercial banks over the years has lead to the importance studying the volatility associated with it. In this study, we have examined the stock market and the foreign exchange market in Kenya for evidence of volatility of stock prices caused by foreign exchange rates using augmented market models. The results from the study indicate that commercial banks in Kenya are not significantly exposed to foreign exchange rate risk.

CHAPTER ONE

1.0 INTRODUCTION

1.1. Background to the study

Foreign exchange rate risk is the current or prospective risk to earnings and capital arising from adverse movements in currency exchange rates. Foreign exchange exposure is a measure of the sensitivity of the firm's cash flows to changes in exchange rate. The potential for loss arises from the process of revaluing foreign currency position in shilling terms. Theoretically, the value of the firm is defined as the present value of its future cash flows. Since future cash flows are difficult to estimate, most empirical studies measure exposure by studying how the firm's stock price responds to exchange rates. It is widely accepted that foreign exchange risk (FOREX risk) causes significant variability in the cash flows of most companies, and hence, is supposed to induce a response in their equity returns (Walter and Tewodros, 2004).

In theory, banks can benefit from derivative markets because derivatives, like insurance, can be used to hedge against risk. Carefully chosen derivative deals can reduce interest rate risk inherent in banking activities because the pre-existing interest rate risk can sometimes be offset by a counterbalancing derivative risk. Therefore, if derivatives are used to hedge against interest rate risk, then the volume of derivatives held by a bank should be negatively related to the current interest rate risk experienced by the bank (Hundman, 2000).

The various sources of foreign exchange risk have been treated under three main categories: transaction, translation and economic exposure. Translation exposure relates to the accounting treatment of changes in exchange rates while the transaction exposure involves the gain or loss that occurs when settling a specific foreign transaction and economic exposure relates to the change in value of a company that accompanies an unanticipated change in exchange rates. Since it is the combined effect of these sources that determine the foreign exchange risk, they should all be measured and mitigated to reduce their adverse impact on the value of a firm. A focus on merely one of these exposure components would not provide a complete picture of exchange rate risk. While the exchange rate can influence the value of firms in many industries, the focus on banks stems in part from the limited number of studies that attempted to explore the FOREX risk of banking institutions. In addition, the growing international interest in monitoring banks, market risks, including foreign exchange risk, also raises our interest in examining banking institutions.

The primary nature of the business of credit institutions consists of accepting deposits and issuing loans with different maturities and at different interest rates. This can lead them to become exposed to different types of risk, namely, (i) interest rate risk, which arises from a bank accepting deposits and issuing loans at different interest rates, (ii) default risk - the risk of borrowers defaulting on loan repayments, and (iii) liquidity risk - the risk that the bank will have insufficient funds to hand at a given time to deal with depositors' cash demands and day-to-day cash and regulatory requirements.

(iv) Market risk- The risk that an institution's financial condition will be adversely affected by changes in market prices or rates (including interest rates, foreign

exchange rates, or equity prices). (v) Operational risk- This is the risk of loss arising directly from service or product delivery, resulting from human or system errors. It is a risk that arises on a daily basis as transactions are processed. Risks associated with human resources, governance and information technology are included in this category. (vi) Legal and compliance risk -These are risks arising from failure to follow relevant legal and regulatory requirements. (vii) Reputation risk- The risk to earning or capital arising from negative public opinion, which may affect the institution's ability to sell products and services or to access other funding. (viii) Strategic risk- The risk to earnings or capital arising from adverse business decisions or improper implementation of those decisions.

This risk is a function of the compatibility of the organization's strategic goals, the business strategies developed to achieve those goals, the resources deployed against these goals, and the quality of management and capabilities.

Their exposure to these risks has led to their greater participation in the derivatives markets (Doran, 2004). The impact of foreign exchange (FOREX) risk on banks' cash flows is directly influenced by foreign currency-denominated asset and liability structures, off-balance sheet exposures, and non-asset-based services.

The Central Bank of Kenya requires that the board of directors and senior management of financial institutions are ultimately responsible for the institutions exposure to foreign exchange risk and the level of risk assumed. They are expected to put in place well-articulated policies, setting for the objectives of the financial institution's foreign exchange risk management strategy. Financial institutions should have written policies in general the policies should reflect the tolerance of the board

and senior management for the various risks arising from foreign currency transactions. Measuring foreign exchange rate risk is very critical to understanding the potential loss an institution may be exposed to in event of any currency fluctuations. Management's principal goal is to provide strong assurance that foreign exchange losses will not substantially diminish the total earnings of the financial institution. Accurate and timely information systems are critical to the management of foreign currency position and for ensuring compliance with relevant risk limits. The internal control system of the financial institution should review and assess the foreign exchange risk management process.

The econometric approaches, which are currently gaining popularity in informing companies' FOREX risk policies, have taken either cash flows or equity returns as a sound measure of company's performance. The lack of strong evidence of significant FOREX risk has triggered substantial research interest among academics and practitioners.

The widespread use of foreign currency derivatives (FCD), the use of low frequency data (Chamberlain et al., 1997), the averaging and offsetting effect inherent in measuring FOREX risk for elongated study periods (Di Iorio and Faff 2001), the concern about the strength of the contemporaneous relationship between equity returns and changes in exchange rates (Amihud, 1994; Bartov and Bodnar, 1994), and the impossibility of market efficiency hypothesis to take hold in practice are some of the major reasons contemplated for weak empirical evidence on FOREX risk among institutions in the banking sector.

The majority of the studies estimated exchange rate risk using market-based models (e.g., Jorion, 1990; Bartov and Bodnar, 1994; Allayannis et al. 2001; Atindéhou and Gueyie, 2001; Kiymaz, 2003). Market-based models measure sensitivity of the stock returns to exchange rate changes.

In the ensuing sections of this study, chapter two will be dwelling on the literature review, chapter three will enlighten on the research methodology and finally chapter four will bring out the results, discussion and the conclusion of the study.

1.2. Problem Statement

Pringle and Connolly (1993) argue that the overall impact of exchange rate changes on a firm depends not only on how the firm reacts but also on how the firm's competitors, customers and suppliers react. The various reactions from these business agents can be referred to as indirect sources of currency risk and it has been the source of concern to financial firms. Thus, the economic exposure of the firm to exchange rate changes represents the overall effect of these numerous responses.

Therefore, empirical studies that rely merely on direct sources of exposure cannot be expected to provide adequate explanation of currency risk. There should be a mechanism to capture the indirect sources so that one can predict properly the direction of the FOREX risk business. The complexity that is observed in measuring and managing economic exposure is attributed to the multitude of factors that must be considered in estimating the level of economic exposure (Di Iorio and Faff, 2001) and the diffusion of responsibility in multinational corporations (MNC's) among marketing, manufacturing and the corporate level finance units in managing economic exposure (Martin and Muer, 2003).

Economic activity affects the level of stock prices. The stock price of a firm reflects the expected cashflows, which are influenced by the future internal and external aggregate demand. Consequently, stock prices will incorporate present and expected economic activity as measured by industrial production, real economic growth, employment rate or corporate profits (Fama (1981), Geske and Roll (1983)).

A fall in real exchange rate may increase stock prices through its effect on economic activity. Investors allocate their wealth amongst alternative assets including domestic money, and domestic and foreign securities. The role of exchange rate is to balance the asset demands and supplies. Thus, any change in the demand for and supply of assets will change the equilibrium exchange rate. For example, an increase in domestic stock prices will increase wealth and the demand for money and consequently interest rates will go up. High interest rates in turn, will attract foreign capital, resulting in appreciation of the domestic currency and a rise in the real exchange rate. Return spillovers may also result in volatility spillovers.

In the past few years, commercial banks' exposure to foreign exchange rate risk has grown in importance due to the continuing expansion of foreign currency business, greater variability of exchange rates, increase in foreign exchange deposits and foreign borrowing in the Kenyan banking sector. Although the Central Bank of Kenya has formulated various policies towards regulation of foreign exchange rates effects to protect the interest of players in the financial service sector, the sector still remains exposed to the risks associated with foreign exchange. This study sought to establish the extent of foreign exchange risk and the impact on commercial banks' returns in Kenya.

1.3 Objective of the Study

The aim of this study was to establish the extent of foreign exchange risk and the impact on commercial banks' returns.

1.4 Importance of the Study

The findings of the study will inform banks in developing mechanisms for hedging such exposure by developing foreign exchange risk management mitigation guidelines. Discussing this issue can lead to the development of new instruments so that banks will have more options when they deal with foreign currency risk in the future. It will also hopefully serve a call to action on the need for financial market reform in most developing countries. Finally, the study forms a basis for future researchers and academicians who may be conducting research on foreign exchange risk and related monetary studies.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1. Introduction

This chapter presents a review of the related literature on the subject under study presented by various researchers, scholars, analysts and authors. The research has drawn materials from several sources which are closely related to the theme and the objectives of the study. Models by writers are used to illustrate the various sub topics mentioned in the objectives of the study.

2.2. Exposure to Foreign Exchange Risk

The banking system's direct exposure to exchange rate risk is mitigated by prudential controls. However, banks face indirect exchange risk through their clients. According to the World Bank (1999), approximately one-third of total credit is foreign currency denominated, of which 70% is extended to state-owned enterprises (SOEs). Since enterprises do not have instruments to hedge currency risks and do not have adequate currency reserves, they face extreme difficulty in servicing their obligations when the economy experiences a downturn, especially the weakening of the export sector.

Prior studies in the empirical exposure to foreign exchange risk literature have primarily focused on the measurement of exposure and its consistency with the theoretical determinants of exposure. Jorion (1990) found evidence of significant exchange rate risk exposure exists and showed that the level of foreign sales was the main determinant of exchange rate risk exposure for large U.S. multinational firms.

However, Amihud (1994) and Bartov and Bodnar (1994) established that no evidence of contemporaneous exposure existed for U.S. multinationals, although Bartov and Bodnar had found that U.S. firms responded to past quarterly exchange rate movements.

In their study, Jongmoo and Elyas (1996) estimated the interest rate risk and exchange rate risk betas of 59 large U.S. commercial banks for the period of January 1975 to December 1992 in a multifactor model framework. The estimation procedure used a modified seemingly unrelated simultaneous method that adjusted for cross-equation dependencies as well as heteroskedasticity and serial correlation. Using this method, the estimation was carried out in two steps. First, the interest rate risk and exchange rate risk betas were estimated for individual banks, and second, the betas were estimated as a function of bank-specific basic and derivative exposure variables. The equations were estimated as a system in the two steps, to capture, respectively, the cross-bank dependencies and the joint influences of interest rate and exchange rate exposure variables.

The result of the first step estimation showed that the exchange rate risk betas were generally more significant than the interest rate risk betas. In addition, there were significant variations in interest rate and exchange rate risk betas across banks and across periods. Jongmoo and Elyas (1996) interpreted this as a result of different exposure positions of banks. The result of the second step estimation revealed the importance of traditional financial statement variables and derivative contract variables as firm-specific determinants of interest rate and exchange rate risk betas.

Using a sample of Japanese firms, He and Ng (1998) found a strong contemporaneous relation between foreign sales and exposure, but found no evidence of a lagged relation. Dominguez and Tesar (2001) found no relation between foreign sales and exposure in a sample of firms from eight non-US countries, including Japan.

A second finding regarding the nature of exposure is its relation to firm size.

If large firms have more foreign activity relative to small firms, they may have more exposure. Therefore, to the extent that size proxies for a firm's level of foreign activity, it could be a determinant of exposure. Indeed, Bodnar and Wong (2000) and He and Ng (1998) show that large firms have more exposure than small firms in the U.S. and Japan. Interestingly, they also show that large firms have more exposure, even after controlling for the level of foreign sales. Conversely, Dominguez and Tesar (2001) argue that exposure varies little with firm size. In addition to the questions about the importance of foreign sales and firm size, there is evidence that the nature of exposure varies across countries and time (Bodnar and Gentry (1993), Williamson (2001), and Allayannis (1997)). The various findings regarding the nature of the exposure relation highlight the need for a systematic comparison of exchange rate exposure across time, countries, and determinants.

Another finding of the empirical exposure literature is that exchange rate movements do not explain a large part of the variation in stock returns. Although it is not the focus of the analyses, Jorion (1990), and Bartov and Bodnar (1994) show that exchange rates do not explain a large fraction of the variation in individual stock returns. Griffin and Stulz (2001) demonstrate that in a variety of settings, exchange rate movements explain only a small amount of variation in international industry

stock returns and conclude that exchange rate movements have little economic importance. These results are seemingly at odds with the conditional international asset pricing literature [e.g., Dumas and Solnik (1995) and De Santis and Gerard (1998)] in that it is puzzling how exchange rate risk can be priced if it is of small economic importance. In the international setting, if investors hedge their exposure to anticipated variation in investment opportunity set, both the market hedging risk and the currency hedging risk should be priced in addition to the market and currency risks.

A firm's total foreign exchange exposure measured as the coefficient of a univariate regression of stock returns on changes in exchange rates, following Adler and Dumas (1984), incorporates both the firm-specific cash flow effects and the value-relevant macroeconomic effects that influence cash flows or valuation of all firms, and are correlated with the exchange rate. The total exposure measuring the joint firm-specific and macroeconomic effects would be of interest to practitioners seeking to hedge the firm's net exposure. However, empirical estimates of this measure, to date, seemingly lack economic meaning and are inconsistent with conventional expectation. Most studies (Bodnar and Wong, 1999, among others) report insignificant total exposures, on average.

In their study on the impact of foreign exchange and interest rate changes in U.S, Canadian and South African banks, Choi et al. (1992), Wetmore and Brick (1994), Chamberlain et al. (1997), Atinddhou and Gueyie (2001), Walter and Tewodros (2004); and Kiymaz (2003) employed EGARCH model to account for the ARCH effects in daily returns. Their findings was that the market index return accounts for

most of the variation in stock returns at both the individual bank and portfolio levels; and the degree of sensitivity of the stock returns to interest rate and foreign exchange rate changes is not very pronounced despite the use of high frequency data.

2.2.1. The Determinants of Exchange Rate Risk Exposure

The sensitivity of firm returns to changes in the value of the domestic currency depends on firms' operating profiles, financial strategies, and industry characteristics. Furthermore, the measured ex-post exchange rate risk exposure of firms also depends on the extent to which they use hedging strategies to reduce their exposure to currency fluctuations. Firms that effectively hedge against unfavorable currency fluctuations may have little or no measured exposure during a given time period (Walker, Blenman, and Lee; 2006). It follows that characterization of exchange rate exposure as a function of firm-specific variables presumes that the exchange rate exposure faced by the firm is not fully eliminated by hedging strategies. The assumption of imperfect hedging was observed by Grammatikos, Saunders, and Swary (1986) for commercial banks, and is consistent with the results reported in Eun and Resnick (1988). Thus, a cross-sectional analysis is necessary to understand why individual firms display varying sensitivity to exchange risk.

Cross-sectional differences in exchange exposure depend not only to firm-specific variables and but also the characteristics of industry to which each firm belongs. Firm-specific factors include the level of a firm's international operations and a firm's operating characteristics which influence its potential reaction to exchange rate changes. Industry characteristics include the export and import ratios (Walker, Blenman, and Lee; 2006).

2.2.2. Firm-specific factors

Degree of foreign involvement: A study on the U.S. market by Jorion (1990) demonstrated that a firm's exchange rate exposure is significantly related to the level of its foreign involvement. As the degree of foreign involvement is increased, the exposure should increase and a positive relationship suggests that firms with high foreign involvement are more sensitive to exchange rate changes. This degree of foreign involvement is measured as the degree of foreign operation. It is hypothesized that the degree of foreign operation is positively related to the level of exposure. A proxy for the degree of foreign operation is measured as the ratio of foreign sales to total sales.

The Incentives for reducing exposure: This is further broken down into five sub-categories as follows:

i) Bankruptcy Costs: Smith and Stulz (1985) also argue that hedging decreases the probability that a firm will go bankrupt and thus mitigates the expected costs of financial distress by reducing the variability of the future value of the firm. A firm's long-term debt ratio can be used as proxy for its pre-hedging measure of financial distress.

ii) Underinvestment Problems: Myers (1977) characterizes firms' potential investment opportunities as options and demonstrates that, with fixed claims in the firm's capital structure, taking a positive net present value project can reduce shareholders' wealth if the gains accrue primarily to the debt holders. Consequently, the shareholders may have incentives to forego positive NPV

projects. Froot, Scharfstein, and Stein (1993) argue that without hedging, firms are more likely to pursue suboptimal investment projects. Hedging reduces this underinvestment problem by reducing not only the costs of obtaining external funds, but also a firm's dependence on external financing. The benefits of hedging thus increase with a rise in potential underinvestment costs. Hence, firms with more investment opportunities are more likely to use hedge and thus, are less exposed to exchange-rate risk (Walker, Blenman, and Lee; 2006).

iii) Short-Term Liquidity: Nance, Smith, and Smithson (1993) argue that firms can mitigate the expected financial distress and agency costs associated with long-term debt by maintaining greater short-term liquidity. (Walker, Blenman, and Lee; 2006) established that the greater a firm's quick ratio and the lower its dividend payout ratio, the greater its need not to hedge to reduce the expected financial distress and agency costs of straight debt, and hence the lower its exposure.

iv) Economies of scale in costs of hedging: Nance, Smith, and Smithson (1993) observe that the off-balance sheet instruments exhibit significant scale economies in the structure of transaction costs and thus, large firms are more likely to hedge with these instruments. Geczy, Minton, and Schrand (1997) argue that costs associated with implementing and maintaining a risk management program, including those related to the acquisition of expertise, exhibit economies of scale related to the amount of risk managed. Multinational firms with economies of scale of hedging are more likely to use

hedging instruments and then those firms are less likely to be exposed to foreign exchange exposure. Therefore, Walker, Blenman and Lee (2006) established that firm size is negatively related to the level of exposure since large firms are more likely to hedge. Firm size was computed as the natural log of the market value of its equity.

v) Substitute for Derivatives Hedging: Nance, Smith, and Smithson (1993) argue that firms can reduce the agency and expected financial distress costs associated with long-term financing not only by hedging, but also by issuing convertible debt or preferred stock. Because convertible debt and preferred stock are possible substitutes for hedging, (Walker, Blenman, and Lee; 2006) concluded that there might be a negative association between the use of preferred stock and exchange exposure.

2.2.3. Industry-specific factors

Bodnar and Gentry (1993) and Marston (2001) argue that exchange rate movements affect some industries differently than others because some are more export or import dependent than others. For example, a depreciation of the domestic currency improves (worsens) the terms of competition for export (import)-intensive industries since fewer foreign currency (more domestic currency) units are required to purchase the exported (imported) goods. On the other hand, firms that compete with imports benefited from a depreciation, which made their products price competitive in home currency terms. Therefore, export and import ratios at the industry level are employed to proxy for industry characteristics. The export ratio is measured as industry export

over total domestic production and the import ratio, industry import divided by sum of industry export and import.

2.3. Empirical Evidence on Exchange Risk Exposure

Jorion (1990) credited Bernard Dumas, among others, with defining economic exposure to foreign exchange volatility as the elasticity between random changes in an exchange rate and the real value of a firm, i.e. what Bodnar and Wong (2000) referred to as *total exposure*. Among the factors complicating total exposure estimates has been the influence of changes arising from the interaction of domestic economies and foreign markets, i.e. the so-called “dual-effect” dilemma (Pritamani et al, 2003). Because exchange rate effects may be a function of both direct and indirect influences, simply understanding the form of a firm’s international engagement may not be sufficient to interpret the impact of exchange rate changes on firm value particularly among exporters. For instance, exporting firms are thought to benefit from a depreciation of the domestic currency, but in fact may suffer if the currency depreciation is accompanied by reduced domestic demand. For importing firms, the circumstances are less ambiguous as local and foreign market effects are reinforcing such that a change in value of the local currency enhances (appreciation) or detracts from (depreciation) the value of the importer (Pritamani et al ,2003).

Using simple univariate models of exposure elasticity with a trade-weighted index as the single independent variable, early studies of total exposure often reported only marginally significant statistical and economic levels of exposure elasticity. Bodnar and Wong (2000) trace such marginality to model specification issues that fail to control for value-relevant market-wide factors – macroeconomic effects - that may be correlated with the exchange rate. Parsley and Popper (2002) further suggest that

model specification issues can extend to the choice of currency index., emphasizing that individual currency effects may be masked by a trade-weighted index particularly if the home currency is not fully convertible and does not float freely.

Bodnar and Wong (2000) studied the exchange rate exposure of a broad sample of US firms from 1977 to 1996 and estimated several different model structures – both univariate and multivariate, employing a market proxy to capture macro-economic influences on equity returns in the latter. They distinguished between the “total” exposure estimates of the univariate models and the more stable and statistically relevant “residual” exposure estimates of the market model. They demonstrated empirically that effectively controlling for market-wide factors in the latter has a discernable impact on the estimation of exposure elasticity and its statistical significance. However, and importantly, in measuring “residual” exposure, the introduction of the market proxy requires interpretive care (Bodnar and Wang, 2000, Pritamani, et al, 2003).

In a two-factor regression model on firm-level equity returns against an exchange rate variable and the market variable, the coefficient of the market proxy does not measure the absolute (or total) foreign exchange exposure of the firm. Rather it indicates the deviation of the firm’s exposure from that of the market portfolio. Accordingly a statistically insignificant coefficient does not necessarily suggest that the firm is not exposed to exchange rate risk, but instead that it has the same exposure as the market portfolio (Bodnar and Wang, 2000, Pritamani, et al, 2003).

With respect to the issue of choosing an exchange rate proxy, Parsley and Popper (2002) studied the relationship between currency arrangements and firm-level exchange rate exposure among nine Asian countries and specifically examine whether currency exposures are masked by trade-weighted indexes in the context of known pegged currencies. They tested for both total and residual exposure and used returns on individual exchange rates, in favor of that on a trade-weighted index, to disaggregate and capture the exposure effects of individual currencies. They isolated individual exposure elasticity's under both pegged and non-pegged regimes and found that despite dollar-based pegs, firms exhibit significant foreign exchange exposure (particularly, in their empirical reference, to the yen).

Given the complexity of estimating foreign exchange exposure, it is reasonable to question the economic value of such estimates and whether they justify actionable financial choices, such as active programs to manage foreign exchange risk. Some researchers (Jorion, 1991) have concluded that foreign exchange risk, in a portfolio context, is diversifiable. Thus, active hedging programs will not affect a firm's cost of capital. Conversely, financial theory suggests that if a hedging policy is to affect the value of the firm, it will do so through tax effects, bankruptcy effects such the cost of financial distress, and agency cost effects (Smith and Stulz, 1985 and Nance et al, 1993).

2.3.1. Autoregressive Integrated Moving Average (ARIMA), Market models

Adler and Dumas (1984) suggest that exchange rate exposure is defined as the impact of unanticipated changes in exchange rates on stock prices and exposure to exchange risk can be quantified by the regression coefficient associated with stock returns regressed against exchange rate changes. This regression model is empirically

examined by Jorion (1990), (1991), Bodnar and Gentry (1993), Bartov and Bodnar (1994), He and Ng (1998), and others. These studies used the rate of change in the spot exchange rate as a proxy for the unanticipated changes in the exchange rate. They utilized a trade-weighted exchange index as a parsimonious representation of the exchange rate risk factor. Foreign exchange risk exposure was thus measured using the two-step methodology of Jorion (1991) and He and Ng (1998). First, to measure foreign exchange exposure, a two-factor OLS market model of equation (1) was used:

$$R_{it} = \beta_{0i} + \beta_{1i} SX_t + \beta_{2i} R_{mt} + e_{it}, t = 1, 2, \dots, T \quad (1)$$

Where R_{it} is the rate of return on the i^{th} firm's common stock in period t . SX_t is the (unanticipated) percentage change in a trade-weighted contemporaneous spot rate index, measured as the dollar price of the foreign currency in period t . e_{it} is the random error in period t . R_{mt} is the rate of return on the value-weighted market index.

In Equation (1), β_{1i} the slope coefficient of the regression is the exchange-rate exposure measure, because it describes the sensitivity of stock returns to unanticipated changes in exchange rates. SX_t represents the unexpected change in the U.S. dollar over the period. It is measured as the difference between the value of a traded-weighted exchange rate index at the end and the beginning of period t , deflated by the index at the beginning of period t . Since it is measured as the dollar price of the foreign currency, a positive value for SX_t indicates dollar depreciation and a negative value means a dollar appreciation. This index approach avoids the problem of multicollinearity that using separate but positively correlated bilateral exchange rates would introduce. However, when using a broad index, large measurement errors could result

if many of the firms in the sample are not exposed to this particular combination of currencies. This market-based model was utilized by Blenman, Lee and Walker (2006) in measuring foreign exchange Exposure in US Multinationals for the period 1985-1997.

The second -cross-sectional- model, takes the form:

$$\beta_{1i} = \beta_0 + \beta_1(\text{FSALE}) + \beta_2 (\text{SIZE}) + \beta_3 (\text{QUICK}) + \beta_4 (\text{DIV}) + \beta_5 (\text{R\&D}) + \beta_6 (\text{LDEBT}) + \beta_7 (\text{PSTK}) + \beta_8 (\text{TRADE}) + \varepsilon_i \dots\dots\dots (2)$$

Where β_{1i} is the regression coefficient estimated from equation (1). The independent variables are foreign sales to total sales (FSALE), natural logarithm of the market value of its equity (SIZE), quick ratio (QUICK), dividend yield (DIV), R & D expenditures to total sales (R&D), and firm’s long-term debt to its market value of equity (LDEBT), book value of preferred stock to market value of equity (PSTK), and a sum of industry export and import ratios (TRADE).

The finding of Jorion (1990,1991) is that exchange rate movements do not explain a large part of the variation in stock returns while the finding of Bodnar and Gentry (1993) is that the nature of exposure varies across countries and time. Bartov and Bodnar (1994) found out that exchange rates do not explain a large fraction of the variation in individual stock returns. He and Ng (1998) showed that large firms have more exposure than small firms in the U.S and Japan.

In his study, Schena (2005) employed the two-step methodology of Jorion (1991) and He and Ng (1998) with some modification on his data to measure and manage the foreign exchange exposure of Chinese companies. First, to measure foreign exchange

exposure, Schena used a two-factor Ordinary Least Squares (OLS) market model, which measures firm-level foreign exchange exposure via a currency index variable.

The study found that despite the pegging of the Local currency (RMB) against the US Dollar (USD), internationally oriented Chinese companies had experienced significant foreign exchange exposure particularly against the yen. It also established that, when foreign exchange exposures were measured against a trade-weighted index, there was no empirical evidence to suggest that Chinese firms were engaged in hedging activities. However, when exposures were measured in yen terms, results suggested that Chinese firms, particularly exporters, engaged in some form of active foreign currency hedging.

2.4. Chapter Summary and gaps to be filled

The broader questions of corporate foreign currency risk exposure and hedging have been examined in some detail in the empirical literature over the last twenty years. From single factor ordinary least squares (OLS) models, current technology employs a variant of the market model to measure firm value (in the form of stock returns) as a function of market returns and exposure elasticity (i.e. changes in determinant exchange rates). Most empirical analyses are dominated by studies of US multinationals and have found only limited evidence of significant exposure (Jorion, 1990, 1991; Bodnar and Wong, 2001). With respect to this study, however, two studies stand out in their broader geographical scope, contextual relevance, and methodological innovation. Parsley and Popper (2002) conducted a thoughtful analysis of the foreign exchange exposure of firms in nine Asian countries (*excluding* China) and examined the relationship between currency regime, specifically a

currency peg, on the exchange rate exposure of individual firms. He and Ng's (1998) study of Japanese multinationals, utilized a two-step estimation procedure developed by Jorion (1990) to first estimate the foreign exchange exposure of a 171-firm sample, then explained the exposure coefficient as a function of firm-specific accounting variables that proxy for the firm's propensity to hedge its exchange rate exposure. This study benefited from the prior work of both studies and extended this literature by conducting an assessment of the foreign exchange exposure of Kenyan commercial banks using market-based models.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1. Data

The data sources were limited to the value of US dollar /Kenya shilling exchange rate and the banking sector index. Given the fact that the US dollar is the principal payment currency of the majority of Kenya's international transactions, US\$/Kshs was considered the best representative exchange rate. The dollar was also preferred because of its strength and stability as opposed to other currencies. The preference to specific exchange rate as opposed to a basket of currencies lies in the possibility of finding excessively low currency risk of individual banks in case of weak co linearity among the various bilateral exchange rates included in the basket. The Nairobi Stock Exchange Share Index was used as the proxy for the market index. The banking sector index was included in the model to capture common shocks to the banking sector. In the model, the nominal exchange rates were used in place of the real exchange rates due to lack of daily frequency real exchange rates and the close relationship that exists between the real and nominal exchange rates.

3.2. Sample

The data set consisted of daily and weekly observations for the ten years period between January 1996 and June 2006. Daily and weekly data on the nominal foreign exchange rate (dollar rate) was obtained from the Central Bank of Kenya. Daily observations for the NSE share indices over the same period and the banking sector indices were obtained from the Nairobi Stock Exchange. The study used observations

from commercial banks that have relatively active business operations in foreign markets. These comprise of Barclays Bank of Kenya (BBK), CFC Bank (CFC), Diamond Trust Bank (DIAMOND), Housing Finance (HF), National Industrial Credit Bank (NIC), Standard Chartered Bank of Kenya (STANCHART), and Kenya Commercial Bank (KCB). The banks are also chosen for the study because they have been trading at the NSE over the study period.

3.3. Research Model

The majority of studies have estimated exchange rate risk using market-based models (Jorion, 1990; Bartov and Bodnar, 1994; Allayannis et al., 2001; Atindéhou and Gueyie, 2001; and Kiymaz, 2003). Irrespective of the competing benefits offered by each of the methodologies, this particular study made use of the market-based model mainly because of the limited availability of higher frequency financial information (cash flows or operating income) necessary for employing the cash-flow based methodology. The market-based model is equally powerful to support the study as long as it is free from any specification error.

This study used an augmented market model similar to the ones used by Choi et al. (1992), Wetmore and Brick (1994), Chamberlain et al. (1997), Atinddhou and Gueyie (2001), Walter and Tewodros (2004); and Kiymaz (2003) to measure the extent of exchange rate exposure of Kenya's major commercial banks. The explanatory variables that are included in the market model are returns on the NSE-share and banking sector indices obtained from the NSE along with the daily percentage changes in US\$/Kshs exchange rate. The reason for including the NSE-share and the banking sector indices in the model is that exchange rate is not the only factor, or even necessarily the most important variable explaining return variability. The banking

sector index also serves as control for industry-wide sources of variation (e.g. interest rates). The model is specified as shown in equation (3)

$$R_{it} = \alpha_i + \beta_{mu} R_{mt} + \beta_{bsi,t} R_{bsi,t} + \beta_{er,t} R_{er,t} + \varepsilon_{it} (3)$$

Where:

- R_{it} represents daily return on bank i stock at time t ;
- R_{mt} represents daily returns on NSE share index at time t ;
- $R_{bsi,t}$ is for daily returns on the banking sector index at time t in the NSE;
- $R_{er,t}$ the daily return on the nominal exchange rate of the US\$/Kshs: and
- ε_{it} is the error term

β_{mu} , $\beta_{bsi,t}$, and $\beta_{er,t}$ measure the sensitivity of companies' stock returns to changes in the NSE-share index, banking sector index and exchange rate changes, respectively. To capture the volatility of the exchange rate returns on the model, the model of equation (3) was modified to incorporate the variances as shown in equation (4)

$$(R_{it} - \bar{R})^2 = \alpha_i + \beta_{mi} (R_{mt} - \bar{R})^2 + \beta_{bsi,t} (R_{bsi,t} - \bar{R})^2 + \beta_{er,t} (R_{er,t} - \bar{R})^2 + \varepsilon_{it} (4)$$

In spite of the popularity of the above model, it does not take into account the problem of multicollinearity. The majority of similar studies conducted in the past (e.g., Atindehou and Gueyie, 2001; Wetmore and Brick, 1994) had not given due attention to this specific econometric problem and regarded it as an issue entailing no major econometric problem. However, collinearity causes acute econometric problems and it was addressed using an orthogonalization technique as explained below.

The banking sector index is determined by obtaining the total daily and weekly capitalization of the seven banks covered in the study. Thereafter, the seventh root of the total capitalization is obtained which then becomes the banking sector index.

Under orthogonalization technique, R_{mt} is replaced by the residual market factor orthogonal to the banking sector index and exchange rate change. In a similar fashion, the $R_{bsi,t}$ is substituted by the residual return of the banking sector index that is orthogonal to the NSE share-index and exchange rate changes. So, equation (4) is re-specified as in equation (5) below:

$$(R_{it} - \bar{R})^2 = \alpha_i + \beta_{mi}(U)(R_{mt} - \bar{R})^2 + \beta_{bsi,t}(U)(R_{bsi,t} - \bar{R})^2 + \beta_{er,t}(U)(R_{er,t} - \bar{R})^2 + \varepsilon_{it} \dots\dots\dots (5)$$

$(U) R_{mt}$ is the residual market return obtained by regressing return on the banking sector index and changes in exchange rate against return on the market index. Likewise, the $(U) R_{bsi,t}$ is the residual return on the banking sector index obtained by regressing the return on the banking sector index on the market and exchange rate returns.

In equation 5, $R_{er,t}$ represents the return on the realized nominal exchange rate changes.

3.4. Tests performed

3.4.1. Diagnostic tests

There are a number of diagnostic tests which were performed in order to evaluate the estimated model and to identify the most ‘satisfactory’ or ‘acceptable’ estimation. If any of the assumptions were violated, problems could arise with regard to the validity

and reliability of the estimated parameters and models. In order to assess whether the coefficients estimated were theoretically meaningful, they were first examined in terms of both *sign and magnitude*. The sign should be positive and the magnitude should be reasonably large. For instance a magnitude of 30% could be considered to be large and an institution facing an exposure of such magnitude is considered to be facing a high risk. As shown in tables 1-20 most of the signs are negative while the magnitude is less than 1% in all cases. Economic theory imposes certain constraints on the signs of the coefficients in regression functions. For the purposes of this study, parameters with 'incorrect' signs were rejected on the grounds of being theoretically implausible. A priori expectations exist with regard to the signs of coefficients. In general, an unexpected parameter sign or size arises as a result of deficiencies in the model itself, for example;

- The presence of multicollinearity;
- The omission of a relevant variable;
- The inclusion of an unimportant variable.

The **t-test** was used to test the hypothesis that a particular coefficient is significantly different from zero or whether the estimated coefficient value occurred by chance. Equation (5) was estimated for each of the banks over the entire study period. To establish whether the banks exhibit significant exposure to first three explanatory variables, T-tests was performed first to establish the significance of the variables in the models (refer to tables 1-20 for the findings). This involved testing the null hypotheses that $\alpha_i = \beta_{mu} = \beta_{bsi} = \beta_{er} = \beta_{erv} = 0$.

The R-squared (R^2) value ranging from ‘0’ to ‘1’ or the ‘corrected R-squared’ (R^2) which is adjusted for degrees of freedom indicates the explanatory power (goodness of fit) of the model (tables 1-20 gives the results of the findings).

CHAPTER FOUR

4.0 RESULTS, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

4.1 Introduction

This chapter constitutes the data analysis and presentation of the results of the study. In this study we wanted to capture how much of the variance in stock returns is attributable to variability in the foreign exchange rates.

The Findings of earlier scholars hold that exchange rates do not explain a large fraction of the variation in individual stock returns (Jorion 1990), and Bartov and Bodnar (1994) and that exchange rate movements have little economic importance (Griffin and Stulz (2001). The hypothesis for no exposure to commercial banks' in dealing with foreign exchange was tested.. Using a sample of 7 banks, we did a regression analysis of daily, weekly and monthly returns. The variability of daily, weekly and monthly returns was also done.

The results are here presented in tables.

4.2 The Relationship between Daily Stock Returns, Daily Returns On NSE Share Index, Banking Sector Index and Foreign Exchange Rates (Model 3)

4.2.1: The Relationship between Daily Stock Returns and Daily NSE Share Index

Table 1 is a summary of regression analysis in which daily stock returns of the seven banks were regressed against the daily returns for the NSE share index

Table 1: Regression analysis

R square			0.000
	Coefficients	t statistic	
Intercept	0.0009	3.6795	

R_{mt}	-0.0012	-0.7837	
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Source: Author's own computations

The R square shows the variance in return in bank stocks (R_{it}) explained by the return in NSE share index (R_{mt}). The result from the regression analysis shows that variance is negligible.

The total observations were 18,200. The null hypothesis tested in the study was that there was no exposure to commercial banks in dealing with foreign exchange. This was tested at 95% level of confidence. The critical value at 95% level of significance is 1.96. As shown above, results indicate that NSE share index returns have a t-statistic of -0.7837 with a corresponding coefficient of -0.0012.

Therefore NSE share index returns are insignificant since the t-statistic is lower than the critical value. This is also confirmed by the variance between the two variables.

4.2.2 The relationship between Daily stock returns, Daily NSE share Index and Daily Banking index

Table 2 is a summary of regression analysis in which daily stock returns of the seven banks were regressed against the daily returns for the NSE share index and banking sector share index.

Table 2: Regression Analysis

R square			0.0002
	Coefficients	t statistic	
Intercept	0.0008	3.5089	
R_{mt}	-0.0012	-0.7831	
R_{bsit}	0.0019	1.6444	

Source: Author's own computations

The R square shows the variance in return in bank stocks (R_{it}) explained by the return in NSE share index (R_{mt}) and the return in banking sector share index (R_{bsit}).

The difference between R square from table 2 and that from table 1 is the variance of return in bank stocks explained by return in banking sector index. The result from the regression analysis shows that the variance is negligible.

From a total observation of 18,200 and a null hypothesis tested at 95% level of Confidence, results indicated that the t-statistic and coefficient of the two variables that is the NSE share index and the banking sector index are insignificant.

4.2.3 The relationship between Daily stock returns, Daily NSE share index, Daily Banking sector index and Foreign exchange rates

Table 3 is a summary of regression analysis in which daily stock returns of the seven banks were regressed against the daily returns for the NSE share index, banking share index and foreign exchange rates.

Table 3: Regression Analysis

R square			0.0002
	Coefficients	t statistic	
Intercept	0.0008	3.5111	
R_{mt}	-0.0012	-0.7813	
R_{bsit}	0.0019	1.6459	
R_{ert}	-0.0105	-0.1397	

Source: Author's own computations

The R square shows the variance in return in bank stocks (R_{it}) explained by the return in NSE share index (R_{mt}), return in banking sector share index (R_{bsit}) and return in foreign exchange (R_{ert}).

The difference between R square from table 3 and that from table 2 is the variance of return in bank stocks explained by return in foreign exchange (R_{ert}). The result from the regression analysis shows that the variance is negligible.

The magnitude of the variance that is variance of R_{it} explained by R_{mt} , R_{it} explained by R_{bsit} and R_{it} explained by R_{ert} is negligible.

The fact that variance is negligible means that the volatility of exchange rate is insignificant.

Also, the results from regression analysis indicate that the t-statistic and the coefficients are both insignificant as far as the NSE share index, banking share index

and the foreign exchange rates are concerned.

As stated in chapter three, we then analyzed data to capture the volatility of the exchange rate returns.

Table 4 is a regression of variability of banks' stock returns against variability of Returns on NSE share index.

4.3 Relationship between variability of daily stock returns, NSE share index, Banking sector share index and foreign exchange rates (model 4)

4.3.1 Relationship between variability of Daily stock returns and Daily NSE Share Index

Table 4: Regression analysis

R square			0.000
	Coefficients	t statistic	
Intercept	0.0108	22.2715	
$(R_{mt}-R)^2$	-0.0018	-0.4783	

Source: Author's own computations

Table 4 shows the results of the regression analysis done for the seven banks, where the variability of the daily bank stock returns were regressed against the variability of the daily NSE share index returns.

The R square shows the variance of the variability of daily return on stocks explained by the variability in the NSE share index. From the results of the regression analysis, with a critical value of 1.96, the returns were statistically insignificant at 95% confidence limit

4.3.2 Relationship between variability of Daily stock returns, Daily NSE Share Index and Banking sector share index

Table 5: Regression analysis

R square			0.1303
	Coefficients	t statistic	
Intercept	0.0042	9.0175	
R_{mi-R}^2	-0.0043	-1.2300	
R_{bsit-R}^2	0.1566	0.2206	

Source: Author’s own computations

Table 5 shows the results of the regression analysis done for the seven banks, where the variability of the daily bank stock returns were regressed against the variability of the daily NSE share index returns and banking sector share index.

The difference between the R square in table 5 and that of table 4 (0.1303) is the variance of the variability of stock returns explained by variability in banking sector share index. With a critical value of 1.96, none of the returns is statistically significant at 95% confidence limit.

4.3.3 Relationship between variability of Daily stock returns, daily NSE Share Index, Banking sector share index and Foreign exchange rates

Table 6: Regression analysis

R square			0.1304
	Coefficients	t statistic	
Intercept	0.0043	8.9635	
R_{mi-R}^2	-0.0043	-1.2335	
R_{bsit-R}^2	0.1566	0.2133	
R_{ert-R}^2	-5.5303	-0.6083	

Source: Author’s own computations

Table 6 shows the results of the regression analysis done for the seven banks, where the variability of the daily bank stock returns were regressed against the variability of the daily NSE share index returns, banking sector share index and exchange rates.

The difference between the R square in table 6 and table 5 (0.0001) is the variance of variability of return on stocks explained by variability of return from exchange rates.

Regression analysis of the variability of daily return on bank stock against the variability of the daily return on NSE share index, banking sector index and on the nominal exchange rate showed no statistical significance at 5% level of significance.

5.0 The Relationship between Weekly Stock Returns, weekly Returns on NSE Share index, banking sector index and foreign exchange rates (Model 3)

5.0.1 The Relationship between Weekly stock returns and weekly Returns on NSE share index

Table 7: Regression analysis

R square			0.0000
	Coefficients	t statistic	
Intercept	-0.00028	-0.71419	
R _{mt}	-0.00049	-0.1324	

Source: Author’s own computations

Table 7 is a summary of regression analysis of the weekly stock returns of the seven banks regressed against the weekly returns for the NSE share index.

The null hypothesis tested in the study was that there was no exposure to commercial banks in dealing with foreign exchange. This was tested at 95% level of significance. The critical value at 95% level of significance is 1.96. As shown above, results indicate that NSE share index returns have a t-statistic of -0.1324 with a corresponding coefficient of -0.00049.

Therefore NSE share index returns are insignificant since the t-statistic is lower than the critical value.

5.0.2 The Relationship between Weekly stock returns, weekly Returns on NSE share index and Banking sector share index

Table 8: Regression analysis

R square			0.0000
	Coefficients	t statistic	
Intercept	-0.00029	-0.74704	
R_{ml}	-0.00051	-0.13804	
$R_{b,rit}$	0.0000692	0.3769	

Source: Author's own computations

Table 8 is a summary of regression analysis in which daily stock returns of the seven banks were regressed against the daily returns for the NSE share index and banking sector share index.

The difference between the R square from table 8 and table 7 (0.000) is the variance of weekly return on stocks explained by the daily returns in the banking sector share index.

The null hypothesis was tested at 95% level of confidence. The critical value at 95% level of confidence is 1.96. As shown above, results indicate that the t-statistic and coefficient of the two variables that is the NSE share index and the banking sector index are insignificant.

5.0.2 The Relationship between Weekly stock returns, weekly returns On NSE share index, Banking sector share index and Foreign Exchange Rates (model 3)

Table 9: Regression analysis

R square			0.0001
	Coefficients	t statistic	
Intercept	-0.0003	-0.7907	
R_{mt}	-0.0007	-0.1770	
R_{bsit}	0.0007	0.3788	
R_{ert}	0.0152	0.5521	

Source: Author's own computations

Table 9 is a summary of regression analysis in which weekly stock returns of the seven banks were regressed against the weekly returns for the NSE share index, banking sector share index and the foreign exchange rates.

The difference between the R square of the weekly returns from table 9 and table 8 (0.0001) is the variance of the stock returns explained by the exchange rate.

The results indicate that the t-statistic and the coefficient are both insignificant as far as the NSE share index, banking share index and the foreign exchange rates are concerned.

We then analyzed data as stated in chapter three to capture the volatility of the exchange rate returns.

Table 10 is a regression of weekly variability of banks' stock returns against variability of returns on NSE share index.

5.1.0 Relationship between the variability of weekly stock returns, NSE share Index, banking sector share index and foreign exchange rates (Model 4)

5.1.1 Relationship between variability of weekly stock returns and weekly NSE Share Index

Table 10: Regression analysis

R square			0.0000
	Coefficients	t statistic	
Intercept	0.0102	9.593	
R_{mt-R}^2	-0.00263	-0.2635	

Source: Author’s own computations

R square is the variance of variability of return on stocks explained by variability of the return on NSE share index

From the results of the analysis shown in table 10, the variability of NSE share index as far as t-statistic and the coefficient concerned does not affect the variability of return on stocks at 5% level of significance.

5.1.2 Relationship between variability of weekly stock returns, weekly NSE Share Index and Banking sector index

Table 11: Regression analysis

R square			0.1299
	Coefficients	t statistic	
Intercept	0.0038	3.6845	
R_{mt-R}^2	0.0006	0.0654	
R_{bsit-R}^2	0.1474	0.3040	

Source: Author’s own computations

The difference between R square from table 11 and table 10 (0.1298) is the variance

of the variability of return on stocks explained by variability of return in banking sector share index.

The above table shows the results of regression of the variability of NSE share index, banking sector share index against the variability of banking sector stocks.

The indication in this case again is that the two variables are statistically insignificant.

5.1.3 Relationship between variability of weekly stock returns, NSE Share Index, Banking sector index and Foreign exchange rates

Table 12: Regression analysis

R square			0.1301
	Coefficients	t statistic	
Intercept	0.0034	3.0458	
R_{mi-R}^2	0.0009	0.1005	
R_{bnt-R}^2	0.1473	0.2858	
R_{ert-R}^2	0.1060	0.8303	

Source: Author’s own computations

The difference between R square from table 12 and table 11 (0.0002) is the variance of variability of stock return explained by variability of foreign exchange rate returns

The results of the regression analysis are that the relationship of the variability of the three variables is statistically insignificant at 95% confidence limit.

5.2 The Relationship between Monthly Stock Returns, Returns on NSE Share Index, Banking sector index and Foreign exchange rates (model 3)

5.2.1 The relationship between Monthly stock returns and Monthly NSE Share index

Table 13: Regression analysis

R square			0.0012
	Coefficients	t statistic	
Intercept	0.0006	0.8355	
R _{mt}	-0.0153	-1.0018	

Source: Author’s own computations

R square is the variance of monthly return on stocks explained by monthly return on monthly NSE share index.

The monthly results of regression analysis indicate that there is insignificant relationship between the two variables.

5.2.2 The relationship between Monthly stock returns, Monthly NSE Share index and Banking sector share index

Table 14: Regression analysis

R square			0.0018
	Coefficients	t statistic	
Intercept	0.0006	0.8618	
R _{mt}	-0.0155	-1.0201	
R _{bmit}	0.0003	0.6923	

Source: Author’s own computations

The difference between R square from table 14 and table 13 (0.0006) is the variance of the monthly stock returns explained by monthly banking sector share index.

The results from regressing the two variables indicate that they are statistically insignificant because the t-statistic and the coefficient were 0.6923 and 0.0003 for the monthly banking sector index and -1.0201 and -0.0155 for the monthly NSE share index respectively.

5.2.3 The relationship between Monthly stock returns, Monthly NSE Share index, Banking sector share index and Foreign exchange rates

Table 15: Regression analysis

R square			0.0021
	Coefficients	t statistic	
Intercept	0.0006	0.8578	
R _{mt}	-0.0154	-1.0105	
R _{bsit}	0.0003	0.7237	
R _{ert}	0.0164	0.5041	

Source: Author’s own computations

The difference between R square from table 15 and table 14 (0.0003) is the variance of monthly returns on stocks explained by monthly returns on foreign exchange. The results from the above regression analysis shows that at 5% level of significance with a critical value of 1.96, the relationship between the three variables is statistically insignificant

5.3.0 Relationship between variability of Monthly stock returns, monthly NSE Share Index, banking sector share index, and foreign exchange rates (Model 4)

5.3.1 Relationship between variability of Monthly stock returns and monthly NSE Share Index

Table 16: Regression analysis

R square			0.0002
	Coefficients	t statistic	
Intercept	0.0062	5.0358	
R _{mt-(R)^2}	-0.0043	0.3856	

Source: Author’s own computations

R square is the variance of the variability in stock returns explained by the variability in NSE share index. The relationship of variability between the stocks and the NSE share index indicates that it is statistically insignificant.

5.3.2 Relationship between variability of monthly stock returns, monthly NSE Share Index and monthly banking sector share index

Table 17: Regression analysis

R square			0.0362
	Coefficients	t statistic	
Intercept	0.0045	3.5671	
$R_{mt}-R)^2$	-0.0028	-0.2602	
$R_{bsit}-R)^2$	0.0446	0.5915	

Source: Author’s own computations

Table 17 is a summary of the variability of monthly stock returns, NSE share index and banking sector share index.

The difference between the R square from table 17 and table 16 (0.036) is the variance of the variability of monthly stock returns explained by the variability of monthly returns from banking sector share index.

The regression analysis has shown that there is statistically insignificant relationship between the two variables.

5.3.3 Relationship between variability of monthly stock returns, NSE Share Index, Banking sector share index and Foreign exchange rates

Table 18: Regression analysis

R square			0.0369
	Coefficients	t statistic	
Intercept	0.0049	3.5689	
$R_{mt}-R)^2$	-0.0029	-0.2638	
$R_{bsit}-R)^2$	0.0445	0.5796	
$R_{ert}-R)^2$	-0.2387	-0.7728	

Source: Author’s own computations

The difference between the R square from table 18 and table 17 (0.0007) is the variance of variability of monthly stock returns explained by variability of foreign exchange rate returns.

The regression analysis for the three variables has given results to indicate that there is insignificant relationship.

5.4 Relationship between residual variability of return on banking sector share Index, return on NSE share index and return on exchange rate (model 5)

Table 19: Regression analysis

R square			0.00014
	Coefficients	t statistic	
Intercept	0.0194	12.6912	
(U) R_{mt-R}^2	-0.0007	-0.0734	
(U) R_{ert-R}^2	0.7689	1.597	

Source: Author’s own computations

From the results of the regression analysis, the coefficient and the t statistic of the residual returns are insignificant statistically.

5.5 Relationship between residual variability of return on NSE share index, Return on banking sector share index and return on exchange rate (Model 5)

Table 20: Regression analysis

R square			0.00188
	Coefficients	T statistic	
Intercept	0.0086	1.6047	
(U) R_{bsit-R}^2	-0.0201	-0.7022	
(U) R_{ert-R}^2	-1.7282	-0.9959	

Source: Author’s own computations

The results shown in table 20 indicate that there is no statistical significance between the two variables.

5.6 Discussions

Given the important role played by foreign exchange dealings in any economy, this study sought to use the Nairobi Stock Exchange (NSE) as a case to determine the existence of exposure on banks in dealing in foreign exchange. We wanted to establish the extent of commercial banks' exposure to foreign exchange risk. The extent of exposure has been measured by the magnitude of the variance between the returns on stocks, NSE share index, banking sector share index and foreign exchange rate.

Seven commercial banks were used to conduct the study. The findings of the study are that the extent of commercial banks' exposure to foreign exchange rate risk is insignificant. The coefficients and the t tests are statistically insignificant at 95% confidence limit in all the scenarios. The results of the study concur with the null hypothesis that commercial banks face little exposure in foreign exchange dealings.

Based on the regression analysis done on the variability of the daily banking sector stock returns Vs variability on the daily returns on NSE share index, banking sector share index, and exchange rate, we could not find evidence of exposure to foreign exchange risk. The above results may be attributed to the following reasons:

Firstly, the volume foreign exchange business done by commercial banks could be very minimal compared the total volume of business. Secondly, the total number of banks' included in the study is small compared to the 39 banks operating currently in Kenya.

Our results also concur with those of Jorion (1990), and Bartov and Bodnar (1994) whose findings showed that exchange rates do not explain a large fraction of the variation in individual stock returns and also those of Griffin and Stulz (2001) who demonstrated that in a variety of settings, exchange rate movements explain only a small amount of variation in international industry stock returns and concluded that exchange rate movements have little economic importance.

Although our findings showed that there is little exposure on commercial banks in dealing in foreign exchange, commercial bank's exposure to foreign exchange rate risk has grown in importance due to the continuing expansion of foreign currency business, greater variability of exchange rates, increase in foreign exchange deposits and foreign borrowing in the Kenyan banking sector.

The results from the study have implications to both commercial banks and individual investors that are importers and exporters. Since the findings from the study are that the exposure to foreign exchange risk is insignificant, commercial banks should focus their energy on other risks facing them. Importers will need the information to determine the behavior of local currency against the US\$ because it has a direct effect on the cost/price of their imports and exports respectively and hence their profit margins.

This study therefore, made a contribution towards establishing the extent to which Kenyan commercial banks are exposed to foreign exchange risk. The extent of exposure from the study is insignificant although commercial banks in Kenya may face exposure among other ways through their clients as explained earlier. Banks therefore should be warned that there is some degree of exposure so long as they deal in foreign currency in their operations. Commercial banks should therefore monitor their volume of foreign currency sales, their size, the countries they deal with and the timing of their foreign exchange dealings.

5.7 Conclusions

The objective of this study was to establish the extent of foreign exchange risk and the impact on commercial banks' returns. On the basis of the tests carried out, this study concluded that there is little exposure of foreign exchange risk on commercial banks in Kenya.

The results of the study will therefore enable banks to decide whether there is need to develop mechanisms of mitigating against foreign currency risks in future and since the results of the study has indicated that the risk is insignificant, then the focus of risk mitigation should be shifted elsewhere.

6.0 Recommendations

The study covered seven commercial banks which are quoted at the Nairobi Stock Exchange. It is possible that the limited number of banks could have affected the findings in this study. It is important to conduct a similar study that covers more commercial banks, say fifteen or more that would be representative enough to depict any patterns in foreign exchange risk exposure.

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Table: List of Commercial Banks in Kenya as at January 2006

1. African Banking Corporation Ltd.	2. EABS Bank Ltd.
3. Bank of Baroda	4. Bank of India
5. Barclays Bank of Kenya Ltd.	6. CFC BANK Ltd.
7. Chase Bank (Kenya) Ltd.	8. Chaterhouse Bank Ltd.
9. Citibank N.A.	10. Commercial Bank of Africa Ltd.
11. Consolidated Bank of Kenya Ltd.	12. Co-operative Bank of Kenya Ltd.
13. Credit Agricole Indosuez	14. Development Bank of Kenya
15. Diamond Trust Bank Kenya Ltd.	16. Dubai Bank Kenya Ltd.
17. Equatorial Commercial Bank Ltd.	18. Fidelity Commercial Bank
19. Fina Bank Ltd.	20. First American Bank of Kenya
21. Guardian Bank Ltd.	22. Giro Commercial Bank Ltd.
23. Habib Bank AG Zurich	24. Habib Bank Ltd.
25. Industrial Development Bank Ltd.	26. Investment & Mortgages Bank Ltd.
27. Kenya Commercial Bank Ltd.	28. K-REP Bank Ltd.
29. Middle East Bank (K) Ltd.	30. National Bank of Kenya Ltd.
31. National Industrial Credit Bank Ltd.	32. Paramount Universal Bank Ltd.
33. Prime Bank Ltd.	34. Southern Credit Banking Corporation Ltd.
35. Stanbic Bank (K) Ltd.	36. Standard Chartered Bank (K) Ltd.
37. Trans-National Bank Ltd.	38. Victoria Development Bank Ltd.
39. Imperial Bank Ltd.	