FOREIGN EXCHANGE-RISK PRICING IN THE NIGERIAN STOCK MARKET

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ABSTRACT

Foreign Portfolio Investment (FPI) is a major source of liquidity to domestic firms. However, foreign exchange-risk makes returns to foreign investors uncertain thereby discouraging FPI. This uncertainty is more pronounced in developing economies where exchange rates play key roles and markets for hedging are underdeveloped. While studies from different economies have shown that firms hedge foreign exchange-risk or pay a premium to investors who bear it, previous studies on Nigeria have paid little attention to this important source of risk. A manifestation of this risk was the exchange rate depreciation from ₦117.97 per US dollars in 2007 to ₦132 in 2008 coinciding with an outflow of ₦633.96 billion from the Nigerian Stock Exchange (NSE). Therefore, this study analysed the foreign exchange-risk exposure and the premium (price) paid to risk-averse investors bearing this risk.

The Adler and Dumas international capital asset pricing model was modified to incorporate the liquidity state of the NSE and this provided the framework for estimating the Fama and MacBeth two-pass regressions. Employing NSE data on 200 Nigerian firms from January 2000 to December 2009, the first-pass time-series regressions were used to estimate the risk exposure, while the second-pass pooled cross-sectional time-series regressions, with corrected standard errors, were used to estimate the risk prices. The pooled regressions solved the error-in-variable problem and the loss of the first five years typical of the Fama and MacBeth method. Deviations from Purchasing Power Parity (PPP) were also computed and used to complement changes in the bilateral rates and Real Effective Exchange Rate (REER) that were the conventional measures of foreign exchange-risk. Moreover, empirical analyses were broken down by firm-size, sector and episodes of exchange rate changes.

More than 80.0% of Nigerian firms were exposed to bilateral exchange rate risk; over 60.0% to PPP-deviation risk and about 12.0% to REER risk. Foreign exchange-risk exposure was mostly negative; implying that Nigerian firms were net importers. Thus, because firms were unable to hedge their exposure to foreign exchange risk, their average monthly values reduced by 1.67% as a result of exchange rate depreciation. Foreign exchange-risk exposure was higher generally in larger firms and particularly in financial firms and there was the tendency for more firms to be exposed during episodes of naira depreciation. Further, foreign exchange-risk was priced (undiversifiable) on the NSE as risk-averse investors demanded a monthly premium of 1.65% on the bilateral rate risk, 0.99% on the PPP-deviation risk and 0.23% on the REER risk. Exposure to the bilateral exchange rate risk, the PPP-deviation risk and REER risk therefore raised the annual cost of capital of Nigerian firms by 19.80%, 11.88% and 2.76% respectively.

The widespread foreign exchange-risk exposure commanded a risk premium on the Nigerian stock market. Therefore, the regulatory authorities should recognise that firms' costs of capital tend to rise as Nigeria's exchange rate system becomes more market-determined and should design appropriate instruments for hedging. Nigerian firms also need to actively manage their exposure to foreign exchange-risk.

Key words: Asset pricing, Cost of capital, Foreign exchange-risk exposure, Liquidity, Pooled regressions.

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DEDICATION

To the Almighty God, for;

"He hath made every thing beautiful in his time" (Eccl. 3:11a; KJV.).

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CERTIFICATION

We certify that this work was carried out by Mr. Afolabi Emmanuel Olowookere in the Department of Economics, University of Ibadan.

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LIST OF ABBREVIATIONS

A-D	Adler and Dumas
ADRs	American Depository Receipts
AFEM	Autonomous Foreign Exchange Market
AGMs	Annual General Meetings
AMER	Average Monthly Excess Return
AMEX	American Stock Exchange
APT	Arbitrage Pricing Theory
ASEA	Africa Stock Exchange Association
ATS	Automated Trading System
BDC	Bureau-De-Change
BM	Brownian Motion
BOFI	Bank and Other Financial Institution
BOPs	Balance of Payments
CAC	Corporate Affairs Commission
CAMA	Companies and Allied Matters Act
CBN	Central Bank of Nigeria
CCI	Certificate of Capital Importation
CFs	Country Funds
CPI	Consumer Price Index
CPIS	Coordinated Portfolio Investment Survey
CRR	Chen, Roll and Ross
CSCS	Central Securities Clearing System
DAS	Dutch Auction System
DP	Diversification Portfolio
D-S	Dumas and Solnik
EFCC	Economic and Financial Crime Commission
EMDB	Emerging Market Database
EMs	Emerging Markets
EMU	European Monetary Union
FEM	Foreign Exchange Market
FFEM	First-Tier Foreign Exchange Market
FII	Foreign Institutional Investors
FOREX	Foreign Exchange
FPI	Foreign Portfolio Investment
GARCH	Generalised Autoregressive Conditional Heteroscedasticity
GDP	Gross Domestic Product
GDRs	Global Depository Receipts
GLS	Generalised Least Squares
G-L-S	Grauer, Litzenberger and Stehle
GMM	Generalised Method of Moments
GTB	Guaranty Trust Bank
HFs	Hedge Funds
IAPM	International Asset Pricing Model
IAPT	International Arbitrage Pricing Theory

ICAPM	International Capital Asset Pricing Model
IFC	International Finance Corporation
IFEM	Inter-Bank Foreign Exchange Market
IIRS	International Investment Road Shows
IMF	International Monetary Fund
IMs	Industrial Markets
INLSUR	Iterated Non-Linear Seemingly Unrelated Regression
IPO	Initial Public Offer
ISA	Investments and Securities Act
IST	Investments and Securities Tribunal
JSE	Johannesburg Stock Exchange
KPMG	Klynveld Peat Marwick Goerdeler
LSE	Lagos Stock Exchange
MLE	Maximum Likelihood Estimation
MNCs	Multinational Corporations
MOU	Memorandum of Understanding
MSCI	Morgan Stanley Capital International
NASDAQ	National Association of Securities Dealers Automated Quotations
NIPC	Nigerian Investment Promotion Commission
NSE	Nigerian Stock Exchange
NSEATS	Nigerian Stock Exchange Automated Trading System
NYSE	New York Stock Exchange
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
QML	Quasi-Maximum Likelihood
REER	Real Effective Exchange Rate
SAP	Structural Adjustment Programme
SDF	Stochastic Discount Factor
SDR	Special Drawing Rights
SEC	Securities and Exchange Commission
SFEM	Second-Tier Foreign Exchange Market
SROs	Self Regulating Organisations
S-S	Solnik-Sercu
STB	Standard Trust Bank
UBA	United Bank for Africa
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
US	United States
VAT	Value Added Tax
WDAS-FWD	Wholesales Dutch Auction System-Forward

CHAPTER ONE

INTRODUCTION

1.1. Preamble

The goal of risk-minimisation[1] is very essential for rational investors and the modern portfolio theory provides a framework for achieving this goal. This theory shows that investment risk is reduced by holding a diversified portfolio of assets and the undiversifiable risk in the portfolio is the only relevant measure of risk for which risk-averse investors should be compensated. It further shows that securities or assets with low correlations of return should be included in a portfolio to reduce its risk profile (Markowitz, 1952). In the international application of the theory, it is shown that this risk is further reduced if the portfolio comprises assets from different countries (Solnik, 1974a); and this positions Emerging Markets (EMs), like Nigeria, as destinations for foreign capital.

Foreign funds can be important for many EMs. They can be used to close the domestic saving-investment gap and develop local capital markets. Specifically, Foreign Portfolio Investment (FPI) has been documented to supply liquidity and thereby reduce cost of capital (Bekaert and Harvey, 2000). It has also been shown that it can increase an economy's level of consumption and growth (Oyejide, 2005; 2006; Kim and Singal, 2000; and Mileva, 2008); attract and finance Foreign Direct Investment-FDI (UNCTAD, 1999); increase financial market efficiency (Bekaert and Harvey, 2000); help in developing advanced financial instruments, like derivatives (UNCTAD, 1999; Evans, 2002); engender the discipline of domestic firms in terms of corporate governance and information disclosure (Evans, 2002) as well as trust among market operators (Flavia, 2006).

[1] Risk is minimised for a given level of return. It can also be stated as return-maximisation for a given level of risk (Elton et al, 2007:79)

Although the portfolio diversification argument can explain why investors should diversify internationally, the destination of the capital flow may depend on some other country-specific-factors (UNCTAD, 1999; Bartram and Dufey, 2003). Broadly, these factors can be classified as foreign exchange (currency) risk and country (political) risk[2]. These factors create different relative riskiness between foreign and domestic investments, making them imperfect substitutes and serving as impediments to capital mobility (Pilbeam, 2006: 182) and consequently, they bring about the breakdown of the standard asset pricing results of the portfolio theory (Solnik, 1974a; Adler and Dumas, 1983, A-D thereafter).

The case of foreign exchange-risk[3] ensues when there are deviations from Purchasing Power Parity (PPP)[4], making the payoff to foreign investors subject to uncertainties of the unanticipated exchange rate changes. Consequently, the capital market is likely to fail in performing its primary role of risk-bearing allocation as foreign investors begin to evaluate differently the returns from the local securities. Moreover, the extent of these deviations usually determines the amount of welfare foregone as a result of the attendant insufficient or inefficient trading (A-D, 1983).

Foreign exchange-risk has been described as one of the major issues facing global investors (Levi, 1996:306) and it has the tendency to reduce the benefits of international diversification; especially into markets with large exchange rate uncertainties (Carrieri and Majerbi, 2006). Thus, investors tend to prefer firms with low exposure to foreign exchange-risk as this lowers the degree of uncertainty contained in their future consumption. This group of firms therefore enjoys lower cost of capital, hence, higher firm value; and this is the reason why firms sometimes commit huge resources to the purchase of futures contract and other hedging instruments for the purpose of reducing their foreign exchange exposure.

[2]While foreign exchange-risk is the possibility of variations in assets value due to variations in (unanticipated) exchange rates (Hekman, 1981), country risk entails domestic policies that reduce returns earned by foreign investors or make the repatriation of dividend, interest and principal more difficult (Bartram and Dufey, 2003).

[3]This has been found to be more amenable to economic analysis (Adler and Dumas, 1983 and Pilbeam, 2006: 182); hence, the focus in this thesis.

[4] Deviation from PPP is when exchange rate changes do not exactly track relative price changes. Several evidences exist on the deviations from PPP, especially in the short run (Adler and Dumas, 1983 and Pilbeam, 2006: 181).

However, when firms fail to hedge their foreign exchange exposure, it means they are leaving it for the portfolio investors on the stock market to deal with it. In a situation whereby these investors can diversify away this risk, firms need not hedge[5] as their exposure to the risk has no implication on their attractiveness and cost of capital (A-D, 1984). Conversely, if these investors also cannot totally diversify away or hedge the risk that has been transferred to them, they will price it on the stock market by demanding a premium for bearing it. This premium consequently raises the cost of capital for firms.

The foregoing therefore shows that foreign exchange-risk management (hedging) by firms will be relevant to the extent that this risk is non-diversifiable (priced) in the portfolio of investors. This therefore provides the explanation on why several studies have analysed whether investors require a premium for bearing foreign exchange-risk. Such studies therefore attempt to establish if there is value in hedging (Di Iorio and Faff, 2002).

1.2. Problem statement

Foreign exchange-risk usually follows the operations of flexible exchange rate regimes and market liberalisation (Shapiro, 1974; Hekman, 1981; Jorion, 1991 and Du, 2010) and this creates uncertainties in the purchasing power of investors' wealth. Also, with deviations from the PPP condition, investors' utility functions are affected and consequently the returns they expect on the assets they hold (Adler and Dumas, 1983 and Wu, 2008). In situations where foreign exchange-risk is undiversifiable and also un-hedged, the risk premium demanded by risk-averse investors tends to raise firms' cost of capital (Du, 2010).

Nigeria as an open economy is affected by fluctuations in exchange rate as evident in the various exchange rate policies that the country has applied till date[6]. Furthermore, the country has taken several steps at encouraging the participation of foreigners in its

[5] This is necessary as hedging also has some "hidden risk" (Hekman, 1981)

[6] The background chapter gives an overview of these. It is notable that the exchange rate regime operated has become less managed since the introduction of the Structural Adjustment Programme in 1986.

capital market[7] as well as in the entire economy. Specifically, part 5 of the Nigerian Investment Promotion Commission Act (NIPC Act, 1995) makes non-Nigerians as eligible as Nigerians to participate in the operations of any legal and registered enterprise in Nigeria. Generally, this type of occurrences has been found to often prompt foreign exchange-risk (Hekman, 1981; Jorion, 1991 and Du, 2010).

As a confirmation of this, Inanga and Emenuga (1997) describe foreign exchange-risk as one of the major problems witnessed in the Nigerian stock market. They documented that when the Structural Adjustment Programme (SAP) was adopted in Nigeria in 1986, many foreigners divested their holdings and this led to the crash of the Nigerian stock market. According to them, this was due to the sharp depreciation of the naira against the US dollars observed at the introduction of SAP.

Similarly, an episode of sharp depreciation in the value of naira corresponding with that of high foreign portfolio divestment was also witnessed during the recent global financial crisis which manifested in Nigeria in the early 2008. In particular, while naira depreciated from ₦117.97/$ in 2007 to ₦132/$ in 2008 (CBN, 2009), there was a sharp foreign portfolio investment outflow of about ₦633.96 billion in the same period (NSE, 2008); and this was one of the major factors that caused the recent crash of the Nigeria stock market from which the economy is yet to fully recover.

The foregoing suggests that Nigerian firms are exposed to and affected by foreign exchange-risk. In this type of setting, the usual expectation is that firms will hedge their foreign exchange risk exposure (De Santis and Gerard, 1998). However, the markets for external hedging instrument like those of derivatives[8], futures and forward exchange[9], by which Nigerian firms can manage their foreign exchange risk exposure, are relatively undeveloped. This is likely to have contributed to these episodes of divestment accompanying currency fluctuations.

[7] This is shown in the background to this study as ranging from the abrogation of some laws to the organisation of foreign trips to sensitise potential investors and to some other recent developments in the Nigerian capital market.

[8] Although the NSE and SEC have stated their intensions to commence (NSE Factbook, 2008) and make rules guiding operations of these instruments (SEC, 2007), these instruments are still undeveloped in the Nigerian market.

[9] The Central Bank of Nigeria (CBN) recently issued the "Guidelines for Foreign Exchange Derivatives in the Nigerian Financial Market" in March, 2011 (CBN, 2011) and just started operations on the Wholesales Dutch Auction System-Forward (WDAS-FWD) market in the second quarter of 2011.

It is therefore necessary to carry out a study on the magnitude of the exposure of Nigerian firms to foreign exchange-risk; and more importantly, to establish whether this risk is priced in the Nigerian stock market.

1.3. Objectives of the thesis

The broad objective of this thesis is to analyse the extent of foreign exchange-risk exposure of Nigerian firms and to ascertain the existence and magnitude of the risk premium required by risk-averse investors for bearing foreign exchange-risk. Specifically, this study is carried out to;

a. analyse the level of exposure to foreign exchange-risk in the Nigerian stock market;
b. estimate the price of foreign exchange-risk in the Nigerian stock market; and
c. analyse the dynamics of foreign exchange-risk price in the Nigerian stock market

1.4. Hypotheses of the thesis

The following null hypotheses are tested:

a. The Nigerian stock market is not significantly exposed to foreign exchange-risk.
b. Foreign exchange-risk is not priced in the Nigerian stock market.

1.5. Justification of the thesis

The justifications for this thesis emanate from its contributions to the theoretical, methodological and empirical literatures in this area of international finance.

The framework employed in achieving the objectives of this thesis is the International (Capital) Asset Pricing Model (ICAPM or IAPM) (A-D, 1983). However, given background knowledge that the Nigerian market is less liquid and less efficient than many other markets where the same model has been applied and that investors have preference for liquid (large firms) assets in Nigeria (SEC, 2009), the ICAPM framework is modified to incorporate the liquidity state of the Nigerian market. In

other words, liquidity is used as a state variable to relax the assumption of constant investment opportunity set assumed in the original derivation of the ICAPM by A-D (1983). This therefore makes this thesis the first to theoretically derive the international version of the CAPM in the context of an EM that is characterised by market illiquidity. The resultant model is named liquidity-adjusted ICAPM[10].

Moreover, this thesis contributes to the methodological literature by examining if exposure and price vary between the financial and non-financial sector. This is because the former happens to be the one that attracted most of the foreign capital inflow into Nigeria during the period of study. Another methodological contribution is that, in addition to the uses of bilateral and trade-weighted exchange rates that are often adopted in the literature, the PPP deviation measure of exchange risk is also computed and tested in this thesis. This measure has been argued to be relevant, though often ignored, in economies like Nigeria where inflation rates are random (Sercu, 1980; Dumas and Solnik, 1995 and Pilbeam, 2006:182).

Applying the modified framework and the new methodology to the Nigerian data, this thesis contributes to the empirical literature on exchange risk exposure and pricing for a market on which little about this phenomenon had been known before now. On the one hand, in the studies of exchange risk exposure, Harvey (1995) only makes use of aggregate data on Nigeria along with those of other countries and this makes it difficult to draw lessons peculiar to the Nigerian market, especially at the level of the firms. Furthermore, his scope comprises the period prior to the liberalisation of the Nigerian capital market in 1993, and several things have changed after his study[11]. These therefore highlight the importance of updating the literature on Nigeria with more recent data.

[10] Acharya and Pedersen (2005) provide the theoretical justification for the liquidity-adjusted Domestic CAPM. This thesis however uses a different and relevant methodology (continuous time mathematics) to provide the theoretical justification for the liquidity-adjusted International CAPM.

[11] The mean returns on Nigeria market now are about 10 times what was observed in that period; and Nigeria which was classified as zero percent investable at that time by IFC (Bekaert and Harvey, 1995) is now attracting some FPI.

Another recent study on exposure (Asaolu, 2011), does not adopt the same definition of concepts[12] as found in the leading literatures in this area and this poses difficulty in drawing comparable lessons with studies from other markets.

On the other hand, it is difficult to identify a study with the specific objective of estimating exchange risk price in Nigeria. Related studies (Emenuga, 1994 and Adeleke, 2011) are not carried out in the international context as done in the present thesis, they are often very aggregative (not firm-level) and exchange rate only appears as one of many regressors. Besides, the coefficients of their exchange rates are likely to be upward biased if used to measure the price of exchange risk since they fail to subtract a measure of risk-free rate from their variables prior to estimation. This is in discordance with the common practice in the leading literature in international finance.

Lastly, the outcome of this thesis will show the contribution of exchange risk to the cost of capital of Nigerian firms; thereby providing the justification for active foreign exchange risk management by these firms. Equally, it will highlight the desirability of balancing the goal of a more market-determined exchange rate regime against the potential increase in the cost of capital to local firms thereby reinforcing the need to uphold the nascent developments in the nation's foreign exchange derivative market.

1.6. Scope of the thesis

This thesis is on the pricing of foreign exchange-risk in the Nigerian stock market between January 2000 and December 2009 for 200 firms listed on the Nigerian Stock Exchange (about 24,000 firm-year). These firms are those on which reasonable[13] data are available and they cut across various industries. The use of monthly data can provide good estimates in this type of analysis especially those which are more relevant for use in the immediate future, rather than just using long past historical data (Damodaran, 2002). Monthly data series is also expected to reveal how foreign portfolio investors respond to short run changes in exchange rates, as against the

[12] Asaolu (2011) uses nominal interest rate as proxy for market return instead of return on a measure of stock index like the Morgan Stanley Capital International index or NSE-all share index; further, he uses earnings per share to measure returns instead of price (or total) returns, uses annual data instead of monthly data as often done and even fails to be clear between the definition of real bilateral exchange rate and real effective exchange rate.

[13] The sub-section on "criterion for security inclusion and level of aggregation" under the methodology section expatiates on this.

response of foreign direct investors which may require low frequency data, but covering many years.

Furthermore, the period of this study is justifiable on the ground that some major barriers to foreign investment in the Nigerian capital market had earlier been removed in the mid 1990s thereby making the 2000s a period of sizeable inflow of foreign capital. This period equally corresponds to the era when the Nigerian exchange rate policy became less managed. Thus, by the year 2000, the policy environment had already allowed for an appreciable level of foreigners' participation while some levels of variations in the nation's exchange rates were becoming observable. This period also nests the sub-periods of banking and insurance sectors' consolidation and government privatisation programmes when the nation's stock market was booming as well as when it busted as a result of the global financial crisis. Therefore, these enable the examination of exposure to exchange risk and its pricing under different developments in the history of the Nigerian stock market.

1.7. Organisation of the thesis report

The rest of this thesis is organised into five chapters. Chapter two is on the background of the thesis and this is divided into three major sections. The first section provides background information on the Nigerian Stock Exchange, the second section is on the Nigerian exchange rate policy developments and the third section describes the link between exchange rate and stock returns in Nigeria. The review of past literatures is presented in the third chapter of the thesis. This is categorised along the three broad categories of theories, methodologies and empirical evidence.

Chapter four is on the theoretical framework and methodology. The chapter presents the reasons for modifying the existing framework and also goes ahead to derive a new theoretical framework that is applied in the thesis. Chapter five is the presentation and analysis of results where the three objectives of the thesis are addressed in separate sections. Lastly, chapter six gives the summary, conclusion, recommendations, and limitations of the thesis along with some identified issues for further research.

CHAPTER TWO

BACKGROUND OF STUDY

This chapter is divided into three broad sections. It presents background information and policies on both the stock exchange and the foreign exchange markets in Nigeria. It also presents the link between these two markets. The first section considers issues like the policy and institutional developments in the Nigerian Stock Exchange (NSE), the performance characteristics of the NSE and foreign investments in the NSE; the second section presents on overview of the important policy developments in the Nigerian foreign exchange market; and the third section describes the link between exchange rate changes and stock returns in Nigeria.

2.1. The Nigerian Stock Exchange

The Nigerian Stock Exchange was originally established as the Lagos Stock Exchange (LSE) in 1960 and started operation at the enactment of the LSE Act No. 14 of 1961 having 19 securities listed in June 5, 1961. In 1962, the Central Bank of Nigeria (CBN) established the Capital Market Committee to oversee the activities of the Nigerian capital market. The need to later improve on securities regulations further led to the enactment of the Capital Issues Commission Act No. 14 of 1973 which upgraded the ad-hoc regulatory committee to the Capital Issues Commission. The Commission was given the responsibilities of determining the prices of shares and to ratify acquisitions, sales and transfers of shares of publicly quoted companies.

Moreover, at the recommendation of a Federal commission in 1976 that Nigeria should operate a single national stock exchange; the LSE was converted to NSE by statutes in 1977 (Nwalimu, 2009). All these, and other developments to be discussed, are targeted towards providing an avenue for the mobilization and utilization of long-term capital for Nigeria's development. Currently, the NSE provides opportunities for issuing new securities (primary market) as well as trading in the existing ones (secondary market) and the need to enable indigenous enterprises, who otherwise

would not have qualified for listing on the Exchange, has led to the establishment in 1985 of the Second-Tier Securities market with less stringent listing requirements.

Recently, several other developments have been recorded in the Nigerian stock market especially in the area of automation. This has therefore raised the level of activities on the NSE as well as enabled remote trading, hence, the opening of new branches of the Exchange, which are now 13 in the major cities of the country. In addition to the Head office in Lagos, the branches are; Kaduna (1978), Port Harcourt (1979), Kano (1989), Onitsha (1990), Ibadan (1990), Abuja (1999), Yola (2002), Benin (2005), Uyo (2007), Ilorin (2008), Abeokuta (2008), Owerri (2009), and Bauchi (2009).

The rest of this section deals with the policies and institutional dimensions of some of these developments.

2.1.1. Policy development in the NSE

In terms of the policy development, there are seven major laws (along with their amendments) that guide the activities on the NSE, namely;

a. The Companies and Allied Matters Act, Chapter 59 of 1990 (CAMA)
b. Nigerian Investment Promotion Commission Act Chapter N117 (Act No 16 of 1995)
c. Investments and Securities Act (ISA), 2007
d. Central Bank of Nigeria Act No 24 of 1991
e. Banks and Other Financial Institutions Act, 1991 (BOFI)
f. Foreign Exchange (Monitoring and Miscellaneous Provisions) Act Chapter F34 (Act No 17 of 1995), and
g. Pension Reform Act No. 2 of 2004

Deriving their powers from some of these laws, the Securities and Exchange Commission (SEC) and the Nigerian Stock Exchange (NSE), following consultations with capital market operators, have published some rules and regulations to guide the activities of capital market operators and their activities on the stock exchange. These rules and regulations include;

h. Securities and Exchange Commission Rules and Regulations (2007)

i. The Nigerian Stock Exchange Listing Requirements, and

j. Rules and Regulations of the Nigerian Stock Exchange Governing Dealing Members

The next ten sub-sections are concerned with the review of these seven laws and three rules along with their implications for the present characteristics of the Nigerian stock market.

i. The Companies and Allied Matters Act, Chapter 59 of 1990[14] (CAMA)

CAMA can be said to have its origin in the Companies Act of 1912, the latter being the first local corporate law in Nigeria. The Companies Act, initially applicable to the colony of the southern Nigeria, contains provisions on the incorporation of companies, distribution and reduction of share capital, the process of winding-up of companies, among others. Following its amendment in 1917 and consolidation in 1922, the Companies Act became applicable to the Northern Provinces (KPMG, 2009). The Companies Act of 1968 added more provisions especially in emphasizing the applications of its provisions to businesses established under previous laws and in the presentation of specimen of memoranda and articles of association and prospectus contents. The 1968 law was operational in Nigeria until 1990 when CAMA was drafted by the Nigeria Law Reform Commission led by Dr. Joseph Olakunle Orojo.

CAMA therefore is the main current corporate law in Nigeria. The law establishes the Corporate Affairs Commission (CAC; also Commission in this section), provides for the incorporation of companies and incidental matters, registration of business names and the incorporation of trustees of certain communities, bodies and associations in Nigeria. The CAC is set up by CAMA mainly to regulate and supervise the formation, incorporation, registration, management, and winding-up of companies and to arrange or conduct an investigation into the affairs of any company where the interest of the shareholders and the public so demand.

CAMA contains legislations on several aspects of businesses and therefore has several sections and sub-sections; however, given below are summaries of some of its contents that are relevant to this study.

[14] CAMA repeals the Companies Act, 1968

Formation and membership of a company: The Act allows any two or more persons to form and incorporate a company in Nigeria by complying with its requirements. In case a foreign company incorporated outside Nigeria wishes to do business in Nigeria, it needs to be incorporated as a separate entity in Nigeria. Conditions for exemption are itemized in the Act to include; foreign companies already exempted under any treaty to which Nigeria is a party, or those specifically invited to Nigeria by the government or foreign government-owned companies engaged solely in export promotion activities. In addition, a company is expected to keep a detail register of its members and their shareholdings; and any person who is a substantial[15] shareholder in a public company is mandated to give notice in writing to the company stating his name and address and giving full particulars of the shares held by him or his nominees (naming the nominee).

Shares and share capital: The Act empowers companies to issue shares up to the total number authorised in the memorandum and these shall be property transferable with each carrying the right of one vote at a general meeting. Although it is possible for a company to raise its share capital if the need arises, it is illegal for it to reduce its issued share capital, except under some special resolutions. Share re-purchase may be allowed for the purpose of settling a claim asserted by or against the company, eliminating fractional shares, fulfilling the terms of a non-assignable agreement under which the company has an option or is obliged to purchase shares owned by an officer or any employee of the company, satisfying the claim of a dissenting shareholder, or complying with a court order. Even when any of these conditions holds, shares are to be re-purchased only out of profits of the company which would otherwise be available for dividend or the proceeds of a fresh issue of shares made for the purpose of the purchase; there has to be due consultation with all the company's creditors, and a company cannot purchase more than 15% of its own shares. A company may issue preference shares and also borrow money for the purpose of its business and may mortgage or charge its undertaking, property and uncalled capital. Equally, detail information about the debt instrument has to be provided. In addition, it is illegal for a

[15] A person is a substantial holder in a public company if he holds himself or by his nominee, shares in the company which entitle him to exercise at least ten percent of the unrestricted voting rights at any general meeting of the company.

company or any of its subsidiaries to give financial assistance directly or indirectly to any person interested in acquiring the company's shares.

*Meetings and proceedings of companies***:** CAMA mandates it for every company to hold an annual general meeting (AGMs), though the board of directors may convene an extraordinary general meeting whenever it deems fit. All meetings are to be held in Nigeria and their notices circulated twenty one days earlier as well as advertised in at least two daily newspapers. This notice is to specify the place, date and time of the meeting and the matter to be transacted. At any meeting, an absent member may appoint a proxy who also has the same right as the member. The law also allows that a member entitled to more than one vote needs not use all his votes in the same way.

*Directors***:** The law has it that a company must have at least two directors who shall observe the utmost good faith towards the company in any transaction with it, or, on its behalf. Section 257 of the Act stipulates the characteristics of those qualified as a director in terms of age, mental status, and criminal records, among others. The appointment, re-election, rejection and remuneration of directors are to be decided by members at AGMs. Directors' interest in the company also must be disclosed and companies are disallowed from making or guaranteeing loans to their directors.

Financial statement and audit: The Act instructs every company to keep accounting records so as to show and explain its transactions, and the directors are to prepare annual financial statements which comply with the requirements of the Statements of Accounting Standards in Nigeria. The financial statement shall contain; statement of the accounting policies; the balance sheet; a profit and loss account; notes on the accounts; the auditors' reports; the directors' report; a statement of the source and application of fund; a value added statement for the year; a five-year financial summary; and in the case of a holding company, the group financial statements. Moreover, external auditor(s) appointed by the company to audit its financial statements is not expected to be an officer or servant of the company or a person who is a partner of or in the employment of an officer or servant of the company; or a body corporate.

Dividends and profits: A company is allowed to declare dividends payable to the shareholders only out of the distributable profits of the company, but it is illegal to

declare dividends when there are reasonable grounds to believe that the company is or would be, after the payment, unable to pay its liabilities as they become due. If dividends have been sent to members and there is an omission to send to some members due to the fault of the company, the dividends are expected to earn interest at the current bank rate from three months after the date on which they ought to have been posted.

Dealings in companies' securities: This is presented in section 541-623, Part XVIII of the Act; however, this is just a mere repetition of the provisions of the SEC Act of 1988. The whole part has been repealed by section 263(1)(d) of the Investment and Securities Act No. 45 of 1999. Thus, it is discussed later under the relevant section.

ii. Nigerian Investment Promotion Commission Act Chapter N117 (Act No 16 of 1995)

This Act establishes the Nigerian Investment Promotion Commission (NIPC) to promote investment in the Nigerian economy. NIPC is expected to initiate and support measures which enhance the investment climate in Nigeria for both Nigerian and non-Nigerian investors.

Part 5 of the Act gives some provisions relating to investment in Nigeria. It is stated that a non-Nigerian is eligible to invest and participate in the operation of any enterprise in Nigeria, provided such an enterprise is registered under CAMA and is not involved in investments on the "negative list"[16].

In order to build the confidence of foreign investors, rule (25) gives the assurance that no enterprise shall be nationalised or expropriated by the Nigerian government and that no person shall be compelled to surrender his interest in the capital of any enterprise. In addition, rule (24) guarantees unconditional transferability of dividends, the remittance of proceeds (net of all taxes) and any interest attributable to investment in Nigeria through an authorised dealer in any freely convertible currency.

[16] Negative list is defined as those sectors of investment prohibited to both foreign and Nigerian investors, they include; production of arms and ammunition, production of and dealing in narcotic drugs and psychotropic substances, production of military and para-military wears and accoutrement, including those of the Police, the Customs, Immigration and Prison Services, and other items as the government may determine.

However, in case it is in public interest to nationalise, the Act guarantees the payment of fair and adequate compensation and a right of access to the courts for the determination of the investor's interest and compensation. It further outlines three dispute settling mechanisms. The first being an amicable settlement through mutual discussion, and if this fails, the second mechanism is adopted. This proposes settlement with an aggrieved Nigerian investor in accordance with the Nigerian Arbitration and Conciliation Act; and settlement with an aggrieved foreign investor within the framework of any bilateral or multilateral agreement on investment protection to which the Nigerian Government and the country of which the investor is a national are parties. The third mechanism is only relevant where there is disagreement between the investor and the Federal Government as to the method of dispute settlement to be adopted. In the occurrence of this, the rules of the International Centre for Settlement of Investment Disputes shall be adopted.

iii. Investments and Securities Act 2007[17] (ISA)

The ISA as the current law regulating the Nigerian capital market is a product of a series of capital market regulations which have their origin in a non-statutory Capital Market Committee established in 1962 by the CBN (Nwalimu, 2009). This committee was converted to a commission by the Capital Issues Commission Act of 1973 which saw the need for improved supervision of the securities market. Later, the Securities and Exchange Commission Act No. 17 of 1979, having established the Securities and Exchange Commission, repealed the Capital Issues Commission Act of 1973 and therefore places the function of the Capital Issues Commission under the newly-established SEC.

These functions include the registration of securities offered to the public and the determination of their prices. In addition to the former role, the SEC Act of 1979 places the responsibility of registering new stock exchanges and the allotment of shares in public companies on the SEC. The SEC Act of 1979 was repealed and replaced by the SEC Act No. 29 of 1988 which saw the need, and goes ahead, to

[17] This Act repeals the following enactments; (a) the Lagos Stock Exchange Act 1961; (b) the Nigerian Enterprises Promotion Issue of Non-voting Equity Shares Act 1990; (c) the Securities and Exchange Commission Act 1988; (d) Part XVII of the Companies and Allied Matters Act 1990 on "Dealings in Companies Securities"; (e) the Nigerian Investment Promotion Commission Act 1995: section 21(2) and (f) ISA No 45, 1999.

empower the SEC to adjudicate on violations of security laws and impose appropriate sanctions on erring capital market operators.

Arising from the need to reconcile and update various laws on the Nigerian capital market, a Review Panel, headed by Dennis Odife, was constituted in 1996. It was therefore based on the panel's suggestions that the ISA was enacted in 1999 (Nwalimu, 2009). The enlarged powers and functions allocated to SEC later led to the replacement of ISA, 1999 with ISA, 2007. The latter provides for a set of new market infrastructures and increased system of regulation of investment and securities business in Nigeria. The Act is divided into 18 major parts and 316 sections comprising rules on various aspects of the Nigerian capital market. Its provisions are reviewed in what follows.

Establishment and functions of SEC: This act provides for the establishment of Securities and Exchange Commission and its enlarged roles in regulating the Nigerian capital market. SEC is given the power to register, regulate and research into investments[18] and securities[19] business in Nigeria; assist in establishing securities exchanges and capital trade points; act in public interest and protect investors; maintain a register of foreign portfolio investments; promote investors' and operators' education and prevent fraudulent and unfair trade practices in securities businesses.

Registration and regulation of securities exchanges, capital trade points and other Self Regulatory Organisations (SROs): These market facilities must register with SEC before they commence their operations in Nigeria. Registered facilities are expected to call for information from, inspect and conduct inquiries and audit of their members and at the end of every quarter file a detailed report on their surveillance and enforcement activities with SEC. SEC also has the authority to carry out inspections of members of a facility and demand for their records of operations and may suspend further trading of a securities if it is for the purpose of protecting persons buying or selling the particular securities.

[18] Investments include; shares, debentures, government and public securities, instruments entitling to shares or securities, certificates representing securities, units in collective investment scheme, options and futures.

[19] "securities" means- (a) debentures, stocks or bonds issued or proposed to be issued by a government; (b) debentures, stocks, shares, bonds or notes issued or proposed to be issued by a body corporate (c) any right or option in respect of any such debentures, stocks, shares, bonds or notes; (d) commodities futures, contracts options and other derivatives.

Registration and regulation of capital market operators[20]: Operators in the capital market have to register with SEC. Such registered operators are expected to keep true records of their transactions separately on behalf of different clients. Contravention of this law is liable to a penalty of ₦100,000 and a further sum of ₦5,000 for every day the violation continues. SEC may also conduct routine and special inspection and investigation of capital market operators and they are expected to fully cooperate.

Regulation of securities: All securities of a public company and a collective investment scheme are to be registered with SEC. Listed companies need to supply their audited financial reports and they also have to disclose their quarterly earnings forecast within 20 working days prior to the commencement of a quarter. Violation of this by a public company attracts a penalty of not less than ₦1,000,000 and a further penalty of ₦25,000 per day for the period the violation continues. Equally, a violating auditor is liable to a penalty of ₦100,000 and a further penalty of ₦5,000 per day for the period the violation continues.

Public offer and sale of securities and invitations to the public: A public company, a statutory body or bank may make an invitation to the public to acquire or dispose of any securities. Forms of application to purchase securities must be issued with a prospectus giving relevant particulars and information about the securities and companies. In case a prospectus includes any untrue statement, any director or officer who authorised its issue commits an offence and is liable on conviction to a fine of not less than ₦1,000,000,000 or to imprisonment for a term not exceeding three years, or to both. Furthermore, anybody who deposits money with a public company as a result of an untrue statement of a material fact made is entitled to repayment of such money with interest at the current bank rate per annum or such higher rate as may have been agreed to be paid on the deposit.

Conduct of securities business: A securities dealer is mandated to give a contract note in respect of a transaction of purchase of securities. Such contract note contains information about the dealer, the receiver of the note, the date of the transaction, the description of the securities, the price per unit of the securities, the volume, the

[20]Capital market operator includes a securities dealer, a stock broker, sub-broker, jobber, share transfer agent, banker to an issue, trustee of a trust deed, registrar to an issue, merchant banker issuing houses, underwriter, portfolio manager, investment adviser and such other capital market intermediaries as may be licensed by the Commission to perform specific functions in the capital market.

amount, the rate and amount of commission charged, the amounts of all stamp duties or other duties and taxes payable in connection with the contract and other charges or benefits. Failure to issue contract note attracts a penalty of between ₦50,000 and ₦100,000. Whenever a securities dealer distributes a circular on any security, he is mandated to include a concise statement of the nature of his, or of a person associated with him, interest in, or any interest in the acquisition or disposal of those securities. Securities dealers are also mandated to first carry out clients' orders on securities on which they also want to personally transact and contravention attracts a fine in the range of ₦100,000 and ₦500,000. Moreover, section 104 of the Act empowers SEC to make regulations to provide for margin requirements and securities lending. The margin requirements are to prevent the excessive use of credit for the purchase of securities. This requirement is to state the amount of credit which may be extended and maintained on all or specified securities or transactions.

Trading in securities: Securities of public companies can only be bought and sold on the securities exchange where they are listed. This part of the Act also identifies trading activities that are considered illegal and their associated penalties. For instance, the law prohibits a person from creating a false or misleading appearance of active trading in any securities or their prices. Also, nobody is allowed to carry out two or more transactions in securities which have the effect of raising, lowering or stabilizing their prices with intent to induce other persons to purchase, sell or subscribe for the securities or others. Further, an insider, having unpublished price-sensitive information in relation to the securities of a company, is disallowed from dealing, or cause others to deal, in those securities. The violation of this condition attract a penalty not less than ₦1,000,000 for a body corporate and ₦500,000 for an individual or an imprisonment for a term not exceeding seven years.

Merger, take-over and acquisition: Every merger, take-over or acquisition is subject to the prior review and approval of SEC. A merger may be achieved through the purchase or lease of the shares, interest or assets of another company in question; or amalgamation or other combination. Equally, the control of a company lies with the person who owns more than one half of the issued share capital of the company or is entitled to vote a majority of the votes that may be cast at a general meeting of the company, or has the ability to control the voting of a majority of those votes, either

directly or through a controlled entity of that person. SEC can approve merger if it is unlikely to substantially lessen competition, or if it is in the public interest. Conversely, SEC may order the break- up of a company into separate entities if its practice substantially lessens competition. Takeover bid is also allowed where any person acquires shares up to 30%. Such a person can then make a takeover offer to the holder of any class of equity share capital in which such person or any person acting in concert with him holds shares.

Collective investment schemes[21]*:* It is also in the power of SEC to approve a collective investment scheme like a unit trust scheme; an open-ended investment company; or a real estate investment company or trust. A unit or security of a scheme is to be valued at its fair market price while the mode of determining such fair market price may be determined by SEC. An open-ended investment company may also be registered by SEC provided the assets and investments of the company are in the custody of a registered custodian or trustee. Equally, a body corporate incorporated for the sole purpose of acquiring intermediate or long term interests in real estate or property development may raise funds from the capital market through the issuance of securities. Further, SEC may approve an application of a scheme administered in a foreign jurisdiction to solicit investment in such scheme from investors in Nigeria.

Investors Protection Fund(IPF)[22]*:* It is mandatory for securities exchange or capital trade point to establish and maintain an IPF with the purpose of compensating investors who suffer pecuniary loss arising from, *a*) the insolvency, bankruptcy or negligence of a dealing member firm of a securities exchange or capital trade point; and *b*) defalcation[23] committed by a dealing member firm or any of its directors, officers, employees or representatives in relation to securities, money or any property entrusted to, or received or deemed received by the dealing member firm in the course of its business as a capital market operator. Any securities exchange, capital trade point, director, official or employees of the securities exchange or the capital trade

[21] "Collective investment scheme", means a scheme in whatever form, including an open-ended investment company, in pursuance of which members of the public are invited or permitted to invest money or other assets in a portfolio.

[22] This provision was introduced in ISA (1999); however, it is yet to come off in 2012 (Oteh, 2012).

[23] Defalcation being the act of a default, act of embezzling, failure to meet an obligation, misappropriation of trust funds or money held in any fiduciary capacity and failure to properly account for such funds.

point, who violate this provision is liable to a penalty of ₦1,000,000 and a further sum of ₦25,000 for every day during which the contravention continues.

Borrowing by federal, state and local governments and their agencies: Governments and their agencies may apply to SEC to raise internal loans for specific projects by issuing registered bonds or promissory notes, provided the total amount of loans outstanding at any particular time, including the proposed loan, does not exceed fifty per cent of their actual revenue for the preceding year. Applications from local and state governments should include a copy of the law authorising the issue of the bond specifying that a sinking fund to be fully funded from the consolidated revenue fund account of the issuer be established; a copy of a rating report by an accredited rating agency registered by SEC; and an irrevocable letter of authority issued by the Accountant-General of the state to the Accountant-General of the Federation, to deduct at source from the statutory allocation due to the issuer in the event of default by or failure of the issuer to meet its payment obligations. Applications from federal or state government agencies or companies should be accompanied by a copy of the law or instrument establishing the agency or company authorising the agency or company to issue the bond; and an irrevocable letter of guarantee of repayment of the loan issued by the Federal or State Government that owns the agency or company. The interest due on a registered bond or securities is to be paid half yearly or quarterly on the dates specified in a trust deed and all documents will be exempted from stamp duty payable to the Federal or a State Government.

Investments and Securities Tribunal (IST): The Act establishes the IST with the power to hear and determine any question of law or dispute within and between capital market operators, their clients, investors, a securities exchange, capital trade point, clearing and settlement agency, SEC and issuers of securities. The law allows aggrieved persons to institute an action of appeal at the IST if they are not satisfied with SEC decisions. A party may appear in person before IST or engage the service of a legal practitioner. The IST has exclusive jurisdiction on matters specified in ISA and its judgment will be enforced as if it were a judgment of the Federal High Court. Hence, parties that are dissatisfied with a decision of the IST may appeal against such decision to the Court of Appeal, but at their own costs.

Miscellaneous: Section 298 gives the authority to the Minister of Finance to direct SEC as appear to him as just and proper for the effective discharge of the functions of the latter under the ISA and SEC must comply. Furthermore, section 308 states that if the Minister is of the opinion, and after consultation with SEC, that it is necessary in public interest, he may, by order published in the Gazette, exempt any person or class of persons buying or selling securities or otherwise dealing with the securities market from the operation of the provisions of ISA. In case any other law relating to capital market, apart from the Constitution of the Federal Republic of Nigeria, is inconsistent with ISA, section 312 makes it clear that the provisions of ISA shall prevail and the provisions of that other law shall, to the extent of the inconsistency, be void. However, section 313 gives SEC the authority to make rules and regulations, from time to time, for the purpose of giving effect to the provisions of the ISA. However, SEC needs to consult with stakeholders in exercising its powers to make rules. Except as otherwise specifically provided under the earlier sections, section 303 states that violations of the provisions of ISA is liable to a penalty of not less than ₦100,000 and a further sum of ₦5,000 per day for every day that the violation continues. In addition, SEC may direct any person who has violated any of the provisions of this Act to compensate any person who may have suffered any direct loss as a result of the contravention. According to section 304, if SEC discovers evidence of possible criminality in the course of its investigation, it is under obligation to relay such information to the appropriate criminal prosecuting authorities.

iv. Central Bank of Nigeria Act No 24 of 1991[24]

The CBN was established by the CBN Act, 1958 and the Bank became fully operational in July, 1959. Following several developments in the Nigerian financial system, especially during the introduction of the Structural Adjustment Programme (SAP) when many new banks and other financial institutions were established, the need arose to improve the capability of the CBN for improved regulation. Thus, the CBN Act No. 24 of 1991 was enacted. It repeals the earlier law that established the CBN, namely; Central Bank of Nigeria Act 1958, and the Central Bank of Nigeria (Currency Conversion) Act 1967, the Finance Act 1969, along with their various amendments.

[24] Amended in 2007 to give more power to CBN. Meanwhile, at the time of completing this thesis, the House of Assembly was still contemplating amending the 2007 Act in order to reduce CBN's power.

The Act legalises the continuance of the CBN with the major objective of (a) issuing legal tender currency in Nigeria; (b) maintaining external reserves to safeguard the international value of the legal tender currency; (c) promoting monetary stability and a sound financial system in Nigeria; and (d) acting as banker and financial adviser to the Federal Government. Part IV of the Act discusses matters relating to the Nigerian currency. This part gives the CBN the sole right of printing and issuing currency and coins throughout Nigeria, unit of which shall be naira divided into one hundred kobo. It goes ahead to state that the exchange rate of the naira shall be determined, from time to time, by a suitable mechanism devised by the Bank for that purpose. Rules (24) – (26) under this part gives the CBN the right to maintain reserve of external assets and do so at levels considered by it to be appropriate for the monetary system of Nigeria. These also include the right to buy and sell the Nigerian currency.

CBN is further given the responsibility to formulate and execute monetary and credit policies for Nigeria. Among several other functions, Part V gives CBN the rights to (a) purchase and sell securities of the Federal Government, (b) trade in shares or debentures of any company for the purposes of promoting the money or capital markets in Nigeria or of stimulating financial or economic development (c) maintain accounts with central banks and other banks outside Nigeria, (d) purchase and sell securities of, or guaranteed, by any government and international financial institutions of which Nigeria is a member and, (e) require certain information from and/or issue guidelines to any person and any institution that engages in the provision of financial services.

Part VI entrusts the CBN with the Federal Government banking and foreign exchange transactions, and Part VIII shows the relations of the CBN with other banks. It is stated in Rules (37) and (38) that the CBN may act as banker to other banks in Nigeria and outside Nigeria and cooperate with them so as to promote and maintain adequate and reasonable financial services for the public and also to ensure high standards of conduct and management throughout the banking system.

Since 1991, the Act has witnessed several amendments due to the growth of the Nigerian financial system. For instance, the amendments done in 1997 increased the supervisory role of the CBN to other specialised banks and financial institutions. It however places the CBN under the Ministry of Finance thereby violating the often-

sought autonomy of central banks. This was quickly corrected in the CBN (Amendment) Act No. 37 of 1998 where the CBN is allowed some operational autonomy so as to effectively carry out its conventional functions.

Recent developments in the Nigerian financial system have also led to the attempt to strengthen CBN supervisory capacity and monetary policy formulation through the amendments to the CBN Act of 1991 and this has resulted into the CBN Act of 2007. The major amendments in the 2007 Act include; (a) granting of operational autonomy to the CBN; (b) stating the objective of price stability as the core mandate of the CBN; (c) allowing CBN more flexibility in the selection of instruments and assets in which to invest external reserves; (d) empowering CBN to enter arrangement for information sharing with other regulatory bodies particularly those outside Nigeria for supervisory purposes; (e) reduction in the limit of the amount that may be advanced to the government for deficit financing, among others.

v. Banks and Other Financial Institutions Act, 1991[25] (BOFI)

This act, which defines what banking[26] and other financial businesses[27] are in Nigeria, empowers the CBN to issue licence to and regulate these banks and other financial institutions. It states the CBN's power to determine the minimum paid-up share capital of each category of licensed banks as well as the conditions under which the licence of these banks can be revoked. Rule 15(1) mandates it for every bank to maintain with the CBN cash reserves, and special deposits and hold specified liquid assets or stabilization securities, as prescribed by the CBN.

On the duties of banks, section 17(1) prohibits any manager or officer of a bank from benefiting from any credit facility granted by the bank, it also stresses that any director

[25] This Act repealed the Banking Act of 1969, and its amendments in 1970, 1972 1975 and 1979.

[26] "Banking business" means the business of receiving deposits on currency account, savings account or other similar account, paying or collection cheques, drawn by or paid in by customers ; provisions of finance or such other business as the Governor may, by order published in the Gazette, designate as banking business.

[27] "Other financial institution" means any individual, body, association or group of persons; whether corporate or unincorporated, other than the banks licensed company and money brokerage and whose principal object include factoring, project financing, equipment leasing, debt administration, fund management, private ledger services, investment management, local purchases order financing, export finance, project consultancy, financial consultancy, pension fund management and such other business as the CBN may, from time to time, designate.

of a bank that also owns not less than 5% of the shares of another company seeking credit from that bank should declare the nature of his interest at a meeting of the board of directors of the bank. Furthermore, there are legislations on the type of person a bank can employ or appoint as a director. In this regard, rule (19) disallows the employment of any person with criminal records and banks are also not allowed, except with the approval of the CBN, to have as a director any person who is a director of another bank or a company that owns over 10% of the bank.

According to rule (24), every bank must keep proper books of account of all its transactions which are done in compliance with the prescribed accounting standard. In addition, it is mandatory for every bank to submit to CBN a monthly report showing the assets and liabilities of the bank and an analysis of advances and other assets, at its head office and branches in and outside Nigeria (rule 25). The conditions for appointment, qualification and rejection of external auditor(s) are also specified under rule (29) of the Act.

Rules (30)–(38) discuss the issue of supervision of banks and other financial institutions. These include the power of the CBN to appoint director of banking supervision and other examiners who carry out routine and special examinations of banks' and other financial institutions' books and how to manage the failing and undercapitalized banks. In rule (55), the CBN Governor is empowered to make rules and regulations for the operation and control of all institutions under the supervision of the CBN.

BOFI has gone through two major amendments since 1991. The first is the 1998 amendment which empowers the CBN to alter or cancel any condition under which a licence was or is to be granted. This also authorises the CBN to withdraw the licences of distressed banks and appoint liquidators of the banks. Therefore, this gives the CBN some autonomy, just like the amended CBN Act of 1998. The other amendment was done in 1999 and this allows other financial institutions that are failing to be treated the same way failing banks are treated. This amendment further empowers the CBN Governor to remove any manager or officer of a failing bank or other financial institution. The foregoing shows that both the CBN Act and BOFI have undergone amendments almost at the same time in history, therefore, the amendments of both

were recently proposed. However, only that of the CBN Act was passed into law in 2007.

vi. Foreign Exchange (Monitoring and Miscellaneous Provisions) Act Chapter F34 (Act No 17 of 1995)[28]

This Act repeals laws that previously constrained free transactions in foreign exchange, and it therefore establishes an Autonomous Foreign Exchange Market. Moreover, the Act contains provision for the monitoring and supervision of the transactions conducted in the foreign exchange market by giving the CBN the right to issue guidelines on foreign exchange transactions so as to ensure the efficient performance of the market. It sets off with the assurance that, a person executing a transaction in the Market shall not be required and, if required, shall not be obliged, to disclose the source of any foreign currency to be sold in the Market, except as required under any enactment or law. Equally, foreign currencies imported into Nigeria are assured not to be liable to seizure by the government.

Two categories of foreign currency importation are recognised in the Act, cash importation and importation through Authorised Dealers[29] by telegraphic transfer, cheques or other negotiable instruments. In the case of cash importation, it is required that foreign currency in excess of US$5,000 or its equivalent, whether being imported into or exported out of Nigeria, shall be declared on the prescribed form for statistics reasons only. In a situation where a person imports foreign currency in excess of US$10,000, or its equivalent, in cash and deposits the foreign currency in a domiciliary account with an Authorised Dealer, the person can only make cash withdrawals from the account, and the remaining balance can only be exportable from Nigeria in cash.

Foreign currencies can also be imported through Authorised Dealers, and the dealers are required to notify the CBN of any cash transfer to or from a foreign country of a sum greater than US$10,000 or its equivalent so as to monitor and determine the flow

[28] This law repeals the following; Exchange Control Act, 1962; Exchange Control (Anti-Sabotage) Act, 1984; Foreign Currency (Domiciliary Account) Act, 1985; and Second-Tier Foreign Exchange Market Act, 1986.

[29] Means any bank licensed under the Banks and Other financial Institutions Act, and such other specialised bank and issued with licence to deal in foreign currency

of foreign currencies into Nigeria. Foreign currencies or capital meant for investment in Nigerian enterprises are expected to be imported through an Authorised Dealer and converted into the naira in the market. The said Authorised Dealer shall, within 24 hours of the importation, issue a Certificate of Capital Importation (CCI) to the investor and shall, within 48 hours thereafter, make returns to the Central Bank giving such information as the Central Bank may, from time to time, require.

Further on investment in Nigeria, it is established in the Act that, whether resident or not, and whether citizen or not, a person may deal in any securities and other money market instruments regardless of the currency of denomination. Dividends, payments and remittances (net of all taxes) from such investments are guaranteed unconditional transferability through an Authorised Dealer in freely convertible currency; while the said Dealer is mandated to communicate this information to the CBN within fourteen days of the repatriation.

Another important section in the Act is that which makes illegal the actions of making and accepting cash payment, whether denominated in foreign currency or not, for the purchase or acquisition of (a) landed properties; (b) securities, including stocks, shares, debentures and all forms of negotiable instruments; and (c) vehicles. Payments for such items should only be made by means of bank transfers or cheques drawn on banks in Nigeria.

vii. Pension Reform Act No. 2 of 2004

This Act repeals the Pension Act of 1990 and establishes for Nigeria a Contributory Pension Scheme for payment of retirement benefits to all employees in the public service and in private sector where there are 5 or more employees. The objectives of the Scheme are to (a) ensure that the employee concerned receives his retirement benefits as and when due, (b) assist improvident individuals by ensuring that they save in order to cater for their livelihood during old age, and (c) establish a uniform set of rules, regulations and standards for the administration and payments of retirement benefits in Nigeria.

Rate of contribution to the scheme: Both the employee and the employer are mandated to contribute to the Scheme. According to the Act, a minimum of seven and half percent of an employee's monthly emolument should be contributed by the employee

and another minimum of seven and half percent by the employer. In the case of the military however, the employer contributes a minimum of twelve and half percent and the employee two and half percent (Rule 9).

Investment of pension funds: This is of much importance to this study and Part IX of the Act contains the relevant provisions. It is legislated that all contributions shall be invested by the pension fund administrators with the objectives of safety and maintenance of fair returns on amount invested. Pension fund administrators are allowed to invest in any of the instrument listed below provided such does not involve using pension funds to deal in own securities, and those of its custodian, their shareholders, employees and families (rules 75 and 76).

a. bonds, bills and other securities issued or guaranteed by the Federal Government and the Central Bank of Nigeria ;
b. bonds, debentures. redeemable preference shares and other debt instruments issued by corporate entities and listed on a Stock Exchange registered under Investments and Securities Act 1999 ;
c. ordinary shares of public limited companies listed on a Stock Exchange registered under the Investments and Securities Acts of 1999 with good track records having declared and paid dividends in the preceding five years.
d. bank deposits and bank securities:
e. investment certificates of closed-end investment fund or hybrid investment funds listed on a Stock Exchange registered under the Investments and Securities Act 1999 with a good track records of earning;
f. units sold by open-end investment funds or specialist open-end investment funds listed on the stock exchange recognised by the Commission;
g. bonds and other debt securities issued by listed companies;
h. real estate investment; and
i. such other instruments as the National Pension Commission may, from time to time, prescribe.

In order to effect compliance therefore, rule (86) legislates that any pension fund administrator or custodian who misappropriates pension funds commits an offence and

is liable on conviction to a fine of an amount equal to three times the amount so misappropriated or imprisonment for a term not less than 10 years or to both fine and imprisonment.

The next three sub-sections review the rules and regulations of the two major regulators of the Nigerian capital market; namely, SEC and NSE.

viii. Securities and Exchange Commission rules and regulations (2007[30])

The Investment and Securities Act (1999) confers on the SEC (also referred to as 'Commission' in this section) the authority to regulate the securities market in Nigeria and it is upon this that the rules and regulations to be discussed below are formulated. The document is divided into 12 major parts with 312 rules and 9 schedules.

Registration of securities exchanges: Rule 22 stipulates the registration procedures of securities exchanges which are filed on Form SEC 5 containing information on market facilities like trading floors; quotation board; information board/ticker tape; trading system and paid-up capital, among others. On the other hand, rules 23 to 39 give the requirements for the registration of other capital market operators and facilities.

Registration of securities: In order to register a security, Form S.E.C. 6 is filed along with other documents like audited accounts for the preceding five years, information about the company, information about the issuer and underwriter, a feasibility report on the project to be financed and rating report by a registered rating agency (for debt issue). Application for securities registration must also contain information about the type and the features of the securities (rule 40). Collective investment schemes like Unit Trusts, Real Estate Investment Schemes, Investment Trusts and Community Savings also have their regulation procedures outlined under rule 41 of the document.

Public offers: The registration statement for the offer of securities to the public is filed with SEC by an issuing house along with a prospectus detailing true information about the securities, company's history and performance, information on directors, issuing house, the level of compliance with the Code of Corporate Governance and so on. It is also important for every prospectus to contain a caveat on risk factors which are

[30] Several amendments have been carried out since 2007 culminating to the 2011 rules and regulations. Hence, attempts have been made to incorporate some of these amendments into this sub-section.

peculiar to the issuer, among which are; risks associated with the business activities of the entity; sectoral risks, political risks, currency risk, environmental risk, and measures, if any, taken to address or mitigate the identified risk.

Opening and closing of offer: Any offer for subscription or offer for sale of securities to the public or a rights issue is open for a maximum period of 28 working days; and 40 working days in the case of privatisation. Also, SEC may grant extension if some unforeseeable events occur.

Over-subscription and under-subscription in a public offer: In the event of over-subscription in a public offer or renounced shares in a rights issue, preference is given to small investors applying for the specified minimum subscription level and the higher the number of shares applied for, the lower the percentage allotted. For under-subscription, underwritten securities are warehoused by the underwriter(s) and sold on the floor of the Securities Exchange or capital trade point within six months after allotment. However, where an issue not underwritten is under-subscribed (that is less than 25% subscription level and 50% in case of securities offered through the capital trade point)[31], the issue is to be aborted by the issuer/issuing house.

Valuation of right issue: This is determined by the issuer and the issuing house, although it may also be influenced by the shareholders and in situation where offer for subscription and rights issues are made using a single offer document, such securities are to be offered at the same price (rule 74).

Book building[32]: This option in the issuance of securities is available to all public companies. In this process, an issuing house reserves a minimum of 20% of the offer for retail investors and then circulate a preliminary prospectus (red herring prospectus) with an invitation letter indicating the price range within which the securities are to be offered for subscription to qualified investors. The issuing house will receive and aggregate the number of securities ordered and price that the investors are willing to pay. At the end, the issuing house and the issuer will determine the price at which the

[31] 50% for both by the latest amendment

[32] A newly introduced rule. It is a process of price and demand discovery by which an issuing house (book runner) attempts to determine the price a public offer should be made based on demand from qualified institutional and high net worth investors.

securities will be offered to the public based on the aggregation of orders received; and the market clearing price so determine is applicable to the retail investors' shares.

Cost of issue: Issuing house fees on equities and interest bearing securities shall not exceed 2.5 percent of the market value of the securities or as prescribed by the Commission from time to time. Equally, broker/dealer fees for the purchase or sale of securities on behalf of their clients shall not exceed 3% of the market value of the securities. The total cost of issue should therefore not exceed 7%[33] of the gross total proceeds from the issue excluding the underwriting fees or such percentage as the Commission may prescribe.

Underwriting of public issues: All[34] public issues are underwritten except where the issuer specifically requests in writing for non-underwriting and SEC finds that it is in the interest of the public not to require underwriting. Moreover, the proportion underwritten by any underwriter or their syndicate will not be less than the 80% of the number of units issued for subscription.

Cash transactions: All payments for securities transactions are to be made by cheque or bank draft. The rule however allows a purchaser to deposit cash, not exceeding ₦50,000, with a stockbroker. Further, a stockbroker is mandated to make a suspicious transaction report to SEC in case a purchaser deposits cash not exceeding ₦50,000 on several occasions within a short period of time for transactions that can be linked.

Security ownership: The impact that ownership concentration may exert on securities' values and trading is acknowledged; hence, it is required that every registrar should file with SEC information on beneficial owners of 5% or more of a company's shares and their subsequent transactions.

Share buybacks: A company may acquire its own shares provided it is not more than 15% of its existing issued and paid-up equity capital in any given financial year, having sought the approval, and meet some other conditions, of the SEC. Further, share purchases are to be made only out of the profit of the company which would

[33] Revised to 4.3% on 24th March, 2010.

[34] The 2010 amendment however places underwriting at the discretion of the issuer.

otherwise be available for dividends, or the proceeds of fresh issue of share made for the purpose of the purchase.

Manipulation of securities transactions: Rule 110 criminalises the application of some manipulative and deceptive devices on securities trading. These include presentation of untrue and misleading information, fraudulent acts and insider[35] dealings.

Disclosure of interests and large transactions: The SEC rules mandate the disclosures of director's interest in stockbroking/dealing companies, stockbroking/dealing companies' interests in quoted companies and public quoted companies' interest in stockbroking/dealing companies. Moreover, directors and other insiders need to file notices upon sales and purchases of their shares in the company. Equally, registered brokers/dealers are mandated to disclose to the SEC any single deal in a company's securities of 500,000 units and above within a day.

Dual listing and trading on other exchanges: An issuer may list its securities on more than one Exchange provided it complies with the listing requirements of the relevant securities exchange. Equally, a securities exchange is expected to permit the trading of a security not listed on it once that security is registered and listed on any recognised securities exchange.

Trading rules: All trading on the floor of an exchange are presided over by a Chairman who is a senior management staff of the exchange and registered by the Commission. The price movement of securities are based on market forces, individual company's incidental macro- and microeconomic factors and preferences of clients. Also, price movements above 5% have to be justified and notified to the Commission not later than the next working day. In case there are more than one stock exchange, it is recommended that the highest closing price of a security on any of the exchanges shall be the opening price on all the other exchanges in order to avoid arbitrage in the trading on securities.

[35] This is where a person or group of persons by virtue of their connection with a company, who is in possession of some confidential and price sensitive information, not generally available to the public, utilises such information to buy or sell securities for his/its own account and for his benefit or makes such information available to a third party (either knowingly or unknowingly) who uses it for his benefit.

Brokers/Dealers: A registered broker/dealer performs the roles of purchasing and disposing of securities on behalf of his clients and himself and ensures that the aggregate worth of all mandates to purchase securities for clients does not exceed 200 percent of paid-up share capital and reserves of the stock broking company. A broker/dealer is also required to keep separate accounts for every client and furnish his clients with a quarterly (and also on demand) report of his client's accounts showing all purchase transactions on behalf of the client including the statement of account for the period and client's share portfolio, including the statement of share ownership from the clearing agency. Furthermore, margin accounts may be maintained by a broker/dealer subject to the provisions of the ISA and monetary guidelines by CBN. Further, no broker/dealer is allowed to extend credit to his clients in excess of 200 percent of his net capital in the aggregate per annum.

Foreign investments[36] *and cross-border securities:* Procedures for these are outlined in Part F which is just a duplication of the sections relevant to foreign investments from the NIPC Act No. 16 of 1995 and the Foreign Exchange (Monitoring and Miscellaneous Provisions) Act, No. 17 of 1995. In addition, the rules allow and give the conditions for cross-border securities transactions, which include the kind of information to be supplied in the prospectus of cross-listing firms and Nigerian firms seeking international depository receipts. Equally, a new rule created in 2010 states that GDR issues shall be approved only upon satisfactory account of utilisation of proceeds from previous raisings.

Mergers, take-overs and acquisitions: Part G of the rules and regulations contains the process for obtaining approval for mergers, requirements for pre-merger notice, requirements for formal approval, post-approval requirements, contents of a bid, authority to proceed with take-over bid, registration of take-over bid and rules on management buy-out.

Collective investment schemes: Part H is on the regulation of Collective Investment Schemes like Unit Trust, Real Estate Investment Schemes and Special Funds (Venture

[36] Foreign investment is defined as any investment in securities involving foreign capital importation made by a foreign person (corporate body or individual) or by any Nigerian resident outside the country; and foreign investors include; (a) foreign institutional investors (F.I.I.'s) (e.g. pension funds, unit trust funds, investment trust funds, institutional portfolio managers, nominee companies, asset management companies, or any other corporate body); and (b) individual investors who are foreigners and Nigerians resident abroad who are investing with foreign currency

Capital). This part gives the information required in a prospectus used in their offering for sales as well as the expected contents of their Trust Deeds.

Fees and fines: SEC charges some fees for registrations and transactions in the Nigerian capital market. These fees can be amended anytime but notice has to be given by publication in two national daily newspapers or by notice in the Gazette. Tables A-1 and A-2 in appendix A give the registration fees for market operators and securities respectively. The tables show that while there has been a downward review in the registration fees and minimum capital of most of the market operators, there has been upward reviews in some the securities fees between 2007 and 2011. On the issue of penalty, the 2007 rules states that except as otherwise specified, any violator of the SEC rules and regulations is liable to a fine not exceeding ₦5,000 for every day of default. However, the 2011 amendment raises the penalty stating that such person is liable to a penalty of not less than ₦100,000 and a further sum of not less than ₦100,000 for every day of default. Table A-3 in appendix A gives the penalties and fines for some common violations.

ix. The Nigerian Stock Exchange listing requirements[37]

It is required that companies wishing to be admitted to the official list of the NSE must comply with its listing requirements; and in addition, comply with the relevant provisions of the Companies and Allied Matters Act 1990, the Investment and Securities Act, 1999 (now 2007) and rules and regulations made under other relevant statutory requirements. The requirements allow for the following broad methods for listing of securities on the NSE;

a. *Offer for subscription:* An invitation by or on behalf of a company or other authority to the public, for subscription of securities at a fixed price;

b. *Offer for sale:* An offer to the public by or on behalf of a shareholder, the proceeds which will go to the vendor(s);

c. *Placing:* Sale by a broker to his clients, of securities, which have previously been purchased or subscribed for;

[37] The NSE listing requirement book is divided into the introduction, definitions, general requirement, 10 chapters on listing requirements, a chapter on share buyback and 16 appendices

d. *Rights offer/issue*: A privilege offer/issue to existing shareholders to acquire proportionately additional shares in the company usually at a special price;

e. *Capitalisation issue:* A bonus/scrip issue to existing shareholders;

f. *Tender*: An offer of specific quantity of shares and stock to the public by or on behalf of a company or other authority or a third party for bidding;

g. *Introduction*: The listing of securities already widely held;

h. *Conversion*: An exchange for or conversion of securities into other classes of securities;

i. *Options*: An offer to buy or sell some shares at an agreed price and time;

j. *Others*: Any other method that the NSE Council may prescribe.

Generally, the following requirements are expected to be adhered to by companies listing on the NSE;

a. Application for listing will only be entertained if sponsored by a dealing member of NSE.

b. The company must be a public company, which will issue or has issued an invitation to the public to subscribe for its shares or has satisfied Council that the public is sufficiently interested in the company's shares to warrant listing.

c. All securities for which listing is sought shall first be registered with the SEC

d. All application and documents to be considered or approved by Council should always be submitted to the NSE at the earliest possible date. The final prospectus for approval must be forwarded to NSE at least seven working days before the date for the completion board meeting.

e. Before the grant of listing, all applicant companies shall sign a general undertaking that they will provide promptly certain information about their operations and that they will follow certain administrative procedures.

f. Where it is desired to increase the authorized share capital, the directors shall state, in the explanatory circular or other documents accompanying the notice of meeting, whether or not they currently have any intention of issuing all or any part thereof.

g. A company which applies for listing shall comply with the minimum public float requirement prescribed by the listing standard criteria chosen by the issuer.

h. Subscriptions list must remain open for a maximum period of 28 working days.

i. A maximum of 10% of an offering will be allowed to staff of a company (or its subsidiaries or associated companies) on special application forms. Such offerings may be placed in Trust for the employees. Where a proportion of the shares in a placement or public offer is reserved for employees, the company shall provide the NSE along with the general undertaking a list of members of staff who have been allotted shares, the number of such shares, the capacity in which they work for the company and the number of years of service with the company.

j. All companies admitted to listing on NSE shall pay a listing fee which is subject to review from time to time. These are shown in tables A-4 and A-5 in appendix A.

k. All clauses in the company's Memorandum and Articles of Association that restrict the transfer of fully paid-up shares must be expunged.

l. All listed companies shall advertise the notice of their annual general meetings in at least two widely read newspapers at least 21 days before the annual general meeting and such advertisement must be conspicuously placed to cover a reasonable portion of a page.

m. The subscription monies pending allotment and return of funds to subscribers shall be deposited in a designated bank account appointed by the issuing house and the company. All accrued interests in respect of cleared allotments shall be paid to the company to offset part of the cost of the Issue.

n. Return monies arising from an unsuccessful application or abortion of an offer/issue shall attract interest at the rate determined by the SEC.

o. These general requirements are not exhaustive and Council may add thereto or subtract therefrom as considered necessary subject to the approval of the SEC.

Moreover, other chapters of the document give detailed listing requirements for companies on the NSE as follows: *Chapter 1*: New listing of securities (in respect of companies whose securities are not listed on the NSE); *Chapter 2:* Subsequent listing of securities (in respect of companies whose securities are already listed on the NSE); *Chapter 3:* Contents of prospectus for new listings (in respect of whose securities are not listed on the NSE); *Chapter 4:* Contents of prospectus for companies part of whose capital is already listed on the NSE; *Chapter 5:* Takeovers and mergers; *Chapter 6*: Listing for unit trusts; *Chapter 7*: Contents of prospectus for unit trusts; *Chapter 8*: Securities issued by statutory bodies; *Chapter: 9*: Solid minerals companies; *Chapter 10*: Cross border listing (Overseas issuers)–equity securities and *Chapter 11:* Share buyback.

x. Rules and regulations of the NSE governing dealing members (2006)[38]

These Rules and Regulations are made to regulate the dealing members on the NSE; dealing members being member companies who have been granted licence by NSE as a dealer in securities.

Article 13 makes it a requirement for every dealing member to keep all monies held on behalf of clients in a bank account separate from own monies; further, proper records and books of account in respect of all stockbroking transactions are to be kept (Article 14). Article 41 gives the dealing members the right to charge brokerage income from clients on whose behalf they deal in securities, to the scale prescribed by the NSE and approved by the SEC and other relevant authorities with regard to transaction in securities.

The following supervision and internal control mechanisms, among others, are expected to be complied with by dealing members;

a. Maintenance of a system of supervision to ensure compliance of its activities.
b. Regular Internal Review of Records
c. Establishment of risk management unit

[38] Made subject to the provisions of the Investment and Securities Act.

d. Maintenance of a liquidity margin of not less than 10% of shareholders' funds always

e. Disclosure of information on shareholders with 5% or more of the share capital in annual accounts.

In terms of fees and charges, the Exchange receives a transaction fee on every sale of securities listed on it; this transaction fee however has to be approved by the SEC (article 65). It is also established that the Exchange is to maintain and operate an Investor Protection Fund to be administered in accordance with the ISA, 1999 and any other relevant legislation. Each dealing member is mandated therefore to pay a non-refundable sum of ₦1,000,000 as initial contribution to the fund or such other amount as may be determined by the NSE Council after which they pay the annual premium prescribed by the Council.

The recognised trading method is the Nigerian Stock Exchange Automated Trading System (The NSEATS) (article 31) and the permission to use the trading system is subject to payment of such charges as the Exchange may from time to time prescribe. Trading activities occur on the Exchange on all days except Saturdays, Sundays and on National public holidays (article 73), and these are conducted at specified times as may be determined by the Council (article 74). Trading is only allowed through approved Workstation(s) located on any of the Exchange Trading Floors and/or at approved office(s) of a Dealing Member or any other access mode as may be approved from time to time by Council (article 76b).

Article 100 explains the pricing methodology on the Exchange, and this is done according to the following requirements;

(a) Opening and closing prices are as generated by the trading engine on any given day; (b) price movement can only occur as a result of transaction whose volume is not less than that prescribed by the Exchange; (c) the price movement band on any given trading day is as determined by the Exchange; and (d) on the day a stock is marked for dividend or scrip, there shall not be a price movement on the stock.

Where blocks[39] of shares are available for sale through a Dealing Member, such transactions should be done with the prior approval of the Exchange. Delivery and settlement are done on a time frame prescribed by NSE on a Delivery-versus-Payment basis, and this has to be honoured by both the buying and selling members. To facilitate this process, the Trade Guarantee Fund is established into which every dealing member contribute as prescribed by the Council.

There are several provisions under the section on the code of conduct for dealing members, and some of these include the prohibition of; the use of a customer's information and account without his prior approval, misinforming customers and disclosing customer's information. The issue of confidentiality of customers' information is highlighted and dealing members are expected to abide by this; exception is however allowed for when the client is suspected to have criminal records, or when he is acquiring not less than 5% of the share capital of a company. Moreover, it is expected that where a director of a dealing member firm is also on the board of a quoted company on the Exchange, such directorship shall be disclosed.

Article 59 contains a list of behaviours that are contrary to the provisions of the NSE rules and regulation and also establishes the power of the NSE Council to exercise its disciplinary powers against an erring dealing member. Activities like price manipulation, illegal market dealings, circulation of false information, front running, trading ahead of customers, manoeuvring with intention to defraud, pegging/stabilising of securities and insider dealing are prohibited in the NSE (Articles 104 to 108). These are practices that may mislead or deceive investors, affect or artificially control the price of securities and illegally allocating customers' benefits to the dealing members.

On the disciplinary processes and procedures, article 45 gives NSE Council the right to fine, censure, suspend, revoke the licence and expel erring members. In the case of suspension and expulsion, the Council will publicise details about the member concerned (article 53). Expelled members lose all trading rights to the Exchange (article 58) and are not eligible for re-admission, except where such expulsion is upturned by SEC and/or the Investments and Securities Tribunal (IST) (article 54).

[39] In this context, block of shares means any number of units of shares or stocks in any company up to an amount to be determined from time to time by the NSE Council.

Although a suspended member must still satisfy his financial obligations with the regulatory authorities (article 57a), he loses his seat on the Exchange (article 57b) and therefore has to appoint another dealing member to carry out any instructions he already received on behalf of his clients prior to the suspension (article 57d). This and other procedures are to ensure that innocent clients do not suffer any loss or embarrassment as a result of the suspension (article 57e).

2.1.2. Institutional development in the NSE

The institutional characteristics of the Nigerian securities market can be classified into regulations, information disclosure rules and accounting standards, settlement process, transaction costs, institutional barriers and market structure (Inanga and Emenuga, 1997). Each of this is discussed in turn below.

i. Regulations

The foregoing review has clearly identified the SEC, empowered by the provisions of the ISA (2007), as the main regulatory agency of the entire Nigerian capital market. SEC has as its primary role the regulation of investment and securities business in Nigeria and therefore has the authority to register securities exchanges and securities in Nigeria. It also regulates all other aspects of the securities transactions like public offers, cost of transactions, share buy-backs, trading rules and foreign investments.

Tables A-1 to A-3 in appendix A give the fees chargeable by the Commission on various registrations of market operators, facilities and securities; it also presents the fines to be paid in case of the violation of some registration requirements. Therefore, SEC enforces the provisions in the ISA (2007), makes rules and regulations in accordance with it and imposes fines/penalties on violating operators in the Nigerian capital market.

NSE is the other regulator, especially in regulating members dealing on its floor. It however derives its regulatory roles from that allotted to it by SEC under the ISA (1999). It therefore uses this to make regulations concerning how dealing members should deal with their clients, how and when they should transact business on the Exchange, qualification and characteristics of dealers and prohibited practices on the Exchange. Table 2.1 below indicates the requirements for listing on the NSE.

It is also important to mention that apart from the power that these two regulators derive from ISA (1999), their oversight functions are also influenced by other regulatory institutions, for instance the CBN administers the CBN Act of 2007, BOFI Act of 1991 and Foreign Exchange Act of 1995 and the provisions of these Acts affect banks and other financial institutions listed on the Exchange as well as foreign investment in Nigerian securities. In addition, the Pension Reform Act (2004) identifies the features of instruments that Pension fund administrators should invest in. Hence, SEC and NSE rules often incorporate the provisions of these other Acts, thereby increasing their regulatory functions.

Table 2.1. NSE listing requirements

First-Tier Securities Market	Second-Tier Securities Market	Third-Tier Securities Market
• Company must be registered as a Public Limited Liability Co. under the provisions of the Companies & Allied Matters decree 1990	• Company must be registered as a Public Limited Liability Co. under the provisions of the Companies & Allied Matters decree 1990	• Company must be registered as a Public Limited Liability Co. under the provisions of the Companies & Allied Matters decree 1990
• Must submit to The Exchange financial statements/business record of past 5 years	• Must submit to The Exchange financial statements/business record of past 3 years	• Must submit to The Exchange financial statements/business record of past 2 years
• Date of last audited accounts must not be more than 9 months	• Date of last audited accounts must not be more than 9 months	• Date of last audited accounts must not be more than 9 months
• Amount of money that can be raised is unlimited depending	• Amount of money that can be raised may not exceed ₦100 million	• Amount of money that can be raised may not exceed ₦ 100 million
• Annual quotation fees based on market capitalization	• Annual quotation fees is a flat rate of ₦30,000.00	• Annual quotation fees is nil
• At least 25% of share capital must be offered to the public	• At least 15% of share capital must be offered to the public	• At least 15% of share capital must be offered to the public
• Number of shareholders must not be less than 300	• Number of shareholders must not be less than 100	• Number of shareholders must not be less than 50
• After listing, company must submit quarterly, half-yearly and annual accounts	• After listing, company must submit half-yearly and annual accounts	• After listing, company must submit half-yearly and annual accounts
• Securities must be fully paid up at time of allotment	• Securities must be fully paid up at time of allotment	• Securities must be fully paid up at time of allotment
• Un-allotted securities must be sold on NSE Trading floors	• Un-allotted securities must be sold on NSE Trading floors	• Un-allotted securities must be sold on NSE Trading floors
• Provision for issue of mergers, acquisitions, unit trust and mutual funds		• Full listing to Emerging market must be within 6 – 18 months of listing

Source: SEC (2009)

The provisions of ISA (1999) notwithstanding, a critical examination of the regulation structure in the Nigerian capital market shows that SEC has not been able to effectively discharge its regulatory duties. Often times, NSE gains more prominence and the roles of SEC are suddenly realised only when there is a major problem in the NSE, like fraud, which requires large penalty. This often leaves one wondering whether such problems would not have been averted if the SEC had duly performed its regulatory roles.

In a recent publication, SEC raises the alarm that being answerable to the Ministry of Finance undermines its autonomy and it goes further to admits that it lacks the adequate capacity to implement the provisions of the ISA and effectively exercise its authority over market operators, exchanges, self regulating organisations (SROs) and other market participants, especially as the market has grown rapidly in size and complexity (SEC, 2009). Consequently, there is a need to improve upon the regulatory framework of the Nigerian capital market.

ii. Information disclosure rules and accounting standards

Information disclosure and compliance with accounting standards are germane for investors to make informed decisions on their choice of securities and their values. They also allow for comparability among different securities. There are four important aspects of information disclosure, namely; availability, adequacy, reliability and existence of institutional check and balances to confirm reliability of disclosed information (Inanga and Emenuga, 1997).

In evaluating the availability of information on the Nigerian stock market, it is noted that information disclosure is mandated by several laws reviewed earlier. For instance, the disclosure of accounting records (CAMA, 1990), the provision of prospectus containing true information about a company and the securities it offers to the public (ISA, 2007) and disclosure of market operators interests in quoted companies and their transactions (SEC rules, 2007) are some of these laws. Information can therefore be expected to be available to the extent of compliance with the requirements of these laws and regulations.

Information adequacy may be more difficult to ascertain, since it may be time-variant and relative. However, relative to what Inanga and Emenuga (1997) document on the Nigerian securities market in the mid-1990s, one can conclude that information is relatively more available in the present time. For instance, common information like market prices of companies' shares which they show as not readily available, can now be easily obtained. On information adequacy, it has been shown that there is frequent non-compliance by many listed companies with the NSE's rules on the completeness and frequency of interim and full-year financial reports (SEC, 2009).

Perhaps, the most difficult aspects of information disclosure to analyse are those of reliability and institutions to confirm this reliability. Inanga and Emenuga (1997) show that information disclosure in Nigeria may be unreliable and they give the example of where SEC indicates that in some instances, the claims in the company account differ from the site observations. They go further to show that the certification of auditors notwithstanding, information disclosed may still be misleading. There are other cases where companies already certified as financially sound liquidated just immediately after the certification while in most cases, such acts go unpunished.

Nonetheless, there is no strong evidence to show that the situation has markedly changed since the period when Inanga and Emenuga (1997) carried out their study. In a recent survey by SEC, it is documented that majority of international investors see the process of information dissemination on the NSE as opaque, and that the accounting standards in Nigeria, especially of banks, are very poor. When asked to rate their perception of the NSE against other global peers on a scale of Worst to Best, only 8% of them see the transparency level on the NSE as Fair. A major argument is that NSE delays newly-obtained information on companies which in addition to the fact that most companies' annual reports cannot be obtained on time, renders market research on Nigerian companies unreliable and heightens the likelihood of price manipulations.

Cases of price manipulations and financial impropriety are also still common. For instance, in a press release on July 7th, 2010 by SEC, cases of price fixing, share price manipulation, fraud, illegal buy-backs and insider trading were pressed against 260 entities and individuals taken to court by SEC (SEC, 2010a). The case of one of Nigeria's leading banks is quite illustrative (SEC, 2010b). The case file shows that

between October and November 2007, the Bank obtained credit facilities of ₦30.477 billion from two foreign financial institutions and over a 10-day period in November 2007, it transferred these funds to one of its wholly owned subsidiary in five tranches who also transferred same to a stock broking firm. The stock broking firm then acquired over 620 million of the bank's shares in order to artificially raise the banks' share price in anticipation of a future public offer.

In another development, SEC on 5th August, 2010, in a press statement, raised allegations of financial impropriety and corporate governance lapses in the NSE; and this led to the removal of the Director-General of NSE from the office (SEC, 2010c). Moreover, SEC has observed that the current standards for identifying, terminating and correcting market manipulation in trades are inadequate and that stock market operators, especially stockbrokers, are also able to utilize privileged and confidential client information to "front run" and execute proprietary deals in advance of client trades (SEC, 2009).

The moral of all these is that if this form of illegality is perpetrated by both the regulated and regulators, only to be revealed years after, the reliability of information disclosed during the intervening period is greatly in doubt and the role of the regulator to check the information reliability is also in a greater doubt. Accessibility to timely companies information and annual reports through online means are among the suggested solutions to these problems (SEC, 2009).

iii. Settlement process

The settlement process on the NSE has evolved over time. For instance, in the period prior to 1999, the trading system was the call-over type while the settlement process was manual; therefore, delay was often experienced in the activities on the Exchange. Inanga and Emenuga (1997) document that it would take at least one year between payment for a share and receipt of share certificate in this early period. Beginning from April 1999 however, the market has been operating the Automated Trading System (ATS) which allows dealers to trade through a network of computers. Also, the clearing, settlement and delivery processes are now performed electronically through a new subsidiary, the Central Securities Clearing System Limited (CSCS), established in April 1997 to carry out the following functions;

a. Central depository for share certificate of companies quoted on the NSE.
b. Sub-registry for all quoted securities (in conjunction with registrars of quoted companies).
c. Issuer of central securities identification numbers to stockbrokers and investors.
d. Clearing and settlement of transactions
e. Safe keeping/Custodian (in conjunction with custodian members for local and foreign instruments).

The foregoing developments, and others, can be said to have resulted into some desirable outcomes. For instance, the official T+14 (15 days) settlement/delivery period was replaced with a weekly settlement period in July, 1996 and with the T+3 cycle in March, 2000 and this has been noted to reduced the possibilities of certificate loss and failed transactions. Consequently, the volume and value of cleared and settled transactions, as well as the usage of shares as collateral, have increased (NSE Factbook, 2007). They have also enabled remote trading, thereby allowing brokers to deal in 14 major Nigerian cities. Other related developments targeted at reducing the risk profile of investing in the stock exchange and compete for international investment capital include;

a. the launching in March, 2005 of the trade alert system which provide text messages on the mobile phones of stockholders of any transaction on their stock within 24 hours, and;
b. the commencements in June, 2011 of a phone-in telephone service that enables investors confirm their stockholdings in the exchanges depository.

Despite the foregoing developments, there are still a number of problems identified in the settlement process of the NSE. Some of these as documented by SEC (2009) include;

a. *Delay in the verification of transfer certificates by registrars:* It is believed that some companies use the Registrar office, especially for in-house Registrars, to regulate the supply of their securities to the market and this frustrates the process of transferring securities.

b. *Unnecessarily lengthy issuance procedure:* Public offerings in Nigeria take an estimated period of 27 weeks to be approved (see figure 2.1 below for the process) which has been noted to be longer than that found in most other markets. This process ties up investors' capital without full assurance of full allotment thereby increasing their opportunity cost.

c. *Incomplete electronic process:* Trading, clearing and settlement are electronic but market instructions are still manual and the time taken to verify stocks before trading is still lengthy.

d. *Monopoly of NSE and the collapse of its infrastructure:* NSE is the only functional trading platform and this limits the options available to market operators and issuers, given the frequent collapse of the NSE infrastructure.

In order to underscore the existence of these problems, as at the time of writing this thesis, the NSE website was not operational for a long time and the information that should be obtainable from the NSE website had to be sourced by the researcher through personal contact at the Headquarters and braches of the NSE. The foregoing therefore highlights the need for improved commitment of the regulators of the Nigerian capital market to aspects that can engender its development.

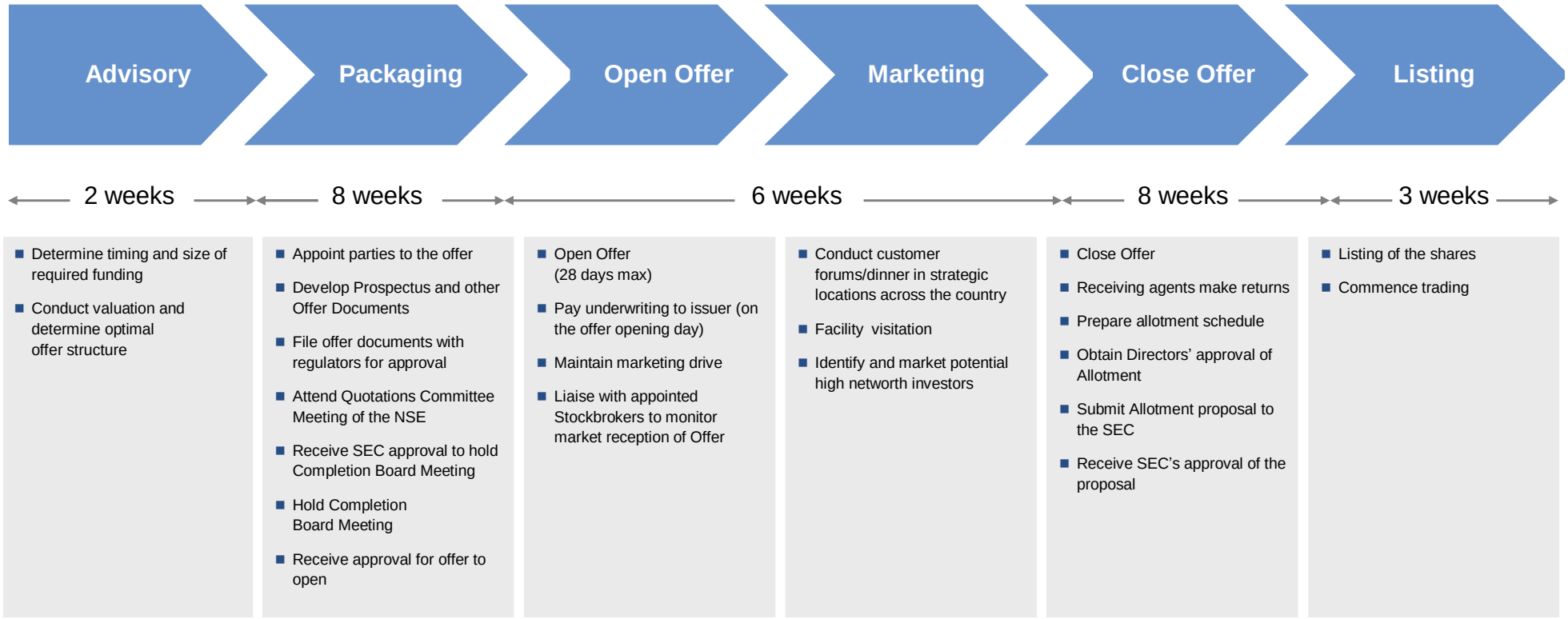

Figure 2.1. Estimated timeline for primary market offers
Source: SEC (2009)

iv. Transaction costs

High transaction costs are disincentives to the activities on the stock exchange and can be used to determine the level of efficiency of a stock exchange relative to other exchanges (Inanga and Emenuga, 1997). Table 2.2 below presents the new[40] transaction charges for both the primary and secondary markets. The table shows that the transaction cost in the primary market segment has recently been reduced by 29% to the new 3.25% value. This is 115 basis points below the 4.4% documented by Inanga and Emenuga (1997) using 1992 data. It is also noteworthy that the transaction cost in the primary market once moved to around 7% but later reduced to 4.3% before the recent reduction to 3.25%. Equally, the transaction cost on the secondary market has been recently reduced to the range 1.12%–1.86% for the buyer and 1.56%-2.19% for the seller. Table A-6 in appendix A shows that this cost structure is yet to change in 2011.

Despite these reductions, the transaction costs on the NSE are still viewed as high and thereby serving as discouragement to companies willing to raise capital as well as frequency of transactions on the Exchange (SEC, 2009). Table 2.3 below highlights this problem by comparing the regulatory costs on the NSE with those of other emerging markets. The table shows that the regulatory costs in Nigeria are, on the average, five times greater than those found in other markets like Chile, Mexico and Brazil.

v. Institutional barriers and market structure

The period prior to 1995 witnessed relatively more barriers to active trading on the NSE than this current period. These include the non-market mechanism for the determination of securities prices[41] and the restrictions on foreign investment in terms of proportion and sector. At the primary sector, the SEC was using two methods to determine prices, namely; the net asset value (total assets less total liabilities) method and the earnings or maintainable profit (average profit capitalised at an expected rate of return in a company's industry) method; either of these would be divided by the total number of shares to obtain the per share value.

[40] Information on the reduced transaction costs was released by SEC on August 12, 2008

[41] The SEC Act No. 17 of 1979 empowered the SEC to determine the prices of securities both at the primary and secondary segments of the market.

Table 2.2. Equities costs[42]

Parties to issues/other Costs	New Fees	Percent Change (Reduction)
	Primary Market	
SEC	0.15% to 0.30%	50%
NSE	0.30%	50%
CSCS	0.0125%	Nil
Receiving Agent Commission	0.75%	Nil
Issuing House Fees	1.35%	10%
Stockbroker to the Issue	0.125%	16%
Registrar Application Fee	N30 per old application; N40/new	Nil
Registrar Take-on Fee	N1 million	Nil
Solicitor to the Issue	0.10% subject to a min of N1m	Nil
Solicitor to the Company	0.05% subject to a min. of N0.5m	Nil
Reporting Accountants	0.10%	Nil
Auditors	0.05%	Nil
Underwriting Fee	Negotiable	-
Corporate Trustees	0.035% to 0.10%	43%
Printing	0.13% per SEC Study	-
Advertisement	For statutory advertisement	-
VAT	-	-
Total Primary Mkt. Cost	**3.25%**	**29%**
	Secondary Market	
Fees	**Buyer**	**Seller**
Brokerage Fee	0.75%-1.35%	0.75%-1.35%
Sec Fee	0.30%	0.00%
NSE Fee	0.00%	0.30%
CSCS Fee	0.06%	0.36%
Contract Stamp	0.075%	0.075%
VAT on Brokerage Fee	5.0%	5.0%
VAT on CSCS Fee	5.0%	5.0%
VAT on NSE Fee	0%	5.0%
Total Sec. Mkt. Cost	**1.123-1.856%**	**1.556-2.186%**

Source: SEC, 2009

Note: with the exception of regulatory fees, all other fees are negotiable

[42] Table A-6 in appendix A provides the 2011 transaction fees on the NSE.

Table 2.3. Primary market regulatory costs for selected Stock Exchanges

Country	Regulatory costs
Chile	0.12%
Mexico	0.20%
Brazil	0.25%
Nigeria	1.21%

Source: SEC, 2009

Since the latter method emphasised the earning capacity of a company, and not just book values, it was more frequently used at this early period. In the secondary market, the offer and bid prices submitted by the stockbrokers were matched to determine share prices. Moreover, in this period, an equity price was disallowed from gaining or losing more than 10kobo on any trading day; and this was later raised to 20kobo in April 1995. This period equally witnessed a lot of complaints on asset mispricing (Emenuga, 1994).

A pioneering effort at solving this problem was the deregulation of pricing on the NSE in January 1993 whereby prices of new shares were allowed to be determined by the issuers and issuing houses, having taken into cognisance the market demand structure. The recent regulation on book-building discussed earlier also evolved from the need to improve on the price determination of new shares, especially in giving due consideration to the wishes of the buyers.

In the secondary market, the determination of share prices is "market" determined. This is because the price determination is left to the forces of demand and supply, though a change above 5% in the price of a share within a single day is discouraged since May 1996. This restriction in price movement as well as the recent decision to move to a 1%/5% up/down limit has been seriously criticised and identified as a reason for low foreign participation on the Nigerian market. Also, there are suggestions that NSE may practice a dual system whereby the share prices of small firms may be subject to the 5% limit rule while those of the highly capitalised firms are allowed to change freely (SEC, 2009).

In the area of foreign participation, the Indigenization Decrees of 1972 and 1977 restricted foreign investment in Nigeria enterprises to 40%. At the enactment of the Nigerian Enterprises Promotion Decree No. 54 of 1989, foreigners could invest up to 100% in Nigerian firms only that their investment were still kept at the 40% level in sectors like banking, insurance, mining and petroleum. However, two laws were enacted in 1995 having as their goals the liberalisation of the Nigerian capital and foreign exchange markets. The first is the Nigerian Investment Promotion Commission **(**NIPC) Act 16 of 1995 which gives a foreigner the same right as a Nigerian to invest in any legal enterprise in Nigeria without limit to the proportion of interest; it also assures foreign investors against any form of government expropriation.

The second legislation is the Foreign Exchange Act 17 of 1995. This Act liberalises dealings in foreign exchange and also places zero restriction on the opening of domiciliary account in Nigeria. Given its provisions, foreign exchange brought into Nigeria is not liable to seizure or explanation and can be transferred unconditionally. It is important to state that this has led to increased foreign participation. This notwithstanding, there are still some areas that require further improvement. For instance, inflows and outflows of funds are expected to be declared to the CBN through the issuance of the Certificate of Capital Importation (CCI) which is issued and retained by the local custodian (Stanbic-IBTC Bank PLC, for instance), however, there are complaints of shortage of CCI paper and at times conflicting information are obtained from the CBN and the custodians (SEC, 2009).

Shares cross-listing is another recent mechanism to aid foreign participation in the NSE. By 2007, three Nigerian Banks have obtained approval to execute Global Depository Receipt (GDR)[43] valued at ₦186.23 billion. Two of these banks, Guaranty Trust Bank (GTB) and Diamond Bank, are now listed on the London Stock Exchange. The effect of such listing is that the local prices of their assets are likely to respond to the happenings in the global economy; and shares of domestic firms may also reflect increased international trend to the extent that they are related to the share of the cross-listed firms; thereby increasing the integration of the Nigerian stock market.

At the regional level, the Nigerian Stock Exchange has been playing significant roles, especially among the member countries of the African Stock Exchange Association (ASEA) and this has led to the signing of Memorandum of Understanding (MoU) between the NSE and Johannesburg Stock Exchange (JSE), Nairobi Stock Exchange, Ghana Stock Exchange and the Egyptian Stock Exchange. Consequent on this, M-Net/Supersport[44] initially listed on the JSE, cross-listed on the NSE in November 1999, and Ecobank Transnational incorporated cross-listed in September, 2006, while in November, 2009, Oando Nigerian PLC also cross-listed on the JSE.

[43] Also American Depository Receipts (ADRs) if in the USA. ADRs/GDRs represent claims on shares held in trust by an off-shore depository. The receipt are registered financial instruments in the country in which they trade and can be issued either for existing shares, or as a part of a new equity issue in order to raise capital (NSE Factbook, 2000)

[44] M-net/Supersports delisted from both JSE and NSE few years later after the acquisition of some of their shares by Naspers Limited

Outside Africa, Nigeria has also made several attempts to create awareness about its stock market and attract foreign investments. A very important tool during this period is the organisation of International Investment Road Shows (IIRS) which has the goal of providing information about the Nigerian market in order to increase the participation of international fund managers in Nigeria. The first IIRS organised in collaboration with the United Nations Development Programme (UNDP) and the New York Stock Exchange was in 2003. In 2004, international road show were organised in Washington DC, Atlanta, New York, London and Nairobi.

The 2005 road shows were organised in London, Nashville, Houston, Newark and Washington DC. Equally, in June of 2006, they were in Atlanta and New Jersey, both in the US. Even in the midst of the global financial crisis, and foreigners' divestment, road shows were still organised in Spain, Italy, Monte Carlo, Malta, Tunisia and Charlotte, USA in 2008. Maybe to highlight the country's desire for foreign investment, the following excerpt from the speech of the NSE Director-General made at the Road show in Houston, USA in 2005 is quoted:

> *"… we shall identify partners that will assist us and the nation build a sustainable capital flow structure which can take us to the next level of market development…and I look forward to the heavy trading activity your orders for shares will bring to our stock market". (NSE, 2005)*

In some of these road shows, top Nigerian government officials like the minister for the Federal Capital Territory, the Director General of the Bureau of Public Enterprises and the Chairman of the Economic and Financial Crime Commission (EFCC) were in attendance to show the depth of government commitment as well as the transparency involved. Equally, the benefits of buying into some privatised Nigerian companies and the newly-consolidating banks were usually emphasised. These efforts could be said to yield some results; as the NSE Factbook (2008) reports that foreign investor injected about $654 million in Nigerian banks between 2005 and early 2006 under the banking consolidation programme, thereby attributing the success of the programme to international inflows.

2.1.3. Performance characteristics of the NSE

The performance characteristics discussed in this sub-section include market size, liquidity, market concentration, return rate and predictability and volume of foreign portfolio investments attracted.

i. Market size

According to Demirgue-Kunt and Levine (1993) the size of a stock market determines its ability to mobilise funds and diversify risk in the economy. Important measures of size include the number of listed securities, market capitalisation, market capitalisation ratio and their respective growth rates. Table 2.4 presents the trends of market size indicators. The table shows that the number of securities listed on the NSE was 260 in the year 2000 and the maximum number of listed securities (309) was recorded in 2007. However, there were 266 securities listed on the stock exchange by the end of the study period and the average number of securities listed per annum during the period 2000-2009 was about 277 securities.

The number of listed companies in the entire period revolved around 200 companies. This pattern depicts that the NSE has not really been growing in terms of the number of securities/companies listed during the period under study. There is therefore an argument that there is a need for more companies to be listed on the NSE (SEC, 2009).

Despite that the total numbers of listed firms in the NSE did not change much during this period; there were still several cases of new listings and delisting. Considering the equity segment of the market, while just one Initial Public Offer (IPO) was witnessed in 2001, there were eight IPOs in 2002, some of which include Mutual Benefits Assurance PLC, Presco PLC and First Atlantic Bank PLC. Further, companies like Dumez Nigeria PLC and Impresit Bakolori PLC delisted from the Exchange and in 2004, five new banks, a tourist company (first time in Nigeria) and an insurance company were added to the list of quoted companies.

Table 2.4. The size of the Nigerian stock market

	Listed Securities		Listed Companies		Market Capitalisation (₦'b)		Capitalisation Ratio (%)	
Years	**Value**	**Growth(%)**	**Value**	**Growth(%)**	**Value**	**Growth(%)**	**Value**	**Growth(%)**
2000	260	-	195	-	472.3	-	10.30744	-
2001	261	0.4	194	-0.5	662.5	40.3	14.02091	36.0
2002	258	-1.1	195	0.5	764.9	15.5	11.06565	-21.1
2003	265	2.7	200	2.6	1359.3	77.7	16.0162	44.7
2004	276	4.2	207	3.5	2112.5	55.4	18.51273	15.6
2005	287	4.0	214	3.4	2900.1	37.3	19.90154	7.5
2006	293	2.1	202	-5.6	5121.0	76.6	27.58477	38.6
2007	309	5.5	212	5.0	13294.6	159.6	64.35782	133.3
2008	299	-3.2	213	0.5	9516.2	-28.4	39.91331	-38.0
2009	266	-11.0	216	1.4	7030.0	-26.1	28.3500	-29.0
Average	***277.40***	***0.37***	***204.80***	***1.19***	***4323.34***	***45.31***	***25.0000***	***20.86***

Source: Author's computation: underlying annual data from CBN Statistical Bulletin, 2009 and NSE Annual Review, 2009

During this period, most IPOs were from banks that were using the Exchange to raise funds in order to meet up with the new government regulation on minimum capital base for Nigerian banks. In the year 2005, there was an increase in the number of companies listed, as seven banks raised capital through IPOs, an Insurance company was also listed, and finally, the listing of Japaul Oil and Maritime services PLC led to the creation of a new equity sector, Maritime.

In the same 2005, United Bank for Africa (UBA) Nigerian PLC and Standard Trust Bank (STB) PLC merged, thus, the latter was delisted. Also in the delisted category was M-Net/Supersport (the only foreign firm cross-listed on NSE). The sharp fall in 2006 was due to the delisting of about 21 banks that were either liquidated or merged or acquired due to failure to meet up with the new capitalisation directive. In the same year, four new sub-sectors were created, namely; Mortgage, Road, Transport, Leasing and following the listing of a new foreign firm, Ecobank Transnational Incorporated, the foreign listing sub sector was re-introduced.

Conversely, in 2007, there were 12 new IPOs, but just one delisting in the equity sector (CFAO Nigeria PLC); thereby leading to an increase in the number of companies listed. In 2008, there was almost a balance in the number of listed and delisted firms. For instance, there were 21 new listings, the forced delisting of nineteen dormant companies and the delisting of an insurance company which was undergoing restructuring. It is equally noteworthy that during this period, quite a number of insurance companies got listed as new laws were also enacted for their re-capitalisation, just like that of the banks'. Fourteen new companies were added in 2009, nine dormant companies were delisted and Universal Trust Bank PLC was also delisted due to its acquisition by Union Bank of Nigeria PLC.

The column on the market capitalisation shows that these values rose from the minimum value of ₦472.3 billion in 2000 to the maximum value of ₦13,294.6 billion in 2007, but it has since then been declining. The rising period was mainly accounted for by price appreciations as many people were becoming more informed about stocks. Other factors included the fact that there were many new issues, supplementary issues and scheme shares, especially by banks. The decline in 2008 was due to the global economic environment around this period. In fact, foreign investors who quickly divested their holdings contributed greatly to the price depreciation. For instance,

foreign investors sold about ₦633.96 billion and ₦185.20 billion worth of securities in 2008 and 2009 respectively (NSE Annual Review, 2008; 2009) and the delisting of several dormant companies, as mentioned above, equally contributed to the decline in market capitalisation.

The last column is the ratio of the market capitalisation to the nation's GDP (capitalisation ratio). This is observed to show the same pattern as capitalisation with the same factors as discussed above influencing their trends. In other words, the relative size of the NSE in the Nigerian economy rose to peak in 2007 but start falling immediately thereafter.

ii. Liquidity

It is easier to trade on liquid stock markets and transaction costs are often lower. Measurements of a market liquidity include the turnover (value of securities traded); value traded expressed as a percentage of GDP and the turnover ratio, which is the value traded as a percentage of the market capitalisation. Table 2.5 shows an upward trend in the major measures of the liquidity of the Nigerian stock market. The importance of the stock market to the whole economy rose steadily from 0.6% in 2000 to about 10.2% in 2007.

The rise in 2008 was due to huge sales in that year even in the face of declining prices and capitalisation. The turnover ratio equally rose but to fall at the latter end of the period due to the global financial crisis. Although the trend depicts a general improvement in the liquidity state of the Nigerian stock market, the level of liquidity is still low when compared with some other EMs and it is a major factor used in explaining the high transaction costs experienced in the Nigerian stock market (SEC, 2009).

Therefore, the NSE is still classified as a market with liquidity problem and this has been noted to be worrisome to investors, especially the foreigners (SEC, 2009). Some of the reasons for this include; the buy-and-hold behaviour of multinational companies, government holdings and uninformed local investors (SEC, 2000), high transaction cost, lack of a functioning derivative market, short trading hours, absence of market makers and short-selling arrangement (SEC, 2009).

Table 2.5. Liquidity of the Nigerian stock market

Years	Turnover (value traded) (₦'b)	Value Traded/GDP(%)	Turnover ratio(%)
2000	28.2	0.6	6.0
2001	57.6	1.2	8.7
2002	60.3	0.9	7.9
2003	120.7	1.4	8.9
2004	225.8	2.0	10.7
2005	262.9	1.8	9.1
2006	470.3	2.5	9.2
2007	2100.0	10.2	15.8
2008	2400.0	10.1	25.2
2009	685.7	2.8	9.8

Source: Author's computation: underlying annual data from CBN Statistical Bulletin, 2009 and NSE Annual Review, 2009

iii. Market concentration

This is the share of the market capitalisation that is due to the most capitalised companies. Based on this definition, the NSE also reports statistics on the 20 most capitalised firms and this study adopts the same definition. An evaluation of Table 2.6 offers some important insights into the concentration structure of the Nigerian stock market. For instance, it is observed that only 43, out of over 200 firms, dominated the market in terms of market capitalization for the period of ten years (2000-2009). Out of these firms, banks like First Bank of Nigeria Plc, Union Bank of Nigeria Plc, and Guaranty Trust Bank (GTB) and non-banks like Nigerian Breweries Plc, Guinness Nigeria Plc and Nestle Nigeria Plc maintained their statuses among the most capitalised throughout the period (Union Bank only skipped a year).

Moreover, Nigerian Banks are observed to have risen gradually to dominate the list of the most capitalised firms. A trend that depicts their number rising from just 5 in 2000 to peak at 14 in 2007; mainly due to the government requirement in July 2004 that all banks should recapitalise which then made many of them source funds from the NSE. A number of them use the NSE to consolidate. However, the capital base of Nigerian firms has been drastically reduced in the global financial crisis period, a fact which is truer for the banks. This has therefore reduced the number of banks in the top 20 category to 10 in 2009.

Another interesting pattern from the table is that international firms that cross-listed in Nigeria are often among the most capitalised firms. M/Net super sport was among the most capitalised firms during the period it was listed on the NSE; equally, the newly-listed Ecobank Transnational Incorporated was also in the list of the top 20. However, their rank among the 20 tended to fall over time. This may suggest that they are initially valued highly; but as time goes on, investors are able to determine their actual worth. It may also suggest that, indigenous firms learn from them to also improve on their own firm value.

Table 2.6. Market capitalisation (₦'b) of the largest Nigerian firms[45]

COMPANY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
First Bank of Nigeria PLC	38.7(1)	47.9(2)	53.4(3)	60.97(5)	94.43(3)	160.10(2)	347.052(1)	889.084(1)	524.848(1)	407.54(1)
Nigerian Breweries PLC	37.4(2)	66.1(1)	114.1(1)	238.83(1)	323.67(1)	293.42(1)	281.705(2)	370.565(9)	308.931(3)	401.00(2)
Union Bank of Nigeria PLC	34.7(3)	42.5(3)	53.6(2)	83.93(3)	93.96(5)	152.01(3)	221.077(4)	498.624(5)	-	81.10(17)
M/Net Supersport	26.5(4)	26.3(6)	24.8(9)	23.63(17)	-	-	-	-	-	-
United Bank for Africa PLC	23.5(5)	19.6(12)	13.1(13)	-	26.92(20)	-	178.689(6)	558.869(3)	283.467(4)	-
Guiness Nigeria PLC	21.6(6)	24.4(9)	31.1(6)	99.11(2)	138.04(2)	113.27(4)	159.277(8)	191.740(16)	146.755(15)	188.05(6)
Unilever Nigeria PLC	19.8(7)	33.0(4)	48.8(4)	55.99(7)	46.91(13)	62.08(13)	-	-	-	70.00(20)
Nestle Nigeria PLC	18.6(8)	27.1(5)	36.7(5)	66.05(4)	79.06(6)	98.80(7)	124.182(13)	182.786(18)	126.455(19)	158.20(9)
PZ Industries PLC	15.2(9)	15.5(13)	13.0(14)	15.91(18)	-	-	66.018(20)	-	-	79.41(18)
Total Nigeria Plc	13.8(10)	21.5(11)	20.4(11)	51.99(8)	61.96(10)	62.14(12)	-	-	-	-
Nigerian Bottling Company Plc	11.9(11)	26.3(7)	30.6(7)	60.42(6)	75.03(7)	84.92(9)	-	-	-	-
WAPCO Plc	11.8(12)	25.2(8)	21.5(10)	31.75(13)	-	51.93(16)	162.10(7)	239.528(13)	-	90.05(15)
Mobil Oil Nig. Plc	11.7(13)	12.4(16)	12.3(16)	34.61(11)	44.23(15)	-	-	-	-	-
Afribank Nigeria PLC	11.3(14)	-	15.4(12)	-	-	42.85(20)	-	186.907(17)	129.801(18)	-
Cadbury Nigeria Plc	10.4(15)	21.8(10)	26.1(8)	48.60(9)	59.05(11)	65.60(11)	-	-	-	-
Agip	8.7(16)	14.8(14)	-	-	-	-	-	-	-	-
Conoil Plc	8.5(17)	10.2(18)	-	39.44(10)	53.92(12)	-	-	-	-	-
Texaco (Nigeria)Plc	7.9(18)	10.1(19)	-	29.03(14)	42.92(16)	-	-	-	-	-
Julius Berger	6.5(19)	-	-	-	-	-	-	-	-	-
Guaranty Trust Bank	5.9(20)	13.4(15)	12.7(15)	32.97(12)	70.14(8)	74.40(10)	145.20(110)	479.625(6)	194.907(12)	289.13(4)
Ashaka Cement Plc	-	12.2(17)	12.2(17)	15.58(19)	-	50.02(17)	80.44(19)	-	-	-
FSB international Bank Plc	-	10.1(20)	12.2(18)	-	-	-		-	-	-

[45] Superscripts indicate the ranks of the firms in each year, (1) is the most capitalised and (20) is the least capitalised.

Flour Mills Nigeria Plc	-	-	12.0$^{(19)}$	-	-	-	100.718$^{(15)}$	-	-	-
Unipetrol Nigeria Plc/Oando	-	-	10.9$^{(20)}$	27.85$^{(15)}$	64.11$^{(9)}$	54.94$^{(15)}$	-	-	-	85.10$^{(16)}$
UBA Plc	-	-	-	26.49$^{(16)}$	-	90.70$^{(8)}$	-	-	-	232.81$^{(5)}$
Intercontinental Bank	-	-	-	15.25$^{(20)}$	28.03$^{(19)}$	99.20$^{(5)}$	145.857$^{(10)}$	752.593$^{(2)}$	243.055$^{(7)}$	-
Zenith Bank Plc	-	-	-	-	94.14$^{(4)}$	99.00$^{(6)}$	226.079$^{(3)}$	533.810$^{(4)}$	368.385$^{(2)}$	341.6$^{(3)}$
Standard Trust Bank Plc	-	-	-	-	44.46$^{(14)}$	-	-	-	-	-
Oceanic Bank Int'l (Nig) Plc	-	-	-	-	37.80$^{(17)}$	60.44$^{(14)}$	143.336$^{(12)}$	435.411$^{(7)}$	267.767$^{(6)}$	-
African petroleum Plc	-	-	-	-	29.81$^{(18)}$	-	-	-	231.888$^{(8)}$	-
Diamond Bank Plc	-	-	-	-	-	47.10$^{(18)}$	-	254.238$^{(11)}$	-	107.12$^{(14)}$
First City Monument Bank Plc	-	-	-	-	-	43.43$^{(19)}$	-	180.30$^{(19)}$	-	116.50$^{(13)}$
Transnational Corp. of Nig.	-	-	-	-	-	-	180.16$^{(5)}$	-	-	-
Ecobank Trans. Inc.	-	-	-	-	-	-	156.649$^{(9)}$	292.250$^{(10)}$	273.396$^{(5)}$	130.40$^{(11)}$
Ecobank Nigeria Plc	-	-	-	-	-	-	108.488$^{(14)}$	172.151$^{(20)}$	201.817$^{(11)}$	76.73$^{(19)}$
Benue Cement Co.Plc	-	-	-	-	-	-	91.575$^{(16)}$			168.41$^{(8)}$
IBTC-Chartered Bank Plc	-	-	-	-	-	-	88.125$^{(17)}$	248.625$^{(12)}$	204.375$^{(10)}$	140.10$^{(10)}$
Spring Bank Plc	-	-	-	-	-	-	81.06$^{(18)}$	-	-	-
Dangote sugar Refinery Plc	-	-	-	-	-	-	-	389.500$^{(8)}$	186.000$^{(13)}$	181.20$^{(7)}$
PlatinumHabib Bank Plc	-	-	-	-	-	-	-	205.197$^{(14)}$	206.387$^{(9)}$	-
Fidelity Nigeria Plc	-	-	-	-	-	-	-	194.765$^{(15)}$	135.837$^{(17)}$	-
Wema Bank Plc	-	-	-	-	-	-	-	-	145.562$^{(16)}$	-
Access Bank Plc	-	-	-	-	-	-	-	-	116.211$^{(20)}$	124.92$^{(12)}$
Total Cap.(N'b)	***344.4***	***480.4***	***574.9***	***1058.4***	***1508.59***	***1806.35***	***3087.79***	***7256.568***	***4295.844***	***3469.37***
Percent of Market Cap.(%)	***72.9***	***72.5***	***75.2***	***77.9***	***71.4***	***62.3***	***60.3***	***54.6***	***45.1***	***49.4***
Percent of Equity Cap.(%)	***73.9***	***74.1***	***76.8***	***79.8***	***78.3***	***71.6***	***73.0***	***70.4***	***61.7***	***69.5***
Number of Banks	***5***	***6***	***6***	***5***	***8***	***10***	***10***	***14***	***13***	***10***

Source: Author's computation: underlying annual data from NSE Annual Review, various issues

Finally, it is shown that the share of the top 20 in the total market capitalisation of the NSE revolved around 70% in the years prior to 2004; after this, their share fell, especially in the crisis period. This depicts that activities in the equity sector of the market is far higher than those in the debt sector. For instance, transactions in the equity sector accounted for 99.86%, 99.85% and 99.94% in the years 2007, 2008 and 2009 respectively; explaining why foreigners' participation is usually found in the equity subsector of NSE. This sharp fall in the share of the most capitalised firm without a corresponding fall in their share of equity capitalisation indicates that the equity sector is the worst hit during the crisis period.

iv. Rates and predictability of returns[46]

The rate of return on (equity) investment is very important to both the investor and the issuer of security in the market. High rate of return often serves as an attraction to both local and foreign investors; however, it also serves as the cost of capital to security issuers. More often, when such returns are predictable, they signal opportunities to earn abnormal profits, thereby reflecting an element of inefficiency. Table 2.7 shows the mean monthly returns (a measure of gain) and standard deviation (a measure of risk) of the NSE all-share-index. The return-risk ratio is also given, while the last panel shows autocorrelation tests to detect returns predictability.

The table shows that the average monthly equity returns on the Nigerian stock market was highest in 2003 (4.42%) and 2007 (4.86%). But the negative returns in the last 2 years of this study period exerted a downward pressure on the mean return for the 10-year period of study to close at 1.4%. Another feature of the table is that, as the mean return was high, so also was the spread of these returns, as measured by their standard deviations. This is characteristic of Emerging Markets (EMs) returns as they are noted to display high expected returns and standard deviations (risk), leading to low risk-adjusted returns.

[46] Note that the analysis in this part uses the all-share-index in order to broadly describe the entire market. However, analyses presented in table 2.13 as well as in the chapter five of this thesis use firm-level data.

Table 2.7. Returns rates and predictability in the Nigerian stock market all share index

Year	Mean	Std. Deviation	Return/risk Ratio	Kurtosis	Skewness	Autocorrelations		
						ρ_1	ρ_2	ρ_3
2000	3.27	4.81	0.68	0.314	0.645	-0.126	-0.049	-0.49*
2001	2.63	4.34	0.60	-1.744	0.059	0.091	-0.393	-0.237
2002	0.92	3.77	0.24	-0.179	0.644	0.168	-0.225	-0.122
2003	4.42	5.09	0.87	-0.288	0.204	0.034	0.023	-0.239
2004	1.72	8.13	0.21	-0.99	-0.193	0.212	-0.113	-0.034
2005	0.19	4.77	0.04	-1.471	0.18	0.194	-0.058	-0.166
2006	2.85	5.88	0.49	4.564*	1.984*	0.128	0.077	-0.085
2007	4.86	4.84	1.01	0.001	-0.725	0.539*	0.298	-0.062
2008	-4.52	9.91	-0.46	4.488*	1.293*	0.124	-0.068	0.087
2009	-2.19	16.32	-0.13	3.46*	1.053	-0.116	-0.077	-0.041
Aggregate	***1.40***	***7.94***	***0.18***	***5.376****	***0.216***	***0.162***	***0.102***	***0.138***

Source: Author's computation: underlying monthly data from CBN Statistical Bulletin, 2009 and Monthly Economic Reports, various issues

Moreover, the normality of Nigerian returns is slightly doubted at the latter end of the study period where the skewness and kurtosis tests are significant. In terms of predictability or weak-form efficiency, the simple autocorrelation test shows that returns on the Nigerian index were hardly predictable. Exceptions are when 3 months past values are used to predict returns in 2000 and a month past value is used to predict current returns in the booming year of 2007.

v. Comparative analysis of the NSE performance with other markets

The analyses so far are based absolutely on the Nigerian market, but further appreciation requires a comparative analysis between Nigeria and other markets. The other markets considered are some EMs that have been found in related studies, others are some industrial markets like UK, US and Japan which serve as a control group. The official liberalization dates of these EMs were very close to one another (late 1980s and early 1990s) and they exhibited roughly similar characteristics in the mid 1990s (Bekaert and Harvey, 2000).

Table 2.8 therefore presents the mean values of some indicators for each of these markets during the study period (2000-2009). The table shows the relatively weaker position of the EM as a group compared with the industrial group in terms of turnover, market capitalization, number of listed companies and the inflow of FPI. Expectedly, returns are higher, though more volatile, across the EM group than the Industrial Markets (IMs) group.

On the one hand, Nigeria records the least values in terms of average turnover, market capitalization and FPI while its average number of listed companies of 205 only exceeds that of Argentina within the EM group. In terms of average annual returns, Nigeria's value of 24.74% is only exceeded by the same Argentina (a country with high inflation rate) and Nigeria also ranks third with average annual currency depreciation (a measure of exchange risk) of 4.95%, falling just behind those of Argentina (23.41%) and Turkey (17.39%).

Table 2.8. Comparative analysis of the Nigerian stock market with other markets (mean values for the period 2000-2009)

Country	Turnover		Mkt. Capitalisation		Num. of Listed Company	FPI		Index Returns		Exchange Rate Change (%)
	($'M)	Growth (%)	($'M)	Growth (%)		($'M)	Growth (%)	Growth (%)	SD	
Emerging Market Group										
Brazil	277157.21	31.74	557455.35	37.22	401.20	107516.23	38.37	18.77	42.83	1.93
Argentina	5557.36	9.60	41285.63	7.86	111.40	2601.57	6.66	27.49	48.59	23.41
Mexico	68005.43	13.44	222117.48	16.62	288.80	67811.41	12.56	21.64	26.82	3.74
Chile	20319.33	33.25	125733.36	21.61	244.30	6352.92	16.49	12.93	21.36	1.28
Malaysia	69966.12	17.99	191440.77	14.40	928.40	24833.04	17.01	5.74	22.54	-2.19
Indonesia	48859.64	31.79	95349.65	36.75	345.30	18457.67	38.89	22.86	38.64	3.22
Korea	1016663.08	19.19	522708.53	29.46	1208.30	140140.59	19.54	14.64	30.17	1.20
Philippines	10602.21	27.99	46517.81	22.06	238.10	7053.15	25.57	7.97	32.44	2.29
Taiwan	753902.46	2.49	437098.99	16.83	670.40	83874.58	26.93	2.84	24.79	0.31
Thailand	86856.33	28.14	108624.12	32.61	465.20	23729.54	27.87	14.26	47.26	-0.81
Greece	76114.33	8.64	130387.97	8.90	307.80	26268.38	37.78	0.03	35.88	-11.21
Turkey	183512.80	12.32	128053.69	29.36	306.90	19663.38	37.58	22.87	44.71	17.39
Nigeria	5094.68	72.97	33686.22	41.65	204.80	290.03	130.58	24.74	38.24	4.95
Industrial Market Group										
U.K.	5510465.68	1.73	2732724.38	5.35	2860.10	1079197.87	7.30	-1.76	19.91	0.73
U.S	16962069.06	9.43	12136403.21	2.72	2297.20	1559150.18	8.52	0.23	22.58	0.00
Japan	3718197.45	10.14	3394159.91	3.07	2280.80	690898.15	14.77	-1.57	27.14	-1.65

Source: Author's computation: FPI data from IMF CPIS database, price return data from the Standard and Poor database, and others are from the World Federation of Exchanges database

On the other hand, the growth rates of turnover, market capitalisation and FPI are relatively higher in Nigeria. A finding explainable by the increased activities experienced in the Nigerian stock market during the banking consolidation era. During this period, the NSE experienced more IPOs, higher foreigners' participation and many more Nigerians were sensitised on the investment opportunities available in stocks. Consequently, turnover rose sharply while increased share listings and price appreciations led to higher market capitalisation. Equally, the high foreign divestment and panicky sales witnessed during the global financial crisis raised turnover rate in that period.

Table 2.9 depicts the correlations of the market returns of some EMs with those of some Industrial Markets (IMs) and this gives an indication of how integrated each one of them is with the world. It is observed that countries like Brazil, Mexico and Republic of Korea possess relatively higher correlation coefficients with the IMs and the global index (Morgan Stanley Capital International, MSCI global index). Interestingly, this group also constitutes the relatively more developed markets in terms of size, liquidity and ability to attract FPI. Returns on the Nigerian index correlate least with those of IMs (Nigeria's average correlation value of 0.30 is the least among the EMs). Thus, this can explain the relative underdevelopment of the Nigerian market and at the same time qualifies Nigeria as the potential destination of huge flow of FPI in the future.

2.1.4. Foreign Portfolio Investments (FPI) in the NSE

Several attempts are made in this section to describe the activities of foreign investors in the NSE. Data on FPI can be difficult to obtain (see UNCTAD, 1999; Rao et al, 1999 and IMF CPIS Guide, 2002), and this difficulty can even be larger for an EM like Nigeria that does not have a consistent/reliable database on foreign investors on the stock market. In order to solve this problem, multiple sources are discussed with a view to providing a somewhat complete story. The first source enables one see FPI as documented from the receiving end, the second source allows one to identify the country of origin of FPI into Nigeria and the third source allows one see some specific FPI Funds that have interest in the Nigerian market.

Table 2.9. Correlations between monthly returns of EMs and the world

	Developed markets and the world				
Emerging market	**UK**	**US**	**Japan**	**MSCI**	**Average**
Nigeria	0.36	0.25	0.24	0.34	**0.30**
Turkey	0.62	0.65	0.42	0.67	**0.59**
Greece	0.73	0.63	0.48	0.72	**0.64**
Thailand	0.56	0.51	0.55	0.60	**0.56**
Taiwan	0.54	0.56	0.38	0.63	**0.53**
Philippines	0.44	0.44	0.35	0.48	**0.43**
Korea	0.62	0.71	0.59	0.76	**0.67**
Indonesia	0.58	0.51	0.46	0.60	**0.54**
Malaysia	0.56	0.50	0.35	0.58	**0.50**
Chile	0.69	0.62	0.43	0.69	**0.61**
Mexico	0.74	0.80	0.55	0.82	**0.73**
Argentina	0.53	0.45	0.35	0.53	**0.47**
Brazil	0.76	0.71	0.48	0.78	**0.68**

Source: Author's computation: underlying monthly data from Standard and Poor and MSCI

i NSE Data on foreign portfolio investments

Foreign portfolio investors deal directly with the stock brokers in the Nigerian stock market and since there is no legal limit to foreigners' shareholdings[47] in Nigeria, there is little incentive for NSE to monitor foreigners' activities on the Exchange; although they may do when their activities are expected to have a very large market impact. As a part of its own achievement record, the NSE periodically (usually on annual basis) asks stock brokers to supply information on their activities on behalf of foreign clients. The addition of such figures is what is presented in table 2.10.

The table shows a sharp increase in FPI inflow in the period between 2004 and 2007 when Nigerian banks and insurance companies came to the stock market to source funds for their recapitalization in the period. Foreigners' purchase of Nigerian securities fell sizably in the period of the global financial crises, and their sales were quite enormous. It is equally observed that inflow as percentages of market capitalisation and turnover was highest in the year prior to the beginning of the crisis.

One interesting finding from the table is that in the period of the crisis, the share of FPI flow in market capitalisation rose sharply. This may imply either or both of two things. It may be because of the drop in the value of securities and such that any new investment relative to the already fallen market capitalisation will appear big. Another explanation is that it is possible for some form of FPI flows or institutions to make strategic large purchase of some stocks during crisis period. This counter-behaviour is likely to be good for the market as they may help revaluate the securities (Choe et al, 1999 and Kim and Wei, 2002).

[47] It appears that countries with restrictions to foreign ownership have better database on FPI investors

Table 2.10. Purchases and sales[48] of Nigerian securities by foreigners

Years[49]	FPI Inflow		FPI Outflow		Percent of Mkt. Cap.(%)		Percent of Mkt. Turnover (%)	
	(₦'b)	(US$'m)	(₦'b)	(US$'m)	Inflow	Outflow	Inflow	Outflow
2000	1.251	12.20	-	-	0.26	-	4.44	
2001	0.448	4.00	-	-	0.07	-	0.78	
2002	0.968	8.00	-	-	0.13	-	1.61	
2003	1.000	7.57	-	-	0.07	-	0.83	
2004	8.000	59.51	-	-	0.38	-	3.54	
2005	10.00	75.29	-	-	0.34	-	3.80	
2006	35.00	272.35	-	-	0.68	-	7.44	
2007	256.0	2036.54	-	-	1.93	-	12.19	
2008	153.5	1289.96	633.96	5327.57	1.61	6.66	6.40	26.42
2009	204.2	1363.53	185.20	1236.66	2.90	2.63	29.78	27.01
Total	***680.59***	***5249.49***	***819.16***	***6564.23***	***1.53***	***1.84***	***10.62***	***12.78***

Source: Author's computation: underlying annual data from NSE Factbooks and NSE Annual Reviews, various issues

[48] FPI outflow are unreported by NSE until the shock received from the major outflow in 2008

[49] Nigerian stock market was liberalised in 1995 (Bekaert and Harvey, 2000). Data for 2001 and 2002 obtained from IMF CPIS.

ii. IMF Coordinated Portfolio Investment Survey (CPIS) data

Realising the difficulty involved in obtaining reliable data on FPI, the IMF organized the first internationally Coordinated Portfolio Investment Survey (CPIS) in 1997 with a view to enabling the standardization of FPI measurement. A benchmark survey was carried out in 2001 and the survey is now executed on an annual basis. A major strength of the CPIS over the NSE data[50] is that it enables one to trace the origin and destination of FPI in the world. The results for Nigeria are extracted from each year's tables and presented in table 2.11. The table shows that the total amount that flowed into the Nigerian equity market during the period of 8 years captured by the CPIS so far is $2,320.273 million; about half of this is from Mauritius[51]. It is also shown that funds flowed consistently into the NSE from Luxembourg throughout this period.

In corroboration of the earlier finding, inflow of FPI rose in the 2005-06 period, thus depicting FPI roles as aiding the IPO and supplementary listings of the Nigerian banks and some privatised enterprises. Interestingly, FPI into Nigeria rose sharply in the year prior to the crash of the Nigerian stock market; and the huge outflow in 2008 definitely worsen the situation. Despite the crash which saw a huge outflow of FPI from the nation's stock market, the Mauritius source became stronger, same for the Italy source which increased sharply. The two sources actually compensated for the loss from other sources. A likely explanation for this is that these were among the countries where the IIRS, discussed earlier under the sub-section on 'institutional barriers and market structure', were organised in the crisis years. It is also possible that some foreign investors from these countries took advantage of the undervaluation of Nigerian stocks during the crisis period (Oteh, 2012).

[50] The NSE figures are larger than the CPIS probably because the latter does not report some flows for various reasons (see note to the table). But as a reliability test, a spearman rho of 0.9 is obtained between the two series.

[51] The Mauritius case is interesting as Rao et al (1999) have documented that some US Investment Funds operate several offices in Mauritius.

Table 2.11. Sources of portfolio investment assets (equity securities) into Nigeria ($'m)

Source Country[52]	YEARS								
	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**Total**
Canada	....	0.000	0.000	0.000	0.000	0.000	15.8891	9.28868	***25.178***
Cyprus	0.000	0.000	0.000	0.000	0.000	0.000	13.0031	0.02639	***13.029***
Denmark	0.000	0.141	0.000	0.000	0.000	3.00279	13.9893	4.91968	***22.053***
Egypt	2.4	2.6	5.5	5.5	5.5	5.5	5.5	5.5	***35.6***
France	0.000	0.000	0.000	0.000	....	....	4.72544	1.52391	***6.249***
Germany	0.000	0.000	0.000	0.000	0.000	0.000	8.8326	2.7834	***11.616***
Guernsey	0.000	0.000	0.000	0.000	5.234	18.713	90.236	7.944	***122.127***
Italy	0.03112	1.0487	0.000	0.000	0.63498	0.38352	2.15766	100.36	***104.585***
Japan	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	***0.000***
Jersey	....	....	....	23.1768	29.2723	100.113	....	....	***152.562***
Rep. of Korea	0.000	....	....	....	....	0.000	0.000	0.79	***0.79***
Luxembourg	1.65578	4.00674	2.47255	8.27466	17.9348	22.9961	184.742	86.2854	***328.368***
Mauritius	0.05	0.1	5	7.9	84	126	307	579.5	***1109.55***
Netherlands	0.000	0.000	0.000	0.000	5.8985	9.1913	7.3605	37.5759	***60.02624***
S/ Afr	....	....	....	....	1.73913	32.4247	90.7489	90.274	***215.187***
Sweden	....	....	0.000	....	....	1.59053	30.4247	7.21212	***39.228***
UK	0.000	0.000	0.000	0.000	(c)	20.8389	41.0533	7.69127	***69.584***
US	....	....	....	(c)	....	....	....	....	***...., (c)***
Others	-- , ... , (c)	-- , ... , (c)	-- , ... , (c)	-- , ... , (c)	-- , ... , (c)	-- , ... , (c)	-- , ... , (c)	-- , ... , (c)	***-- , ... , (c)***
Total	4.22037	7.89664	12.9725	44.8549	150.274	340.754	817.56	941.741	***2320.273***

Source: IMF Coordinated Portfolio Investment Survey Database

Symbol Key		
-- Indicates a zero value or a value less than US$ 500,000	**....** Indicates an unavailable datum	**(c)** Indicates that a non-zero datum was not disclosed for reasons of confidentiality

[52] the data are derived from the creditor (source country) side

iii. Specific foreign portfolio investors in Nigeria

Obtaining data on some specific Investment Funds may also be informative towards the characterisation of the behaviour of FPI investors in Nigeria. Large Funds exist in the US and there are reasons to believe that a lot of funds flowed into the country from this source. The fact that IIRS were organised in some states of the US also buttresses this belief. However, the CPIS data excludes the information from the US market mainly for confidentiality reasons (see table 2.11). Since Nigeria does not keep adequate data on these investors[53], a procedure described in Rao et al (1999)[54] was adopted. Using this procedure, 310 files were identified out of which 32 involved transactions in Nigeria; however, 24 were deals in the Central Bank of Nigerian debt securities, hence, excluded. Table 2.12 presents information extracted from the remaining relevant 8 files.

The table shows some interesting results, especially as they corroborate some of the earlier findings. Three Funds are identified with their activities ranging from 2007 till date. They are; Morgan Stanley Emerging Market Fund, Inc., Morgan Stanley Frontier Emerging Markets Fund, Inc., and First Trust/Aberdeen Emerging Opportunity Fund.

Panel 1 shows that between the third quarter of 2008 and first quarter of 2009, Morgan Stanley Emerging Market Fund Inc. increased the share of Nigeria in its investment portfolio from 0.3% to 0.5%. The Fund's interests are in the GDRs of GTB Nigerian PLC. It should be noted that GDRs/ADRs are new products employed by Nigerian firms (specifically, three banks so far; the other two are Diamond bank PLC and United Bank for Africa PLC) to source funds outside the country and the subscription of a fund like Morgan Stanley is encouraging.

[53] As foreign portfolio investors deal directly with stockbroking firms and there are no legal barriers to the volume of shares they can hold, the NSE has less incentive to obtain and keep detailed records of their operations. Investigations show that although the NSE expects the stockbrokers to periodically notify it of transactions on behalf of foreign clients, the stockbrokers are not under obligation to do so, hence only few of such firms normally comply. However, following the recent market crash, the Exchange is now becoming more interested in documenting these transactions.

[54] US investment Funds are required under law to file a form (FORM N-Q) with the US-SEC which is a quarterly schedule of their portfolio holdings; and these files are downloadable from the Commission's website. The procedure therefore is to access all the files from year 2000 till date, with interest particularly in the activities of Funds whose names contain words like; Nigeria, Africa, Emerging, Frontier, Global, International etc. Among all files so identified, the word 'Nigeria' is string-searched within the body of every record; and the outcome of this is summarised in the following table.

Table 2.12. Activities of some US investment funds in Nigeria

PANEL	Fund's name	Filing period	Share in Nigeria	Instrument	Companies	Share Volume	Value ($'000)
1	Morgan Stanley Emerging Market Fund Inc.	30/09/08	0.3	GDR	Guaranty Trust Bank PLC	105,370	737
		31/03/09	0.5	GDR	Guaranty Trust Bank PLC	132,720	1,983
2	Morgan Stanley Frontier Emerging Markets Fund, Inc	31/01/09	5.2	Stocks	Nigerian Breweries PLC	4,704,000	948
					United Bank for Africa PLC	14,390,800	645
					Dangote Sugar Refinery PLC	14,719,100	998
					Oando PLC	2,126,600	775
		31/07/09	8.2	Stocks	Nigerian Breweries PLC	3,248,273	1089
					Access Bank PLC	12,596,000	515
					Guaranty Trust Bank PLC	10,036,050	899
					United Bank for Africa PLC	25,556,361	2088
					Dangote Sugar Refinery PLC	10,923,200	1272
					Oando PLC	2,059,600	1196
		31/01/10	11.1	Stocks	Nigerian Breweries PLC	3,248,273	1165
					Access Bank PLC	24,034,800	1131
					Guaranty Trust Bank PLC	13,519,624	1594
					United Bank for Africa PLC	25,556,361	2108
					Oando PLC	4,575,700	2849
					First Bank of Nigeria PLC	9,261,511	903
3	First Trust/Aberdeen Emerging Opportunity Fund	30/09/07	0.7	GTB Finance BV[55]	Guaranty Trust Bank PLC	-	960
		31/03/08	1.1		Guaranty Trust Bank PLC	-	950
		31/03/10	0.7		Guaranty Trust Bank PLC	-	813

Source: Extracted from Form N-Q filed with the Security and Exchange Commission USA

[55] The GTB Finance B.V was launched on January 22nd, 2007 for a 5-year period and it was the first dollar denominated Eurobond issued by a Nigerian company in the global market and it was valued at $350million. The bank also undertook a $750million GDR offer in the same year. Both are traded on the London Stock Exchange

Panel 2 depicts the investment behavior of Morgan Stanley Frontier Emerging Markets Fund, Inc. especially in the Nigerian equity sub-sector. Similar to the above evidence, this Fund has increased the Nigerian share from 5.2% in the last quarter of 2008 to 11.1% in the last quarter of 2009. Highly capitalized Nigerian firms like Nigerian Breweries PLC, Access Bank PLC, Guaranty Trust Bank PLC, United Bank for Africa PLC, Dangote Sugar Refinery PLC, Oando PLC and First Bank of Nigeria PLC, are often the targets. Finally, First Trust/Aberdeen Emerging Opportunity Fund invests solely in the GTB Finance BV, as shown in the last panel.

The above analysis offers some lessons. First, it can be stated that the introduction of new instruments in the Nigerian market is likely to increase the flow of FPI into Nigeria, and consequently, the integration of the Nigerian market into the world. In as much as there are innovations in the market, in one form or another, integration status of the Nigerian market can never be said to be static; therefore, the changing investment opportunity set needs to be incorporated by studies on the Nigerian stock market. Second, banks in Nigeria are likely to attract more FPI, although other highly capitalised firms, like the Nigerian Breweries are also potential candidates. In short it appears that FPI investors in Nigeria target large firms as all the investments by these US Funds are into the list of the 20 most capitalised firms.

Therefore, apart from incorporating the changing investment opportunity condition, it may also be informative for empirical analysis on Nigeria to check for the sensitivities of results to firm size and whether firms are in the financial or in the non-financial sectors.

2.2. Exchange rate policies in Nigeria

The analysis of exchange rate policies in Nigeria can be categorised into the pre-SAP and post-SAP (including SAP) periods; and the former can further be categorised into the fixed regime of 1960-1970, the adjustable peg regime of 1974-1978 and the managed float regime of 1978-1985 (Oyejide and Ogun, 1995). In the 1960-1970 period, the Nigerian currency was fixed to a given gold value under the Bretton Wood System, just like the British pound and the American dollars. However, when these other countries were devaluing their currencies to achieve favourable Balance of Payments (BOPs), Nigeria was more interested in maintaining a strong local currency until the oil glut of 1976-1978 when it was realised that the relative appreciation was unsustainable; therefore, a system of currency basket had to be adopted for the naira exchange value in 1978 (Oyejide and Ogun, 1995).

Moreover, as part of SAP objectives of ensuring BOPs and fiscal viability, there was the need to allow market forces to determine the exchange rate; thus, the Second-tier Foreign Exchange Market (SFEM) was introduced in September, 1987 as an auction process for the determination of an appropriate exchange rate for the naira. It was therefore expected that SFEM operation would make foreign exchange (FOREX) management less costly to administer and more efficient to operate. In the early stage of its introduction, SFEM co-existed with the former First-tier Foreign Exchange Market (FFEM) with the latter not being an auction system but just an arrangement whereby the CBN supplied foreign exchange to the bearers of applications that have received prior exchange control approval; therefore, it was a fixed exchange system (Odubogun, 1995).

In July, 1987, FFEM and SFEM were merged into Foreign Exchange Market (FEM) which was an auction system but also enabled authorized dealers to transact foreign exchange business with one another independent of the FEM. By March 5, 1992, the system of pre-determined quotas was discontinued; hence, naira was allowed to completely float. However, given the high demand pressure for foreign exchange, this procedure was stopped and the guided deregulation method was adopted in 1995 under the Autonomous Foreign Exchange Market (AFEM).

AFEM was not without its own problems, as it encouraged high speculative activities and sharp practices; for instance, it was noted that the authorized dealers kept the autonomous rates permanently high, reflecting a faster depreciation of the naira in the autonomous market than in the official foreign exchange market (Odubogun, 1995). This therefore led to its conversion to the Interbank Foreign Exchange Market (IFEM) on October 25th 1999. IFEM was designed to encourage the funding of interbank operations from privately-earned foreign exchange; hence it was a two-way quote system that intended to diversify the supply of foreign exchange in Nigeria. The IFEM however suffered from the shortage of supply of foreign exchange.

In the recent times (2000 till date, also the period of the present study), the need to achieve stability in the foreign exchange market is still crucial, and to ease the pressure on the CBN as the sole supplier of foreign exchange, on December 8th 2000, the transferability of IFEM funds between the authorised dealers was restored. However, given the continuously high demand pressure on foreign exchange and the need to conserve the falling external reserves, IFEM was replaced with the Dutch Action System (DAS) of exchange market on July 22nd 2002. Under DAS, the CBN determines the amount of foreign exchange it is willing to sell at the price that buyers are willing to buy and the rate that clears the market (marginal rate) represents the ruling rate at the auction.

Since the inception of DAS, the country's monetary authority has been able to reduce the arbitrage premium in the market and ensure the general stability of the naira. Some reported evidence may underscore this; at its introduction, the difference in the premium between the IFEM/DAS and the parallel market fell from 18.2% in 2001 to 13.5% in 2002 (CBN, 2002) and the DAS-Bureau de Change (DAS-BDC) premium rate fell to 5.5% in 2004 from its 2003 value of 9.8%. In addition, nominal exchange rate appreciated and real exchange rate was relatively stable in the 2004-2005 period. Equally, the Nigerian economy has successfully attracted significant inflows of autonomous foreign exchange under the DAS (CBN, 2003).

In order to consolidate on its achievements, the DAS was upgraded to the Wholesales Dutch Auction System (WDAS) on 20th February, 2006; here, authorised dealers are required to bid for foreign exchange on their own account and they are also free to deal with such funds in the interbank market. WDAS also allows for the direct sales of

foreign exchange (FOREX) to licensed BDCs operators starting from April, 2006 so as to increase the access of small end-users to foreign exchange. Its introduction has also made better the stability of the naira and the unification of official exchange rate and the inter-bank exchange rate. This improved performance continued up till the last quarter of 2008 when the market witnessed heightened demand pressure as a result of the huge portfolio divestment by foreign investors in the global financial crisis period.

Three episodes of exchange rate changes[56] are therefore identifiable in Nigeria during the period of this study. In the first period (January 2000 to November 2003), naira depreciated against the dollar; in the second period (December 2003 to March 2008) naira appreciated against the dollar; but at the inception of the global financial crisis, the value of naira experienced a sharp fall against the dollar and this occurs to almost the end of the period of study (April 2008 to December 2009).

Table 2.13 shows the trend of the naira-dollar exchange rates between 2000 and 2009. It is important to note that the periods when naira depreciated highly are also the periods of high inflation rate; for instance, naira depreciated from ₦126.90/$ to ₦137/$ between 2002 and 2003 and in this period, inflation rose from 12.14% to 23.84%. Conversely, when naira appreciated from ₦128.27/$ to ₦117.97/$ between 2006 and 2007, inflation rate fell from 8.57% to 6.56%.

The latest development in the country's foreign exchange market is the introduction of the Wholesales Dutch Auction System-Forward (WDAS-FWD) market at the end of March, 2011. Under this market, hedging products like the European-styled Foreign Exchange Options, Forwards, Swaps and Cross-Currency Interest Rate Swaps were approved by the CBN. The goal of this approval is to offer risk management support to the exchange rate risk exposures of the end-users (CBN, 2011).

[56] "Episodes of exchange rate changes" is used to represent those periods when the pattern of exchange rate changed. This will be more appropriate than the use of "exchange rate regimes" as the latter is likely to connote a wrong impression that Nigeria switched among floating, managed floating and fixed regimes during the study period.

Table 2.13. Trend of inflation and exchange rates in Nigeria

	Inflation Rt. (%)	Ex-rt (N/$)
2000	14.53	110.05
2001	16.49	113.45
2002	12.14	126.90
2003	23.84	137.00
2004	10.01	132.85
2005	11.57	129.00
2006	8.57	128.27
2007	6.56	117.97
2008	15.10	132.56
2009	12.10	149.58
Average	***13.09***	***127.76***

Source: Year-end value from CBN Statistical Bulletin, 2009

2.3. Exchange rate risk and stock returns in Nigeria

The analysis in this section is classified into two subsections. The first subsection tests the presence of exchange risk in Nigeria by providing a graphical test of relative PPP while the second subsection presents the performance of the 200 firms sampled from the NSE in terms of their risk and returns. Also, the measures of risk and returns are expressed in US dollars so as to see the extent that they are affected by exchange rate movements.

2.3.1. Evidence of exchange risk: a graphical test of relative PPP in Nigeria

Deviation from PPP, especially in the short-run, has been documented to imply the existence of both exchange risk and inflation risk (Adler and Dumas, 1983). As a preliminary analysis, it is necessary to verify if there were actually deviations from the PPP conditions during the period selected for this study. Figure 2.2(a) is on the trend (EX_RT) and percentage changes (EX_RT_GR) in the naira-US dollars bilateral exchange rate. As depicted in the figure, the percentage changes in exchange rate was higher in the periods of naira depreciation (2000-2003 and 2008-2009) than in the period of naira appreciation (2004-2007), suggesting higher exchange risk during depreciations. Equally, an examination of the trend of inflation rate in Nigeria *vis-a-vis* that of the US, as shown in figure 2.2(b), depicts both a higher and more varied pattern in the case of Nigeria. This therefore provides a justification for using measures of real exchange rate (Carrieri and Majerbi, 2006).

Furthermore, figure 2.3 provides a graphical test of the relative[57] version of PPP. From the figure, the rates of change in the exchange rate (DLNE) tend to follow that of their PPP values (DLNPNG_DLINPUS) during this period, safe for some short-run deviations. For instance, in the first period of naira depreciation, the exchange rates fluctuated more widely than their PPP values. Conversely, in the period of naira appreciation, exchange rates tend to be relatively more stable than their PPP values. But given the sharp depreciation of the naira in the crisis period, the relatively wider fluctuation of exchange rate resumed. It can therefore be concluded that during periods of naira depreciation, exchange rate overshoots its PPP value, but in periods of stable relative price levels, naira tends to appreciate more steadily.

[57] It has been argued that this version is expected to hold even in the presence of distortions like transport costs, imperfect information, tariff and other non-tariff barriers (Pilbeam, 2006; 127).

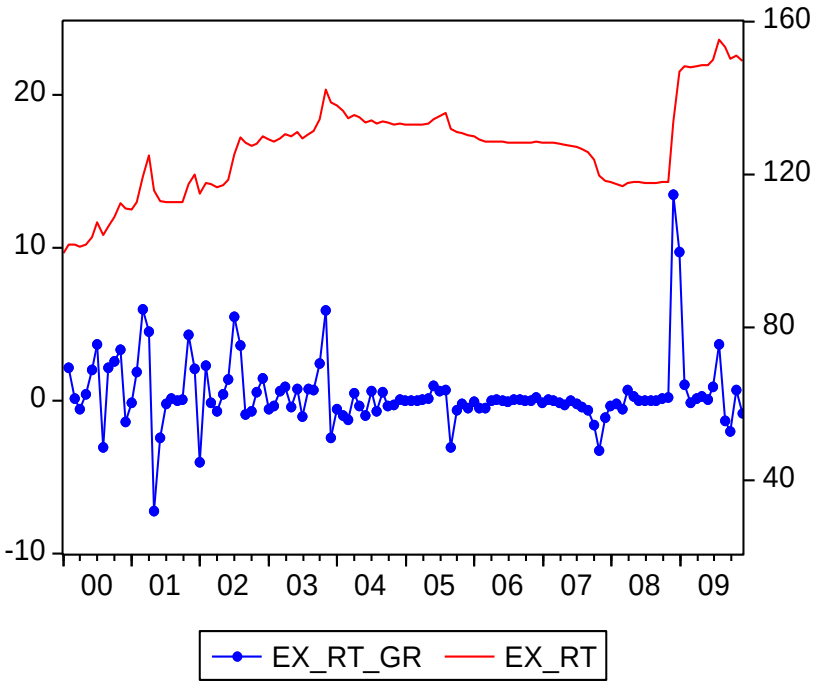

Figure 2.2a. Trends of ₦/$ exchange rates and its growth rate

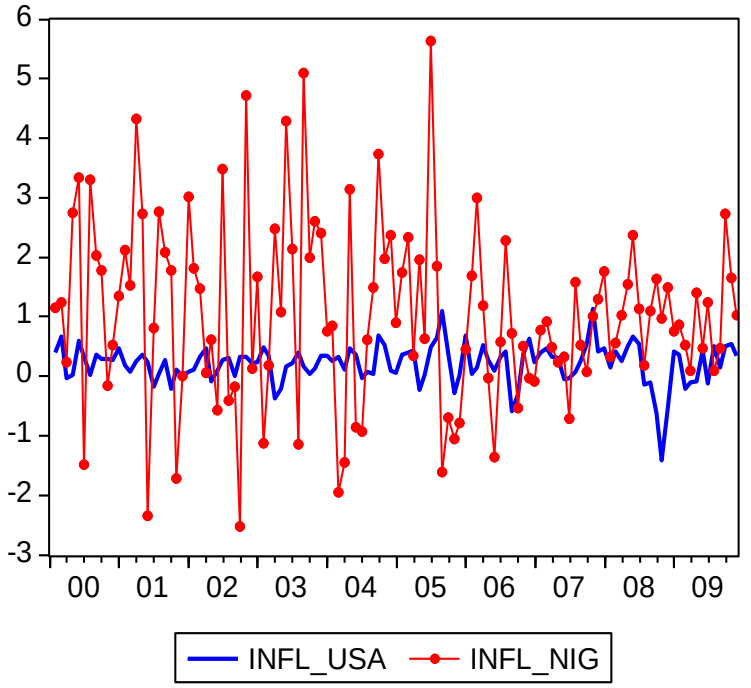

Figure 2.2b. Trends of the US and Nigerian inflation rates

Source: Author's drawn: underlying monthly data from the World Bank Database

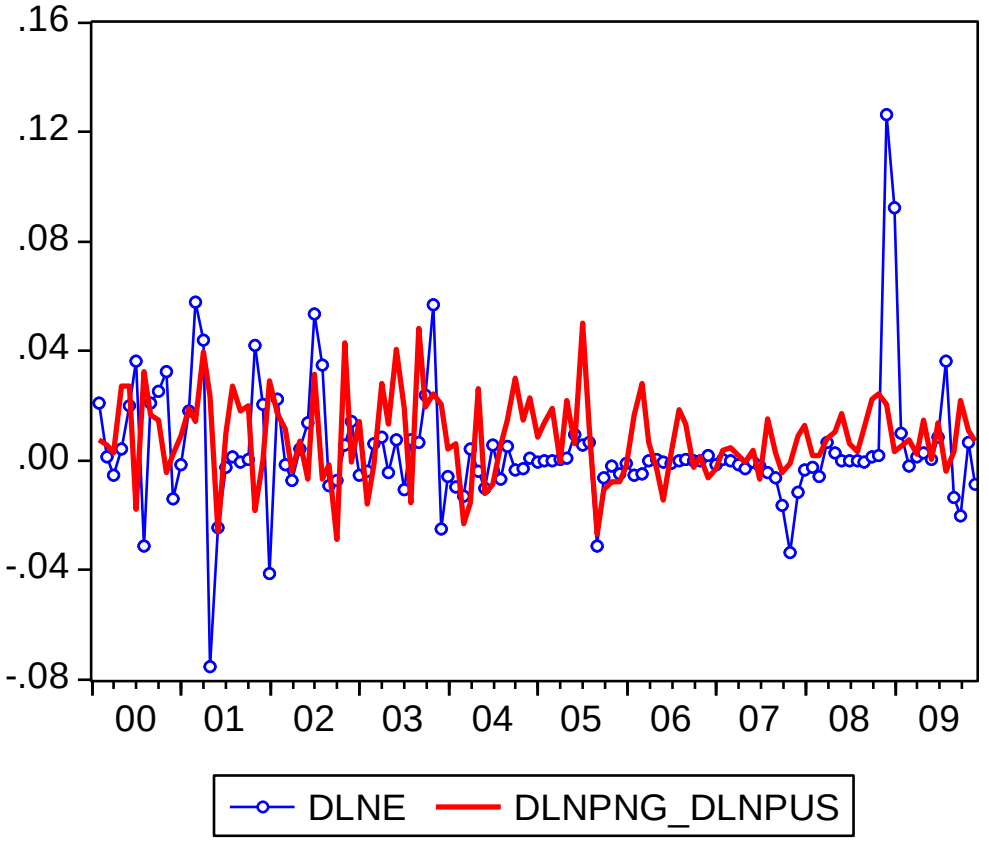

Figure 2.3. Graphical test of relative PPP

Source: Author's drawn: underlying monthly data from the World Bank Database

2.3.2. Descriptive analysis of return and risk of Nigerian firms

Table 2.14 shows information on average returns, average excess returns and their standard deviations (measures of risk) for different classifications of Nigerian firms for the entire period. The classifications[58] are carried out at the levels of NSE industrial classification, size, sector and the entire market. These are done both in terms of naira and US dollars so as to have a descriptive understanding of the nature of risk posed by exchange rate fluctuations to international investors.

The column on naira returns shows that the mean monthly industrial (un-weighted) returns vary widely and range between -1.14% (foreign listing) and 4.64% (Chemical and Paint) for the entire period. It is also observed that the sector with the highest mean returns has the highest risk, thereby confirming the relationship between risk and returns. Other industries with relatively high returns and standard deviations are airline services (4.02%), industrial domestic (3.63%), footwear (3.60%), conglomerates (3.12%) and computer and office equipment (3.08%). Panel B of the table shows that returns and risk increase with size up to the third quartile. Equally, it is shown that the average monthly returns are slightly higher in the non-financial sector (2.00%) while the average monthly return for all firms in the entire period is 2.16%.

The pattern discussed above is also observable when returns are expressed in dollars. A major difference however, is that dollar returns are lower than their naira equivalent in all cases for the entire periods. Taking the average returns on all stocks as an example (Panel D), the monthly dollar return is 0.28% (3.36% when annualised) lower than the naira returns. When this is combined with the fact that dollar returns exhibit higher risks than naira returns, it clearly shows that foreign investors are at a disadvantage when exchange rates fluctuate. Moreover, a much more relevant measure of performance for the foreign investor will be the Sharpe ratio[59] in dollar terms which is a measure of risk-adjusted performance.

[58] This should not give an impression that portfolio returns are used for estimation later in the empirical analysis. The values presented are just the average of all firms under each classification since including all firms in the body of this thesis will be space consuming.

[59] The Sharpe ratio is the ratio of mean excess return to standard deviation, given as $E(R_i)-R_f \big/ \sigma(R_i)$; where $E(R_i)$ is the expected return on security i, R_f is a measure of risk-free rate and $\sigma(R_i)$ is the standard deviation of returns on security i. It has been found to yield a better description of any security than the mean return alone as it answers the question on how much more mean return can an investor earn by taking a bit more volatility in her portfolio (Cochrane, 2001).

Table 2.14. Return and risk of Nigerian firms (Jan. 2000-Dec. 2009)

	Naira Returns (%)		Dollar Return (%)		Naira Excess Returns (%)			Dollar Excess Returns (%)		
Sector	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Sharpe Ratio**	**Mean**	**SD**	**Sharpe Ratio**
Panel A: NSE Industrial Classification										
Agriculture	2.01	18.05	1.75	18.37	1.74	18.03	0.10	1.49	18.35	0.08
Airline	-0.81	3.91	-1.03	4.46	-1.09	3.90	-0.28	-1.30	4.44	-0.29
Airline Services	4.02	37.13	3.71	37.58	3.80	37.07	0.10	3.48	37.52	0.09
Automobile	2.06	22.09	1.78	22.35	1.79	22.08	0.08	1.51	22.34	0.07
Banking	1.82	24.38	1.57	24.72	1.56	24.37	0.06	1.31	24.70	0.05
Breweries	2.15	20.32	1.82	20.14	1.88	20.33	0.09	1.55	20.15	0.08
Building Material	1.99	16.30	1.70	16.61	1.73	16.29	0.11	1.43	16.61	0.09
Chemical and Paints	4.64	41.59	4.36	42.01	4.38	41.58	0.11	4.10	42.00	0.10
Commercial Services	2.35	18.37	2.08	19.02	2.08	18.35	0.11	1.81	19.00	0.10
Computer and Office Equipment	3.08	34.18	2.79	34.52	2.81	34.17	0.08	2.52	34.51	0.07
Conglomerates	3.12	22.02	2.83	22.32	2.86	22.00	0.13	2.57	22.31	0.12
Construction	2.73	18.78	2.43	19.15	2.46	18.76	0.13	2.17	19.13	0.11
Engineering Technology	2.78	36.61	2.54	36.95	2.51	36.60	0.07	2.26	36.94	0.06
Food Beverages and Tobacco	1.15	14.46	0.86	14.77	0.88	14.46	0.06	0.59	14.77	0.04
Footwear	3.60	20.35	3.28	20.65	3.33	20.34	0.16	3.01	20.64	0.15
Foreign Listing	-1.14	14.14	-1.55	14.36	-1.39	14.13	-0.10	-1.80	14.36	-0.13
Healthcare	2.23	26.31	1.93	26.61	1.96	26.30	0.07	1.66	26.61	0.06
Hotel and Tourism	0.70	7.32	0.55	7.70	0.41	7.33	0.06	0.26	7.70	0.03
Industrial/Domestic	3.63	37.09	3.34	37.44	3.36	37.09	0.09	3.07	37.43	0.08
Insurance	2.21	28.23	1.96	28.58	1.94	28.22	0.07	1.70	28.56	0.06

Machinery	0.00	0.87	-0.32	2.32	-0.26	0.88	-0.30	-0.59	2.32	-0.25
Maritime	2.73	30.95	2.71	31.28	2.44	30.91	0.08	2.42	31.24	0.08
Packaging	2.28	18.60	1.97	18.89	2.02	18.59	0.11	1.71	18.88	0.09
Petroleum Marketing	2.60	20.89	2.27	21.06	2.33	20.88	0.11	2.01	21.05	0.10
Printing And Publishing	2.24	16.56	1.95	16.87	1.98	16.54	0.12	1.68	16.85	0.10
Real estate	2.96	14.88	2.67	15.13	2.70	14.88	0.18	2.40	15.12	0.16
Second tier	0.87	12.42	0.55	12.77	0.60	12.41	0.05	0.29	12.76	0.02
Textiles	0.62	15.71	0.38	16.09	0.34	15.70	0.02	0.10	16.08	0.01
Panel B: Size Classification										
1st quartile(lowest)	0.52	16.78	0.23	16.91	0.24	16.78	0.01	-0.05	16.90	0.00
2nd quartile	1.96	23.20	1.64	23.47	1.69	23.19	0.07	1.37	23.47	0.06
3rd quartile	3.21	29.39	2.92	29.76	2.96	29.38	0.10	2.66	29.74	0.09
4th quartile(highest)	2.99	25.12	2.76	25.49	2.73	25.10	0.11	2.50	25.47	0.10
Panel C: Sectoral Classification										
Non-financial	2.21	23.39	1.91	23.67	1.94	23.38	0.08	1.65	23.66	0.07
Financial	2.00	26.23	1.75	26.57	1.73	26.22	0.07	1.49	26.56	0.06
Panel D: All Firms										
Total	**2.16**	**24.06**	**1.88**	**24.35**	**1.89**	**24.05**	**0.08**	**1.61**	**24.34**	**0.07**

Source: Author's computation: underlying month-end data from NSE Daily Official List, various issues

In the last column of panel A, it is shown that industries like real estate (0.16), footwear (0.15), conglomerates (0.12) and construction (0.11) have relatively higher monthly risk-adjusted excess dollar returns over the returns on 1-month Eurodollar rate. Further, it is shown that Sharpe ratio increases with firm size, a fact explaining why most foreign investments are found in large Nigerian firms. The Sharpe ratio is also slightly higher in the non financial sector (0.07) than the financial sector (0.06) for the entire period.

It is unlikely that the measures of risk and returns as given in table 2.14 will be representatives of each of the three episodes of exchange rate changes identified earlier. In order to address this, similar tables are constructed for each of the three sub-periods and these are contained in Appendix B as tables B-1 to B-3. A cursory examination of the last column on Sharpe ratio for each of these tables shows the following:

Table B-1: It is shown that in the first period of naira depreciation, high-performing industries include real estate (0.17), petroleum marketing (0.11), breweries (0.08) and conglomerates (0.07). It is also shown that Sharpe ratio increases with size and the financial sector performs better (0.03) than the non financial sector (-0.01) generally.

Table B-2: Naira appreciated during this period and therefore, dollar returns are higher than naira returns as investors gain from both capital gain and currency appreciation thereby supporting the high inflow of foreign capital during this period. Industries with relatively higher risk-adjusted performance include airline services[60] (0.43), construction (0.30) and maritime (0.30). Performance also rises with firm size and comparable level of performance is witnessed between the financial and non-financial sectors within this period.

Table B-3: This is the period of the global financial crisis and this largely drives the pattern observed in the table. Naira return is mostly negative for all industries and dollar returns are worse. Industries like airline services, banking, chemical paints, and insurance and maritime, which had earlier experienced price boom are the worst hit.

[60] The newly-listed firms in the airline services sector, namely; Nigerian Aviation Handling company PLC (2006) and Airline services and Logistic PLC (2007) came during booming period of the stock market and their prices rose sharply. Also, the prices of stocks like CAPL PLC and Nigerian German chemicals PLC rose sharply in the year 2008 making them responsible for high returns in chemical and paints.

Table 2.14 (as well as tables B-1 to B-3 in appendix B) just presents the simple averages for firms in each of the industries and the information about individual firms and firms driving each industry are hidden. Therefore, panel A of table G-1 in appendix G is presented to appreciate the variations among the 200 firms in terms of their individual risk and returns. For the purpose of space however, only the result of the entire period is presented.

CHAPTER THREE

LITERATURE REVIEW

This chapter is divided into three major sections. The first section is the theoretical review, the second is the review of methodologies and the third section presents some important empirical findings on the foreign exchange risk exposure and the pricing.

3.1. Theoretical review[61]

This section presents the review of the theoretical literature in the area of foreign exchange risk pricing. Perhaps it is relevant to mention from the outset that the theories explaining the pricing of foreign exchange risk are basically two; namely, the International (Capital) Asset Pricing Model (IAPM) and the International Arbitrage Pricing Theory (IAPT). In the remaining part of this section, both theories are derived and their relative strengths and weaknesses discussed so as to identify the one that is more suitable for the present thesis.

3.1.1. The International Asset Pricing Model (IAPM)[62]

The IAPM applies the modern portfolio theory (mean-variance analysis) to explain the global risk-return trade-off in international finance. The setup includes many countries whose residents have different purchasing power indices; and because PPP fails to hold, investors residing in these countries have different benchmarks for evaluating real returns and risks. Hence, the compositions of their portfolios are also expected to

[61] The step-by-step derivation of the relevant theories is presented. This enables the reader see the contribution of this thesis later in the theoretical framework. But to avoid repetition, few steps that are excluded in this review are later specified in the theoretical framework

[62] The pioneers of this theory include Solnik (1974), Grauer et al (1976), Sercu (1980) and Adler and Dumas-AD (1983). As rightly pointed out in Solnik (1983), the work of A-D (1983) provides the most comprehensive and clarifying synthesis of the IAPM. Hence, the treatment in this thesis draws mainly from A-D (1983) and from Merton (1969, 1971 and 1973) which popularise the continuous-time mathematics in economics on which A-D (1983) build.

vary[63]. Apart from the differences above, basically arising from heterogeneous investors' consumption preferences, the IAPM assumes a unified world capital market without taxes and transactions costs where all investors can access all assets, both foreign and domestic, and there is one default-free asset. The theory therefore proceeds, in a continuous-time[64] setting, to derive the optimal portfolio choice condition for investors who are assumed to maximize a time-additive; von Neumann-Morgenstern expected utility of life-time consumption function.

Since the IAPM uses the continuous-time approach, it will be necessary to itemise some of the assumptions relating to the capital market structure under which this approach is used; these are given by Merton (1973) as;

a. No transaction costs and taxes
b. No problem with indivisibilities of assets
c. There are sufficient number of investors with comparable wealth levels so that each investor believes that he can buy and sell as much of an asset as he wants at the market place
d. The capital market is always in equilibrium[65]
e. There exists an exchange market for borrowing and lending at the same rate of interest
f. Short-sales of all assets is allowed[66]
g. Trading in assets takes place continually in time[67]

[63] The notions of real returns between a foreign and local investor will vary to the extent that PPP is violated (A-D, 1983)

[64] Continuous-time models are the limit of discrete-time models, in other words, in the limit as the time between trades tends to zero, a random walk process converges to a Brownian motion (BM) process. The preference for continuous-time mathematics of Merton (1969, 1971, and 1973), as against discrete, arises because it uses Ito processes which transforms products of random variables into sums and hence yields mathematical convenience. This offers a way out of the difficulty often encountered when currency translation yields products of random variables whose probability distributions are hard to obtain; and by the approximation reasoning of Samuelson (1970), it also justifies the mean-variance paradigm (A-D, 1983).

[65] Although in IAPM, there are different equilibria for different countries.

[66] Equilibrium result will not significantly change even if this assumption is violated (Elton, et al, 2007:306)

[67] Hence, the returns and the changes in the opportunity set can be described by continuous-time stochastic process. Merton (1973) also argues that a stock market that opens daily may satisfy this assumption. Further, Solnik (1974) shows that monthly return may be used in estimation to magnify the potential difference

h. The vector set of stochastic process describing the opportunity set and its changes, is a time-homogeneous Markov[68] process.

The theory starts by assuming a world with *L+1* countries and currencies where nominal returns are measured in terms of the *L +1st* currency. Jointly in these countries, there are *N* nominally risky securities, whose nominal price dynamics, in terms of the measurement currency, are given by geometric[69] (stationary) Brownian motions (BM):

$$\frac{dY_i}{Y_i} = \mu_i dt + \sigma_i dz_i \qquad ; \qquad i = 1 \ldots N \tag{1}$$

Where, Y_i is the market value[70] of security *i* in terms of currency *L+1;* μ_i is the instantaneous expected nominal rate of return on security *i*, σ_i is the instantaneous standard deviation of the nominal rate of return on security *i*; and z_i is a standard Wiener process while dz_i is the associated white noise which is used to measure the uncertainty about the future values of Y_i.

Let us define $\underline{\Omega}$ as the *N*x*N* matrix of instantaneous covariances $\sigma_{i,k}$ of the nominal rates of return on the various securities and also assume that there is one ($N+1^{st}$) security which is nominally riskless. This last security is denominated in the measurement currency and its nominal rate of interest is *r*. Furthermore, the price index P^l of an investor of type *l*, expressed in the measurement currency, is also assumed to follow a stationary process;

$$\frac{dP^l}{P^l} = \pi^l dt + \sigma_\pi^l dz_\pi^l \qquad ; \qquad l = 1 \ldots L+1 \tag{2}$$

---

[68] That is, the distribution of their future values depend only on their present value, and not on the past (Cvitanic and Zapatero, 2004: 65)

[69] A BM is a continuous-time stochastic process that is the limit of a discrete random walk and because it assumes normal distribution, it can be defined by two parameters; an expectation or 'drift' parameter, μ, and a volatility or 'diffusion' parameter, σ. Apart from the issue of mathematical convenience resulting from the fact that a BM requires small number of parameter to describe asset prices, a major economic justification is that it satisfies the random walk hypothesis. Where geometric BM is assumed to hold for asset prices, μ_i and σ_i will be constant (Merton, 1971) and it is also called logarithmic BM or the logarithmic Wiener-Einstein Process (Bailey, 2005: 60). Cochrane (2001) and Focardi (2004) discuss other types of BMs and their properties.

[70] Note that this equation assumes income from only capital gains, although the addition of dividend does not change the underlying process (A-D, 1983).

Where π^l and σ_π^l are the expected value and standard deviation of the instantaneous rate of inflation as observed by investor *l* and $\underline{\omega}^l$ therefore represents the *N*x*1* vector of covariances $\sigma_{i,\pi}^l$ of the *N* risky securities returns with investors *l*'s rate of inflation.

As often used in the standard portfolio theory, the investors are assumed to maximise a time-additive, von Neumann-Morgenstern expected utility of life-time consumption function which is constructed as a function of the several consumption rates achieved for the various commodities[71].

$$Max\ \mathrm{E}\int_t^T U\left(\underline{c}(s);s\right)ds \tag{3}$$

Where, *E(.)* is the expected-value operator conditional on the information available at time *t*; and $\underline{c}(s)=\left[c_g(s);g=1,...,G\right]$ is the vector of consumption rates for the *G* goods at time *s*.

The optimisation of the consumption mix at each point in time leads to an equivalent objective in terms of the indirect utility (maximum value) function *V(.)*:

$$Max\,E\int_t^T V\left(C(s);\underline{P}(s);s\right)ds \tag{4}$$

Where, *C(s)* is the rate of nominal consumption budget expressed in some arbitrary monetary unit per unit of time; and $\underline{P}(s)=\left[P_g(s);g=1,...,G\right]$ is the vector of prices for the *G* goods at time *s* expressed in the same monetary unit, and,

$$V\left(C;\underline{P};s\right)\equiv Max\ U\left(\underline{c};s\right) \qquad s.t.\ \underline{c}.\underline{P}=C, \qquad \underline{c}\geq 0 \tag{5}$$

Equation (5) will be cumbersome due to the inclusion of all prices of consumption goods as separate arguments and this problem is usually solved by assuming that the utility function (equation 3) is homothetic[72]. Therefore, with homothetic utility function, the investor's indirect objective function (4) becomes;

[71]This setup excludes a bequest function but this is unlikely to affect the final results. Also, since there are many commodities involved, it is difficult to define and use a single consumption rate (A-D, 1983)

[72] Homotheticity assumption keeps relative prices constant, thus, it guarantees that price indices do not fluctuate with wealth. Samuelson and Swamy (1974) offer the proof that the condition under which the price vector $\underline{P}$ can be compressed into a scalar which will still lead to the same decisions and valid at all

$$Max\, E \int_{t}^{T} V(C, P, s)\, ds \tag{6}$$

Where, C is the nominal rate of consumption, P is the price level index, and $V(.)$ is a function homogeneous of degree zero in C and P expressing the instantaneous rate of indirect utility.

Following Merton (1971), the wealth of a consumer-investor less his consumption at time t can be defined as:

$$W(t) = \sum_{i=1}^{N} N_i(t) Y_i(t) - C(t) \tag{7}$$

Where $W(t)$ is the total wealth at time t, $N_i(t)$ is the number of shares of asset i purchased and held during period t and $C(t)$ is the consumption budget per unit of time during period t. The wealth equation above will be stochastic since its Y_i component[73] is also stochastic.

Merton (1969, 1971 and 1973) have shown that if X represents a *state-variable* vector with *m-elements*, its dynamics can be written as the vector Itô process;

$$dX = F(X)dt + G(X)dB \tag{8}$$

where F is the vector $[f_1, f_2, \ldots, f_m]$, G is a diagonal matrix with diagonal elements $[g_1, g_2, \ldots, g_m]$ and dB is the vector Wiener process $[db_1, db_2, \ldots, db_m]$.

If we define $w = (w_i)$ as the $(N+1)$x1 vector whose components sum to 1 indicating the investor's portfolio choice among the available investment opportunities and by applying itô's theorem in equation (8) to equation (7), the wealth dynamics of the consumer becomes[74];

$$dW = \left[\sum_{i=1}^{N} w_i(t)\left(\mu_i - r\right) + r \right] W(t)dt + W(t)\Sigma w_i(t)\sigma_i dz_i - C(t)dt \tag{9}$$

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levels of consumption budget C is for the direct utility function to be homothetic with respect to the vector of consumption rates $\underline{c}$.

[73] When uncertainty is introduced by a random variable, the budget equation must be generalised to become a stochastic differential equation, as against ordinary differential equation.

[74] The Itô's rule, an extension of the chain rule, is the fundamental theorem of stochastic calculus which is used to manipulate and obtain the dynamics of diffusion processes.

In order to solve the investor's optimization problem, we use the dynamic programming technique[75] and denote *J (W, P, t)*[76] as the maximum value of equation (6) subject to equation (9), while equation (2) is used as a state equation. According to the Hamilton-Jacobi-Bellman principle, this function must be stationary or that its total expected rate of increase must be identically zero (Kamien and Schwartz, 1991; A-D, 1983 and Merton, 1971).

$$0 = \underset{C,\underline{w}}{Max} \left[\begin{array}{l} V\left(C,P,t\right) + J_t + J_W \left[\left(\sum_{i=1}^{N} w_i \left(\mu_i - r \right) + r \right) W - C \right] \\ + J_P \, P\pi + \frac{1}{2} J_{W,W} \sum_{i=1}^{N} \sum_{k=1}^{N} w_i w_k \sigma_{i,k} W^2 + \frac{1}{2} J_{P,P} \sigma_\pi^2 P^2 \\ + J_{W,P} \sum_{i=1}^{N} w_i \sigma_{i,\pi} WP \end{array} \right] \tag{10}$$

Recall that the maximum value function *V(C, P, t)* has been defined as homogenous of degree zero; thus, *J(W, P, t)* and *C(W, P, T)* that are satisfying equation (10) must also be homogenous of degree zero in *W* and *P*. The Euler's equation (Fischer, 1975 and A-D, 1983) therefore is;

$$J_P P + J_W W = 0 \qquad ; \qquad J_P = -\left(\frac{W}{P} \right) J_W \tag{11}$$

Differentiating (11) with respect to *W* and then *P*, we have;

$$J_{P,W} = -\left(\frac{1}{P} \right) J_W - \left(\frac{W}{P} \right) J_{W,W} \tag{12}$$

$$J_{P,P} = -\left(\frac{1}{P^2} \right) J_W - \left(\frac{W}{P} \right) J_{W,P} \tag{13}$$

and substituting for $J_{W,P}$ in equation (13) yields equation (14) below,

[75] This enables the reduction of a multi-period problem to a sequence of single-period problems once the value function (indirect utility) is specified for the terminal period.

[76] $J(W,P,t) = Max\, E_t \int_t^T V(C,P,t) ds$ and is called the "*derived*" utility of wealth function and the subscripts represent partial derivatives (Merton, 1973)

$$J_{P,P} = 2\left(\frac{W}{P^2}\right)J_W + \left(\frac{W}{P}\right)^2 J_{W,W} \tag{14}$$

Substituting (11), (12) and (14) into (10) and simplify,

$$0 = \underset{C,\underline{w}}{Max}\left[\begin{array}{l} V(C,P,t) + J_t + J_W\left[\left(\sum_{i=1}^{N} w_i(\mu_i - r) + r - \pi + \sigma_\pi^2 - \sum_{i=1}^{N} w_i\sigma_{i,\pi}\right)W - C\right] \\ + \frac{1}{2}J_{W,W}\left[\sum_{i=1}^{N}\sum_{k=1}^{N} w_i w_k \sigma_{i,k} + \sigma_\pi^2 - 2\sum_{i=1}^{N} w_i\sigma_{i,\pi}\right]W^2 \end{array}\right] \tag{15}$$

Differentiating (15) with respect to the decision variables C and w_i;

$$V_C(C,P,t) = J_W(C,P,t) \tag{16}$$

$$J_W W\left(\mu_i - r - \sigma_{i,\pi}\right) + \frac{1}{2}J_{W,W}W^2\left[\sum_{k=1}^{N} w_k\sigma_{i,k} - 2\sigma_{i,\pi}\right] = 0 \tag{17}$$

Equation (16) is the standard envelope condition that the marginal utility of consumption is equal to the marginal utility of nominal wealth.

Defining $\alpha = {}^{-J_W}\!/_{J_{W,W}W}$ as the investor's risk tolerance (reciprocal of the investor's relative risk aversion), equation (17) can then be re-written in the form of required nominal return on security i:

$$J_W\left(\mu_i - r - \sigma_{i,\pi}\right) = -J_{W,W}W\left[\sum_{k=1}^{N} w_k\sigma_{i,k} - \sigma_{i,\pi}\right] \tag{18}$$

$$\alpha\left(\mu_i - r - \sigma_{i,\pi}\right) = \left[\sum_{k=1}^{N} w_k\sigma_{i,k} - \sigma_{i,\pi}\right]$$

$$\mu_i = r + \frac{1}{\alpha}\sum_{k=1}^{N} w_k\sigma_{i,k} + \left(1 - \frac{1}{\alpha}\right)\sigma_{i,\pi} \tag{19}$$

Equation (19) shows that a security must yield a nominal return in excess of the nominal risk free rate, and this comprises two risk premia. The first is the risk premium which is proportional to the covariance of the security's nominal return with the investor's portfolio return[77]. The second is the inflation premium arising because

[77] Implication of the traditional CAPM

investors are concerned with their purchasing power and they relate the required nominal yield on each asset to the real returns on their benchmark portfolio.

The optimal portfolio holding can also be computed from equation (19) thus;

$$\left[\mu_i - r - \left(1-\frac{1}{\alpha}\right)\sigma_{i,\pi}\right]\alpha\sigma_{i,k}^{-1} = \sum_{k=1}^{N} w_k \alpha\left(\mu_i - r\right)\sigma_{i,k}^{-1} - \alpha\left(1-\frac{1}{\alpha}\right)\sigma_{i,\pi}\sigma_{i,k}^{-1}$$

$$\sum_{k=1}^{N} w_k = \alpha\left(\mu_i - r\right)\sigma_{i,k}^{-1} + \left(1-\alpha\right)\sigma_{i,\pi}\sigma_{i,k}^{-1} \qquad (20)$$

which in vector notation becomes:

$$\underline{w} = \alpha\left[\frac{\underline{\Omega}^{-1}\left(\underline{\mu} - r\,\underline{\iota}\right)}{1 - \underline{\iota}'\underline{\Omega}^{-1}\left(\underline{\mu} - r\,\underline{\iota}\right)}\right] + \left(1-\alpha\right)\left(\frac{\underline{\Omega}^{-1}\underline{\omega}}{1 - \underline{\iota}'\underline{\Omega}^{-1}\underline{\omega}}\right) \qquad (21)$$

Where ι is an *N* x *1* vector of ones and ι' is its transpose; $\underline{\mu}$ is the vector of nominal expected returns; $\underline{\Omega}$ is the *N* x *N* matrix of instantaneous covariances of the nominal return rates on the various securities; $\underline{\omega}$ is the *N* x *1* vector of covariances $\sigma_{i,\pi}$ of the *N* risky securities returns with the investor's rate of inflation.

The optimal portfolio therefore is the combination of two component portfolios with weights α and (*1*- α). The first portfolio (with coefficient α) is the logarithmic investor portfolio[78] and its composition is independent of the behaviour of commodity prices[79]. This logarithmic component is the same for all investors, regardless of nationality, as a logarithmic investor is *nationless*. The second portfolio with weight (*1*- α) is that of an investor with zero risk tolerance (α = 0) with $\Omega^{-1}\underline{\omega}$ denoting the vector of regression coefficients of the investors rate of inflation on the various securities returns. This portfolio is therefore the one whose nominal rate of return is the most highly correlated with the investor's rate of inflation, in other words, it is the best possible hedge against inflation.

[78] Merton (1971) has shown that the logarithmic utility function implies (α=1)

[79] Hakansson (1969) has specifically shown that with logarithmic preference, price-level information is completely irrelevant to the decision maker. This is because it is assumed that the individual expresses his estimates of future opportunities in monetary units – rather than units of constant purchasing power – it follows that this estimates implicitly reflect the projected price movement of all items that have an influence on them. In this situation, knowledge of future price level distribution or past price level-index clearly does not increase knowledge of future opportunities. He has also shown that logarithmic utility function implies the same behaviour as that specified by the permanent income hypothesis.

The foregoing therefore shows that the optimal portfolio strategy for the individual investor is to hold a combination of the universal logarithmic portfolio with weight α and his personalised hedge portfolio which constitute the best protection against inflation as he perceives it, with weight (1- α).

In this manner, an investor's hedge portfolio is going to be almost entirely made up of a nominal bank deposit (or Treasury Bills) denominated in his home currency. This is because exchange rate and stock price fluctuations are much wider than price level (CPI) fluctuations; therefore, risk averse investors prefer to bear fully their home inflation risk than to bear exchange rate uncertainty or stock price uncertainty. Specifically, Solnik (1974) and Sercu (1980) have shown that in the event of small variability of home CPI relative to foreign securities returns and exchange rates, investors will ignore home-currency inflation and therefore consider rate of return expressed in their home currency units as being real returns. Therefore, the hedge portfolio reduces to the home deposit and this can explain the *home-bias puzzle*[80].

3.1.2. The International Arbitrage Pricing Theory (IAPT)[81]

The major argument against the IAPM is the different assumptions on utility functions as well as the difficulty encountered when asset demands are aggregated over people using different numeraires to measure returns (Solnik, 1983). The International Arbitrage Pricing Theory (IAPT) therefore provides an alternative, just as the APT (Ross, 1976) does for the domestic CAPM. All that the IAPT requires is that markets are perfect such that investors hold homogenous belief that nominal returns follow a *k-factor* generating linear model[82]. In other words, the theory builds on the assumption that if the economy is described by a small number of pervasive factors, then these factors may well be priced in the sense that investors will be willing to pay a premium to avoid these sources of risk.

[80] Conversely, Kouri and de Macebo (1978) show that an investor's hedge portfolio is distributed among several countries in the proportion at which he consumes their goods.

[81] Solnik (1983) extends the closed-economy Arbitrage Pricing Theory of Ross (1976) to international finance. However, the treatment in this thesis is based on Ikeda (1991) model which sets up a linear factor return-generating process in local currency so as to emphasise the effect of exchange risk on international arbitrage asset pricing.

[82] The k-factor assumption replaces the multivariate-normal or Itô-Wiener asset return distribution assumption of the IAPM, (Ross, 1976; Solnik, 1983).

In order to illustrate the development of the theory, consider a world with *N + 1* countries and risky assets. These risky assets are denominated in their respective local currencies (*l*) and are freely traded in perfect international capital markets. In line with the closed-economy APT, it is also assumed that the risky assets follow the *k-factor* model in their return generating process:

$$\tilde{\mu}_i^l = \bar{\mu}_i^l + \beta_{i1}\tilde{f}_i + ... + \beta_{ik}\tilde{f}_k + \tilde{\varepsilon}_i \quad ; \quad i = 1...N+1 \tag{22}$$

Where $\tilde{\mu}_i^l$ is the random return on the risky asset *i* in terms of the local country currency *l* ; $\bar{\mu}_i^l$ is the expected value of this random return; $\tilde{f}_k$ are the global pervasive factors with zero means; β_{ik} is the sensitivity of return $\tilde{\mu}_i^l$ to fluctuations in factor *k;* $\tilde{\varepsilon}_i$ is the unpredictable element in asset *i* that is not explained by the other factors; and $E(\tilde{\varepsilon}_i \mid f_k) = 0 \ \forall \ i$ and *k*.

If it is assumed further that the exchange rate regime is flexible such that the rates can be represented with stochastic process;

$$\tilde{\pi}_l^j = \bar{\pi}_l^j + \tilde{\sigma}_l^j \quad ; \quad l, j = 1 \ldots\ldots N+1 \tag{23}$$

Where $\tilde{\pi}_l^j$ is the random rate at which country *l's* currency appreciate relative to country *j's*, with $\bar{\pi}_l^j$ and $\tilde{\sigma}_l^j$ respectively representing the expected and random component of country *l's* currency value relative to country *j's.* If the view of an investor from country $N+1^{th}$ is taken and respectively defining Y_i^{N+1} *and* P_l^{N+1} as the currency *N+1* price of asset *i* and price of currency *l*, then the price of asset *i* in country *l* (Y_i^l) when measured in terms of currency *N+1* will be given by the law of one price as;

$$Y_i^{N+1} = Y_i^l P_l^{N+1} \tag{24}$$

Applying the Ito's lemma to equation (24), the currency *N+1* return of asset *i* then becomes;

$$\tilde{\mu}_i^{N+1} = \tilde{\mu}_i^l + \tilde{\pi}_l^{N+1} + \sigma_{i,\pi} \quad ; \ i = 1 \ldots N+1 \tag{25}$$

where $\sigma_{i,\pi}$ represents the covariance of $\tilde{\mu}_i^l$ and π_l^{N+1}

Substituting (22) and (23) into (25);

$$\tilde{\mu}_i^{N+1} = \bar{\mu}_i^{N+1} + \beta_{i1}\tilde{f}_i + ... + \beta_{ik}\tilde{f}_k + \tilde{\sigma}_i^{N+1} + \tilde{\varepsilon}_i \tag{26}$$

where $j = N+1$ and $\bar{\mu}_i^{N+1} = \bar{\mu}_i^l + \bar{\pi}_l^{N+1} + \sigma_{i,\pi}$

The term $\tilde{\sigma}_i^{N+1}$ in equation (26) denotes the exchange risk for the reference country's investors. The fact that this risk depends on asset *i* and is undiversifiable implies that it is impossible to construct riskless portfolio in the same manner as the traditional APT (Ikeda, 1991). Furthermore, given the APT assumption of large number of assets[83], the asset-specific risk, $\tilde{\varepsilon}_i$, will be diversified away and the opportunity for riskless and costless arbitrage is unexpected when equation (27), which is given below, holds;

$$\bar{\mu}_i^{N+1} = \lambda_0 + \lambda_1\beta_{i1} + ... + \lambda_k\beta_{ik} + \lambda_\pi\beta_{i\pi} \qquad (27)$$

where λ_0 is the return on a risk-free security and λ_k is the risk premium on the *k-th* source of risk. Further, the exchange risk from equation (26) now introduces an additional premium (λ_π) into the pricing relation given in (27).

In sum, this theory postulates that a well-diversified portfolio is exposed only to factor risks which then determine its expected returns, and in an international setting, exchange risk becomes one of these factors. In other words, the usual risk diversification rule in APT will not yield a risk-free portfolio in the presence of exchange rate fluctuations, unless the expected returns are adjusted for the cost of exchange risk hedging (Ikeda, 1991).

It is noteworthy that the above conclusion that the *k-factor* returns generating process is not invariant to the numeraire currency depends on the fact that the currency fluctuations, equation (23), is not allowed to have the same factor structure as the asset returns equation, equation (22). If this has been allowed, the closed-economy APT will be directly applicable to the international setting without the exchange risk which is the argument of Solnik (1983)[84].

[83] The theory assumes close to infinity number of assets which must be greater than the sources of risk. Other assumptions include perfect market and homogenous expectations of investors.

[84] But contrary to Solnik (1983), it will be more realistic to assume different factor structure for returns and currency under APT (Ikeda, 1991).

3.2. Methodological review

This area of international finance is replete with several methodologies which have been developed to address important issues like the estimable models of IAPM, the definition of exchange rate risk, definition of market risk and issues relating to market segmentation and orthogonalisation of risk factors, characteristics of exposed firms, level of aggregation at which analyses are made, incorporation of time-varying exchange risk exposure and pricing (conditional models), and estimation procedures. In order to appreciate the afore-mentioned, sub-sections are created below to identify and discuss these relevant issues respectively.

3.2.1. Estimable models of IAPM[85]

Equation (19)[86] in the review of theories shows that a security yields an inflation risk premium in excess of the traditional nominal risk free rate and the market risk premium. This additional premium arises because investors are concerned with their purchasing power and they relate the required nominal yield on each asset to the real returns on their benchmark portfolio (A-D, 1983). However, the individual portfolio holdings, w_k^l is not observable, what is observable is the aggregate holdings (w_k^m) which is given by the relative market capitalisations of all the securities on the market, and according to A-D (1983), this is given as;

$$w_k^m = \sum_{l=1}^{N+1} W w_k^l \Big/ \sum_{l=1}^{N+1} W \qquad (28)$$

The summation above is taken over all the investors and W^l is investor *l*'s nominal wealth. In order to transform (19) into an equation valid at the aggregate market level,

[85] Moving from the theory to the estimable equation only becomes an issue under the IAPM; this is because equation (27) under the IAPT is linear, hence directly estimable through any of three methods. These include the use of macroeconomic variables (Chen, Roll and Ross, 1986), the use of exploratory (factor) statistical analysis (Roll and Ross, 1980) and specifying a set of portfolio affecting the return-generating process (Fama and French, 1993).

[86] For convenience, equation (19) is $\mu_i = r + \frac{1}{\alpha^l}\sum_{k=1}^{N} w_k^l \sigma_{i,k} + \left(1 - \frac{1}{\alpha^l}\right)\sigma_{i,\pi}^l$; $i = 1 \ldots N$. Note that this equation is re-written here emphasising with superscripts to identify terms which depend on the identity of the *l* investor.

it is multiplied by α^l and an average is taken over all investors while the weights are their relative wealth.

$$\mu_i = r + \left(1 - \frac{1}{\alpha^m}\right) \frac{\sum_{l=1}^{L+1} \left(1-\alpha^l\right) W^l \sigma_{i,\pi}^l}{\sum_{l=1}^{L+1} \left(1-\alpha^l\right) W^l} + \left(\frac{1}{\alpha^m}\right) \sum_{k=1}^{N} w_k^m \sigma_{i,k} \;\; ; \qquad i = 1 \ldots \mathrm{N} \qquad (29)$$

where $\alpha^m = \sum_{l=1}^{L+1} W^l \alpha^l \Big/ \sum_{l=1}^{L+1} W^l$

Following from Dumas and Solnik (1995), De Santis and Gerard (1998) and Moerman and Dijk, (2010), the pricing restrictions on asset *i* imposed by the unconditional version of equation (29) can be written as;

$$E(r_i) = \lambda_m \operatorname{cov}(r_i, r_m) + \sum_{l=1}^{L+1} \lambda_\pi \operatorname{cov}(r_i, r_\pi) \qquad (30)$$

Where,

$$\lambda_m = \frac{1}{\alpha^m} = \frac{1}{\sum_{l=1}^{L+1} \frac{W^l \alpha^l}{W}} \text{ and } \qquad \lambda_\pi = \alpha^m \left(\frac{1}{\alpha^l} - 1\right) \frac{W^l}{W} \qquad (31)$$

E(.) and *cov(.)* represents the unconditional first and second moments respectively; r_i is the nominal return on security *i* in excess of the risk-free rate, r_m is the nominal return on the world market portfolio in excess of the risk-free rate, r_π is the domestic inflation rate of country *l* measured in the numeraire currency, λ_m is the world price of market risk which is an average of the risk aversion coefficients of all countries, weighted by their corresponding relative wealth (W^l/W); finally, λ_π is the world price of exchange rate risk.

Equation (30) therefore results into a CAPM containing *L+1* terms of covariances with inflations in addition to the intercept and the covariance with the market. The hypotheses to be tested are that the intercept is equal to the nominal measurement-currency interest rate, that the regression coefficients on all the covariance terms sum to one and that the coefficient on the covariance with the market is positive (A-D, 1983).

Two major features of the last term in equation (30) are worth highlighting. First, the summation sign implies that the inflation risk of many countries (*L+1*) will be relevant in the pricing of a security (A-D, 1983; A-D, 1984, Vassalou, 2000). Second, the term

$cov(r_i,r_\pi)$ entering as a result of the PPP deviations measures the exposure of asset *i* to both inflation risk and the exchange rate risk associated with country *l* (Dumas and Solnik, 1995; De Santis and Gerard, 1998; Vassalou, 2000; Carrieri and Majerbi, 2006 and Moerman and Dijk, 2010).

While the implications of the second feature are discussed in the remainder of this sub-section, those of the first feature are discussed in the sub-section on the 'definition of exchange rate risk'.

The working definitions of the term $cov(r_i,r_\pi)$ usually vary in the literature depending on which of the three major models of IAPM that is tested, these models are; the Grauer, Litzenberger and Stehle (1976) model (G-L-S model), the Solnik (1974) as extended by Sercu (1980) model (S-S model) and the Adler and Dumas (1983) model (A-D model), which nests the first two[87]. These models are discussed below.

i. Grauer, Litzenberger and Stehle (G-L-S) model

The G-L-S (1976) model assumes that the PPP conditions hold but that inflation rates are stochastic; and when this occurs, all random inflation rates can be lumped into a single world inflation rate index which is therefore the only priced factor alongside the world market risk. An example of very few studies that have tested this version of IAPM is Vassalou (2000).

ii. Solnik-Sercu (S-S) model

In the Solnik-Sercu version of the IAPM, it is assumed that there are deviations from PPP, only that inflation rates are zero or non-stochastic and therefore, PPP deviations correlate with exchange rates. This implies that there are *L*-country exchange rate premia along with the world market risk premia. It is noteworthy that this is the most widely-tested version of the IAPM with different numbers of exchange rates included. The major argument for assuming that inflation rates are non-stochastic, hence employing this version, is that inflation rates have been found to be substantially less volatile than nominal exchange rates at short time horizons, say, monthly (Rogoff, 1996; Dumas and Solnik, 1995; and Moerman and Dijk, 2010), especially in developed markets.

[87] Vassalou (2000) and Moerman and Dijk (2010) provide detailed analysis of these models.

iii. Adler and Dumas (A-D) model

The A-D (1983) model that is derived up to equation (19) above provides the most comprehensive and clarifying synthesis of the IAPM (Solnik, 1983). This version nests the other two models in that it allows for the pricing of both inflation risk and exchange rate risk and with the appropriate restrictions, one can easily obtain either of the first two models. Similar to the G-L-S model, just few studies have tested this version, some important of which include; Vassalou (2000), Carrieri and Majerbi (2006) and Moerman and Dijk (2010). It is crucial to note that this model will be more appropriate in markets where inflation rates are stochastic; hence, Carrieri and Majerbi (2006) have argued that for an EM, it is more appropriate to test this version of the IAPM. In other words, the assumption of non-stochastic inflation rates on which IAPM studies in advanced markets are based may be less realistic in EMs.

Moreover, the methodologies for including both inflation and exchange rate risks in a single IAPM vary in the literature. Vassalou (2000) tests for each of these two risks in separate models and documents that they are individually significant; however, when they are included in the same model, they become insignificant. This is explained by the fact that measures of inflation rates and exchange rates tend to move together, thereby leading to multicollinearity problems in regression analyses. However, Moerman and Dijk (2010) include both risk and through the use of a different estimation methodology, they do not report any evidence of multicollinearity problem. Another way out of the multicollinearity problem is to use real exchange rates as these have already controlled for the impact of inflation (Carrieri and Majerbi, 2006; Chaieb and Errunza, 2007).

3.2.2. Definition of exchange rate (risk)

The other feature of equation (30) highlighted in the last sub-section is discussed in this sub-section. Following from the theory, the economic value of a firm is theorised to be exposed to many exchange rates which are expected to be hedged or to command a risk premium in equilibrium (A-D, 1983). However, one major issue faced by many studies is the choice of the relevant exchange rate. A common question that often arises is whether to use trade-weighted (effective) exchange rates or bilateral exchange rates. This issue is discussed below.

i. Trade-weighted exchange rate risk

The use of trade-weighted exchange rate premises on the fact that the combined effects of all the bilateral exchange rates of a country's trading partners can be captured in a single index rate. Studies that have used trade-weighted exchange rate measures include Jorion (1991), Choi et al (1998), Doukas et al (1999), Dahlquist and Robertsson (2001), Roache and Merritt (2006). Moreover, a study like Chaieb and Errunza (2007) use two trade-weighted exchange rate indices, comprising a developed market exchange rate index and an emerging market exchange rate index.

Nonetheless, it has been argued that the use of trade-weighted exchange rate definition is often biased and lacks power, as firms are mostly exposed to only a few currencies within the basket (Dominguez and Tesar, 2001a and Muller and Verschoor, 2006). In trade-weighted exchange rate indices; therefore, the effects of various exchange rates may offset one another as there is the possibility of both positive and negative exposure co-existing among firms. This can lead to underestimation of firms exposure to exchange risk (Dahlquist and Robertsson, 2001 and Muller and Verschoor, 2006) and this has been used to explain why earlier studies are unable to document significant exposure to and pricing of foreign exchange risk[88] (Dominguez and Tesar, 2001a).

ii. Multiple bilateral exchange rate risk

In a situation where assets are simultaneously exposed to multiple exchange rates, all the bilateral exchange rates can be included in the model to be estimated (A-D, 1984, Dominguez and Tesar, 2001a) and this can provide a way out of the offsetting effects of using a single trade-weighted exchange rate. Examples of studies in this area include; Dumas and Solnik (1995), De Santis and Gerard (1998), Dahlquist and Robertsson (2001), Priestley and Odegaard (2004), Wu (2008) and Moerman and Dijk (2010). A variant of this include studies that simultaneously test exposure to and/or pricing of exchange risk coming from firm-specific and industry-specific exchange rates (Dominguez and Tesar, 2001a and Muller and Verschoor, 2006) as well as

[88] The sub-sections on the 'characteristics of exposed firms' and 'empirical literature review' later expatiate on this. Other arguments for the insignificance of earlier studies are that they use returns on industry portfolios rather than firm-level data and that they do not allow for time-varying risk exposure and prices (Dahlquist and Robertsson, 2001; Dominguez and Tesar, 2001a and Carrieri and Majerbi, 2006).

studies that decompose a single exchange rate index into the common component and residual component (Vassalou, 2000).

Due to the fact that the exchange rates against different currencies have tendencies to co-move, the models with multiple exchange rate risks often become intractable when the number of countries is large (Dumas and Solnik, 1995 and Vassalou, 2000). Hence, most authors therefore use few exchange rates, or in the extreme case, a single bilateral exchange rate.

iii. Single bilateral exchange rate risk

In addition to the point raised in the last paragraph, the use of a single exchange rate is further justified when there is the dominance of a country as the trading partner (Priestley and Odegaard, 2004 and Muller and Verschoor, 2006) or when a country's international transactions are usually invoiced in a given international currency (Di Iorio and Faff, 2002). Most studies use the local currency-US dollar exchange rate and these include; Choi et al (1998), Doukas et al (1999), Di Iorio and Faff (2002), Aquino (2005), Antell and Vaihekoski (2007), Saleem and Vaihekoski (2007), Jacobsen and Liu (2008).

Also, studies like Choi and Rajan (1997) that employ local currency per unit of IMF's Special Drawing Rights (SDR) and Moerman and Dijk (2010) that use the German mark as the numeraire, obtain similar result as when the US dollar is used.

In obtaining the risk element in the exchange rates, the rates of change in the selected measure of exchange rate are often used as the measure of exchange risk, in line with A-D (1984). These authors assume that the rates of change in exchange rate can be used to proxy[89] for unanticipated exchange rate changes (risk) (Priestley and Odegaard, 2004).

Surprisingly, the literature in this area still appears to overlook a measure of exchange risk, which is the deviation from PPP itself; according to Pilbeam (2006: 182), the common practice of using exchange rate changes to measure exchange risk is

[89] However, there may be some slight differences when the parsimonious multivariate GARCH-in-mean methodology of De Santis and Gerard (1997, 1998), later discussed in the conditional models, is used.

incorrect[90], it is the fluctuations of the exchange rate around PPP that constitute exchange risk. Therefore, a major methodological contribution of this thesis is to employ, among others, the PPP deviation definition of exchange risk and verify the extent to which the results obtained compare to those of earlier definitions found in the literature.

3.2.3. Definition of market risk

The idea of market risk in IAPM is similar to that in the domestic CAPM setting. Deriving from the modern portfolio theory that risk-averse investors only consider the mean and variance on their investment returns (Markowitz, 1952), it is shown that all idiosyncratic risks can be diversified away by combining several assets into the investors' portfolio. In a diversified portfolio therefore, the risk (variance) of a single asset is irrelevant, what is relevant is its contribution (covariance) to the risk in the entire portfolio, which is termed market risk or systematic risk (Sharpe, 1964; Lintner, 1965 and Mossin, 1966).

The usual measure of market risk is the return on local stock indices[91] (e.g. returns on the Nigerian Stock Exchange All Share Index) or returns on indices computed from a set of liquid securities (e.g. returns of the S&P 500 index for the USA). However, when asset are priced in a global setting, the definition of the (world) market risk becomes much more complex as it has to include assets from several parts of the world to which the global investor has access. Some authors also consider the extent of integration of the market being studied when defining the market risk. These are discussed in what follows.

i. Market risk in a completely integrated market

The most widely used index in the literature to proxy the world market risk is the return on the Morgan Stanley Capital International (MSCI) world index[92] (Harvey,

[90] The degree of this incorrectness will depend on the extent to which the inflation rates of countries of interest are stochastic in short frequencies; and for many developed markets, the error may be negligible (Dumas and Solnik, 1995).

[91] Roll (1977) provides a popular critique of this definition

[92] This is still so despite some of its limitations, especially in terms of coverage (see Jenner Sa, 2008). However, few studies have used other measures of world portfolio; for example, Saleem and Vaihekoski (2007) use the Thomson Datastream Global Index because it has longer history of weekly data on the market of their study.

1995; Choi and Rajan, 1997; Carrieri and Majerbi, 2006; Antell and Vaihekoski, 2007 and Jacobsen and Liu, 2008).

However, it has been argued that when one uses a single global index, like the MSCI world index, as the only measure of market risk, it is implicitly assumed that the market under study is fully integrated. But several studies, both theoretical (Stulz, 1981; Errunza and Losq, 1985) and empirical (Carrieri and Majerbi, 2006; Antell and Vaihekoski, 2007), have found that markets are often partially integrated. Therefore, security returns tend to be sensitive to both the world market risk factor and the local market risk factor.

Thus, in addition to a single definition of world market risk in tests of IAPM, these studies have employed methodologies that recognise the inclusion of other measures of market risk, especially, local market risk. This is therefore the focus in the next sub-section.

ii. Market risk in a partially integrated market

The mild segmentation model of Erruza and Losq (1985) recognises the existence of several barriers in an economy and how these cause market segmentation and limit international portfolio flows and diversification benefits. Because these barriers are less prevalent in industrial markets (IMs), there is an unequal access to global securities by local (EMs) and foreign (IMs) investors. Consequently, the presence of these barriers affects the relevant definition of market risk as well as the extent of integration of an economy.

According to Errunza and Losq (1985), it is difficult for IM investors to hold the EM securities and thus properly diversify their holdings due to market segmentation. As a second best solution therefore, they hold the Diversification Portfolio (DP) which is supplied to them by the EM investors through opportunities to invest in ADRs/GDRs and Country Funds (CFs). The EM investors therefore play the role of financial intermediaries by providing diversification services for which they receive an implicit remuneration which leads to the existence of super-risk premiums. This super-risk premium however becomes smaller the more the returns on the DP correlates with the returns on the EM securities.

In other words, the expected return on a security commands a global risk premium and a super risk premium that is proportional to the conditional local market risk. This is due to the existence of substitute assets like ADRs and CFs which make technically ineligible markets to be perceived as eligible (Carrieri, et al, 2007). Conversely, any security that can be bought by any investor without barriers will be priced as if the markets were fully integrated (absence of a super risk premium).

Importantly, it has been argued that partial integration is more likely for an EM (Bekaert and Harvey, 1995; Carrieri and Majerbi, 2006). This is because EMs are generally characterised by several barriers to portfolio flows ranging from limits on ownership, capital controls, lack of investor protection, low quality of information, corporate governance and accounting practices problems (Carrieri et al, 2007).

The mild segmentation model has been tested by various researchers. For instance, Choi and Rajan (1997), Choi et al (1998), Carrieri and Majerbi (2006), Antell and Vaihekoski (2007) and Fedorova and Vaihekoski (2008) estimate some forms of the three-factor model specified below;

$$E(r_i) = \lambda_l \operatorname{cov}(r_i, r_l) + \lambda_w \operatorname{cov}(r_i, r_w) + \lambda_\pi \operatorname{cov}(r_i, r_\pi) \tag{32}$$

Where r_i is excess returns on security *i*; r_l, r_w *and* r_π are the excess returns of the local, world and exchange risks while the *cov(.)* notations is a measure of asset *i's* sensitivities to each of them. Further, λ_l, λ_w and λ_π are the prices of local, world and exchange risks respectively.

The price of local risk (λ_l) in the above equation therefore represents the super risk premium which, according to models of market segmentation, is a measure of the increase in required return that securities in segmented markets must yield. From the viewpoint of firms, it also measures the effect of segmentation on the cost of supplying risky securities (Errunza and Losq, 1985). The following hypotheses are therefore testable from equation (32) above;

a.	*Complete segmentation:*	$\lambda_l \neq 0; \lambda_w = 0$
b.	*Complete integration:*	$\lambda_l = 0; \lambda_w \neq 0$
c.	*Partial segmentation:*	$\lambda_l \neq 0; \lambda_w \neq 0$
d.	*Exchange risk factor priced:*	$\lambda_\pi \neq 0$
e.	*Mis-specification:*	$\lambda_l = 0; \lambda_w = 0$

(33)

iii. Orthogonalisation of the risk factors

It has however been argued in the literature that the factors in equation (32) are likely to correlate with one another (Choi and Rajan, 1997); for instance, local and world market risks may co-move. In order to solve this problem, the factors are made orthogonal to one another by estimating some preliminary regressions. For instance, the world factor is made orthogonal to the local factor from the regression below;

$$r_w = \phi_0 + \phi_1 r_l + u_w \tag{34}$$

The residuals (u_w) from the above equation are then used as the pure world market risk factor. Equally, the exchange risk factor is orthogonalised over the other two factors while the residuals (v_π) from the equation below is used in the estimation as the pure effect of exchange rate changes on asset returns.

$$r_\pi = \theta_0 + \theta_1 r_l + \theta_2 r_w + v_\pi \tag{35}$$

According to Jorion (1991), the orthogonalisation as done above makes the model conforms to the original assumptions behind the APT. This may explain why most studies where orthogonalisations are performed also employ the IAPT as their theoretical framework.

The foregoing therefore underscores the advantage of the model presented in equation (32) as it does not assume the extreme cases of segmentation or integration. However, as pointed out by Bekaert (1995), it is still limited as it restricts the analysis to the effects of one particular barrier to investment despite the fact that there are many barriers in the real world. Moreover, different barriers may be found in different markets.

In Nigeria for instance, the operations of substitute assets like ADRs/GDRs and CFs are marginal thereby giving no opportunity to test the market risk conditional upon such assets. It is also noticeable that even in markets with these substitute assets, lack of full information on them when computing the DP may lead to biased result (Chaieb and Errunza, 2007).

Furthermore, the way this model defines eligible securities might have been very relevant in the 1980s when the work on mild-segmentation was published, as most EMs were still closed[93] to foreign investors. Contemporarily, eligibility as defined by this framework may apply to a market like the Chinese stock market where there are securities that can be bought by foreigners and those that can be bought by indigenes (See Jacobsen and Liu, 2008 for a description). But in the Nigerian market where foreigners can buy any securities (at least technically), although perceived ineligibility may still be present in every asset, it will be necessary to identify relevant factors that may cause this.

As one of the contributions of this thesis therefore, the fact that foreigners have preference for liquid asset in Nigeria is exploited and the degree of liquidity in every asset is therefore modelled as a state variable in an IAPM.

3.2.4. Characteristics of exposed firms and levels of aggregation

The methodologies found in the literature for addressing three broad issues on firms' characteristics and level of aggregation are discussed in this sub-section. The first is the discussion on the characteristics of firms to be included in a study on exchange risk exposure and pricing. The second is the level of aggregation of the employed returns data, and the third is the level of aggregation of the risk prices.

i. Characteristics of exposed firms

The first set of studies in this area assumes that significant exchange risk exposure (and pricing) can only be documented among firms with large international operations. For instance, Jorion (1990) uses only US Multinational Corporations (MNCs) and Amihud (1994) uses 32 biggest US exporting firms. Contrary to theoretical expectation however, both find insignificant results. In order to test if the US results can be generalised to other markets, He and Ng (1998) uses 171 Japanese multinational corporations and documents a relatively higher exposure in Japan.

Deriving from the foregoing, testing for exchange exposure among multinational corporations has been criticized in the literature; an important one is from Dominquez and Tesar (2001a) claiming that there is selectivity bias in using only MNCs by earlier

[93] Bekaert and Harvey (2000) document when most EMs were liberalised

studies and this may explain their insignificant results. They claim that MNCs are ordinarily expected to be less exposed since they have access to several internal and external hedging strategies; Bartov and Bodner (1994) also present a similar view.

In addition, testing the argument that previous studies fail to identify significant exposure and pricing because of poor sample selection procedures, Doukas et al (1999) classified 1079 Japanese firms traded on the Tokyo Stock Exchange between January, 1975 to December, 1995 into multinationals, high-exporting, low-exporting and pure-domestic and find a more robust results among the multinationals and high-exporting firms.

ii. Aggregation of returns data

There exist two levels of arguments in the literature on the levels of aggregation of returns data. Some studies are based on the use of returns from indices of a group of firms (portfolio) with similar characteristics while others are based on firm-level returns data. The group of studies that use portfolio returns can be further classified into those that use returns on country portfolios (Dumas and Solnik, 1995; De Santis and Gerard, 1998; Di Iorio and Faff, 2002; Carrieri and Majerbi, 2006; Roache and Merritt, 2006) and returns on industrial (sector) portfolios (Jorion, 1991; Priestly and Odegaard, 2004; Aquino, 2005; and Carrieri and Majerbi, 2006).

This idea of grouping asset into portfolios appears reasonable when the fact that risk-exposure computed from firm-level data possess higher measurement errors (Fama and MacBeth, 1973 and Dahlquist and Robertsson, 2001). It can also be argued that since a country's market index comprises all its relevant stocks, country-portfolio will pose fewer problems to cross-country studies. Therefore, it is common for most studies to use returns on industrial indices or country indices as the dependent variables in asset pricing models.

The above method has been criticized however. It has been argued that when returns on industry portfolios are used to analyse exchange risk exposure and pricing, it is assumed that the so-grouped firms are homogenous (Dominguez and Tesar, 2001a) and exposure in opposite directions among the component firms are likely to average out (Dahlquist and Robertsson, 2001). This may also lead to ambiguous result

(Carrieri and Majerbi, 2006) or making the effect of large firms to dominate (Dominguez and Tesar, 2001a).

This argument has therefore made studies like He and Ng (1998), Dahlquist and Robertsson (2001) Dominguez and Tesar (2001a) and Carrieri and Majerbi (2006) to recommend and employ firm-level data. It has also been argued that large variations in exposure across test assets are needed in estimating the risk premia (Ferson and Harvey, 1994) and the use of firm-level data can aid this (Dahlquist and Robertsson, 2001).

iii. Aggregation of risk prices

There is typically one equilibrium exchange risk price for all the levels of exposures by all portfolios or securities at a point in time. This is because irrespective of the firm or sector, undiversifiable risk must earn a common premium in equilibrium. However, some recent literatures (especially those using firm-level data) attempt to compute different risk prices for groups of firms with similar characteristics. Carrieri and Majerbi (2006) employ 105 firm-level data from nine EMs and generate different risk prices for each country and for each of four quartile-sized portfolios and obtained some interesting results to be discussed later in the review of empirical findings. Similarly, Di Iorio and Faff (2002) present different exchange risk prices for two different sectors; namely, resource and industrial sectors.

The foregoing directly points to three major issues, especially for a market like Nigeria where there is little evidence on exchange risk exposure and pricing. First, it will be informative for a pioneering study to employ firm-level data so as to adequately capture the heterogeneity among firms. Second, it will also be beneficial to include as many firms as acceptable number of data points are available. This is necessary to avoid survivorship-bias since using data from only surviving firms is likely to miss the dynamics of the Nigerian market which is characterised by various listings and delisting. Lastly and following from the argument of studies like Carrieri and Majerbi (2006) and Di Iorio and Faff (2002), it will also be necessary to verify whether risk exposure and prices are driven by large-sized firms or a particular industry.

The last point above is relevant for Nigeria as the background to this thesis shows that foreigners have preference for large-sized Nigerian firms. Equally relevant is the fact

that the Nigerian financial sector enjoyed a relatively higher foreign participation during the period under study, it is therefore important to verify whether this sector exhibits a different risk exposure and prices. This will be similar to the work of Di Iorio and Faff (2002) that tests for different risk prices between resource and industrial sectors in Australia.

However, this thesis represents a value addition as neither of Carrieri and Majerbi (2006) and Di Iorio and Faff (2002) tests for different risk prices between the financial and non-financial sectors even though the literature has it that the characteristics of the financial sector are often different. Another value addition is that this thesis employs a larger number of firms than these earlier studies. For instance, Carrieri and Majerbi (2006) use 105 firms in 9 countries (an average of 15 per country), while Di Iorio and Faff (2002) employ data for 24 Australian industrial portfolio. However, this thesis employs data on 200 firms for an in-depth analysis on a single market which hitherto lacks recent evidence.

3.2.5. Time-varying exchange risk exposure and pricing (conditional models)

Exposure to exchange risk may not be stable, especially when there are sizeable shifts in exchange rates (Dominquez and Tesar, 2001), thereby affecting exchange risk prices. The time variation in exposure may force its coefficient to be insignificant[94] unless this is controlled for (Levi, 1994). This therefore necessitates testing asset pricing models conditional upon some investors information set (Dumas and Solnik, 1995). In other words, if investors anticipate information changes, they are likely to adjust their portfolio choice today so as to hedge those changes. Consequently, it has been argued that if exposure to exchange risk varies with a set of information variables, the assumptions of invariant premium may cause wrong investment decisions (Choi et al, 1998). There are three[95] major methodologies for capturing time variations in exchange risk prices in the literature and they are discussed below.

[94] Note that without exchange risk exposure, there is no risk to be priced

[95] They can be seen as substitutes. For instance, Choi et al (1998) argue that if risk premium analyses are already done for different time periods, the alternative method of choosing instruments in GMM may not be necessary.

i. Use of instruments

Investors' information sets are often used as instruments in conditional asset pricing models (APMs). Dumas and Solnik (1995) and De Santis and Gerard (1998) estimate a conditional version of equation (30) as;

$$\mathrm{E}\left[r_{i,t}\left|\Omega_{t-1}\right.\right]=\lambda_{m,t-1}\,\mathrm{cov}\left[r_{i,t},r_{m,t}\left|\Omega_{t-1}\right.\right]+\sum_{l=1}^{L}\lambda_{\pi,t-1}\,\mathrm{cov}\left[r_{i,t},r_{\pi,t}\left|\Omega_{t-1}\right.\right] \qquad (36)$$

Where Ω_{t-1} is the information set (instruments) used by investors in choosing their portfolios; $\lambda_{\pi,t-1}$ *and* $\lambda_{m,t-1}$ are the time-varying world prices of exchange and market risks respectively. But since the theory does not specify the candidate instruments, their choice is often determined by results from past studies and/or from some relevant characteristics of the economy under study while efforts are required to avoid arbitrariness in the choice of instruments (Dumas and Solnik, 1995). Being a pioneering study to test the conditional form stated above, Dumas and Solnik (1995) have to try out six instruments used in different and unrelated studies. These include a constant, a January dummy, dividend yield on US index, US bond yield, 1-month interest on Eurodollar deposit and excess returns on the world index lagged one month.

Subsequent studies testing this conditional version still try to maintain this list of instruments to ensure comparability. For instance, De Santis and Gerard (1998) use the same variables, but with different transformations; Moerman and Dijk (2010) also use similar instruments. Some other studies try to add their local information factor to this list of instruments. For instance, Bailey and Chung (1995) use the fact that Mexico operates dual exchange rate system as instruments; Saleem and Vaihekoski (2007) include, among others, the change in oil price in the case of Russia while Antell and Vaihekoski (2007) augment the list with four local information variables; namely, annualised difference between US and Finnish short-term interest rate, difference between US and Finnish inflation rate, a liberalisation dummy and an EMU dummy, depicting when Finland joined the EMU.

In most cases, the relevance of these information variables are established by running preliminary regressions of the risk factors and stock returns on the instruments while

their coefficients are expected to be significant. In addition, when they are specified as instruments in equation (36), they are expressed in their lagged terms to place them in the investors' information set. Therefore, models such as in equation (36) are either estimated by the Stochastic Discount Factor (SDF) methodology (pricing kernel) which directly feeds into the GMM framework (Dumas and Solnik, 1995) or by the parsimonious multivariate GARCH-in-mean framework (De Santis and Gerard, 1998). Both methods are later discussed in the sub-section on estimation procedures.

ii. Rolling window regression

Employing the rolling window regression, the time series of, say, exchange risk prices, is computed by estimating λ_π for each overlapping period in the sample. Overlapping periods vary by studies, for example, Harvey (1995), Korajczyk (1996) and Wu (2008) use a five-year, 18-month and five-year rolling period to measure exposure respectively. Equally, Roache and Merritt (2006) use 12 months and Fedorova and Vaheikoski (2008) use 12 months and 24 months to estimate exchange risk prices. A time plot of λ_π can then be made from these estimations.

iii. Sub-period analysis

The third method is different estimations for different sub-periods. It has been argued that firms' behaviour may be different between periods of currency appreciation and depreciation (Krugman, 1987; Priestley and Odegaard, 2004; Muller and Verschoor, 2005) and between periods of large and small exchange rate changes[96] (Muller and Verschoor, 2005). Consequently, it is often advised that the analysis of exchange rate exposure and prices be broken into sub-periods especially when major shifts in currency values can be identified (Dominquez and Tesar, 2001a and Priestley and Odegaard, 2004b). This approach can be found in Jorion (1991), Amihud (1994), He and Ng (1998), Di Iorio and Faff (2002), among others.

For instance, Jorion (1991) breaks the period of his study (January 1971 to December 1987) into 3 major sub-periods in order to capture time variation in exchange risk

[96] Muller and Verschoor (2005) presents the argument that importing (exporting) firms may react to and hedge currency depreciation (appreciation) but do nothing about currency appreciation (appreciation). Equally, a firm may allow a reduction in its mark-up in order to absorb small changes in currency movements since it may be costly to change its export prices. However, if currency movements are large, it may be forced to raise its price.

pricing; Choi et al (1998) estimate an unconditional model for two different periods in Japan, namely; period of strong dollar (January 1974-September, 1985) and period of strong Yen (October 1985-December 1995) and Di Iorio and Faff (2002) divide the period of January 1988 to September 1998 into four sub-periods coinciding with major changes in Australian currency values.

The foregoing therefore establishes the importance of estimating time-varying exchange risk exposures and prices. In fact, it has been shown in the literature that such estimations are more important in EMs because they are often characterized by changing industrial structures which normally induce changes in their risk sensitivities (Harvey, 1995). However, in choosing the appropriate methodology for capturing these time-varying parameters, it is important to pay attention to the methodology of choosing relevant instruments, establish whether the nature of available data can meet the criteria of some sophisticated statistical methodologies and examine if periods of major changes in exchange rates can be identified.

As already shown in the background chapter of this thesis, three episodes of exchange rate changes can be identified in Nigeria during the period of this study[97]; and following from Dominquez and Tesar (2001a) and Priestley and Odegaard (2004b), it is important to estimate different risk exposure and risk prices for these respective periods. This method does not suffer from the arbitrariness problem encountered in the selection of instruments (Dumas and Solnik, 1995). It is also more easily interpretable as studies that use the parsimonious multivariate GARCH-in-mean methodology often have to result to it in order to provide meaningful interpretations of their typically volatile risk prices (De Santis and Gerard, 1998 and Moerman and Djik, 2010).

3.2.6. Estimation procedures

The list of the estimation procedures found in the literature can be broadly classified into five. These include the traditional Ordinary Least Squares (OLS) or Generalised Least Squares (GLS) two-pass procedure (Fama and MacBeth, 1973), the iterated non-linear seemingly unrelated regression procedure (Gibbons, 1982; McElroy and

[97] In the first period (January 2000 to November 2003), naira depreciated against the dollar; in the second period (December 2003 to March 2008) naira appreciated against the dollar; but at the inception of the global financial crisis, the value of naira experienced a sharp fall against the dollar and this occurs to almost the end of the period of study (April 2008 to December 2009)

Burmeister, 1988), the Stochastic Discount Factor (SDF) representation using the Generalised Method of Moments (GMM) (Hansen and Jagannathan, 1991; Dumas and Solnik, 1995), the expected return-beta representation also using GMM (Cochrane, 2001 and Jagannathan, et al, 2002) and the parsimonious GARCH-in-mean procedure (De Santis and Gerard, 1997; 1998). Each of these is discussed in turn below.

i. Fama and MacBeth (1973) two-pass method

This computationally simple method (Cochrane, 2001) has been described as very influential in asset pricing tests (Elton, et al, 2007). Applying this method on equation (30), the *first pass* regression implies that the following time series ordinary (or generalised) least squares regression is run for each security or portfolio[98];

$$r_t = \alpha + \beta_m r_{m,t} + \beta_\pi r_{\pi,t} + \varepsilon_t \tag{37}$$

It should be noted that the betas represents each security's or portfolio's (r_t) exposure to the respective risks. For instance, for security *i*, β_m is *exposure to the market risk* ($r_{m,t}$) and β_π is *exposure to exchange rate risk* ($r_{\pi,t}$). Following from the definition of betas in a regression analysis, that is;

$$\beta_m = \frac{\text{cov}(r_i, r_m)}{\text{var}(r_m)} \qquad \text{and} \qquad \beta_\pi = \frac{\text{cov}(r_i, r_\pi)}{\text{var}(r_\pi)} \tag{38}$$

the numerators in equation (38) serve as the explanatory variables (risk-exposure factors) in equation (30); only that they are scaled by the variance terms to express them as the price per unit of variance risk.

In the *second pass*[99] therefore, a cross sectional regression is run at each time period (say, monthly), according to equation (39) below;

$$r_i = \lambda_0 + \lambda_m \beta_{i,m} + \lambda_\pi \beta_{i,\pi} + e_i \tag{39}$$

[98] Note that equation (37) assumes a single exchange rate; it may be single bilateral or a single trade-weighted rate

[99] In the original Fama and MacBeth (1973) specification, the first five years are used in the first pass to estimate the risk exposure (betas), and the second-pass cross-sectional regression is done for each month subsequent to these five years to estimate the risk prices. This approach leads to the loss of the first five years in subsequent estimations which is usually unsuitable for studies with few years' data. The approach presented in this thesis minimise these loss (Cochrane, 2001).

Since the coefficients from equation (39) are generated for each time period, Fama and MacBeth (1973) suggest that the risk prices should be computed from the arithmetic averages of the coefficients as given below;

$$\hat{\lambda}_m = \frac{1}{T}\sum_{t=1}^{T}\hat{\lambda}_{m,t} \quad ; \quad \hat{\lambda}_\pi = \frac{1}{T}\sum_{t=1}^{T}\hat{\lambda}_{\pi,t} \text{ and } \quad \hat{\lambda}_0 = \frac{1}{T}\sum_{t=1}^{T}\hat{\lambda}_{0,t} \tag{40}$$

In other to test the significance of the above parameters, Fama and MacBeth (1973) further suggest that the standard deviations of the cross-sectional regression estimates should be used to generate their sampling errors.

The foregoing simplicity and intuition notwithstanding, the traditional Fama and Macbeth (1973) approach as reviewed above suffers from the errors-in-variable problem (Elton et al, 2007; Cochrane, 2001 and Choi and Rajan, 1997). This is because the betas from the first pass regression are estimates of the "*true*" betas for security or portfolio *i* and this has the tendency to bias the values of the risk prices obtained at the second pass.

One popular way of solving this problem is to use the Shanken (1992) corrected standard error formula, which adds a multiplicative $\left(1+\lambda'\Omega_{risks}^{-1}\lambda\right)$ and an additive (Ω_{risks}) correction terms to the standard OLS variance formula (Roache and Merritt, 2006; Cochrane, 2001), this is given as;

$$\text{var}(\hat{\lambda}_{ols}) = \frac{1}{T}\left[\left(\beta'\beta\right)^{-1}\beta'\Omega\beta\left(\beta'\beta\right)^{-1}\left(1+\lambda'\Omega_{risks}^{-1}\lambda\right)+\Omega_{risks}\right] \tag{41}$$

where Ω_{risks} is the variance-covariance matrix of the risk factors, and $\Omega = E(\varepsilon_t\varepsilon_t')$.

Apart from the Shanken (1992) correction shown above, Cochrane (2001) presents the proof that when the right hand variables in equation (30) do not vary over time (as expected of most asset pricing applications), the Fama and MacBeth procedure is numerically equivalent to a pooled regression estimation. However, since it will be expected that the error terms from such a pooled regression will be cross-sectionally correlated at a given time, it will be necessary to estimate such pooled regression with corrected standard errors.

ii. Iterated non-linear seemingly unrelated regression (INLSUR) method

The INLSUR method (Gibbons, 1982; McElroy and Burmeister, 1988) represents an alternative to the two-pass method and it is used to simultaneously estimate both the risk exposure and risk prices (Priestley and Odegaard, 2004; Roache and Merritt, 2006). Assume[100] a *k-factor* model for expected returns, with *k* now representing the market factor and exchange factor, the earlier equation[101] (27) can be substituted into (26) and when this is stacked for all securities (N), it yields;

$$\boldsymbol{\mu}^{\mathbf{N+1}} - \lambda_0 = \left\{ \mathbf{I}_{\mathbf{N}} \otimes \left[\left(\lambda' \otimes \iota_T \right) + \mathbf{f} \right] \right\} \beta + \varepsilon \tag{42}$$

Where $\boldsymbol{\mu}^{\mathbf{N+1}}$ is an *NT* x 1 vector of returns expressed in the numeraire currency, λ is a *k* x *1* vector of risk prices, **f** is a *T* x *k* matrix of observation of the factors, β is an *N*k x *1* vector of sensitivities, $\boldsymbol{I_N}$ is a *N* x *N* identity matrix and $\otimes$ is the Kronecker product operator.

Equation (42) above is usually estimated with iterated nonlinear seemingly unrelated regression (INLSUR) estimator which minimises equation (43) below;

$$\min_{\boldsymbol{\lambda},\mathbf{B}} \boldsymbol{\varepsilon}' \left(\Omega_{\boldsymbol{\varepsilon}}^{-1} \otimes \mathbf{I}_{\mathbf{T}} \right) \boldsymbol{\varepsilon} \tag{43}$$

Where $\boldsymbol{\varepsilon}$ is obtained from (28), and $\Omega_{\boldsymbol{\varepsilon}}^{-1}$ is the estimated residual covariance matrix from (42).

The above single-pass procedure is often preferred to the two-pass. However, the parameters are non-linear; thus, they are jointly estimated using the maximum likelihood (MLE) procedure that allows for the contemporaneous correlations across all the assets especially by the iterative non-linear seemingly unrelated regression

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[100] The derivation in this thesis draws from Priestley and Odegaard (2004).

[101] For convenience, equations (26) and (27) are respectively re-written as $\tilde{\boldsymbol{\mu}}^{\mathbf{N+1}} = \bar{\boldsymbol{\mu}}^{\mathbf{N+1}} + \beta_k \tilde{\mathbf{f}}_{\mathbf{k}} + \tilde{\boldsymbol{\varepsilon}}$ and $\bar{\boldsymbol{\mu}}^{\mathbf{N+1}} = \lambda_0 \iota_N + \lambda_k \beta_k$; where $\tilde{\boldsymbol{\mu}}^{\mathbf{N+1}}$ is an *N* vector of security returns expressed in the reference country's currency, $\tilde{\mathbf{f}}_{\mathbf{k}}$ is a *k*-vector of observations on the *k* risk factors, β_k is an *N* x *k* matrix of betas (sensitivities of returns to the factors), $\tilde{\boldsymbol{\varepsilon}}$ is an *N*-vector of disturbance terms, $\bar{\boldsymbol{\mu}}^{\mathbf{N+1}}$ is an *N* vector of expected returns expressed in the reference country's currency, λ_0 is the return on the riskless security, ι_N is an *N*-vector of *ones* and λ_k is a *k*-vector of risk prices.

technique. However, because the procedure assumes a distribution for the error terms, it is less general compared to the GMM framework to be discussed below (Roache and Merritt, 2006).

iii. Stochastic discount factor (pricing kernel) method

The stochastic discount factor (SDF) representation assumes that an asset price is a function of the stochastic discount factor and the assets' gross payoff; and the risk prices are estimated within the GMM framework. It is usually used to estimate conditional models like equation (36). This framework premises on the fact that the first-order condition of any portfolio choice problem can be expressed as equation (44) below (Dumas and Solnik, 1995; Campbell, 2000; Jagannathan et al, 2002).

$$E\left[m_t \left(1+r_{f,t-1}\right) \middle| \Omega_{t-1} \right] = 1 \tag{44}$$

Where m_t represents the marginal rate of substitution between nominal returns at time t and at time $t-1$, and $r_{f,t-1}$ is the conditional risk free rate. The term m_t in equation (44) above is called the pricing kernel or stochastic discount factor (SDF) and using equation (36), it is transformed into (45) below;

$$m_t = \frac{\left[1-\lambda_{0,t-1}-\lambda_{m,t-1}r_{m,t}-\sum_{i=1}^{L}\lambda_{\pi,t-1}r_{\pi,t}\right]}{(1-r_{f,t-1})} \tag{45}$$

Defining $\lambda_{0,t-1}$ as the time-varying constant term, equation (45) states the SDF as a projection on a subspace of asset returns, that is, the risk-free returns, the market returns and currency returns (Hansen and Jagannathan, 1991; Dumas and Solnik, 1995). Moreover, a vector ($\mathbf{z}_{t-1}$) representing predetermined instrumental variables of everything known to the investor is used to specify how the risk prices change with time;

$$\begin{aligned} \lambda_{0,t-1} &= -\mathbf{z}_{t-1}\boldsymbol{\varphi}'_0 \\ \lambda_{m,t-1} &= -\mathbf{z}_{t-1}\boldsymbol{\varphi}'_m \qquad\qquad i = 1,\ldots, L \\ \lambda_{\pi,t-1} &= -\mathbf{z}_{t-1}\boldsymbol{\varphi}'_\pi \end{aligned} \tag{46}$$

Where the $\boldsymbol{\varphi}$*'s* are the row vectors of weights for the instruments. Finally, the relevant moment conditions are generated from the SDF and the Hansen's (1982) GMM is used

to minimize the average deviations from these moment conditions and obtain best parameters (MacKinlay and Richardson, 1991; Dumas and Solnik, 1995; Choi et al, 1998; Jagannathan et al, 2002).

iv. Expected return-beta method

This is a closely related framework to the SDF representation of asset pricing models. Both are estimated within the GMM framework and they yield comparable results (Cochrane, 2001; Jagannathan, et al 2002). The beta representation exists both as *unconditional linear beta pricing model* and as *conditional linear beta pricing models*. The latter uses exogenous instruments and is very similar to the form of SDF provided above. In the literature on IAPM, the unconditional linear beta pricing model is more common, especially in its *restricted*[102] format. This leads to over-identifying restrictions which are tested within the GMM framework as;

$$GMM = \mathrm{T}_{g_T}\left(\hat{\beta}\right)' S_T^{-1} g_T\left(\hat{\beta}\right) \tag{47}$$

Where $g_T\left(\hat{\beta}\right) = \frac{1}{\mathrm{T}}\sum_{t=1}^{\mathrm{T}} f_t\left(\hat{\beta}\right)$

$\hat{\beta}$ is the vector of estimated coefficients and S_T^{-1} is the weighting matrix, chosen to be the inverse of the covariance matrix of the sample moments. The restricted GMM is asymptotically distributed chi-square with *N* degrees of freedom.

The beta-representation above maps the whole of equation (30) into a GMM framework. This procedure treats the moments that generate the regressions (betas) at the same time as the moments that generate the cross-sectional risk prices (lambdas) and the covariance matrix between the two sets of moments captures the effects of generating the regressors on the standard error of the cross-sectional regression coefficients (Cochrane, 2001).

Moreover, conditional studies in this area have relied on the SDF framework (Dumas and Solnik, 1995; Choi et al, 1998) while unconditional studies often use the restricted case of the beta-representation framework (Vassalou, 2000; Di Iorio and Faff, 2002; Acharya and Pedersen, 2005 and Carrieri and Majerbi, 2006). It should be noted that

[102] That is imposing the mean-variance condition that the constant term be zero. Jagannathan et al (2002) provides a detailed treatment of these distinctions.

the results of the last set of studies will be comparable to those obtained in a pooled regression with standard errors corrected for cross-sectional correlation in errors. The result will only be different to the extent that the errors are correlated over time; a condition more likely to occur in corporate finance than in asset pricing models (Cochrane, 2001).

The SDF and beta-representations within the GMM framework gains popularity because both the Fama and MacBeth (1973) two-pass method and the MLE of Gibbons (1982) assume returns normality which reduces their importance (Mackinlay and Richardson, 1991). This assumption, as well as the difficulty often encountered in the linear approximation of non-linear models under the maximum likelihood method, therefore makes the Hansen's (1982) Generalized Method of Moments (GMM) the preferred[103] method of estimation (Mackinlay and Richardson, 1991; and Jagannathan et al, 2002).

As the conditional versions of asset pricing models are gaining popularity, it has been noted that the GMM framework is limited because it does not specify the dynamics of the conditional second moments. This therefore makes it difficult to evaluate the economic magnitude of the exchange risk premiums relative to the market premium. In other words, as there are many parameters to be estimated in complete conditional models, the GMM orthogonality condition requirement will be many and this renders it unreliable (De Santis and Gerard, 1998).

v. Parsimonious multivariate GARCH-in- mean method

This is a fully parametric method and an approach to addressing the afore-mentioned problem (De Santis and Gerard, 1997; 1998). This approach enables the simultaneous testing of many securities whereby the conditional measures of risks and their prices vary over time. If a disturbance term orthogonal to the information available at the end of time *t-1* is added to the conditional equation (36) above, one obtains the econometric representation that can be used to estimate the risk premia given below;

$$r_t = \lambda_{m,t-1} h_{m,t} + \sum_{l=1}^{L} \lambda_{\pi,t-1} h_{\pi,t} + \varepsilon_t \qquad ; \qquad \varepsilon_t \left| \Omega_{t-1} \sim N\left(0_j H_t\right) \right. \tag{48}$$

[103] GMM is valid under much weaker distributional assumption (Hansen, 1982)

Where H_t is the *s* x *s* conditional covariance matrix of asset returns at time *t*, $h_{\pi,t}$ is the *(n+i)th* column of matrix H_t, and $h_{m,t}$ is the last column of H_t. It is further assumed that the conditional second moments follow a diagonal GARCH process[104] and therefore the variance in H_t will depend on past squared residuals and an autoregressive component while the covariance depends on past cross-products of residuals and an autoregressive component. Moreover, if the system is covariance stationary, the H_t matrix process can then be written as;

$$H_t = H_0 * \left(ii' - \mathbf{aa}' - \mathbf{bb}'\right) + \mathbf{aa}' * \varepsilon_{t-1}\varepsilon'_{t-1} + \mathbf{bb}' * H_{t-1} \tag{49}$$

Where H_0 is the unconditional variance-covariance matrix of the residuals, *i* is an *s* x *1* vector of ones, ***a*** and ***b*** are *s* x *1* vector of unknown parameters, and $*$ represents the Hadamard matrix product (element by element matrix multiplication). Equations (36) and (48) represent the benchmark model and if we denote the vector of unknown parameters as ϕ, the log-likelihood under the assumption that the errors are conditionally normally distributed, can be stated as:

$$\ln L(\phi) = \frac{-\mathrm{T}_s}{2}\ln 2\pi - \frac{1}{2}\sum_{t-1}^{\mathrm{T}}\ln\left|\mathrm{H}_t(\phi)\right| - \frac{1}{2}\sum_{t-1}^{\mathrm{T}}\varepsilon_t(\phi)'\,\mathrm{H}_t(\phi)^{-1}\varepsilon_t(\phi) \tag{50}$$

The above approach is often estimated by the quasi-maximum likelihood (QML) approach of Bollerslev and Wooldridge (1992) because the assumption of conditional normality is too restrictive (see De Santis and Gerard, 1998; Carrieri, et al, 2007; Chaieb and Errunza, 2007; and Jacobsen and Liu, 2008). Finally, the exponential function is often used to model the dynamics of λ_m because risk averse investors will demand positive market risk premium, but the dynamics of the prices of exchange risk (λ_π) is just modelled linearly since theory is not specific about its sign. Representing the vector of instruments observed at the end of period t_{-1} with z_{t-i}, and their coefficients as κ. The dynamics of market risk price and exchange risk prices are given below respectively;

$$\begin{aligned}\lambda_{m,t-1} &= \exp\left(\kappa'_m z_{t-1}\right)\\ \lambda_{\pi,t-1} &= \kappa'_\pi z_{t-1}\end{aligned} \tag{51}$$

[104] This is to account for the fact that security returns usually have heteroscedastic innovations.

The dynamics of the market is modelled as exponential function because the theory suggests that the price of market risk should be positive since it is the weighted average of the coefficients of risk aversion of all national investors and the weight is the relative wealth of each country. But the theory does not give the sign of the exchange price.

However, a major limitation of this method is that it imposes a parameterization on the dynamics of the unconditional moments. It also assumes the functional form for the conditional density of the asset returns. When either or both are wrong, the method is wrong. One other issue is that the obtained risk prices are often very volatile showing both negative and positive values and subject to estimation error. It is therefore advised that attention should be paid to the general trend rather than the values at each point in time (De Santis and Gerard, 1998); and to enable this, filtered prices (for example, Hodrick-Prescott) may be used (Moerman and Djik, 2010). Further, in providing informative summary for important sub-periods, the averages of these prices are typically presented (De Santis and Gerard, 1998).

3.3. Empirical review

It is necessary to reiterate from the outset of this section that exchange risk exposure precedes exchange risk pricing; firms are first exposed to this risk and when the risk is undiversifiable in equilibrium, it earns a premium, that is, it is priced (Ferson and Harvey, 1994 and Andren and Kjellsson, 2005). Hence, it is possible to have a study solely on exchange risk exposure without going ahead to test for the pricing of the risk; but studies on risk pricing may have to compute risk exposure in the first stage before going ahead to determine risk prices in the second stage. This idea of having to move through two stages for risk prices to be determined is more vivid when the Fama and MacBeth (1973) two-pass procedure is used.

However, given that this procedure suffers the errors-in-variable problem because the betas from the first pass regression are estimates of the "*true*" betas; many studies with the main goal of determining risk prices often estimate both the risk exposure and risk prices jointly. Hence, majority of studies in this category may not report risk exposure as they just go ahead to report the risk prices.

The foregoing has implications for this section. The first two sub-sections present evidence on exchange risk exposure and exchange risk pricing respectively. The sub-section on exposures considers the evidence from studies that are solely based on exchange risk exposure as well as from studies on exchange risk prices that also report their exposure coefficients. The sub-section on exchange risk pricing presents the evidence under the respective estimation procedures identified in the methodological review; and each of these two sub-sections attempts to present the little evidence available on Nigeria.

Moreover, because this thesis attempts to price Nigerian assets in the framework of an International Asset Pricing Model which controls for market illiquidity, sub-sections are also created to review evidence on the prices of world risk and liquidity risk. This will later enable the proper evaluation of the results obtained in the thesis.

3.3.1. Review of studies on foreign exchange risk exposure

Exchange rate risk exposure can be defined as the possibility of changes in the value of the firm which arises from the potential for changes in foreign exchange rates (Hekman, 1981). Exchange risk can affect two sets of participants in the international market. Business firms are affected through the expected cash flows from their operations across different currencies (operating exposure)[105], so are international portfolio investors[106].

According to Dominguez and Tesar (2001a), significant exposure suggests some form of inefficiency arising from the inability of firms to fully hedge this risk and/or investors to fully diversify their portfolios. In other words, a firm's stocks are unlikely to be exposed to exchange risk if it can completely hedge the risk through either internal mechanisms (operations in different markets) or external mechanisms (using derivative market instruments).

[105] The theoretical explanations for the exposure from the side of business firms can be seen in the works of Shapiro (1974) and Marston (2001). Muller and Verschoor (2006) present an excellent review of this literature. Some of the relevant explanatory variables include a firms' import and export structure, their foreign operations and adoption of hedging mechanisms. However, it is possible for a firm that has no foreign operations to be exposed to exchange risk and this may be as a result of its link with firms that have foreign operations through competitions for market and factors of productions (A-D, 1984; Dominguez and Tesar, 2001a; Dahlquist and Robertsson, 2001 and Du, 2010)

[106] This group is particularly affected because exchange rate fluctuations affect both the expected value and the variance of returns on their internationally diversified portfolio.

Complete risk diversification by portfolio investors into several and different assets may also shield them from bearing this risk. Thus, the hedging activities of these two players can be substitute, such that if the portfolio investors can costlessly diversify the risk on personal account, firms need not employ any additional external hedging strategy (Hekman, 1981; Jorion, 1991; Dominguez and Tesar, 2001a).

Given the removal of barriers to international transactions and the adoption of floating exchange rate regimes, international financial economists generally expect that exchange risk should matter for asset pricing (Hekman, 1981; Jorion, 1991; Doukas et al, 1999; Priestley and Odegaard, 2004 and Du, 2010). Therefore, this has resulted in several studies trying to determine if actually firms are exposed to exchange rate risk and the magnitude of such exposure. Surprisingly, the first set of studies (Jorion, 1990 and Amihud, 1994) finds weak evidence of exchange exposure and this represents a puzzle in this area of international finance (Chow et al, 1997; Dominguez and Tesar, 2001a; Muller and Verschoor, 2006 and Du, 2010).

However, this has resulted in other studies trying to explore the reasons for such results. Many reasons have been advanced in the literature especially those connected with restrictions imposed by these earlier studies. Important issues include testing whether the US evidence can be generalised to other markets, searching for appropriate definition of exchange rate and risk, examining the characteristics of firms included in tests of exposure and controlling for the effect of time (Chow et al, 1997; He and Ng, 1998; Dominguez and Tesar, 2001a; Muller and Verschoor, 2006 and Du, 2010). The documented evidence under each of these issues[107] are presented in the remaining part of this sub-section.

i. The first set of evidence:

These studies fail to document significant exposure, especially among US Multinational Companies (MNCs). Specifically, Jorion (1990) documents that only about 5% of US MNCs are significantly exposed to exchange risk in the period of January 1971 to December 1987. Amihud (1994) finds even a weaker effect of currency movements on share prices among the 32 biggest US exporting firms

[107] It is clear that a single study may consider a combination of these issues, but what is done in this remaining part is to categorise studies according to their major themes

between 1979 and 1988. Equally, Choi and Prasad (1995) show that only 14.9% of firms and 10% of industries in the US are exposed to foreign exchange risk even at the 10% level of significance.

ii. Evidence from other countries

There is the argument that the weak evidence of exposure of US firms may be because, in a developed market like the US, firms can determine their foreign exchange exposure and they have access to hedging facilities with which they eliminate such risks (Bartov and Bodnar, 1994 and Muller and Verschoor, 2006). This therefore warrants evidence from other parts of the world (He and Ng, 1998).

Harvey (1995) employs data on a set of 21 IMs and 20 EMs using market returns on a value-weighted portfolio of securities that trade in each market and a trade-weighted index of currency returns for the period between 1976 and 1992. It is found that 12 out of 21 IMs are exposed to trade-weighted exchange rate, ranging between -0.50 (US) and 0.95 (Austria) but marginal exposure is observed in only 8 out of the 21 EMs. An African country, Zimbabwe, is one of these 8 EMs with an exposure coefficient of 0.619 and an adjusted R^2 of 0.028.

In another study by He and Ng (1998), data on 171 Japanese multinationals stocks for the period of January 1978 to December 1993 are used and they find a better result than that of the US. Specifically, it is found that about 25% of the Japanese multinational stocks have significant and positive exposure to trade-weighted exchange rate. Table 3.1 below is an extract from their study.

The table shows that the number of multinationals that are significantly and positively exposed increases from 41 in the first sub-sample period to 81 in the second sub-period, while the number of firms with negative exposure falls from 26 to 11. Since yen depreciates against the dollar in the second period, it implies that the depreciation of yen has a positive impact on Japanese Multinationals, except for few exceptions. This type of result is expected from a net exporter.

Table 3.1. Cross-sectional distribution of exchange-rate exposure coefficients of Japanese multinational firms

Sample Period (Year : Month)	Quartiles					N^-	N^+
	Min.	q1	Median	q3	Max.		
1978:01-1993:12	-0.109	0.070	0.242	0.451	1.075	2	43
1979:01-1986:12	-0.205	-0.014	0.116	0.303	0.954	26	41
1987:01-1993:12	-0.107	0.144	0.411	0.859	1.459	11	81

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure out of 171 multinational firms at the 5% level of significance
Source: Extracted from table 1 (pg 738) in He, J. and Ng, L. 1998. The foreign exchange exposure of Japanese multinational corporations. Journal of Finance 53. 2: 733-753.

Furthermore, Carrieri and Majerbi (2006) find significant and positive exchange risk exposure in 7 out of 9 EMs between the period of January 1976 and October 1999. This ranges between Zimbabwe (0.46) to Argentina (3.18). Since they define a positive change in the exchange rate to mean appreciation of EMs currencies, positive exposure implies that depreciation will lead to lower dollar excess returns on EMs securities, implying most EMs are net importers.

High exposure to exchange risk among EMs has been explained by the fact that they are incomplete markets that lack adequate mechanisms for hedging exchange rate risk. Thus, it has been argued that this usually makes the monetary authorities in EMs to actively manage[108] their exchange rates (Calvo and Reinhart, 2002).

iii. Alternative definitions of exchange rate risk

Arguments exist that the use of trade-weighted multilateral exchange rates is likely to reduce exposure estimates (Dominguez and Tesar, 2001a; Muller and Verschoor, 2006). Dominguez and Tesar (2001a) use weekly data on 8 non-US industrialised markets for the period January 1980 to May 1995. They use an average of 300 firms and 30 industries per country and 3 country-specific measures of exchange rates. They find a relatively higher percentage of exposure; 23% of firms and 4% of industries are exposed to at least one of the three exchange rates types (the trade-weighted exchange rates, bilateral exchange rate with US and the rate against the currency of the country's major trading partners).

In a related study, Muller and Verschoor (2005) use data on 935 US MNCs with real production and/or trade operations in foreign countries between January 1970 and December 2001 and have documented that 29.09% of them are exposed to region-specific exchange rates. Similarly, Dahlquist and Robertsson (2001) employ data on 352 Swedish firms between January 1988 and December 1998 and find that 15-30% of these firms are exposed to changes in a trade-weighted exchange rate index, but 40-70% of the firms are exposed to at least one of three bilateral rates.

In addition, Muller and Verschoor (2005) argue that the sensitivity of stock returns to changes in exchange rates may depend on the signs and magnitude of these changes.

[108] A contrary effect of active exchange rate management on exchange risk exposure is later discussed under the moral hazard problem in the sub-section on 'time-varying exposure'.

Allowing for sign asymmetries in exchange risk exposure (different exposure for appreciation and depreciation periods), they show that 37.75% of US MNCs have significant exchange risk exposure. Further, when magnitude asymmetries in exchange risk exposure is allowed, it is found that 56.04% of the US MNCs are significantly exposed to exchange risk.

iv. Characteristics of exposed firms

Testing for exchange exposure solely among MNCs has been criticized by some literature; an important one is from Dominquez and Tesar (2001a) claiming that there is selectivity bias in using only MNCs by earlier studies as this may explain their insignificant results. They claim that MNCs are ordinarily expected to be less exposed since they have access to several internal and external hedging strategies[109]. It is also upon this basis that Dominquez and Tesar (2001a) are able to establish significant exposure for many firms in a group of eight countries.

However, there are other literatures that show that exchange rate exposure is higher among MNCs. For instance, Dahlquist and Robertsson (2001) present the evidence that large Swedish firms with high foreign ownership are more exposed to exchange rate risk and He and Ng (1998) also show that larger Japanese MNCs are more exposed to exchange risk. This finding is also corroborated by Doukas et al (1999) in a study involving 1079 Japanese firms that are traded on the Tokyo Stock Exchange.

Furthermore, Dominguez and Tesar (2001b) employ firm-, industry- and market-level data of Chile, France, Germany, Italy, Japan, the Netherlands, Thailand and the UK between 1980 and 1999 and they have found that exposure is less in industries like mining, oil and gas, food and drug retail, telecommunication and information technology. Similar to the findings of Dahlquist and Robertsson (2001), they also find that foreign exchange exposure increases with firm size.

On whether significant exposure arises when a firm operates in a traded sector or not, it has been found that firms are equally exposed regardless of whether they operate in traded or non-traded industries. This is because it is possible for a firm that has no foreign operations to be exposed to exchange risk due to its link with exposed firms

[109] Similar views are presented by Bartov and Bodnar (1994) and Chow et al (1997).

during competitions for market and factors of productions (A-D, 1984; Dominguez and Tesar, 2001a; Dahlquist and Robertsson, 2001 and Du, 2010). However, Dahlquist and Robertsson (2001) have found that foreign exchange risk exposure is higher among firms with high exports in Sweden.

v. Aggregation of returns data

The practice of aggregating similar firms into portfolios prior to estimation has also been shown to be responsible for the weak exposure documented by earlier studies (Khoo, 1994; Choi and Prasad, 1995 and Dominguez and Tesar, 2001a). Hence, Dominguez and Tesar (2001a) document 23% exposure rate with firm-level data but 4% exposure rate with industrial portfolio data for a group of 8 non-US industrial markets between 1980 and 1995. Similarly, Khoo (1994) and Choi and Prasad (1995) find that significant exposure to exchange risk is more prominent when firm-level data is used as against portfolio data.

Dahlquist and Robertsson (2001) find that the size and sign of exposure vary widely across some 352 Swedish firms between January 1988 and December 1998 and exposure tends to disappear when forming portfolios of firms with similar attributes. The main argument has been that if firms in a given portfolios are not perfectly homogeneous, it is possible for the simultaneous occurrence of both positive and negative exposure to average out leading to zero or weak exposure (Dahlquist and Robertsson, 2001).

vi. Time-varying exposure

Exchange rate risk exposure may vary over time (A-D, 1984) and this is likely to influence the estimated exposure coefficient (Dominguez and Tesar, 2001a; Muller and Verschoor, 2006). An important issue raised by Priestley and Odegaard (2001) is that shifts in exchange rate regimes should be considered when computing exchange risk exposure. They go ahead to show that the statistical significance, size and sign of exchange rate exposure depend on the exchange rate regimes. Specifically, using data on 9 Norwegian industries between 1983 and 1998, they document that exposure tends to be larger in free floating regimes relative to pegged regimes.

Conversely, it is also possible for firms to be relatively more exposed in a period of active exchange rate management. This argument is based on the ***moral hazard problem*** ensuing when exchange rate is pegged. In this situation, because firms expect low volatility in exchange rates, they may fail to hedge thereby raising their currency exposure (Eichengreen and Hausmann, 1999; Burnside et al, 2001 and Schneider and Tornell, 2004).

The moral hazard argument above has equally been confirmed by some studies. For instance, Patnaik and Shah (2010) use the weekly returns on the 100 most liquid stocks on Indian stock exchanges and break the period April, 1993 to March, 2008 into four sub-periods of exchange rate regimes. They find that when there was high currency flexibility, firms reduced (hedged) their exposure; but when the government actively managed exchange rate, firms carried significant currency exposure. Similarly, Parsley and Popper (2006) show that East Asian firms became more exposed to exchange rate risk under a pegged exchange rate regime.

In addition to this argument that firms tend to take un-hedged positions during pegged regimes, the anticipation that a country may abandon its fixed exchange rate regime is also likely to cause higher exposure (Jacobsen and Liu, 2008).

Moreover, Dominguez and Tesar (2001b) in a study involving 8 countries split the period 1980-1999 into three sub-samples in order to test if exposure to exchange rate risk is higher during periods of currency depreciation and/or appreciation. They find that the extent of exposure is similar during periods of currency depreciation and appreciation. However, they document that while the exposure level may be relatively stable for the whole economy, the firms that are exposed change over time.

Bartov and Bodnar (1994) also put forward the argument that since investors learn the effect of exchange risk from past information, it may be necessary to explore the effect of lagged exchange rate changes on stock prices. They actually find that US firms are more exposed to lagged exchange risk than contemporaneous. However, Nydahl (1999) and He and Ng (1998) are unable to establish the same hypothesis in their respective cases of the Swedish and Japanese markets.

The impact of the recent global financial crisis has also been tested on exchange risk exposure. In a study by Men and Yang (2009), data on 20 industrial portfolios from

each of the two segmented Chinese stock markets of Shanghai (SSE) and Shenzhen (SzSE) and 53 industrial portfolios from the Renminbi special stocks (B-shares, denominated in US$ and traded by foreigners) for the period July 2005 to December 2008 are used. Using the period when Russia saw the impact of the US sub-prime crisis (March, 2007) as the beginning of the crisis period, they document the excerpt in table 3.2 below. As evident from the table, exposure is higher in the segmented Chinese markets than the integrated market. However, save for some slight variations, exposure does not significantly change during crisis period in China.

vii. Evidence of exchange rate exposure in Nigeria

There is paucity of evidence on exchange exposure in Nigeria. The study by Harvey (1995) includes Nigeria and Zimbabwe as the only two African countries in a study of 21 IMs and 20 EMs between 1985 and 1992. The study shows that Nigeria has an insignificant exposure to a measure of trade-weighted exchange rate with an exposure coefficient value of 0.360 and an adjusted R^2 value of -0.002. The study further documents time-variations in the Nigerian exposure coefficient with a tendency to rise in the future.

It should however be noted that the fact that this study makes use of aggregate data on Nigeria along with those of other countries make it difficult to draw lessons peculiar to the Nigerian market. Furthermore, it was carried out in the period prior to the liberalisation of the Nigerian capital market in 1993, and several things have changed after this study[110]. These therefore highlight the importance of updating the literature on Nigeria with more recent data.

Asaolu (2011) represents an attempt to address this objective. He uses annual data on 117 listed firms in Nigeria between 1998 and 2007 and separately tests for the sensitivity of Nigerian firms to the real exchange rates[111] against each of US dollars, British pounds and the euro; but finds that Nigerian firms are mostly exposed to the exchange rate against the US dollars.

[110] The mean returns on Nigeria market now are about 10 times what was observed in that period; and Nigeria which was classified as zero percent investable at that time by IFC (Bekaert and Harvey, 1995) is now attracting some FPI as shown in the background to this study.

[111] Although the study refers to the measure of exchange rate used as "real effective exchange rate", the fact that different exchange rates are used for each of the US dollars, UK pound and euro implies that the study actually employs the real (bilateral) exchange rate definition.

Table 3.2. Proportion of significant exposure coefficients

Sample Period (Year : Month)	Significant exposure (%)		
	SSE	SzSE	B-Share
2005:07-2008:12	60	70	11
2005:07-2007:03	5	45	25
2007:04-2008:12	15	45	8

Source: Extracted from Tables II and IV in Men, M. and Yang, C. 2009. Exchange rate exposure of Chinese security markets: before and after American sub-prime crisis. Conference paper at the Research Centre for International Economics (UIBE) China; June.

In his study, the estimated coefficients of exposure to the dollar rate are found to range between -0.012 and 0.644 with an average value of 0.222. Generally, it is shown that 103 (88%) of Nigerian firms are exposed and majority of them (80 firms) have negative exposure. Furthermore, it is found that exposure is higher in the non-financial sector (95.3% of the firms are significantly exposed) than financial sector (78.8% of the firms are significantly exposed). Although he fails to offer an explanation for this exposure differential, a likely reason is that the Nigerian financial sector is relatively more involved in foreign operations involving exchange rates than the non-financial sector.

However, more studies are still required to offer comparable lessons with studies from other markets. This represents one of the limitations in the study by Asaolu (2011) as he does not employ the same definition of concepts as found in the leading literatures in this area. For instance, the study uses nominal interest rate as the proxy for market returns instead of return on a measure of stock index like the Morgan Stanley Capital International index[112] or NSE-all share index[113]; further, he uses earnings per share to measure returns instead of price (or total) returns; uses annual data instead of monthly data as often done and he is even not clear between the definition of real (bilateral) exchange rate and real effective exchange rate.

The foregoing may be responsible for some inconsistent results from the study. For instance, since it is shown that almost all the firms are negatively exposed, one would have expected the average coefficient of exposure to be negative[114]. Also, it should be ordinarily expected that the exposure coefficient found by him would be greater than that of Harvey (1995)[115] who employs a trade-weighted exchange rate measure.

[112] Appropriate when the view of an international investor is taken

[113] Appropriate if the view of a local investor is taken

[114] It is however important to note that the magnitude of the exposure coefficients may affect whether the average value will be positive or negative.

[115] Harvey (1995) obtains an exposure coefficient of 0.360. But, it should also be noted that difference in scope may also account for this inconsistency.

3.3.2. Review of studies on foreign exchange risk pricing

The wide variations in the evidence on exchange exposure as discussed above ushers in the study on exchange risk pricing to determine if at equilibrium, varied exposure among firms will earn a common risk premium (i.e. priced) (Jorion, 1991). When exchange risk is priced, the coefficient λ_π of the exposure term $cov(r_i,r_\pi)$ in equation (30) is expected to be significant and this can either be positive or negative, as the theory does not indicate the *a priori* sign (De Santis and Gerard, 1998 and Jacobsen and Liu, 2008). Further, the sign of the risk price has different implications for firms hedging activities; depending on whether such firms are positively or negatively exposed.

According to Du (2010), a positive risk price implies that firms that are positively exposed should hedge exchange risk while a negative risk price implies that firms with negative exposure should hedge exchange risk[116]. It should also be noted that when exchange-risk is priced in a stock market, some securities in that market are used as hedging proxies; but this is less likely in a developed market where there are better hedging instruments (Roache and Merritt, 2006).

Several studies have used different theoretical frameworks and methodologies to verify if exchange risk is priced in different stock markets around the globe. Similar to the evidence on exposure presented in the last sub-section, early studies in this area do not establish that exchange risk is priced (Hamao, 1988 and Jorion, 1991). This is partly responsible for by the fact that they fail to document significant exchange risk exposure; consequently, there is no risk to be priced in the first place.

Many other studies have also been carried out trying to establish if exchange rate risk is priced. Table C-1 in appendix C classifies some of these studies under their framework and estimation procedures in line with the methodological review section of this thesis. Also, the subsequent empirical review in this section is structured in a similar manner.

[116] This is necessary as hedging implies taking an opposite position in order to eliminate a particular risk.

i. Fama and MacBeth (1973) OLS studies

Dahlquist and Robertsson (2001) employ data on 352 Swedish firms between January 1988 and December 1998. They find that firms have high positive and negative exposures which tend to cancel out in the aggregate and this renders the exchange risk price insignificant thereby showing that exchange risk is diversifiable in the Swedish market. Specifically, it is found that trade-weighted exchange risk has a price of -0.09, and the price of bilateral exchange rate risk against the Deutsch mark is -0.02; Yen is -0.06 and US dollars is -0.18; but they find none of them to be significant.

Also, Roache and Merritt (2006) study a group of seven IMs between January 1974 to February 2005, using between 29 and 33 industrial portfolios for each country and testing both the unconditional and conditional foreign exchange pricing models. The OLS results in the unconditional two-pass method show significant pricing in the US (0.51%), Germany (0.33%) and the UK (-0.36%) after using Shanken-adjusted standard errors. This shows that investors in the American and German markets required premiums for holding securities that are adversely affected when the local currency depreciates. Conversely, investors in the UK market will require a premium for holding securities that are favourably affected when the local currency depreciates.

ii. Iterated non-linear seemingly unrelated regression studies

Jorion (1991) is a pioneer work in this area. In an IAPT framework (Solnik, 1983), he estimates a two-factor model (comprising changes in trade weighted exchange rate and market return) and a 7-factor model (adding the Chen, Roll and Ross, CRR, 1986 six-factor) for 20 sectors in the US between January 1971 and December 1987. The obtained exchange risk premium is very small (0.00033) meaning that a positive monthly exposure as large as 0.5% leads to just 0.2% returns per annum. Following this insignificant premium, it is concluded that exchange risk is diversifiable in the US market and active foreign exchange risk management by financial managers in the US should be explained by other reasons outside the usual goal of reducing cost of capital.

The argument that earlier studies like Jorion (1991) do not document significant exposure and pricing because of poor sample selection was examined by Doukas et al (1999) in a sample of 1079 Japanese firms classified into MNCs (62), high-exporting (260), low-exporting (281) and pure domestic (476). For the period of January 1975 to

December 1995, it is shown that currency risk price is significant and positive especially for the MNCs and high-exporting categories; but this result is insensitive to the measure of currency risk whether bilateral or trade-weighted.

Choi and Rajan (1997) also employ the same procedure in a study of 337 companies from non-US major countries using monthly rate of changes in the value of local currency per unit of the SDR as a measure of exchange risk. Their results show that exchange risk is positively priced in France (1.84), Germany (0.59) and Italy (0.50), but negatively priced in Switzerland (-0.98) and U.K. (-1.42). Therefore exchange rate depreciation raises (lowers) stock returns in the former (later) group. Also allowing for periodic change in exchange rate pricing, they find that prices are higher when local currency is stronger relative to the US dollars.

Furthermore, Choi et al (1998) combines the conditional model of D-S (1995) and the partial segmentation model of Choi and Rajan (1997) to empirically estimate a model of exchange risk pricing for Japan between January 1974 and December 1995. Table 3.3 presents an excerpt from their unconditional result which is representative of findings in many exchange risk pricing studies.

It is observed from the table that exchange risk price is generally positive in the Japanese market; a finding that suggests that as a net exporter, Japanese firms offer risk premium compensating investors when Yen depreciates. However, in periods of depreciating Yen, investors are willing to pay (instead of being compensated) for firms whose values rise with depreciating yen (usually exporting firms). This is because during this period, positive exposure will be a source of low risk and hence, low expected returns (Choi et al, 1998). The results also show that the bilateral definition performs better in terms of significance, corroborating the netting-out effect in the use of multilateral rates.

It has also been argued that asymmetry may exist in firms' responses to currency movements and this is likely to affect exchange risk pricing. Priestley and Odegaard (2004) examine this with monthly value-weighted excess returns on 48 US industries and breaking the period of August 1978 to December 1998 to three sub-periods. After controlling for some CRR (1986) factors, all risk prices are found to be significant.

Table 3.3. Exchange risk prices

Sample Period	Definition of Exchange Risk	
	Change in Multilateral Trade Weighted[117]	Change in Bilateral Yen(¥) -Dollar Rate
Full period (Jan 1975 – Dec. 1992)	3.8590	2.5403*
Relatively strong US$ period (Jan.1975 – Aug. 1985)	-11.9611	-5.4822**
Relatively strong ¥ period (Sept.1985 - Dec 1992)	6.0143	2.3081**

*Note: *, ** imply significance at 10%, 5% respectively*
Source: Extracted from table 2 (pg 370) in Choi, J.J., Hiraki, T. and Takezawa, N. 1998. Is foreign exchange risk priced in the Japanese stock market? Journal of Financial and Quantitative Analysis 33.3: 361-382.

[117] In the original table, Choi et al (1998) define a positive change in the bilateral rate as yen depreciation against the dollar but defines a positive change in the trade-weighted exchange rate as yen appreciation against its trading partners, this inconsistency in definition is corrected in this thesis by reversing the signs in this column to make positive changes under both rates to represent the depreciation of yen.

Specifically, using the dollar-yen bilateral exchange rate, exchange risk price in the period of dollar appreciation (August 1978 to February 1985) was -3.8%, period of dollar depreciation (March 1985 to December 1989) was 2.2% and period of stable dollar but small depreciation against yen (January 1990 to December 1998) was -3.3%[118]. A major implication of this is that as US is a net importer from Japan in the period under study, dollar appreciation (depreciation) implies lower (higher) import costs for US importing firms, hence, investors are willing to pay (demand) a premium to hold their stocks[119].

Another study in this category is Aquino (2005) which uses 16 equally-weighted industrial portfolios of Philippines' firms to show that bilateral exchange rate is not priced in the period of relative stability of Philippine's currency (pre-Asian crisis period; 1992-1997), but as exchange rate fluctuated widely during the crisis, exposure and pricing became significant. It is found that the exposure coefficients for all significant portfolios are negative and the exchange risk price is -0.771. This implies that Philippines' industries are perceived to be exposed to foreign exchange risk that are not fully hedged either through ownership of risk-offsetting assets or the use of derivatives (Aquino, 2005). Therefore, a premium is expected on stocks with negative exchange risk exposure.

iii. Stochastic discount factor representation with GMM studies

The immediate work by Dumas and Solnik (1995) put forward the argument that Jorion (1991) could not establish a significant exchange risk pricing because the study does not allow for time-varying risk pricing. In a sample comprising Germany, UK, Japan and the US between January 1970 and December 1991, D-S (1995) use multiple bilateral exchange rates and find that exchange risk is not priced in the unconditional model; but when 6 instrumental variables are introduced in a pricing kernel (conditional model), exchange risk becomes significantly priced. This is also consistent with the findings of Choi et al (1998) for Japan between January 1974 and December 1995.

[118] This is unexpected given the result of the first period.

[119] This is the interpretation offered by Priestley and Odegaard (2004). However, they overlook the fact that alternatively, dollar appreciation (depreciation) implies lower (higher) export income for US exporting firms, hence, investors will demand (pay) a premium to hold their stocks. Since it is likely that both exporting and importing firms will be affected, their results show that the effect on importing firms dominate that of exporting firms; and this net effect is likely to explain their unexpected results in the third sub-period.

iv. Expected return-beta representation with GMM studies

Vassalou (2000) employs firm-level[120] data on 10 developed markets and changes in two exchange-rates indices (common and residual component indices) in the period of January 1973 to December 1990 to estimate the three models of IAPM. In the Solnik-Sercu model, it is shown that at least one of the two exchange rate indices is priced in 6 markets; for instance, the common index is priced in Germany (-0.15%), Japan (-0.72%), Switzerland (-0.51%) and Netherlands (1.2%). For the first three countries, exchange risk hedging would have brought about increases in the returns on their equity portfolios; but for a market like the USA, where exchange risk is not priced (similar to the findings of Jorion, 1991), exchange risk hedging would have only reduced return volatility while leaving the expected returns constant (Vassalou, 2000).

In the G-L-S (1976) model, it is shown that the unanticipated US inflation rate is positively priced in all the markets and this refutes the belief that only domestic inflation is priced in a country's equities. This suggests that US inflation can also be hedged by investing in the equities of other countries. Lastly, the A-D (1983) model is used to combine the first two and it performs better. However, the simultaneous inclusion of both the exchange and inflation risks leads to multicollinearity problem and renders their respective coefficients insignificant.

Testing an unconditional model for 24 Australian industries between January 1988 and September 1998, Di Iorio and Faff (2002) document that exchange risk premium is significant in 9 out of 15 coefficients, ranging between 0.0003 and 0.0009 (in the negatives). Furthermore, the classification of the study period according to major changes in the Australian currency values shows increased pricing of exchange risk in periods of relative weakness of the Australian economy (similar to Choi et al, 1998). This implies that foreign exchange risk may be more diversifiable in periods of high economic growth (Di Iorio and Faff, 2002). Attempts by the study to try other exchange rates (apart from US dollar) yield worse results thereby confirming the invoice currency hypothesis. In addition, they test for different pricing between Australian industrial and resource sectors and find that exchange risk is a bit more priced in the industrial sector.

[120] The number of securities used ranged between 32 for Canada to 600 for the UK. The study is among the first to use firm-level data in this area, though the individual securities data were later re-classified into 8-beta portfolios for each of the 10 countries.

Carrieri and Majerbi (2006) argues that the inability of the first set of studies like Jorion (1991) and Hamao (1988) to document significant exchange risk pricing may be due to their use of too aggregated data and nominal exchange rate. Their study then presents a well-disaggregated analysis on exchange risk pricing for nine EMs between January 1976 and October 1999. Analyses are done at the levels of the market, quartile-sized portfolio, International Finance Corporation (IFC) portfolio and that of the firm; and the log of change in the inverse of real trade-weighted exchange rate indices is used to measure exchange risk[121]. Using market level data (returns on 9 countries), it is shown that exchange risk premium for EMs is 0.73% and it is significant; sub-period analysis to capture the effect of crisis in EM (1994-1999) on exchange risk prices shows that exchange risk price becomes negative (-0.97%) during crisis.

The quartile-sized portfolio (4 portfolios for each of 9 countries) results show that exchange risk premium rises with size from -0.43% (first quartile) to 1.75% (fourth quartile), but insignificant in the first quartile. This implies that the pricing of exchange risk is explained by large firms in EMs (Carrieri and Majerbi, 2006). Further, when 24 IFC industry indices are used, exchange risk premium becomes -0.767 for EMs; and when firm level data is used (105 firms in all the countries, an average of 15 per country), exchange risk is priced in the stock market of each of the countries used except in India. The estimated risk premia are Mexico (-1.23), Argentina (-0.879), Korea (-0.389), India (-0.250), Thailand (0.171), Brazil (1.085) and Chile (1.35). They also add measures of local risks and these tend to reduce the magnitude and significance of exchange risk prices, thereby suggesting that exchange risk may serve as a proxy for other sources of local risks that correlate with exchange rates in EMs (Carrieri and Majerbi, 2006).

One major factor that limits the strength of their firm-level analysis is the issue of few firms (an average of 15) that are used per country; and as one can observe, their exchange risk prices are sensitive to the percentage of total market capitalisation that the used firms account for in their respective countries. For instance, countries like Thailand, Brazil and Chile have about 50% of their firms included in the analysis, and

[121] In Carrieri and Majerbi (2006), a positive change in the exchange rate represents an appreciation of EMs' currencies. Hence, their positive (negative) prices can be interpreted as negative (positive) when the common definition that a positive change represents depreciation is used.

their risk prices are positive, while those with lower percent of capitalisation have negative risk prices; except for Argentina.

Equally, Fedorova and Vaihekoski (2008) document significant and time-varying exchange risk pricing among six Eastern European EMs between January 1999 to December 2007 and prices are found to range between 0.007 (Slovenia) and 0.016 (Hungary).

v. Parsimonious multivariate GARCH-in-mean studies

De Santis and Gerard (1998) identify that the GMM framework employed by D-S (1995) does not specify the dynamics of the conditional second moments, and they therefore introduce the parsimonious multivariate GARCH-in-mean procedure to study similar markets as those of D-S (1995). It is found that both the market and exchange rate risks are priced and time-varying. However, their estimates are volatile over time and to offer meaningful interpretations, averages of these time-varying values are taken.

For instance, the average world prices of currency risk are given as Deutsche Mark (-1.39), Yen (2.27) and Pounds (-1.03). The results of De Santis and Gerard (1998) are generally similar to those of D-S (1995), even though different methodologies are used. A major difference is that information variables in the GMM of D-S (1995) which are used to determine time-variation in risk prices are found unnecessary in the multivariate GARCH-in-mean methodology.

In addition, there are several other studies that have applied the multivariate GARCH-in-mean method. One example is Antell and Vaihekoski (2007) on Finland in the period of March 1970 to December 2004. The study shows that exchange risk price is significant and negative (-0.084) but time-invariant, as none of the conditioning variables, including the local ones, is significant. It is therefore concluded that the multivariate GARCH method may not be suitable for a non-free floating currency (Antell and Vaihekoski, 2007). Saleem and Vaihekoski (2007) is another study in this category. Using 417 weekly observations (January 1999 to December 2006) for the Russian market, it is shown that the world, local and currency factors are priced in Russia and time-varying. The average price of exchange risk in this period was estimated to be -0.166 in the Russian market.

Chaieb and Errunza (2007) in a study of eight EMs (Argentina, Brazil, Chile, India, Korea, Malaysia, Mexico and Thailand) between January 1976 and December 2003 test for the prices of two trade-weighted real exchange rate indices[122] (major market exchange rate index and EM exchange rate index). They find that the major currency risk is significantly priced and time-varying in all countries with an average value of -1.39 while the EM currency risk is significantly priced and time-varying in all, except for Malaysia, with an average value of -5.85. It is further shown that while the price of major currency risk rises from negative to positive values during economic recession; that of EM does not show a definite pattern.

China operates a dual stock market whereby some stocks, *type-A*, are quoted in Yuan and can only be held by the Chinese, and *type-B* are quoted in US dollars and are for foreigners only. Jacobsen and Liu (2008) exploited this feature in a study between January 1999 and December 2007 with weekly data and report that exchange risk is priced in *type-B* (-8.91) and *type-A* (-8.935) Chinese stocks, and; all prices are time varying.

Moerman and Dijk (2010) use monthly returns in the period January 1975 to December 1998 on stock indices for the G-5 countries (France, Germany, Japan, UK and the US)[123], hence, changes in four bilateral exchange rates are used to measure exchange risk. Their findings are similar to D-S (1995) and De Santis and Gerard (1998), as they show that all the bilateral exchange rates are significantly priced and time-varying when inflation rates are assumed to be non-random. They equally test two additional models of IAPM. They obtain a different results in their model that uses real[124] exchange rate risk; it is found that real exchange risk is significantly priced only in two (Japan and UK) out of four, implying that even in a sample of developed markets, studies that ignore the stochastic nature of inflation may be misleading.

[122] Both are constructed such that higher index represents appreciation of EM currencies. Hence, their negative results can be interpreted as positive, and vice versa, if re-defined as higher index representing depreciation.

[123] They add France to the list of countries used by D-S (1995) and De Santis and Gerard (1998).

[124] This assumes that domestic inflation rates are stochastic but the numeraire (Germany) inflation is not. Their study is therefore similar to Carrieri and Majerbi (2006) except that the latter mainly use broad trade-weighted exchange rate indices, not multiple bilateral, and it is on EMs.

In another scenario to determine the relative importance of inflation and exchange risks[125] by including them in the same model, it is shown that the four exchange risk and the five inflation risks are significantly priced and time-varying. They further show that the exchange rate and inflation rate risk premia are generally of the opposite sign for France and UK, but they tend to reinforce each other in the cases of the US and Japan. This therefore suggests inflation risk premia as a distinct element in expected international stock returns as its values are comparable to those of nominal exchange risk premia (Moerman and Dijk, 2010).

vi. Evidence of exchange risk pricing in Nigeria

Similar to the point raised under exchange risk exposure, evidence in this area on Nigeria is also not readily available. Earlier studies on asset pricing were not carried out in the international context as done in the present thesis and they are often very aggregative. Two earlier theses (Emenuga, 1994 and Adeleke, 2011) are in this category. Emenuga (1994) estimates three models of asset pricing for Nigeria; a local CAPM using 50 firm-level data, an APT model using factor analysis with varimax rotation and an APT model using the CRR (1986) procedure for the period of January 1987 to December 1991. Since the CAPM is domestic (local market risk is used and there is no exchange risk) and none of the five extracted factors from the APT suggests world market risk or exchange risk, then these two models are irrelevant to this study.

However, the fact that one of the six macroeconomic factors[126] used in his CRR (1986) method is exchange rate is a matter of interest. Making returns on the Nigerian stock index dependent on these six factors gives an adjusted-R^2 value of -0.113 and none of the factors is significant including exchange rate which has a coefficient of 0.0814. Infrequent trading and policy restrictions on price movement during the period of study are used to justify the observed results.

[125] This model therefore assumes that inflation is stochastic in all countries including the numeraire's. This is similar to the A-D (1983) model estimated by Vassalou (2000). A major distinction is that Vassalou (2000) uses a GMM beta-representation framework and experiences multicollinearity when both inflation and exchange rates are used in a single model, but Moerman and Dijk (2010) use the multivariate GARCH and did not report such a problem.

[126] The other factors used are money supply, interest rate, change in inflation rate, expected inflation rate and unexpected inflation rate

Adeleke (2011) also estimates a CRR (1986) APT model using quarterly data between 1984 and 2009 for Nigeria. Returns on the NSE all share index is made dependent on macroeconomic variables like GDP, industrial production index, interest rate, international crude oil prices, money supply, CPI and exchange rate. The result of the long run model via the Johansen's cointegration test shows that both the exchange rate and inflation factors are significant yielding coefficients of 0.237 and 0.855 respectively. Although both studies use different methodologies, the significant impact of exchange rate observed by Adeleke (2011) may be explained by the recent developments in the NSE in terms of improved liquidity and the adoption of less regulated pricing mechanisms.

It is however important to note that while the CRR (1986) procedure uses macroeconomic factors to predict inter-temporal stock returns, evaluating cross-sectional variations in stock returns will require the usage of less aggregative data, say, firm-level. Furthermore, apart from the fact that these earlier studies are domestic, the coefficients of their exchange rates will be upward biased when used to measure the price of exchange risk as they fail to subtract a measure of risk-free rate from their variables prior to estimation as done in the leading literature.

3.3.3. The price of world risk

In IAPM, is it assumed that investors hold world market portfolio and the risk of an individual security is given by its contribution to (covariance with) the world market portfolio, which is called world market beta (Harvey, 1995) and the price of this risk is the price of world risk. Studies on exchange risk pricing will have to simultaneously determine the prices of world risk and exchange risk, therefore this sub-section is created to document evidence from the earlier studies on the significance, sign and size of the prices of the world risk.

De Santis and Gerard (1998) document that the average world price of market risk is significant with a value of 3.46 when the prices are allowed to be time varying in a study on the G4 countries. Antell and Vaihekoski (2007) shows that the price of world risk is 0.005; this is time-varying but insignificant for Finland in the period March 1970 to December 2004. Jacobsen and Liu (2008) in a study between January 1999 and December 2007 show that the world risk is priced in Chinese stocks quoted in US

dollars (4.466), but not in Chinese stocks quoted in yuan (1.850). Saleem and Vaihekoski (2007) between January 1999 and December 2006 estimate that the world risk is priced in the Russian market with an average value of 0.036.

Chaieb and Errunza (2007) in a study of eight EMs between January 1976 and December 2003 show that the price of world market risk is significant and time-varying with an average value of 3.0 except in Chile and Mexico, and this value is also noted to increase during economic contractions. Using market level data, Carrieri and Majerbi (2006) shows that the world risk premium is 0.11% for EMs but insignificant. Using quartile-sized portfolio, they find that the price of world market risk is significant only for quartile one (2.974%); but surprisingly, this is the only portfolio where exchange risk is not priced. Using firm-level data, the price of world market risk is significant for almost all the countries used in their study. However, Di Iorio and Faff (2002) report insignificant market risk premiums in a study of 24 Australian industries between January 1988 and September 1998.

It is difficult to get a study that has been able to determine the price of world risk using Nigerian data as the empirical evidence on the International version of the CAPM is rare for Nigeria. However, Harvey (1995) uses aggregate market data for Nigeria between 1985 and 1992, a period of relatively high capital market regulation, to show that exposure to world risk in not significant in Nigeria with a value of 0.157. The insignificant exposure coefficient during this period also suggests that the world risk was unlikely to be priced in the Nigerian market. A finding which suggests that the Nigerian market was not integrated with the world during his study period.

3.3.4. The price of liquidity risk

This thesis builds on the idea that market-wide liquidity is an important characteristics of the investment environment and should be included as a state variable in asset pricing models (Pastor and Stambaugh, 2003; Chorda et al 2000 and Hasbrouck and Seppi, 2001) and then attempts to incorporate liquidity risk into the standard A-D (1983) IAPM. In order to enable the evaluation of the results later, it is necessary to assess what the existing literature[127] on liquidity risk pricing contains, and this is the goal of this sub-section.

[127] The literature reviewed in this section is on liquidity risk but the pricing is done in the framework of local APM as against IAPM to be developed in this thesis later.

The importance of liquidity in asset pricing derives from the fact that illiquid assets have higher transaction costs creating a wedge between gross and actual returns. This makes them trade at low prices relative to their expected cash flows, thereby leading to higher expected returns (Amihud and Mendelson, 1986; Chordia et al, 2001; Bekaert et al, 2007). Therefore, as a market becomes more liquid, it is usual that the expected excess returns fall (Bekaert et al, 2007). Characteristics of illiquid firms include that they are small (Pastor and Stambaugh, 2003 and Acharya and Pedersen, 2005), have low turnover and high stock volatility (Acharya and Pedersen, 2005). Hence, it has been shown that in periods of market illiquidity, premium is expected on securities with high returns (Acharya and Pedersen, 2005 and Pastor and Stambaugh, 2003).

Measuring liquidity is an important issue in the literature and several authors have done this with different procedures and justifications. For instance Lo and Wang (2000) use average turnover in the NYSE and AMEX stocks and this is similar to the definition adopted by Griffin et al (2006); Jones (2002) uses bid-ask spreads on the stocks in the Dow Jones index; Chordia et al (2002) employs some measures including market depth, bid-ask spread and turnover. A very influential method in this area is that used by Amihud (2002) where the ratios of average absolute price change to trading volume is used to measure illiquidity. Furthermore, Pastor and Stambaugh (2003) measure illiquidity as temporary price changes accompanying order flow.

In terms of empirical evidence, Pastor and Stambaugh (2003) use data from NYSE and AMEX between 1966 and 1999 to investigate whether expected returns are related to systematic liquidity risk in returns. It is found that liquidity risk factor is priced as the average return on stock with high sensitivities to liquidity exceeds that for stocks with low sensitivities by 7.5% annually, after adjusting for exposure to other factors. In other words, fall in liquidity is viewed as undesirable by investors and they therefore demand a premium[128] for holding stocks with higher exposure to this risk (Pastor and Stambaugh, 2003).

Bekaert et al (2007) in a study of nineteen EMs from the Standard and Poor's Emerging Market Database (EMDB) between January 1993 and December 2003 show

[128] It will be difficult to compare the magnitude of their liquidity risk premium with any other study, as the authors themselves warn that their parameter depends on the arbitrary scaling they did on their measure of liquidity risk.

that lagged market liquidity has negative impact on current return, but this negative effect falls as a market becomes more open. Equally, Griffin et al (2006) in a study on the relationship between liquidity and returns in 46 markets show that return-liquidity relationship is less pronounced as market efficiency increases.

Acharya and Pedersen (2005) use Amihud (2002) measure of illiquidity and within a GMM framework similar to the Fama and MacBeth (1973) method (Cochrane, 2001), they find that marketwide liquidity is priced among common shares listed on NYSE and AMEX between July 1962 and December 1999 with an annualised value of 0.16% (0.013% monthly)[129].

In sum, it is apparent from the foregoing that the literature offers rich evidence from several parts of the world on the issues of exchange rate exposure and pricing. Regardless of the methodology used, exchange rate exposure and pricing have been documented for many markets, especially outside the US. However, what is known about Nigeria on many of these issues is quite negligible, yet the country's stock market is one of the few in the Africa region which have recorded some level of growth in the recent times. Therefore, adding the evidence from Nigeria to the list of global studies on exchange rate exposure and pricing represents one of the major contributions of this thesis.

[129] Note that this value which shows that investors demand a premium for holding illiquid stock can also be interpreted that they are willing to accept lower expected excess returns on liquid stocks.

CHAPTER FOUR

THEORETICAL FRAMEWORK AND METHODOLOGY

This chapter contains the theoretical framework and the methodology employed in this thesis. Basically, these are standard framework and methodology found in the literature on the exposure to and pricing of exchange risk. However, some required modifications in the existing framework and methodology are introduced in this chapter so as to incorporate some important features of the Nigerian economy that is being modelled.

4.1. Theoretical framework

The major distinction between the IAPM and the IAPT according to Moerman and Djik (2010) is that while the IAPT is empirically inspired, the IAPM is theoretically inspired. As earlier mentioned, the IAPT makes no restrictive assumption about utility functions and the existence of a market portfolio, but rather that there are some pervasive factors[130] that will be priced in equilibrium. This fact makes it to provide a better explanation to asset returns than the IAPM (mean-variance analysis) (Elton, et al, 2007). Hence, IAPT is very general and can accommodate a lot of determinants of asset pricing (Roache and Merritt, 2006).

However, this relative strength of IAPT is discounted by the fact that it lacks theoretical justification for selecting the factors. Really, in the arbitrage pricing theory, any variable can serve as an explanatory variable (Merritt and Roache, 2006) and this is aggravated by the fact that the theory says nothing about the size of the risk premia, nor the number of origin of the common factors (Solnik, 1983). Unlike the IAPM that does the above, IAPT only specifies the linearity of the pricing relation and emphasizes that once any factor is significant, it is important in predicting expected returns (Solnik, 1983; Elton, et al 2007).

[130] Although this theory does not identify these pervasive factors, they may be obtained through exploratory statistical analysis like the extracted components in a factor analysis (Roll and Ross, 1980), they may also be represented by a set of macroeconomic variables (Chen, Roll and Ross, 1986) or through the specification of a set of portfolio affecting the return-generating process (Fama and French, 1993).

Hence, according to Roache and Merritt (2006), it is almost impossible to reject the arbitrage theory empirically. The foregoing therefore makes arbitrage theory more difficult to test as it does not itself, unlike IAPM, specify the other factors in equation (27) in the IAPT review (Elton et al 2007).

For the purpose of this thesis therefore, the IAPM (which builds on the Mean-Variance theory) is adopted as the underlying theory. The theory shows that because foreign investors consider the different purchasing power indices between their country and their investment country, exchange risk is introduced which has implications for asset pricing. The theory is therefore relevant for this thesis which has as its objective the determination of the exchange risk premium earned by foreign investors investing in the Nigerian stock market.

Some relevant literatures have shown that foreign investors have preference for liquid securities; especially in less-liquid and highly-concentrated markets, like Nigeria (Chuhan, 1992; Gompers and Metrick, 2001 and Prasanna, 2008). This also has implications for asset pricing (Bekaert et al, 2007; Acharya and Pedersen, 2005; Pastor and Stambaugh, 2003; Hasbrouck and Seppi, 2001 and Chorda et al, 2000). It has therefore been established that market-wide liquidity is a state variable important for asset pricing since it represents an important feature of the investment environment (Acharya and Pedersen, 2005; Pastor and Stambaugh, 2003; Hasbrouck and Seppi, 2001 and Chorda et al, 2000).

This important argument is based on the fact that illiquid assets exhibit high transaction costs and they therefore trade at low prices relative to their expected cash flows (Amihud and Mendelson, 1986; Chordia et al, 2001). Hence, measures of liquidity have been documented to predict returns with a negative sign, that is, investors require higher expected returns on assets whose returns have higher sensitivities to aggregate liquidity (Pastor and Stambaugh[131], 2003 and Bekaert et al, 2007).

The above argument can be seen to dovetail with the mathematical properties of the underlying processes used in modelling security returns; especially when the

[131] Using data from NYSE and AMEX between 1966 and 1999, they find that the average return on stock with high sensitivities to liquidity exceeds that for stocks with low sensitivities by 7.5% annually, after adjusting for other factors.

applicability of these models is evaluated in the context of the Nigerian Stock Exchange (NSE). In other words, due consideration to the fact that activities on the NSE are less-efficient and may be less tractable than where these models originated may compel one to use models that do not assume a constant investment opportunity set. Specifically, the geometric (stationary) Brownian motion process used in modelling asset returns in the theoretical literature review premises on the assumption that the investment opportunity set (μ, α) is constant thereby representing a long-run equilibrium model of asset prices.

However, Merton (1971) has shown that this is only realistic for liquid assets found in an economy where expectations about future returns have settled down; a condition hardly met in reality (Merton, 1973 and Fischer, 1975), especially given the assumption of positive risk-aversion (Lucas, 1978). Moreover, the likelihood of violating the above condition is even more pronounced in a market such as Nigeria with low, but constantly changing, liquidity state.

Given this type of scenario, Merton (1971) shows that the investment behaviour of an intertemporal maximiser will change significantly and that to explain short-run consumption and portfolio selection behaviour, alternative models of price behaviour that reflect the dynamic adjustment of expectations are required. One of these alternatives is to assume that the expected rate of return is itself generated by the stochastic differential equation and use a measure of market development and supply that changes stochastically over time as a state variable (Merton, 1973; Breeden, 1979)[132].

In addition to the foregoing, there are other specific reasons why the liquidity state of the Nigerian stock market should be incorporated into any asset pricing model. For instance, some information provided in the background to this thesis, among others, show that the Nigerian equity market is characterised by low, though recently increasing, liquidity; and this reflects in the high transaction cost observed in the market. Moreover, a recent survey by the country's Securities and Exchange Commission (SEC, 2009) documents foreign investors' complaints on the market's states of underdevelopment as reflected in low liquidity and high transaction costs.

[132] Another alternative is the use of jump processes like the Poisson processes (Merton, 1971).

Furthermore, large (liquid) Nigerian firms attract more foreign portfolio investments. This can be explained by the fact that the major portfolio investors like Mutual Funds (MFs), Country Funds (CFs) and Hedge Funds (HFs) trade very often (Schwartz and Shapiro, 1992) and therefore are very sensitive to high transaction costs on illiquid or low-priced stocks (Gompers and Metrick, 2001)[133]. Low liquidity therefore discourages foreign investors from investing in EMs (Chuhan, 1992).

Moreover, the facts that an EM like Nigeria is characterised by low market depth, short trading hours, high market concentration and less diversity in ownership and securities make liquidity risk more pronounced[134],[135]. It has therefore been found that the return-liquidity relationship is less pronounced as market efficiency increases.

The remaining part of this section of the thesis therefore extends the IAPM to explicitly incorporate the liquidity state of the Nigerian stock market. In other words, this thesis uses liquidity as a state variable to model the dynamic adjustment of the investment opportunity set in Nigeria. Thus, this relaxes some of the capital market structure assumptions discussed earlier under the IAPM in the theoretical literature review.

These include the first assumption on transaction cost, the third assumption that investors believe they can buy and sell as they wish and the eighth assumption that the vector set of stochastic process describing the opportunity set and its changes, is a time-homogeneous Markov process. The implication of liquidity state on the first and third assumption is somewhat clear as the existence of transaction cost and the extent to which an investor can buy and sell may depend on the extent to which the market is liquid.

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[133] In a cross-sectional regression for all common stocks listed on the NYSE, AMEX, and NASDAQ for the period 1980 to 1996, Gompers and Metrick (2001) find out that institutional investors truly demand for liquid stocks as measured by size, turnover and price. Prasanna (2008) also documents similar results for India.

[134] For instance, Bekaert et al (2007) document that lagged market liquidity has a negative impact on current return of a sample of EMs, but this negative effect falls as they become more open and developed. Griffin, et al, (2006) further show that the relationship between liquidity and returns in a sample of 46 markets is stronger in markets with the following characteristics; more opaque and volatile economies, no opportunity for short-sales, high corruption, few or no institutional investors, less well-developed equity markets and markets that are less correlated with world stock markets.

[135] Most of these features can be observed in the Nigerian stock market as already shown in the background chapter of this thesis. Besides, NSE is 15.5 times less liquid than its EM peers and far less liquid than the global peers (SEC, 2009).

In addition, incorporating equation of motion for liquidity as an explanation for the dynamics of expected return and its volatility implies that even if the Markov assumption is violated under the geometric BM, the likelihood of it holding is now enhanced through what is termed "expansion of state" approach (Merton, 1973; Lucas, 1978; Campbell et al, 1997 and Cochrane, 2001). A major implication of the modifications done above therefore is that the former equation (1) from the theoretical literature review will be reconstructed to recognise that the investment opportunity set (μ_i, σ_i) is not constant, thereby leading to equations (52) and (53) below which introduce a state variable[136] (liquidity) to close the Markov process;

$$\frac{dY_i}{Y_i} = \mu_i(Q,t)\,dt + \sigma_i(Q,t)\,dz_i \quad ; \qquad i = 1...N \tag{52}$$

where Q = a measure of market liquidity[137] and it is used to close[138] the Markov process as specified below with its dynamics also following a Wiener process for investor-type l;

$$\frac{dQ^l}{Q^l} = q^l dt + \sigma_q^l dz_q^l \quad ; \qquad l = 1 \ldots L+1 \tag{53}$$

Where q^l and σ_q^l are respectively the expected value and standard deviation of the rate of liquidity growth as observed in country l and other variables are as earlier defined. Apart from the modifications above, other assumptions and equations contained in the IAPM theoretical review still remain the same. Itô's theorem (Merton, 1969, 1971; Kamien and Schwartz, 1991 and Cvitanic and Zapatero, 2004) has shown that when a diffusion process such as equation (7), which is also repeated in the footnote below[139], depends on equation (52), the wealth dynamics of the consumer-

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[136] The simplest model is to assume that a single state variable is sufficient to describe changes in the opportunity set. Merton (1973) employs similar model, except that the element of the opportunity set which he assumes to be directly observable and changing stochastically over time is the interest rate.

[137] In the liquidity-adjusted CAPM of Acharya and Pedersen (2005), measures of individual asset liquidity are also included. This thesis does not do so as it will introduce more state variables and computational complexities. However, this is unlikely to change the outcome significantly as measures of market liquidity and individual asset liquidity have been found to highly correlate (Chordia et al., 2000 and Hasbrouck and Seppi, 2001). Besides, their model is the local version.

[138] Merton (1973) also makes similar assumption that the dynamics of the opportunity set reflect the changes in supply of shares as well as other factors such as new technical development

[139] For convenience, equation (2) is $dP^l/P^l = \pi^l dt + \sigma_\pi^l dz_\pi^l$, equation (6) is $Max\, E\int_t^\tau V(C,P,s)\,ds$ and equation (7) is $W(t) = \sum_{i=1}^{N} N_i(t) Y_i(t) - C(t)$

investor is given as;

$$dW = \sum_{i=1}^{N} N_i(t) Y_i(t) \mu_i \left(t, Q\right) dt + \sum_{i=1}^{N} N_i(t) Y_i \sigma_i \left(t, Q\right) dz_i - C(t) dt \tag{54}$$

Defining the fraction of wealth invested in the *i-th* asset at time *t* as;

$$w_i(t) = \frac{N_i(t) Y_i(t)}{W(t)} \qquad ; \qquad N_i(t) = \frac{w_i(t) W(t)}{Y_i(t)} \tag{55}$$

and substituting for $N_i(t)$ in (54);

$$dW = \sum_{i=1}^{N} w_i(t) W(t) \mu_i \left(t, Q\right) dt + \sum_{i=1}^{N} w_i(t) W(t) \sigma_i \left(t, Q\right) dz_i - C(t) dt \tag{56}$$

By definition, $\sum_{i=1}^{N} w_i = 1$, and this by Tobin's (1958) separation theorem is allocated between a riskless asset with return *r* and a set of risky assets, hence;

$$\begin{aligned} dW &= \left[\sum_{i=1}^{N} w_i(t) \mu_i \left(t, Q\right) + \left(1 - \Sigma w_i(t)\right) r \right] W(t) dt + W(t) \sum_{i=1}^{N} w_i(t) \sigma_i \left(t, Q\right) dz_i - C(t) dt \\ dW &= \left[\sum_{i=1}^{N} w_i(t) \left(\mu_i(t, Q) - r \right) + r \right] W(t) dt + W(t) \Sigma w_i(t) \sigma_i \left(t, Q\right) dz_i - C(t) dt \end{aligned} \tag{57}$$

Equation (57) above is the wealth dynamics of the consumer investor as derived in Merton (1969, 1971) and used in Merton (1973), A-D (1983) and Errunza and Chaieb (2007). The difference introduced in this thesis is that the opportunity set (μ_i σ_i) is not made constant.

Using the dynamic programming approach and denoting the derived utility *J(W,P,Q,t)* as the maximum value of (6) subject to (57) while (2) and (53) also represent state equations, the Hamilton-Jacobi-Bellman principle implies;

$$0 = \underset{C, \underline{w}}{Max} \begin{bmatrix} V\left(C, P, t\right) + J_t + J_W \left[\left(\sum_{i=1}^{N} w_i \left(\mu_i - r \right) + r \right) W - C \right] + J_P P\pi + J_Q Qq \\ + \frac{1}{2} J_{W,W} \sum_{i=1}^{N} \sum_{k=1}^{N} w_i w_k \sigma_{i,k} W^2 + \frac{1}{2} J_{P,P} \sigma_\pi^2 P^2 + \frac{1}{2} J_{Q,Q} \sigma_q^2 Q^2 \\ + J_{W,P} \sum_{i=1}^{N} w_i \sigma_{i,\pi} WP + J_{W,Q} \sum_{i=1}^{N} w_i \sigma_{i,q} WQ + J_{P,Q} \sigma_{\pi,q} PQ \end{bmatrix} \tag{58}$$

The Euler's equation in this case will be;

$$J_P P + J_W W + J_Q Q = 0 \qquad ; \qquad J_P = -J_W \frac{W}{P} - J_Q \frac{Q}{P} \tag{59}$$

Differentiating (59) with respect to *W*, *Q* and *P*, we have;

$$J_{P,W} = -J_W \left(\frac{1}{P}\right) - J_{W,W}\left(\frac{W}{P}\right) - J_{Q,W}\left(\frac{Q}{P}\right) \tag{60}$$

$$J_{P,Q} = -J_{W,Q}\left(\frac{W}{P}\right) - J_Q\left(\frac{1}{P}\right) - J_{Q,Q}\left(\frac{Q}{P}\right) \tag{61}$$

$$J_{P,P} = J_W\left(\frac{W}{P^2}\right) - J_{W,P}\left(\frac{W}{P}\right) + J_Q\left(\frac{Q}{P^2}\right) - J_{Q,P}\left(\frac{Q}{P}\right) \tag{62}$$

Substituting (60) and (61) into (62);

$$\begin{aligned}
J_{P,P} &= J_W\left(\frac{W}{P^2}\right) - \left[-J_W\left(\frac{1}{P}\right) - J_{W,W}\left(\frac{W}{P}\right) - J_{Q,W}\left(\frac{Q}{P}\right)\right]\left(\frac{W}{P}\right) + J_Q\left(\frac{Q}{P^2}\right) - \left[-J_{W,Q}\left(\frac{W}{P}\right) - J_Q\left(\frac{1}{P}\right) - J_{Q,Q}\left(\frac{Q}{P}\right)\right]\left(\frac{Q}{P}\right) \\
J_{P,P} &= J_W\underline{\left(\frac{W}{P^2}\right)} + J_W\underline{\left(\frac{W}{P^2}\right)} + J_{W,W}\left(\frac{W}{P}\right)^2 + \underline{J_{Q,W}\left(\frac{QW}{P^2}\right)} + \underline{J_Q\left(\frac{Q}{P^2}\right)} + \underline{J_{W,Q}\left(\frac{WQ}{P^2}\right)} + \underline{J_Q\left(\frac{Q}{P^2}\right)} + J_{Q,Q}\left(\frac{Q}{P}\right)^2 \\
J_{P,P} &= 2J_W\left(\frac{W}{P^2}\right) + 2J_{W,Q}\left(\frac{WQ}{P^2}\right) + 2J_Q\left(\frac{Q}{P^2}\right) + J_{W,W}\left(\frac{W}{P}\right)^2 + J_{Q,Q}\left(\frac{Q}{P}\right)^2
\end{aligned} \tag{63}$$

Substituting (59), (60), (61) and (63) into (58);

$$0 = \underset{C,\underline{w}}{Max}\left[\begin{array}{l}
V(C,P,t) + J_t + J_W\left[\left(\sum_{i=1}^{N} w_i(\mu_i - r) + r\right)W - C\right] + \left(-J_W\frac{W}{P} - J_Q\frac{Q}{P}\right)P\pi + J_Q Qq \\
+\frac{1}{2}J_{W,W}\sum_{i=1}^{N}\sum_{k=1}^{N} w_i w_k \sigma_{i,k} W^2 + \frac{1}{2}\left[2J_W\left(\frac{W}{P^2}\right) + 2J_{W,Q}\left(\frac{WQ}{P^2}\right) + 2J_Q\left(\frac{Q}{P^2}\right) + J_{W,W}\left(\frac{W}{P}\right)^2 + J_{Q,Q}\left(\frac{Q}{P}\right)^2\right] \\
\sigma_\pi^2 P^2 + \frac{1}{2}J_{Q,Q}\sigma_q^2 Q^2 + \left[-J_W\left(\frac{1}{P}\right) - J_{W,W}\left(\frac{W}{P}\right) - J_{Q,W}\left(\frac{Q}{P}\right)\right]\sum_{i=1}^{N} w_i\sigma_{i,\pi}WP + J_{W,Q}\sum_{i=1}^{N} w_i\sigma_{i,q}WQ \\
+\left[-J_{W,Q}\left(\frac{W}{P}\right) - J_Q\left(\frac{1}{P}\right) - J_{Q,Q}\left(\frac{Q}{P}\right)\right]\sigma_{\pi,q}PQ
\end{array}\right]$$

$$0 = \underset{C,\underline{w}}{Max}\left[\begin{array}{l}
V(C,P,t) + J_t + J_W\left[\left(\sum_{i}^{N} w_i(\mu_i - r) + r\right)W - C\right] - J_W W\pi - J_Q Q\pi + J_Q Qq \\
+\frac{1}{2}J_{W,W}\sum_{i=1}^{N}\sum_{k=1}^{N} w_i w_k \sigma_{ik} W^2 + J_W W\sigma_\pi^2 + J_{W,Q}WQ\sigma_\pi^2 + J_Q Q\sigma_\pi^2 + \frac{1}{2}J_{W,W}W^2\sigma_\pi^2 \\
+\frac{1}{2}J_{Q,Q}Q^2\sigma_\pi^2 + \frac{1}{2}J_{Q,Q}\sigma_q^2 Q^2 - J_W\sum_{i=1}^{N} w_i\sigma_{i,\pi}W - J_{W,W}W^2\sum_{i=1}^{N} w_i\sigma_{i,\pi} - J_{Q,W}QW\sum_{i=1}^{N} w_i\sigma_{i,\pi} \\
+J_{W,Q}\sum_{i=1}^{N} w_i\sigma_{i,q}WQ - J_{W,Q}\sigma_{\pi,q}WQ - J_Q\sigma_{\pi,q}Q - J_{Q,Q}\sigma_{\pi,q}Q^2
\end{array}\right]$$

$$0 = \underset{C,\underline{w}}{Max}\begin{bmatrix} V(C,P,t) + J_t + J_W\left[\left(\sum_{i=1}^{N} w_i(\mu_i - r) + r - \pi + \sigma_\pi^2 - \sum_{i=1}^{N} w_i\sigma_{i,\pi}\right)W - C\right] \\ -J_Q\left[\pi - q - \sigma_\pi^2 + \sigma_{\pi,q}\right]Q + \frac{1}{2}J_{W,W}\left[\sum_{i=1}^{N}\sum_{k=1}^{N} w_i w_k\sigma_{i,k} + \sigma_\pi^2 - 2\sum_{i=1}^{N} w_i\sigma_{i,\pi}\right]W^2 \\ +J_{W,Q}\left[\sigma_\pi^2 - \sum_{i=1}^{N} w_i\sigma_{i,\pi} + \sum_{i=1}^{N} w_i\sigma_{i,q} - \sigma_{\pi,q}\right]WQ + \frac{1}{2}J_{Q,Q}\left[\sigma_\pi^2 + \sigma_q^2 - 2\sigma_{\pi,q}\right]Q^2 \end{bmatrix} \quad (64)$$

Differentiating (64) with respect to *C* and then with respect to *w* gives (65) and (66) respectively;

$$\begin{aligned} &V_C(C,P,t) - J_W(W,P,Q,t) = 0 \\ &V_C(C,P,t) = J_W(W,P,Q,t) \end{aligned} \quad (65)$$

Equation (65) is the usual intertemporal envelope condition to equate the marginal utility of current consumption to the marginal utility of wealth (future consumption) (Merton, 1973).

$$\begin{aligned} &J_W W\left[\mu_i - r - \sigma_{i,\pi}\right] + \frac{1}{2}J_{W,W}W^2\left[\sum_{k=1}^{N} w_k\sigma_{i,k} - 2\sigma_{i,\pi}\right] + J_{W,Q}WQ\left[-\sigma_{i,\pi} + \sigma_{i,q}\right] = 0 \\ &-J_W\left[\mu_i - r - \sigma_{i,\pi}\right] = J_{W,W}W\left[\sum_{k=1}^{N} w_k\sigma_{i,k} - \sigma_{i,\pi}\right] + J_{W,Q}Q\left[\sigma_{i,q} - \sigma_{i,\pi}\right] \end{aligned} \quad (66)$$

Defining $\alpha = -J_W / J_{W,W}W \quad and \quad h = -J_W / J_{W,Q}Q$

$$\mu_i = r + \frac{1}{\alpha}\sum_{k=1}^{N} w_k\sigma_{i,k} - \frac{1}{\alpha}\sigma_{i,\pi} + \sigma_{i,\pi} + \frac{1}{h}\sigma_{i,q} - \frac{1}{h}\sigma_{i,\pi}$$

$$\mu_i = r + \frac{1}{\alpha}\sum_{k=1}^{N} w_k\sigma_{i,k} + \left[1 - \left(\frac{1}{\alpha} + \frac{1}{h}\right)\right]\sigma_{i,\pi} + \frac{1}{h}\sigma_{i,q} \quad (67)$$

Equation (67) is the equilibrium asset pricing relationship and the terms are defined as follows; μ_i is the instantaneous expected nominal rate of return on security *i*; *r* is the nominal rate of interest on the riskless security; α is the investor's risk tolerance while its inverse represents the coefficient of relative risk aversion of the indirect utility function; w_k is the investor's portfolio weights; $\sigma_{i,k}$ is the instantaneous covariance of the nominal rates of return on the various securities; the inverse of *h* represents the elasticity of the marginal utility of wealth with respect to the state variable liquidity; $\sigma_{i,\pi}$ is the covariance of the *N* risky securities returns with investors rate of inflation;

and $\sigma_{i,q}$ is the covariance of the N risky securities with changes in the level of market liquidity.

This equation implies that an asset i must yield a nominal return in excess of the nominal riskless rate comprising three risk premia. The first is the market premium and is proportional to the covariance of the security's nominal return with the investor's portfolio return (traditional CAPM conclusion); the second is the inflation premium arising because investors are concerned with their purchasing power and they relate the required nominal yield on each asset to the real returns on their benchmark portfolio (IAPM conclusion) and the third[140] is the liquidity premium which arises because investors have preference for liquid asset (contribution of this thesis).

Equation (67) therefore implies that the IAPM without liquidity risk is likely to wrongly state the exchange risk price to the extent of the value of the omitted liquidity risk premium.

4.2. Methodology

The methodology adopted in this thesis draws from those discussed earlier in the methodological review while some modifications necessary to address exchange risk exposure and pricing in Nigeria are also included. Hence, this section discusses how each of the six broad methodological issues reviewed earlier are addressed in this thesis.

4.2.1. Model specification

Equation (67) in the theoretical framework showing that an asset i must yield a nominal return in excess of the nominal riskless rate comprising three risk premia is the model to be estimated in this thesis and this is repeated in equation (67') below for convenience;

$$\mu_i = r + \frac{1}{\alpha}\sum_{k=1}^{N} w_k \sigma_{i,k} + \left[1 - \left(\frac{1}{\alpha} + \frac{1}{h}\right)\right]\sigma_{i,\pi} + \frac{1}{h}\sigma_{i,q} \qquad (67')$$

[140] A-D (1983) actually hint that if the investment opportunity set is assumed to be non-constant, the final model will contain one more hedge fund per state variable used to model the opportunity set; and this is what the result of this thesis turns out to be. However, what they do not mention is that the inclusion of the new state variable risk premium will have an impact on the coefficient of the exchange risk premium, as obtained above.

Following from equations (28), (29) and (31) in the methodological review, the unconditional version of equation (67') above can be written as equation (68) below (A-D, 1983; Dumas and Solnik, 1995; De Santis and Gerard, 1998 and Moerman and Dijk, 2010);

$$E(r_i) = \lambda_m \operatorname{cov}(r_i, r_m) + \sum_{l=1}^{L+1} \lambda_\pi \operatorname{cov}(r_i, r_\pi) + \lambda_q \operatorname{cov}(r_i, r_q) \tag{68}$$

Furthermore, if a single measure of exchange rate is assumed to be relevant[141], equation (68) can be written as;

$$E(r_i) = \lambda_m \operatorname{cov}(r_i, r_m) + \lambda_\pi \operatorname{cov}(r_i, r_\pi) + \lambda_q \operatorname{cov}(r_i, r_q) \tag{69}$$

Since the covariance terms represent the exposure of the securities to each of the three sources of risk (world market, exchange rate and liquidity), the exposure coefficients obtained from a first-pass regression can be used to replace them (Fama and MacBeth, 1973), and this is given below, along with the stochastic term;

$$E(r_i) = \lambda_m \beta_{i,m} + \lambda_\pi \beta_{i,\pi} + \lambda_q \beta_{i,q} + e_i \tag{70}$$

Hence, the liquidity-adjusted ICAPM specified in (70) is the model to be estimated in this thesis; however, to compare the obtained results with the traditional ICAPM, the latter is equally estimated.

Given the assumption of the mean-variance theory that risk-averse investors prefer higher expected returns, the risk in the individual securities which is measured by its covariance with an efficient market index ($\beta_{i,m}$) is expected to be positively signed (Harvey, 1995). Equally, the price of world market risk (λ_m) is generally positive in line with the positive risk-aversion argument (Lucas, 1978; A-D, 1983 and De Santis and Gerard, 1998). Therefore, securities with higher market covariance risk (higher market risk exposure) will command higher expected returns in equilibrium (Harvey, 1995).

In the case of exposure to exchange rate risk ($\beta_{i,\pi}$), both positive and negative coefficients are feasible depending on the nature of the securities under study. Ceteris

[141] As argued in the methodological review, inclusion of multiple bilateral rates may cause multicollinearity problem and the use of the bilateral rate against the US appears reasonable in the case of Nigeria as most of the country's international transactions are invoiced in US dollars and exchange rates against other currencies are calculated using the US dollar as the reference currency. This assumption is still plausible even when a measure of trade-weighted exchange rate is used.

paribus, exporting firms are expected to benefit from depreciation (positive exposure) while importing firms are expected to lose from depreciation (negative exposure) and the exposure of a firm that simultaneously imports and exports will be determined by the elasticity of the demand of its imports relative to the elasticity of the demand for its exports (He and Ng, 1998 and Du, 2010).

Furthermore, equation (31) in the methodological review shows that the price of exchange risk (λ_π) is a non-linear function of the aggregate measure of risk aversion and the extent of the risk aversion of country *l*'s investors; hence, there is no restriction on its sign (A-D, 1983 and De Santis and Gerard, 1998). Similarly, the presence of the term *1/h* in the price of exchange risk as shown in the derived equation (67) further indicates that the sign of exchange price is an empirical issue.

Preference for liquid securities is a way of reducing uncertainties in the future consumption of portfolio investors as liquid securities can be easily sold (Bekaert et al, 2007). Hence, the liquidity risk premium (λ_q) is present in the above model because the consumer-investor will want to minimise the unanticipated variability in his consumption over time. It therefore constitutes a hedge against unfavourable shifts in the investment opportunity set caused by liquidity problem. According to Merton (1973), when a state variable has a positive impact on consumption, risk-averse utility maximisers will demand less of an asset that is more positively correlated with the state variable.

This is a way of hedging against an unfavourable shift in the state variable. For when ex-post returns on assets are lower, investors are expecting a more favourable investment environment. In view of the fact that liquidity is taken to aid consumption, less of asset whose returns co-vary highly with liquidity (illiquid assets) will be demanded. Investor therefore can accept lower return on liquid asset. In a market that is getting increasingly liquid therefore, the liquidity premium (λ_q) will be expected to be negative[142].

The expectation about the explanatory power of equation (70) is that it will represent a slight improvement over the usual CAPM models. This is because in most CAPM

[142] This is because the sensitivity of security returns to liquidity ($\beta_{i,q}$) falls as return rises. Thus, an inverse relationship is expected to hold between liquidity and security returns (negative liquidity risk premium).

regressions, the R^2's are often low; a fact that may be aggravated when an international index is used to represent market risk instead of a local index[143] (Dominguez and Tesar, 2001b). Studies that have obtained low explanatory power include Harvey (1995), Chow et al (1997), De Santis and Gerard (1998), Carrieri and Majerbi (2006) and Wu (2008), among several others.

In particular, Harvey (1995) obtains adjusted-R^2 that is on the average less than 4% for most EMs and specifically -0.002 for Nigeria. Also, the adjusted-R^2 of almost all of the nine EMs considered by Carrieri and Majerbi (2006) are less than 10%. For instance, they obtain -0.12% for Argentina and 0.99% for India when they estimate a two-factor model using firm-level data. Hence, more attention is paid to the individual significance of each of the risk premia and their joint significance as measured by, say, t-test and F-test respectively.

4.2.2. Measures of exchange rate (risk)

The methodological review on the definition of exchange rate risk suggests that it may be necessary to consider exposure to and pricing of several currencies, but in order to avoid intractability problem when several exchange rates are included (D-S, 1995), the use of trade-weighted exchange rate is used to capture the combined effects of all the exchange rates of Nigeria's trading partners. However, given the argument that non-stochastic inflation rates assumed by tests of IAPM in Industrial markets are less realistic in EMs, the real effective exchange rate index is used in line with the argument of Carrieri and Majerbi (2006).

Moreover, because an index of trade-weighted exchange rate definition often lacks power, especially when firms are mostly exposed to only a few currencies within the basket (Dominguez and Tesar, 2001a and Muller and Verschoor, 2006), and as in the case of Nigeria, where international transactions are usually invoiced in the US dollars, the bilateral naira-dollar nominal exchange rate is also used.

Finally, and as a value addition by this thesis, the deviations of exchange rate around PPP is also used as a measure of exchange risk, following from the argument

[143] However, since investors are assumed to hold a diversified portfolio of securities from all national markets (world market portfolio) (Harvey, 1995), an international index is still more relevant than a local market index despite that the latter may yield a higher R^2

presented by Pilbeam (2006: 182), and D-S (1995) when inflation rate is stochastic. This definition will be similar to the one on real exchange rate as PPP deviations nest both the exchange and the inflation risks. However, since the definition of exchange rate used in the PPP deviations is the bilateral naira-dollar rate, it is expected that the result of this measure will lie between those of the real trade-weighted rate and the bilateral naira-dollar rate.

4.2.3. Measures of market risk

Since it is assumed that investors hold the world market portfolio, the risk of an individual security is therefore given by its covariance with this world market portfolio (Harvey, 1995). The most popular measure of the world market portfolio from the literature is the Morgan Stanley Capital International (MSCI) world index (Harvey, 1995; Choi and Rajan, 1997; Carrieri and Majerbi, 2006; Antell and Vaihekoski, 2007 and Jacobsen and Liu, 2008) and this is the index used in this thesis.

Studies that include local risk in models similar to equation (70) often premise on the partial segmentation framework of Erruza and Losq (1985). But since the channel through which this framework affects asset prices (ADRs/GDRs and CFs) are rare in the case of Nigeria, explicitly recognising a more specific barrier like liquidity risk, as done in this thesis, is assumed to be more relevant in Nigeria.

4.2.4. Criterion for security inclusion and level of aggregation

Any firm, with or without foreign operations, can be exposed to exchange risk (A-D, 1984), hence using only a segment of firms, especially the large ones, is likely to bias the result of exchange risk exposure and pricing and this has attracted some criticisms in the literature (Dominguez and Tesar, 2001a). Besides, large variations in exposure across test assets are needed in estimating the risk premia (Ferson and Harvey, 1994 and Dahlquist and Robertsson, 2001).

During the period of this study, many new firms became newly listed and several others were delisted on the NSE, thereby leading to incomplete data on many firms. A common temptation is to include only firms with complete data for the whole period. However, it has been shown that this introduces survivorship bias in a study (Copeland et al 2005; Elton et al, 2007) as failure to include delisted firms may lead to upward

bias in the estimates of risk prices since they are likely to have lower returns. Their exclusion is therefore unrealistic as a foreign investor might have invested in them at the beginning of the period.

In order to solve this problem, it is necessary to select a sample of all firms listed as at the beginning of the study period and then collect data on them forward. This is to capture all firms including the delisted ones and the newly listed ones. This approach however has the shortcoming of including some redundant firms in the sample. In order to avoid this, securities that were traded in less than 35 out of the 120 periods are excluded as done in Bailey and Chung (1995)[144].

Furthermore, firm-level analysis is done as against grouping into portfolios as the latter has been shown to result in ambiguous results (He and Ng, 1998; Dahlquist and Robertsson, 2001; Dominguez and Tesar, 2001a and Carrieri and Majerbi, 2006).

As pointed out in the methodological review, this thesis attempts to verify the findings of Carrieri and Majerbi (2006) that the pricing of exchange risk is explained by large firms in EMs; hence, every analysis done in this thesis is also repeated for each of four quartile-sized portfolios which is created with firms' data on market capitalisation[145]. Equally, Di Iorio and Faff (2002) document that exchange prices can be different for different sectors of the economy; this finding is verified by running different estimation for the financial and non-financial sectors in Nigeria.

4.2.5. Time-variations in exchange risk exposure and pricing

It is expected that when there are major shifts in exchange rates, measures of exchange risk exposure and prices may not be stable as firms' behaviour may be different between periods of currency appreciation and depreciation (Krugman, 1987; Priestley and Odegaard, 2004; Muller and Verschoor, 2005 and Dominquez and Tesar, 2001).

[144] Although arguments may be raised against the inclusion of some 'dead' and delisted firms, their inclusion is a way of solving the survivorship bias. Also, it is unlikely that their inclusion will pose serious problems to the analysis in this thesis given the approach discussed in the next sub-section on 'time-variations in exchange risk exposure and pricing'. Cursorily, when the effect of time is considered by breaking the analysis into different sub-periods, firms that had already died prior to a given sub-period are automatically excluded from the analysis of that sub-period. This way, the dynamics of the market is equally captured.

[145] In order to classify firms into the four quartile groups, the average market capitalisation of each firm for the period under study was computed. Firms were sorted on this values in ascending order and the first 50 firms fell into the first quartile (smallest firms) while the last 50 firms fell into the fourth quartile (largest firms).

Three major periods of exchange rate changes are identifiable in Nigeria during the period of this study. In the first period (January 2000 to November 2003), naira depreciated against the dollar; in the second period (December 2003 to March 2008) naira appreciated against the dollar; but at the inception of the global financial crisis, the value of naira experienced a sharp fall against the dollar and this occurred to almost the end of the period of study (April 2008 to December 2009).

Hence, following earlier studies like Jorion (1991), Amihud (1994), He and Ng (1998), Di Iorio and Faff (2002), Priestley and Odegaard (2004) and Muller and Verschoor (2005), analyses on exchange risk exposure and pricing are broken into these major sub-periods of exchange rate shifts along with the one for the entire period.

4.2.6. Estimation procedures/methods of data analysis

Equation (70) is used to address the objectives of this thesis, namely; measuring exchange risk exposure and exchange risk prices; hence, an appropriate procedure is the Fama and MacBeth (1973) two-pass regression method. In the first pass regression, estimates of risk exposures (betas in equation 70) are obtained by running a time-series regression of excess returns of the securities on the risk factors. Estimated betas (exposure coefficients) from the first pass regression therefore serve as the explanatory variables in the second pass cross-sectional regression. In the 2^{nd} pass regression, the expected excess returns on the securities serve as the dependent variable while the obtained coefficients (lambdas) represent the measure of risk prices.

However, it is often necessary to correct for the error-in-variable problem that is typical of this procedure (Elton et al, 2007; Cochrane, 2001 and Choi and Rajan, 1997). This thesis therefore adopts an approach presented in Cochrane (2001) showing that the Fama and MacBeth (1973) two-pass method is numerically equivalent to a pooled regression estimation while the error-in-variable problem is solved with corrected standard errors because such regressions tend to be cross-sectionally correlated at a given time.

This proof of equivalence does not only make the running of the two-pass procedure easier, it also solves the problem of losing the first five years of the study period which is characteristic of studies that employ the two-pass method. The pooled regression has

also been shown to take into account the pre-estimation of the betas and the estimates are equivalent to those derived using the Shanken (1992) standard error or the GMM framework (Cochrane, 2001 and Acharya and Pedersen, 2005). This approach[146] is therefore taken in this thesis to estimate equation (70) and robust standard errors, which are consistent in the presence of any pattern of heteroscedasticity and autocorrelation within the dataset, are computed.

It is important to note that the determination of firm-level exchange rate exposure of 200 firms implies that 200 individual time-series regressions are estimated. Moreover, estimations are carried out by firm size divided into four quartiles, two sectors, three episodes of exchange rate changes, and three exchange rate measures under each of the ICAPM and the liquidity-adjusted ICAPM[147]. Therefore, the results presented in this thesis include ***6972*** regressions to address the objective of risk exposure and ***96*** regressions to address the objective of risk price. The results are summarised following the approach in He and Ng (1998) and Men and Yang (2009).

4.2.7. Definitions and sources of key variables

The key variables used in estimating equation (70) are defined in this sub-section along with their sources.

a. Stock returns: This is measured as the percentage change in the month-end individual prices of Nigerian stocks. The data on prices are extracted from the NSE Daily Official Lists Publication. Therefore, price returns as against total returns (adjusted for dividends) are used. The use of price returns is not expected to bias the results for two main reasons. First, it has been shown that beta estimates are insensitive to whether total returns or price return are used (Sharpe and Cooper, 1972; Vassalou, 2000 and Andren and Kjellsson, 2005). Second, obtaining data on dividend payout for all firms listed on the NSE for a period of 10 years is quite a task, and even when obtained, the figures are usually so small that when disaggregated into monthly dividend payout (divided by 12) they are likely to

[146] It should be noted that the first pass regression is initially estimated to address the first objective of this thesis. This regression is a version of equation (37) that is modified to incorporate a liquidity risk factor; i.e., $r_t = \alpha + \beta_m r_{m,t} + \beta_\pi r_{\pi,t} + \beta_q r_{q,t} + \varepsilon_t$. However, the pooled regression estimation as presented here is used to address the second objective. As argued, this is equivalent to the second pass regression, but the error-in-variable problem is corrected; hence, the idea behind the Fama and MacBeth (1973) two-pass method is still maintained.

[147] This equally has implications for the number of regressions estimated under the risk pricing.

become insignificant and adding their rates of change to the relatively larger price returns is unlikely to have significant impacts on the latter.

In the descriptive analysis, the percentage changes in the dollar prices of these securities are also computed, and when compared against the main returns, this gives an indication of return loss due to exchange rate fluctuations. The expected dollar return in excess of the risk-free rate $E(r_i)$ is used as the dependent variable in the regression.

b. *Exchange rate risk:* Three measures of exchange risk are used in this thesis. The first is the percentage change in the month-end real effective exchange rate of the naira. The second is the percentage change in the month-end bilateral naira-US dollar exchange rate[148], and the last one is obtained from deviations from relative PPP. This is computed as the difference between the change in the log of naira-dollar exchange rates and the change in the log of relative CPI between Nigeria and the US. Monthly data on the real effective rate, bilateral naira-dollar rate and CPI of both countries are all obtained from the World Bank Global Economic Monitor Databank at http://siteresources.worldbank.org/INTDAILYPROSPECTS/Resources /GemData EXTR.zip

c. *World market risk:* This is computed as the percentage change in the Morgan Stanley Capital International (MSCI) World Index. This is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed markets. As at December, 31, 2010, the MSCI World Index consists of the following 24 developed market country indices: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States. Data is available at http://www.msci.com/

d. *Liquidity risk:* This is calculated as the percentage change in the month-end turnover ratio[149]. This is computed from the monthly price, market capitalisation

[148] It is often preferred to use the bilateral exchange rate with a major trading partner (Di Iorio and Faff, 2002), a fact which is reinforced especially when a country's international transactions are often invoiced in dollars as is the case of Nigeria.

[149] Note that since turnover is negatively related to illiquidity cost (Amihud and Mendelson, 1986), it is expected that higher rate of change in market-wide turnover will result in lower expected excess returns.

and quantity data on each of the 200 firms sampled from the NSE Daily Official Lists Publication. Market turnover is computed as the equity value traded for each month, divided by that month's equity market capitalisation, expressed in percentage form (Bekaert et al 2007). This definition is also used by Griffin et al (2006).

e. *Eurodollar rate*: Eurodollars are deposits denominated in US dollars at banks outside the United States. Following studies like De Santis and Gerard (1998), Carrieri and Majerbi (2006) and Fedorova and Vaihekoski (2008), the returns on these deposits are used as a proxy for the risk-free rate. The rate of return on one month Eurodollar deposit is therefore deducted from the dollar returns on each of the Nigerian securities to obtain a measure of excess return. Equally, this rate is also deducted from other measures of risk to convert them into their respective excess returns measures. The return on the one month Eurodollar deposit is obtained from the official website of the Federal Reserve Bank, USA at http://www.federalreserve .gov / releases/h15/data.htm

CHAPTER FIVE

RESULTS AND DISCUSSIONS

This chapter presents the results and discussions of this thesis. The chapter is broadly divided into two sections. Section one presents the empirical analysis of the existence, magnitude and dynamics of foreign exchange risk exposure and pricing in the Nigerian stock market. Section two presents the discussions of the obtained results with a view to comparing and explaining them with those already documented in the literature.

5.1. Empirical results

This section on empirical analysis is divided into five sub-sections. The first sub-section presents the results of the bivariate relationship among the variables of interest in this thesis. The second sub-section addresses the first objective of this thesis; namely, the exposure of Nigerian firms to exchange risk. The third sub-section looks at the exposure of Nigerian firms to other risks; namely, the world market risk and the liquidity risk[150]. In the fourth sub-section, the second objective on exchange risk pricing is addressed while the fifth sub-section addresses the third objective of this thesis on the dynamics of exchange risk pricing.

5.1.1. Bivariate relationships among variables

The results of the Pearson Product Moment Correlation in table 5.1 show bivariate relationship between each pair of dollar returns on Nigerian stocks (R_i), returns on MSCI world portfolio (R_w), rates of change in the bilateral naira-dollar rates (R_{bex}), rates of change in the Real Effective Exchange Rate (R_{reer}), deviations from PPP (R_{ppp}) and turnover ratio (R_q). Results are presented for the entire period as well as for the three sub-periods.

[150] These two are important because world market risk comes traditionally into models of exchange risk pricing and liquidity risk comes in as a state variable introduced in the theoretical framework developed in this thesis.

Table 5.1. Results of pairwise correlation among variables

	R_i	R_w	R_{bex}	R_{reer}	R_{ppp}	R_q
Panel A: Full Period (Jan. 2000-Dec. 2009)						
R_i	*1*					
R_w	*.027***	*1*				
R_{bex}	*-.157***	*-.051***	*1*			
R_{reer}	*.021***	*-.184***	*-.404***	*1*		
R_{ppp}	*-.105***	*-.056***	*.814***	*-.649***	*1*	
R_q	*-.009*	*.044***	*-.016**	*-.115***	*-.024***	*1*
Panel B: First Depreciation Period (Jan. 2000-Nov. 2003)						
R_i	*1*					
R_w	*.035***	*1*				
R_{bex}	*-.174***	*-.026**	*1*			
R_{reer}	*-.001*	*.010*	*-.215***	*1*		
R_{ppp}	*-.124***	*-.080***	*.804***	*-.529***	*1*	
R_q	*.035***	*.091***	*-.060***	*-.204***	*-.056***	*1*
Panel C: Appreciation Period (Dec. 2003-Mar. 2008)						
R_i	*1*					
R_w	*-.055***	*1*				
R_{bex}	*-.077***	*-.032***	*1*			
R_{reer}	*-.036***	*-.049***	*.087***	*1*		
R_{ppp}	*.003*	*-.211***	*.305***	*-.627***	*1*	
R_q	*-.043***	*.070***	*.113***	*.045***	*.061***	*1*
Panel D: Second Depreciation and Crisis Period (Apr. 2008-Dec. 2009)						
R_i	*1*					
R_w	*.071***	*1*				
R_{bex}	*-.231***	*.005*	*1*			
R_{reer}	*.147***	*-.438***	*-.814***	*1*		
R_{ppp}	*-.230***	*.074***	*.973***	*-.870***	*1*	
R_q	*-.088***	*-.104***	*.050***	*-.101***	*.053***	*1*

*Note: * and ** depict significance at the 5% and 1% levels respectively*
Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

The relationship between returns on Nigerian stocks and the returns on the world portfolio is significant and positive (0.027) for the entire period as well as for the two sub-periods of depreciation (0.035 and 0.071 respectively). This is expected as individual stock returns often go in the same direction as the market returns. However, negative relationship is recorded during the period of naira appreciation; a likely explanation is that this was a period when returns on Nigerian stocks were relatively higher than those found in most parts of the world (Amedu, 2010). Another striking feature of these relationships is that the correlation coefficient is relatively higher during the global financial crisis, a fact that corroborates the finding in the literature that economic variables tend to commove more in periods of economic downturn (Chaieb and Errunza, 2007).

It is also crucial to note that the correlation of Nigerian firm-level returns with the world market returns in this section is far lower than those obtained in the background chapter where market-wide returns are used. This shows that the use of returns on market-index, rather than on individual firms, is likely to overstate co-movement with the world.

On another note, it is observed that a negative relationship exists between bilateral naira-dollar exchange rate and stock returns in Nigeria. In other words, naira depreciation is associated with lower stock returns, thereby depicting Nigerian firms as net importers and also placing foreign investors in worse position following naira depreciation. This negative association is stronger and more significant in periods of general depreciation and especially strongest during the crisis period. Equally, the relationship between stock returns and PPP deviation measure of exchange risk depicts similar pattern, only that the coefficients are a bit smaller. However, the relationship with REER risk depicts a slightly different pattern. It is shown that the depreciation of the naira against the currency of Nigeria's trading partner is positively associated with higher returns of Nigerian firms. This is particularly true during the crisis period which then dominates that of the entire period.

Moreover, four major findings can be discerned from the relationship between stock returns and exchange rate changes. First, naira depreciation is significantly related to lower performance of Nigerian firms, thereby depicting them as net importers. Second, a measure of exchange risk like PPP deviation, that also recognises randomness in

inflation rates between two trading partners, shows a slightly lower reduction in returns following naira depreciation. Third, a measure of exchange risk like changes in real effective exchange rate, which recognises many trading partners and inflation randomness, shows a much lower reduction in returns following depreciation. In fact, there exists the possibility of better returns following naira depreciation in periods of global crisis when this measure is used. Finally, the negative relationship between stock returns and naira depreciation is more pronounced in periods of general depreciation than periods of general appreciation.

Other relationships are depicted in the table. For instance, it is depicted that the return on the world index is mostly negatively correlated with measures of exchange risk. This is expected given the positive relationship between stocks returns and world returns on the one hand and that of negative relationship between stocks returns and measures of exchange risk on the other. Further, it is shown that periods when the Nigerian stock market becomes more liquid are significantly associated with rising global returns. However, this is reversed during the crisis period as higher liquidity co-exists with lower world returns. This may be explained by the fact that high liquidity during the crisis co-existed with lower global returns as many foreigners divested their holdings with the sole objective of salvaging the situation in their own countries.

Similarly, the relationship between the rates of changes in turnover ratio (measure of liquidity risk) and return on stock is negative. Although, this relationship appears insignificant in the aggregate, the results of the sub-periods analysis suggest otherwise. It is shown that in the first sub-period when liquidity was relatively low, there was a positive relationship between stock returns and liquidity risk. However, as the market saw many activities in the second sub-period, higher liquidity becomes significantly associated with lower returns; this occurs up till the crisis sub-period. This is expected as expected returns on stocks have been documented to fall when markets become more liquid (Bekaert et al, 2007).

The relationship between liquidity and the different measures of exchange risk is also generally negative, suggesting that periods of improved liquidity are often associated with lower exchange risk. This pattern is true in the first sub-period of depreciation which then overrides the relationships in the other periods. Hence, during a period of general depreciation, global investors lose from further unanticipated depreciation and

they then tend to trade less often (lower liquidity). However, during naira appreciation period, it is observed that higher liquidity is positively associated with higher exchange risk. It is therefore likely that in this sub-period of increased foreigners participation and liquidity, naira appreciated steadily, however any small unanticipated naira depreciation is interpreted as implying lower stock prices which then engenders higher demand and liquidity.

One other interesting interpretation achievable from the table is that of the relationship among the measures of exchange risk as this is likely to impact on the results to be obtained later. The relationship between the real effective exchange rate and the bilateral nominal exchange rate is generally negative; this is because at any given level of nominal rate, increase in the relative price level in Nigeria will lead to a fall in the real exchange rate (Pilbeam, 2006: 11). This pattern is reversed in the period of naira appreciation as changes in the price level in Nigeria vary less thereby making nominal and real rates exhibit positive relationship.

In addition, the bilateral nominal rate and PPP deviation are significantly and highly correlated, which can be explained by the fact that both are bilateral rates, only that the PPP deviation is adjusted for relative price changes between Nigeria and the US. This high and positive correlation therefore suggests that it is unlikely that the result of the two measures will be markedly different; hence, studies that have assumed inflation risk away may not be totally incorrect, especially during currency depreciation periods. Since PPP deviation and the bilateral rates are positively correlated, it is expected that the former will display a negative correlation[151] with the real rate, and this is confirmed by the correlation results.

In conclusion, some implications of these correlation results for further empirical analysis can be drawn. The correlation coefficients showing relationships between pairs of the factors, namely; exchange risk, world risk and liquidity risk, are low, thereby suggesting no multicollinearity problem when included in a single model for estimation. Further, since each one of them is mostly significantly related to firms' stock returns, it suggests that they are going to be relevant determinants. Finally, the

[151] Both the PPP deviation and real effective rate controls for the impact of price, yet PPP is directly related to nominal rate and inversely related to real effective rate. This suggests that even when naira depreciates against the dollar both in nominal and real terms; it often appreciates against currencies of the trading partners in the real term.

high correlations among the exchange risk factors do not pose any problem since they are not going to be simultaneously included in the same model.

5.1.2. Exposure to exchange rate risk among Nigerian firms

This sub-section addresses the first objective of this thesis and the analyses are presented in six sub-headings in line with the methodology issues reviewed earlier. The first sub-heading in this sub-section examines the cross-sectional distribution of exchange rate exposure of Nigerian firms for the whole period. The second sub-heading attempts to document variations in exchange rate exposure among firms of different sizes (Carrieri and Majerbi 2006). The third sub-heading does the same but between the financial and non-financial sectors (Di Iorio and Faff, 2002).

The last three sub-headings consider the dynamics of exchange risk exposure among the Nigerian firms. Specifically, the fourth sub-heading tests whether exposure varies by episodes of exchange rate changes (Priestley and Odegaard, 2004). The fifth sub-heading examines whether exposure by firm size vary across different episodes of exchange rate changes, while the last sub-heading examines whether exposures by sector equally vary across different episodes of exchange rate changes.

It should be noted that since three measures of exchange risk are employed in this thesis, each of the above analysis is carried out for each of these measures and results are presented on both the number of firms exposed to exchange risk as well as the average of the exposure coefficients. Therefore, each of the tables presented in this sub-section summarises the results of over a thousand regressions following the format used by He and Ng (1998) and Men and Yang (2009) so as to save space. Hence, underneath each of the tables in this sub-section are the figures showing the total number of regressions estimated that are summarised in the respective tables. Moreover, panel B of table G-1 in appendix G presents the exposure betas in their raw forms for just 200 of such regressions.

i. Cross-sectional[152] distribution of exchange rate exposure of Nigerian firms

A clear deduction from table 5.2 below is that exchange risk matters a lot for Nigerian firms as a significant proportion of them are exposed at the 5% level of significance. It further shows that exposure of Nigerian firms to exchange risk is dependent on the measure of exchange risk and on whether the model controls for liquidity risk or not. It is shown that 81% (162 out of 200) of Nigerian firms are exposed to the measure of nominal bilateral exchange rate (bilateral) risk; 61% (122 out of 200) are exposed to the PPP-deviation measure (PPP-Dvn), while only 12% (24 out of 200) of them are exposed to the REER risk measure. Hence, the hypothesis of no significant exposure of the Nigerian stock market to exchange rate risk is thereby rejected.

Furthermore, exposures to the bilateral rate and the PPP deviation are mostly negative with average coefficient values of -1.7 and -1.1 respectively. These values indicate that the monthly excess dollar returns on Nigerian stock fall by about 1.7% or 1.1% for every percentage depreciation of the naira or deviation from PPP. Hence, majority of Nigerian firms are net importers.

Conversely, exposure to real effective exchange rate risk measure is mostly positive; indicating that while nominal depreciation of the Nigerian currency places firms in a worse performance position, Nigerian firms that are exposed to real effective exchange risk gain from its depreciation. The result implies that 1% depreciation causes 0.285% increase in monthly excess dollar returns. Since REER best shows the changes in the competitive position of a country, this finding has some implications to be discussed later. It is also observed that exchange exposure, both in terms of number of firms and mean coefficient values, is slightly higher when liquidity risk is not controlled for.

[152] Following the practice in the literature (He and Ng, 1998 and Men and Yang, 2009), exposures of a cross-section of 200 firms are summarised under different assumptions and exchange rate measures. This is necessary as presenting the results of all the regressions will consume several pages. Panel B of table G-1 in appendix G therefore presents the results of few out of such regressions, but only for the entire period.

Table 5.2. Cross-sectional distribution of exchange-rate exposure coefficients β_π of Nigerian firms (Jan. 2000-Dec. 2009)

Measure of Exchange rate and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
Bilateral without liquidity risk	200	-4.372	-2.262	-1.686	-1.040	.674	-	164
Bilateral with liquidity risk	200	-4.374	-2.263	-1.673	-1.035	1.180	-	162
REER without liquidity risk	200	-3.00	-.053	.283	.596	3.49	25	-
REER with liquidity risk	200	-3.30	-.028	.285	.591	3.31	23	1
PPP-Dvn without liquidity risk	200	-4.062	-1.436	-1.058	-.651	1.090	-	124
PPP-Dvn with liquidity risk	200	-4.02	-1.437	-1.053	-.650	1.07	-	122
Total number of regressions	**1200**							

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance
Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

ii. Cross-sectional distribution of exchange rate exposure among Nigerian firms of various sizes

The results presented in table 5.3 show that exposure to exchange rate varies with firm size, even though firms of different sizes are all exposed. Apart from exposure to bilateral rate which does not significantly vary across firm size, most firms that are exposed to REER risk are in the first quartile of size, comprising most firms in the 2nd tier market[153]. This pattern is also reflected in the exposure to the PPP deviation risk, thereby depicting that measures of exchange risk that control for price movements are more relevant to small firms than to large firms in Nigeria.

Specifically, around 80% of firms in each of the quartiles are exposed to bilateral risk; and while 28% of smallest firms are exposed to REER risk, only 2% of largest firms are exposed to this risk. Similarly, while 80% of the smallest firms are exposed to PPP deviation risk, about 60% of largest firms are exposed. Judging from the average monthly exposure coefficients, it is depicted that large firms tend to lose more from nominal bilateral exchange rate depreciation and increases in the PPP deviation.

Interestingly however, the few largest firms that are exposed to REER risk derive more benefit from the competitive advantage provided by its depreciation as the average exposure coefficient to this risk is 0.612 as against 0.057 for the smallest firms.

[153] Table F-1 in appendix F presents the list of these firms as well as their exposure to other risks

Table 5.3. Cross-sectional distribution of exchange-rate exposure coefficients β_π of Nigerian firms by size[154] (Jan. 2000-Dec. 2009)

Measure of Exchange rate and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
1ST QUARTILE								
Bilateral without liquidity risk	50	-3.071	-1.300	-1.156	-.939	-.109	-	43
Bilateral with liquidity risk	50	-3.059	-1.306	-1.158	-.939	-.080	-	43
REER without liquidity risk	50	-3.000	-.312	.057	.331	.990	13	-
REER with liquidity risk	50	-3.300	-.026	.039	.334	.970	14	-
PPP-Dvn without liquidity risk	50	-1.830	-.724	-.627	-.627	.423	-	40
PPP-Dvn with liquidity risk	50	-1.840	-.726	-.631	-.626	.400	-	40
2ND QUARTILE								
Bilateral without liquidity risk	50	-3.729	-2.222	-1.586	-1.012	.674	-	44
Bilateral with liquidity risk	50	-3.740	-2.145	-1.540	-.960	.660	-	44
REER without liquidity risk	50	-1.580	-.178	.067	.397	1.500	5	-
REER with liquidity risk	50	-1.690	-.207	.075	.458	1.440	3	1
PPP-Dvn without liquidity risk	50	-2.479	-1.091	-.818	-.531	1.090	1	28
PPP-Dvn with liquidity risk	50	-2.500	-1.092	-.834	-.544	1.070	-	28
3RD QUARTILE								
Bilateral without liquidity risk	50	-4.372	-2.548	-1.962	-1.367	-.225	-	36
Bilateral with liquidity risk	50	-4.374	-2.548	-1.961	-1.382	1.180	-	35
REER without liquidity risk	50	-.980	-.093	.410	.814	2.100	6	-
REER with liquidity risk	50	-1.130	.010	.414	.808	2.070	5	-
PPP-Dvn without liquidity risk	50	-3.641	-1.701	-1.227	-.676	.443		25
PPP-Dvn with liquidity risk	50	-3.650	-1.716	-1.227	-.686	.420	-	25
4TH QUARTILE								
Bilateral without liquidity risk	50	-3.988	-2.588	-2.039	-1.553	-.583	-	41
Bilateral with liquidity risk	50	-3.962	-2.577	-2.035	-1.558	-.578	-	40
REER without liquidity risk	50	-.470	.140	.598	.830	3.490	1	-
REER with liquidity risk	50	-.530	.135	.612	.835	3.310	1	-
PPP-Dvn without liquidity risk	50	-4.062	-1.802	-1.561	-1.030	-.181		31
PPP-Dvn with liquidity risk	50	-4.020	-1.807	-1.521	-1.028	.990		29
Total Number of Regressions	**1200**							

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

[154] 1st quartile represents firms with the smallest average market capitalisation during the period under study, while 4th quartile represents firms with the highest average market capitalisation.

iii. Cross-sectional distribution of exchange rate exposure between the financial and non-financial sectors

Table 5.4 depicts three major patterns. First, it shows that a higher percentage of the firms in the non-financial sector are exposed to each of the measures of exchange risk. For instance, about 88%, 15% and 65% of the firms in this sector are significantly exposed to the bilateral rate, REER and PPP deviation rates respectively. These figures contrast with the corresponding values of 63%, 3.7% and 50% observed among the financial firms. Second, it is rare to find a firm in the financial sector that benefit from the REER depreciation during the period of this study; only two of them exist.

Third, irrespective of the measure of exchange risk, firms in the financial sector tend to be far more sensitive to risk than their non-financial counterparts. For instance, while 100% depreciation against the dollar will lead to a 155% fall in average monthly excess returns (AMER) in the non-financial sector, the same change will lead to about 200% fall in AMER among firms in the financial sector.

iv. Cross-sectional distribution of exchange rate exposure[155] of Nigerian firms by episodes of exchange rate changes[156]

According to table 5.5 below, exposure to nominal bilateral rate varies across the different episodes of exchange rate changes. Specifically, more firms are exposed during periods of exchange rate depreciation than appreciation, and this is pronounced during the crisis. Nonetheless, the relatively fewer firms that are exposed during appreciation period display very high sensitivity to exchange rate changes, ranging between -21.394 to 16.925 with an average value of -2.495, while the average exposure coefficients during the first and the crisis periods are -1.050 and -1.451 respectively.

[155] For this and the remaining two parts, only the bilateral rates are used so as to keep the number of regressions to be interpreted tractable.

[156] It should be noted that the number of firms in each of the sub-periods may not be up to 200 as some firms would not had not been in existence or had ceased from existence in a given sub-period.

Table 5.4. Cross-sectional distribution of exchange-rate exposure coefficients β_π of Nigerian firms by sector (Jan. 2000-Dec. 2009)

Measure of Exchange rate and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
NON-FINANCIAL								
Bilateral without liquidity risk	146	-3.729	-2.005	-1.550	-.980	.674	-	129
Bilateral with liquidity risk	146	-3.740	-2.001	-1.551	-.984	.660	-	128
REER without liquidity risk	146	-3.000	-.037	.220	.504	2.100	23	-
REER with liquidity risk	146	-3.300	-.070	.216	.529	2.070	21	1
PPP-Dvn without liquidity risk	146	-3.557	-1.167	-.920	-.649	1.090	-	98
PPP-Dvn with liquidity risk	146	-3.570	-1.191	-.914	-.647	1.070	-	97
FINANCIAL								
Bilateral without liquidity risk	54	-4.372	-2.562	-2.052	-1.390	-.255	-	35
Bilateral with liquidity risk	54	-4.374	-2.529	-2.004	-1.389	1.180	-	34
REER without liquidity risk	54	-.960	-.079	.452	.865	3.490	2	-
REER with liquidity risk	54	-1.010	-.005	.470	.878	3.310	2	-
PPP-Dvn without liquidity risk	54	-4.062	-2.022	-1.433	-.829	.443	-	26
PPP-Dvn with liquidity risk	54	-4.020	-2.039	-1.432	-.821	.420	-	25
Total Number of Regressions	**1200**							

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table 5.5. Cross-sectional distribution of exchange-rate[157] exposure coefficients β_π of Nigerian firms by episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period[158] and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
	ALL FIRMS							
Depreciation without liquidity risk	182	-5.010	-1.429	-1.054	-.803	5.552	1	110
Depreciation with liquidity risk	182	-.500	-1.420	-1.050	-.780	4.000	1	109
Appreciation without liquidity risk	199	-22.142	-4.439	-2.734	-.733	16.952	1	59
Appreciation with liquidity risk	199	-21.394	-4.242	-2.495	-.676	16.925	1	57
2nd Depreciation without liquidity risk	181	-15.330	-2.073	-1.542	-.874	.326	1	138
2nd Depreciation with liquidity risk	181	-5.933	-1.957	-1.451	-.877	.350	-	141
Total Number of Regressions	**1124**							

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance
Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

[157] In regressions that have to do with episodes of exchange rate changes, only the bilateral exchange rate is used so as to reduce the number of estimations.

[158] Note that in this table, and similar ones, "*Depreciation*" stands for the first period of exchange rate changes (January 2000 to November 2003) when naira depreciated against the dollar; "*Appreciation*" stands for the second period (December 2003 to March 2008) when naira appreciated against the dollar; and "*2nd Depreciation*" stands for the global financial crisis period (April 2008 to December 2009) when naira experienced a sharp fall against the dollar.

v. Cross-sectional distribution of exchange rate exposure of Nigerian firms by size and episodes of exchange rate changes

Having documented that exposure varies by size and by episodes of exchange rate changes, this part tries to verify whether these two variables can interact to influence exposure, and this is given in table 5.6. It is shown that a higher percentage of small firms are exposed in each of the different episodes of exchange rate changes. However, average exposure coefficients are highest among large firms especially during the two depreciation periods. Even during appreciation, when exposure coefficients are highest in second quartile firms, a wider variation is observed among the fourth quartile firms ranging from -17.8 to 16.9.

vi. Cross-sectional distribution of exchange rate exposure of Nigerian firms by sector and episodes of exchange rate changes

Table 5.7 depicts that even though a lower percentage of financial firms are exposed to exchange rate risk, the average exposure is relatively higher in the financial sector. This is because the mean exposure coefficients are higher in the financial sector than in the non-financial sector, especially during the two depreciation periods. It is also noteworthy that during currency appreciation, very few financial firms are significantly exposed to exchange rate risk.

Table 5.6. Cross-sectional distribution of exchange-rate exposure coefficients β_π of Nigerian firms by size and episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
	1st Quartile							
Depreciation without liquidity risk	49	-1.542	-1.013	-.902	-.923	.651	-	43
Depreciation with liquidity risk	49	-2.000	-1.010	-.900	-.900	1.000	-	43
Appreciation without liquidity risk	50	-22.142	-2.087	-2.495	-.676	1.156	-	25
Appreciation with liquidity risk	50	-21.394	-2.203	-2.362	-.681	1.531	-	24
2nd Depreciation without liquidity risk	47	-15.330	-.983	-1.328	-.877	.091	1	41
2nd Depreciation with liquidity risk	47	-3.926	-.987	-1.054	-.894	.064	-	41
	2nd Quartile							
Depreciation without liquidity risk	49	-2.435	-1.208	-.810	-.605	3.477	-	29
Depreciation with liquidity risk	49	-2.000	-1.210	-.800	-.640	3.000	-	28
Appreciation without liquidity risk	50	-12.436	-5.754	-3.411	-.987	4.051	-	15
Appreciation with liquidity risk	50	-12.279	-5.033	-3.052	-.987	5.209	-	15
2nd Depreciation without liquidity risk	48	-3.675	-1.188	-1.114	-.763	.326	-	41
2nd Depreciation with liquidity risk	48	-3.595	-1.168	-1.108	-.764	.350	-	42
	3rd Quartile							
Depreciation without liquidity risk	48	-5.010	-2.230	-1.304	-.742	5.552	1	22
Depreciation with liquidity risk	48	-5.000	-2.230	-1.250	-.700	4.000	1	21
Appreciation without liquidity risk	50	-15.506	-5.114	-2.806	.095	10.614	1	8
Appreciation with liquidity risk	50	-14.942	-4.859	-2.359	.685	11.219	1	7
2nd Depreciation without liquidity risk	38	-4.716	-2.411	-1.661	-.901	-.138	-	26
2nd Depreciation with liquidity risk	38	-4.667	-2.388	-1.636	-.895	-.097	-	26
	4th Quartile							
Depreciation without liquidity risk	36	-2.716	-1.558	-1.258	-.845	.505	-	16
Depreciation with liquidity risk	36	-4.000	-1.810	-1.320	-.790	0.000	-	17
Appreciation without liquidity risk	49	-14.797	-4.326	-2.212	-.771	16.952	-	11
Appreciation with liquidity risk	49	-17.798	-4.171	-2.200	-.634	16.925	-	11
2nd Depreciation without liquidity risk	48	-6.435	-2.530	-2.086	-1.443	-.427	-	30
2nd Depreciation with liquidity risk	48	-5.933	-2.500	-2.037	-1.404	-.371	-	32
Total Number of Regressions	**1124**							

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table 5.7. Cross-sectional distribution of exchange-rate exposure coefficients β_π of Nigerian firms by sector and episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
NON-FINANCIAL								
Depreciation without liquidity risk	141	-2.943	-1.263	-.940	-.774	5.552	1	90
Depreciation with liquidity risk	141	-3.000	-1.240	-.950	-.770	4.000	-	89
Appreciation without liquidity risk	145	-22.142	-4.348	-2.746	-.976	16.952	1	53
Appreciation with liquidity risk	145	-21.394	-4.065	-2.496	-.966	16.925	1	51
2nd Depreciation without liquidity risk	142	-4.716	-1.693	-1.340	-.874	.091	1	115
2nd Depreciation with liquidity risk	142	-4.667	-1.688	-1.335	-.871	.064	-	118
FINANCIAL								
Depreciation without liquidity risk	41	-5.010	-2.196	-1.446	-.898	2.200	-	20
Depreciation with liquidity risk	41	-5.000	-2.210	-1.410	-.810	2.000	1	20
Appreciation without liquidity risk	54	-15.506	-4.968	-2.700	-.103	3.757	-	6
Appreciation with liquidity risk	54	-17.798	-4.536	-2.490	.046	4.111	-	6
2nd Depreciation without liquidity risk	39	-15.330	-2.538	-2.277	-.964	.326	-	23
2nd Depreciation with liquidity risk	39	-5.933	-2.456	-1.875	-.933	.350	-	23
Total Number of Regressions	**1124**							

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

5.1.3. Exposure to other risks[159]

In the process of measuring exposure to exchange risk (objective 1), exposure to two other risks, world market and liquidity, are generated, and the results are briefly presented in this sub-section.

i. Exposure to market risk

Table 5.8 depicts that only about 7% of Nigerian firms are significantly exposed to the global market risk, as measured by the excess returns on the MSCI global index. On the average, exposure to global risk is positive and it is highest at 0.197 when REER risk measure is used and liquidity risk is accounted for.

Moreover, classifications of exposure to global market risk by size, sector and episodes of exchange rate changes are presented in appendix D. For instance, table D-1 in appendix D shows that most of the firms that are exposed to the global risk are the large ones and the mean exposure coefficients also rises with firm size from 0.002 to 8.582. Equally, while only 2% of the smallest firms are exposed, about 16% of the largest firms are exposed to the world market risk.

In addition, table D-2 shows that about 4% of firms in the non-financial sector are significantly exposed to global risk but around 11% of firms in the financial sector are exposed. Average exposure coefficients are therefore higher (0.411) under REER with liquidity risk in the financial sector than in the non-financial sector (0.118). Since exposure to global risk signifies degree of integration with the world, this implies that larger firms and financial firms are more integrated. Distributions of exposure to the world market factor across episodes of exchange rate changes are given in table D-3. It is shown that even though market exposure is mostly positive, it becomes negative during naira appreciation period, thereby corroborating the earlier findings under the correlation analysis. It is equally shown that exposure becomes far more pronounced during crisis.

[159] Since exposures to the three forms of risk are estimated jointly, the values presented in this sub-section are just extracted from the general regression outputs that produce the results on exposure to exchange risk. Hence, it is not that new regressions are run in this sub-section.

Table 5.8. Cross-sectional distribution of coefficient of exposure to the world market risk β_m by Nigerian firms (Jan. 2000-Dec. 2009)

Measure of Exchange rate and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
Bilateral without liquidity risk	200	-1.006	-.126	.117	.361	2.065	13	-
Bilateral with liquidity risk	200	-.984	-.136	.117	.366	1.804	13	-
REER without liquidity risk	200	-.956	-.068	.187	.410	2.387	13	-
REER with liquidity risk	200	-.942	-.064	.197	.417	2.336	14	1
PPP-Dvn without liquidity risk	200	-.961	-.138	.129	.375	2.202	9	-
PPP-Dvn with liquidity risk	200	-.940	-.122	.140	.391	1.940	9	-

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table D-4 clarifies the earlier evidence that market exposure becomes negative during the sub-period of naira appreciation. It shows that the negativity of market exposure during episode of naira appreciation is actually accounted for by smaller firms. This is because the market exposures of the largest firms are positive under all episodes of exchange rate changes. Since majority of firms in the financial sector are large, table D-5 therefore shows that the negativity of exposure to global risk during appreciation is less significant among firms in the financial sector. It is however shown that in the period of crisis, the financial sector becomes far more exposed to the world risk (0.770) than the non-financial sector (0.149). Finally, the result of this sub-period suggests that world market risk can proxy for liquidity risk, especially for the financial sector in the crisis period, as the average exposure coefficient falls from 0.770 to 0.402 when liquidity risk is accounted for.

ii. Exposure to liquidity risk

Table 5.9 shows that few[160] Nigerian firms are significantly exposed to liquidity risk when estimation is carried out for the entire period. The average exposure coefficient is negative implying that excess monthly dollar returns on Nigerian stocks fall as the Nigerian stock market becomes more liquid.

Table E-1 in appendix E shows that higher liquidity still results in lower returns regardless of firm size. An exception is found in the case of the largest firms where improved liquidity results in higher returns[161]. Table E-2 further shows that improved liquidity is likely to raise returns of firms in the financial sector. Importantly, table E-3 shows that exposure to liquidity risk, both in terms of the number of firms exposed and the average size of exposure coefficient, becomes more pronounced when episodes of exchange rate changes are recognised.

[160] That many firms are not significantly exposed to liquidity risk at the 5% level may not prevent this risk from being priced as wide variations in exposure to liquidity risk is expected among firms. This is because for a risk to be priced, wide variations in the exposure betas are expected (Ferson and Harvey, 1994). Although not reported, exposure to liquidity risk was also verified at the 10% level of significance. The results showed that exposure to liquidity risk with Bilateral increased from 10 firms to 26 firms; with REER increased from 11 firms to 15 firms and with PPP-Dvn increased from 8 firms to 19 firms. Most of the firms that are significantly exposed at the 10% level displayed a negative sign implying that increase in liquidity generally reduces returns.

[161] This can be explained by the 'positive feedback' and 'herding' activities of foreign investors that may characterise such stocks (Choe et al, 1999 and Kim and Wei, 2002).

Table 5.9. Cross-sectional distribution of coefficient of exposure to the liquidity risk β_q by Nigerian firms (Jan. 2000-Dec. 2009)

Measure of Exchange rate	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
Liquidity risk with Bilateral	200	-.155	-.008	-.001	.002	.488	5	5
Liquidity risk with REER	200	-.086	-.008	.000	.003	.494	7	4
Liquidity risk with PPP-Dvn	200	-.130	-.008	-.002	.003	.490	5	3

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

In table E-4, it is observed that a reduction in returns following market liquidity declines with firm size during appreciation, whereas this rises with firm size during economic crisis. In other words, it is shown that when the growth rate of market turnover ratio rises by 100% in the period of appreciation, the monthly excess returns on the second quartile firms will fall by 0.4%, while that on the fourth quartile firms rises by 0.4%. However, in period of crisis, both will fall by about1.3% and 6% respectively.

Lastly, table E-5 depicts that for the financial sector, reduction in returns due to improved market liquidity is less significant during currency appreciation than during the crisis. The table shows that during appreciation, a 100% rise in liquidity will reduce monthly excess returns on non-financial firms by 0.8% and financial by 0.4%. But during crisis they are reduced by 2.2% and 7% respectively.

5.1.4. Price of exchange risk in Nigeria

The second objective of this thesis is addressed in this sub-section and the presentation is done in three sub-headings. In the first sub-heading, the results of the price of exchange risk are generally analysed for all firms in the entire period. In the second sub-heading, the price of exchange risk is analysed according to the firms' sizes while the third sub-heading analyzes exchange risk price according to firms' sectors.

i. Price of exchange risk

Table 5.10 presents the results of the pooled regressions (Cochrane, 2001) on risk prices under the different exchange risk measures and presence or absence of liquidity risk. As typical of studies in this area, the adjusted R^2 are low[162], but the F-ratio tests show that all the models are significant. Thus, the hypothesis that foreign exchange risk is not priced in the Nigerian stock market is rejected. The primary focus of this sub-section is the analysis of results in the column of exchange risk prices (λ_π) in the table.

[162] According to what is discussed under model specification in the chapter on methodology, a low *adj-R^2* is typical of most asset pricing studies. This need not pose a problem provided the risk prices (lambdas) are individually and jointly significant, as is the case in this thesis. This is in line with studies like Harvey (1995), Chow et al (1997), De Santis and Gerard (1998), Dominguez and Tesar (2001a), Carrieri and Majerbi (2006) and Wu (2008).

Table 5.10. Prices of world (λ_m), exchange (λ_π) and liquidity (λ_q) risk factors in the Nigerian stock market (Jan. 2000-Dec. 2009)

Measure of Exchange rate and inclusion of liquidity risk	Adj.-R^2	F-ratio	Constant	λ_m	λ_π	λ_q
Bilateral without liquidity risk	0.0250	560.32**	1.790**	0.096**	-1.653**	
Bilateral with liquidity risk	0.0251	374.31**	1.872**	0.099**	-1.654**	-0.002*
REER without liquidity risk	0.0014	22.84**	1.610**	0.159**	0.241**	
REER with liquidity risk	0.0015	17.30**	1.661**	0.160**	0.233**	-0.001
PPP-Dvn without liquidity risk	0.0115	255.63**	0.900**	0.106**	-0.983**	
PPP-Dvn with liquidity risk	0.0117	174.90**	0.982**	0.108**	-0.985**	-0.002*

*Note: * and ** depict significance at the 5% and 1% levels respectively*
Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

It is observed that exchange risk is significantly priced in the Nigerian stock market and the risk price is negative when both the bilateral and PPP deviation rates are used, but positive when REER risk is used. This results implies that investors see negative exposure as a risk and therefore are willing to pay a premium (accept a lower excess return) on stocks whose values fall slightly as naira depreciates against the dollar.

Differently stated, investors require a premium (demand higher excess returns) on stocks whose values fall significantly as naira depreciates. Specifically, the monthly price of the nominal bilateral exchange risk is -1.654% (-19.9% when annualised); the price of REER risk is -0.233% (-2.8% when annualised) and that of PPP deviation is -0.985 (-11.8% when annualised).

The lower price observed under the PPP deviation measure, relative to the bilateral rates, implies that measures of exchange risk, like the bilateral rates, that do not control for the rate of inflation are likely to overstate the exchange risk prices. Conversely, the adoption of REER risk shows that exchange risk price is significant and positive. This may be interpreted that investors require a monthly premium of about 0.233% on stocks whose values increase relatively more as naira depreciates against the currencies of Nigerian major trading partners.

The column on world risk price shows that this is also significant and positive. It is also observed that the world market price is higher when inflation risk-adjusted measures of exchange risk are employed. Finally, the price of liquidity risk is negative and significant in two out of three scenarios. The value shows that investors will be willing to pay a monthly average price of 0.002% (0.024%, when annualised) on stocks whose returns fall slightly as the market becomes more liquid. It should be noted that a stock that will be this relatively insensitive to liquidity is most likely to be an already liquid stock.

ii. Price of exchange risk according to firms' sizes

The results in table 5.11 show that there is a tendency for exchange risk to be priced in larger firms than smaller ones. Taking the smallest firms for instance, REER risk is not priced and PPP deviation risk is priced only when liquidity risk is controlled for. However, all the three measures of exchange risk are priced among the firms in the fourth quartile (the largest firms).

Table 5.11. Prices of world (λ_m), exchange (λ_π) and liquidity (λ_q) risk factors in the Nigerian stock market according to firms' size (Jan. 2000-Dec. 2009)

Measure of Exchange rate and inclusion of liquidity risk	Adj.-R^2	F-ratio	Constant	λ_m	λ_π	λ_q
1ST QUARTILE						
Bilateral without liquidity risk	0.0153	128.22**	0.004	-0.003	-0.966**	
Bilateral with liquidity risk	0.0155	92.78**	0.087	0.000	-0.968**	-0.001
REER without liquidity risk	0.0000	0.320	-0.049	0.025	0.010	
REER with liquidity risk	0.0002	1.560	0.026	0.028	-0.002	-0.001
PPP-Dvn without liquidity risk	0.0056	27.80**	-0.450	0.000	-0.501	
PPP-Dvn with liquidity risk	0.0059	29.35**	-0.370	0.003	-0.504**	-0.001
2ND QUARTILE						
Bilateral without liquidity risk	0.0164	72.10**	1.527**	0.047	-1.344**	
Bilateral with liquidity risk	0.0169	48.49**	1.657**	0.052	-1.347**	-0.003*
REER without liquidity risk	0.0003	2.81	1.369**	0.091	0.130	
REER with liquidity risk	0.0007	3.23*	1.479**	0.094	0.112	-0.002
PPP-Dvn without liquidity risk	0.0058	35.55**	0.860*	0.050	-0.683**	
PPP-Dvn with liquidity risk	0.0063	25.05**	0.985**	0.055	-0.687**	-0.003*
3RD QUARTILE						
Bilateral without liquidity risk	0.0243	159.55	2.930**	0.014	-1.969**	
Bilateral with liquidity risk	0.0243	111.81**	2.882**	0.012	-1.968**	0.001
REER without liquidity risk	0.0004	2.83	2.634**	0.057	0.236*	
REER with liquidity risk	0.0005	2.13	2.542**	0.075	0.252*	0.002
PPP-Dvn without liquidity risk	0.0103	80.04**	1.800**	0.017	-1.181**	
PPP-Dvn with liquidity risk	0.0103	53.63**	1.750**	0.015	-1.180**	0.001
4TH QUARTILE						
Bilateral without liquidity risk	0.0493	235.09**	2.814**	0.355**	-2.143**	
Bilateral with liquidity risk	0.0494	157.43**	2.869**	0.357**	-2.143**	-0.001
REER without liquidity risk	0.0106	35.53**	2.607**	0.479**	0.697**	
REER with liquidity risk	0.0106	23.76**	2.620**	0.479**	0.696**	-0.000
PPP-Dvn without liquidity risk	0.0334	150.44**	1.496**	0.379**	-1.496**	
PPP-Dvn with liquidity risk	0.0336	100.93**	1.555**	0.381**	-1.651**	-0.001

*Note: * and ** depict significance at the 5% and 1% levels respectively*
Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Moreover, exchange risk price rises with firms' size. In the case of the bilateral exchange risk measure, exchange risk price rises from -0.97% to -2.14% between the smallest and the largest sized firms. Under the REER risk, exchange risk price rises from the insignificant value of -0.002% to the highest value of 0.697% between the smallest and the largest sized firms. Equally, the price of PPP deviation risk rises from -0.504% to -1.651% between the smallest and the largest sized firms.

The table also shows that the price of world risk is mainly positive in each of the quartiles; but significant pricing of the world factor becomes more noticeable among firms in the fourth quartile. One other important finding depicted in the table is that the pricing of liquidity risk becomes less relevant once analysis is broken down by firms' size. This is indicative of the close relationship between liquidity and firm size.

iii. Price of exchange risk according to sector

According to table 5.12, the price of exchange risk is relatively higher in the financial sector than in the non-financial sector. For instance, while investors are willing to accept a 1.55% reduction in the monthly excess returns on stocks of non-financial firms that perform better when naira depreciates bilaterally against the dollar, they are willing to accept up to a 2.03% reduction if such firms are found in the financial sector.

Equally, while investors are willing to accept a 0.9% reduction in the monthly excess returns on stocks of non-financial firms that perform better as exchange rates deviate more from their PPP values, they are willing to accept up to a 1.23% reduction when such firms are in the financial sector. Although the price of REER risk is positive, the same pattern of higher risk price in the financial sector (0.361%) over the non-financial sector (0.20%) is still observed.

In addition, it is observed that the world market risk has a higher likelihood of being priced in the financial sector and that the price of the risk is also higher in this sector. Lastly, there is a higher likelihood for liquidity risk to be priced among firms in the non-financial sector.

Table 5.12. Prices of world (λ_m), exchange (λ_π) and liquidity (λ_q) risk factors in the Nigerian stock market according to sector (Jan. 2000-Dec. 2009)

Measure of Exchange rate and inclusion of liquidity risk	Adj.-R^2	F-ratio	Constant	λ_m	λ_π	λ_q
NON-FINANCIAL						
Bilateral without liquidity risk	0.0229	437.93**	1.814**	0.047	-1.547**	
Bilateral with liquidity risk	0.0232	292.29**	1.921**	0.051	-1.549**	-0.003**
REER without liquidity risk	0.0008	11.74**	1.642**	0.104**	0.208**	
REER with liquidity risk	0.0010	11.93**	1.721**	0.106**	0.196**	-0.002*
PPP-Dvn without liquidity risk	0.0099	189.18**	0.994**	0.057**	-0.898**	
PPP-Dvn with liquidity risk	0.0101	133.61**	1.099**	0.061*	-0.901**	-0.003
FINANCIAL						
Bilateral without liquidity risk	0.0334	139.08**	1.687**	0.275**	-2.033**	
Bilateral with liquidity risk	0.0334	92.74**	1.684**	0.275**	-2.033**	0.000
REER without liquidity risk	0.0046	12.16	1.486**	0.358**	0.354**	
REER with liquidity risk	0.0048	8.13**	1.439**	0.358**	0.361**	0.001
PPP-Dvn without liquidity risk	0.0186	71.20**	0.553	0.282**	-1.286**	
PPP-Dvn with liquidity risk	0.0186	47.46**	0.553	0.282**	-1.286**	0.000

*Note: * and ** depict significance at the 5% and 1% levels respectively*
Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

5.1.5. The dynamics of exchange rate risk price in the Nigerian stock market

This sub-section addresses the third objective of this thesis. First, analysis is presented according to the three different episodes of exchange rate changes. Further analyses are carried out on how each of firms' size and sector interact with the episodes of exchange rate changes to determine exchange risk prices.

i. Price of exchange risk according to episodes of exchange rate changes

Once analysis is broken down according to the different episodes of exchange rate changes, the importance of the derived liquidity-adjusted ICAPM becomes more evident in table 5.13. For instance, save for the bilateral rate, it is shown that exchange risk price becomes higher during the period of depreciation than that of appreciation; and this increase in price is much more pronounced in the crisis period. Equally, it is observed that prior to the crisis, there are situations whereby REER and PPP-deviations are not priced; however, pricing in these periods are enhanced when the liquidity-adjusted ICAPM version is applied. Further, REER risk is positive and priced especially during crisis, by which time its price rises to equalise those of other measures in absolute terms.

Similar to the findings under the sub-section on exposure, it is shown that the price of world market risk is positive during depreciation but negative during appreciation of the naira. Also, there is the tendency for the world market risk price to rise during the period of crisis.

Unlike when the analysis is broken down by size of firms, the inclusion of liquidity risk in the model of asset pricing appears most justified when analysis is broken down according to the different episodes of exchange rate changes. Specifically, it is found that the inclusion of liquidity risk factor reduces the exchange risk prices, thereby confirming the *a priori* expectation under the model specification that the exclusion of liquidity risk is likely to wrongly state exchange risk prices. Using the PPP deviation risk as an example, the inclusion of liquidity risk reduces the absolute price of exchange risk from 0.619% to 0.612% during the first period; from 0.183% to 0.117% in the second period and from 1.588% to 1.564% in the crisis period.

Table 5.13. Prices of world (λ_m), exchange (λ_π) and liquidity (λ_q) risk factors in the Nigerian stock market according to episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Measure of Exchange rate and inclusion of liquidity risk	Adj.-R^2	F-ratio	Constant	λ_m	λ_π	λ_q
1ST DEPRECIATION (JAN. 2000-NOV. 2003)						
Bilateral without liquidity risk	0.0313	158.99**	0.663**	0.098**	-1.089**	
Bilateral with liquidity risk	0.0318	106.50**	0.557**	0.092**	-1.081**	0.002*
REER without liquidity risk	0.0013	5.40**	0.794	.0113**	-0.010	
REER with liquidity risk	0.0023	7.73**	-0.075	0.103**	0.027	0.003**
PPP-Dvn without liquidity risk	0.0161	77.80**	-0.309	0.081**	-0.619**	
PPP-Dvn with liquidity risk	0.0168	52.91**	-0.424*	0.074*	-0.612**	0.002**
APPRECIATION (DEC. 2003-MAR. 2008)						
Bilateral without liquidity risk	0.0092	65.69**	3.244**	-0.600**	-2.857**	
Bilateral with liquidity risk	0.0101	45.18**	3.627**	-0.577**	-2.724**	-0.009**
REER without liquidity risk	0.0045	20.94**	5.279**	-0.590**	-0.594	
REER with liquidity risk	0.0059	15.39**	5.634**	-0.562**	-0.566**	-0.012**
PPP-Dvn without liquidity risk	0.0031	13.81**	4.966**	-0.590**	-0.183	
PPP-Dvn with liquidity risk	0.0046	12.05**	5.411**	-0.555**	-0.117	-0.012**
2ND DEPRECIATION AND CRISIS PERIOD (APR. 2008-DEC. 2009)						
Bilateral without liquidity risk	0.0592	217.36**	-1.393**	0.245**	-1.502**	
Bilateral with liquidity risk	0.0641	153.79**	-1.085*	0.225**	-1.482**	-0.026**
REER without liquidity risk	0.0455	144.17**	-2.969**	0.520**	1.305**	
REER with liquidity risk	0.0481	99.29**	-2.733**	0.495**	1.257**	-0.019**
PPP-Dvn without liquidity risk	0.0616	221.00**	-2.946**	0.294**	-1.588**	
PPP-Dvn with liquidity risk	0.0661	152.76**	-2.629**	0.273**	-1.564**	-0.025**

*Note: * and ** depict significance at the 5% and 1% levels respectively*
Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Including liquidity is also noted to aid the pricing of REER and PPP deviation risks; and finally, the monthly price of liquidity risk rises from 0.002% in the first period to -0.012% in appreciation period and to -0.025% in the crisis period. Hence the annualised liquidity price can be up to 0.3% in the period of crisis.

ii. Price of exchange risk by size and episodes of exchange rate changes

Table 5.14 shows that the price of exchange risk during the 1st depreciation period rises from -0.814 in the smallest firms to -1.41% in the largest firms. Also, it rises from -0.9% among the smallest firms to -1.83% among the largest firms during the 2nd depreciation (crisis) period. Further, in the period of currency appreciation, the price of bilateral exchange risk price rises from -1.44% among the smallest firms to -2.03% among the largest firms. Therefore, the episodes of exchange rate changes notwithstanding, the price of bilateral nominal exchange rate risk still rises with firm size.

The same pattern as above is also observed in the case of the price of world market risk. That is, the price of world market risk rises with firm size. Lastly, when size and episodes of exchange rate changes are interacted, liquidity risk can be priced even among large firms; particularly during the crisis period. For instance, it is shown that the monthly liquidity risk price amounts to -0.05% in the period of the global financial crisis among the largest Nigerian firms.

Table 5.14. Prices of world (λ_m), exchange (λ_π) and liquidity (λ_q) risk factors in the Nigerian stock market according to size and episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period and inclusion of liquidity risk	Adj.-R^2	F-ratio	Constant	λ_m	λ_π	λ_q
1ST QUARTILE						
Depreciation without liquidity risk	0.0373	83.99**	-0.526**	0.061**	-0.812**	
Depreciation with liquidity risk	0.0373	67.89**	-0.506*	0.062**	-0.814**	0.000
Appreciation without liquidity risk	0.0053	13.00**	0.532	-0.412*	-1.548	
Appreciation with liquidity risk	0.0064	8.93**	0.856	-0.404*	-1.438**	-0.007**
2nd Depreciation without liquidity risk	0.1404	157.47**	-0.600	0.021	-0.898**	
2nd Depreciation with liquidity risk	0.1404	107.07**	-0.599	0.020	-0.898**	-0.000
2ND QUARTILE						
Depreciation without liquidity risk	0.0216	47.18**	0.247	0.072	-1.184**	
Depreciation with liquidity risk	0.0218	31.47**	0.349	0.078	-1.191**	-0.001
Appreciation without liquidity risk	0.0102	5.63**	2.965**	-0.247	-1.894**	
Appreciation with liquidity risk	0.0104	5.20**	3.329**	-0.239	-1.768**	-0.008
2nd Depreciation without liquidity risk	0.0677	67.68**	0.619	0.087	-1.121**	
2nd Depreciation with liquidity risk	0.0700	47.62**	0.731	0.079	-1.115**	-0.009
3RD QUARTILE						
Depreciation without liquidity risk	0.0399	46.18**	1.276**	0.069	-1.380**	
Depreciation with liquidity risk	0.0458	34.84**	0.8929*	0.041	-1.350**	0.005**
Appreciation without liquidity risk	0.0123	4.27**	5.954**	-0.423	-2.685	
Appreciation with liquidity risk	0.0141	6.36**	6.571**	-0.399	-2.482**	-0.015*
2nd Depreciation without liquidity risk	0.0442	103.58**	-2.333	0.072	-1.402	
2nd Depreciation with liquidity risk	0.0450	69.87**	-2.227**	0.064	-1.396**	-0.008
4TH QUARTILE						
Depreciation without liquidity risk	0.0483	33.53**	3.295**	0.163*	-1.429**	
Depreciation with liquidity risk	0.0506	24.01**	3.082**	0.152	-1.414**	0.004
Appreciation without liquidity risk	0.0058	10.04**	5.046**	0.034	-2.049**	
Appreciation with liquidity risk	0.0060	7.02**	5.123**	0.045	-2.026**	-0.002
2nd Depreciation without liquidity risk	0.0787	93.36**	-1.653*	0.430**	-1.869**	
2nd Depreciation with liquidity risk	0.0904	7027**	-1.060	0.390**	-1.829**	-0.050**

*Note: * and ** depict significance at the 5% and 1% levels respectively*
Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

iii. Price of exchange risk by sector and episodes of exchange rate changes

Table 5.15 presents the results of the price of exchange risk by sector and episodes of exchange rate changes. It is observed that the earlier finding that exchange risk price is higher for financial sector is consistent across the two different periods of depreciations. Specifically, exchange risk price is higher among the financial firms (-1.46%) than the non-financial firms (-0.98%) during the 1st depreciation period. It is equally higher in the financial firms (-2.04%) than the non-financial firms (-1.33%) during the crisis period. Conversely, exchange risk attracts a higher risk premium in the non-financial sector during a period of naira appreciation. Interestingly however, the inclusion of liquidity risk renders the premium on exchange risk insignificant among these non-financial firms.

In addition, the earlier finding that the price of world market risk is negative during appreciation is seen to be significant in the non-financial sector, whereas it is shown that the increased world price of market risk during crisis (2nd Depreciation) mainly comes from the financial sector. Finally, liquidity risk is more likely to be priced in the non-financial sector. However, during economic crisis, liquidity risk is also priced among firms in the Nigerian financial sector.

Table 5.15. Prices of world (λ_m), exchange (λ_π) and liquidity (λ_q) risk factors in the Nigerian stock market according to sector and episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period and inclusion of liquidity risk	Adj.-R^2	F-ratio	Constant	λ_m	λ_π	λ_q
NON-FINANCIAL						
Depreciation without liquidity risk	0.0266	120.61**	0.453*	0.099*	-0.981**	
Depreciation with liquidity risk	0.0269	80.45**	0.379	0.095*	-0.975**	0.001
Appreciation without liquidity risk	0.0100	53.02**	3.361**	-0.707**	-2.909**	
Appreciation with liquidity risk	0.0112	38.12**	3.815**	-0.677**	-2.753	-0.011**
2nd Depreciation without liquidity risk	0.0945	244.54	-1.198**	0.149**	-1.347**	
2nd Depreciation with liquidity risk	0.0987	167.88**	-0.999**	0.135**	-1.333**	-0.017**
FINANCIAL						
Depreciation without liquidity risk	0.0502	41.50**	1.416**	0.095	-1.478*	
Depreciation with liquidity risk	0.0522	28.62**	1.196**	0.082	-1.461**	0.003
Appreciation without liquidity risk	0.0073	12.60**	2.849**	-1.236	-2.654**	
Appreciation with liquidity risk	0.0075	8.40**	2.986**	-0.230	-2.606**	-0.003
2nd Depreciation without liquidity risk	0.0467	35.97**	-2.128	0.606**	-2.078**	
2nd Depreciation with liquidity risk	0.0557	26.77**	-1.410	0.558**	-2.035**	-0.060**

*Note: * and ** depict significance at the 5% and 1% levels respectively*
Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

5.2. Discussion of results

This section presents the discussions of the results obtained from the empirical analysis section with a view to evaluating them *vis-a-vis* the evidences from other parts of the world and drawing appropriate implications from the new results.

5.2.1. General results[163]

On a general note, the major outcome of the empirical analysis addressing the objective on exposure of Nigerian firms to foreign exchange risk is that most Nigerian firms are exposed to exchange rate risk. Although exposure may vary according to the measure of exchange rate used, the proportion of Nigerian firms that are significantly exposed to the nominal bilateral naira-dollar rate is about 80%. These firms are mostly negatively exposed, yielding an average exposure coefficient of -1.7. Therefore, majority of Nigerian firms are at the risk of exchange rate movements. This result is consistent with earlier studies.

Some of the studies that have found high exposure rate of this magnitude include Carrieri and Majerbi (2006) and Dahlquist and Robertsson (2001). The first study documents that about 80% of EMs are exposed to exchange rate risk while the second documents that up to 70% of 352 Swedish firms are exposed to at least one of three bilateral rates. Equally, Men and Yang (2009) show that about 70% of the industries in the Chinese segmented market of Shenzhen are exposed to exchange rate risk.

The Nigerian evidence however contrasts with the earlier findings of Jorion (1990), Amihud (1994) and Choi and Prasad (1995). None of these earlier studies can establish exposure for up to 15% of US firms. One of the factors that have been used to explain their results is that firms in the US have access to several hedging mechanisms and that it is not unlikely that most of them, especially the large ones, have succeeded in using them to eliminate their exchange risk exposure (Bartov and Bodnar, 1994 and Muller and Verschoor, 2006). The Nigerian evidence therefore appears to confirm this argument as the development of some common hedging tools, like derivatives, are still rudimentary in Nigeria[164]. Therefore, unavailability of these

[163] The discussions of the general results are mainly those of the nominal bilateral exchange rate. Results of the other exchange rate measures are discussed under the sensitivity discussions.

[164] As mentioned earlier, Forex Derivatives market just began in the second quarter of 2011.

instruments is likely to be one of the major factors responsible for high exposure among Nigerian firms to exchange rate risk.

The estimated (negative) exposure coefficient implies that a percentage increase in the nominal exchange rate will reduce the monthly excess returns on Nigerian stocks by about 1.7%. This therefore implies that Nigerian firms are net importers and that they fail to hedge their exchange rate exposure. Usually, exporting firms (positively exposed) gain from currency depreciation, but the findings of this thesis points otherwise for Nigerian firms as all the 162 out of 200 firms that are exposed at the 5% level are all negatively exposed.

Similar results have been found in the literature. For instance, Carrieri and Majerbi (2006) argue that for net importing countries, like many EMs, exposure to currency risk will be negative. Similarly, Aquino (2005) reports that all the industrial portfolios of Philippines firms that are significantly exposed to exchange risk display negative signs. However, in other markets that are net exporters to the US, positively exposed firms have been found to dominate. He and Ng (1998) show that 45 out of 171 Japanese multinationals are exposed to exchange risk between 1978 and 1993, and it is found that 43 out of these 45 are positively exposed.

In terms of the average size of the exposure coefficient, the average value of -1.7 obtained for Nigerian firms is still within those documented in the literature. Exposure coefficient in EMs between 1976 and 1999 have been found by Carrieri and Majerbi (2006) to range between 0.46 for Zimbabwe and 3.18 for Argentina[165]. However, in an IM like Japan, He and Ng (1998) shows average exposure coefficient to be lower at 0.242. Furthermore, the finding of this thesis on exposure is an improvement over what is documented on Nigeria by Harvey (1995). In particular, Harvey (1995) had earlier shown that the exposure of the Nigerian market to exchange rate risk was insignificant with a value of 0.360 in a pre-liberalisation era but that the value had a tendency to rise in the future.

The dual phenomenon of wide exchange risk exposure and absence of hedging mechanisms in Nigeria suggest higher cost of capital for Nigerian firms, especially if

[165] These figures can as well bear negative if their measure of exchange rate is re-defined in line with what is used in this study.

it can be established that exchange risk is not firm-specific, that is, undiversifiable. This is the focus of the second objective of this thesis which is discussed below.

Empirical analysis of exchange risk pricing shows that exchange risk is priced in the Nigerian stock market, and the average monthly risk price for bilateral rate is -1.654% (annualized to be about -20%). This value implies that risk-averse investors see negative exposure of Nigerian firms as a risk and are willing to accept a lower monthly excess return up to 1.654% on positively exposed (exporting) firms. Negative exchange risk prices of similar magnitude have also been documented in other markets.

Studies from other markets like Dahlquist and Robertsson (2001) and Aquino (2005) respectively determine the exchange risk price for the Swedish and Philippines' market to be -0.18% and -0.771%. Further, Choi and Rajan (1997) compute exchange risk price to be -1.42 for UK; Choi et al (1998) show that bilateral exchange risk price is -5.5 for Japan in a period of weak yen; and Priestly and Odegaard (2004) also document this to be -3.3% for Japan. Another study that uses firm-level data on EM is Carrieri and Majerbi (2006) and they find exchange risk price[166] to be 1.085 for Brazil and 1.35 for Chile.

All these studies show in their respective markets that portfolios or stocks are exposed to exchange rate risk that are not fully hedged; thus, investors expect a premium on stocks with negative exchange risk exposure (Aquino, 2005)

Earlier studies on Nigeria like Emenuga (1994) and Adeleke (2011) obtain the monthly coefficient of exchange rate in a regression of market returns on some macroeconomic variables to be 0.0814 and 0.079[167] respectively. Although differences in methodology and focus may be relevant in explaining this difference in result, one other plausible explanation is that their models are estimated without subtracting the risk-free rate; and if this is done, their results are also likely to yield negative premia.

In view of the fact that exposure to exchange rate risk is mostly negative among the Nigerian firms, this negative risk premium can be interpreted to mean that investors

[166] As earlier mentioned, a negative can be added.

[167] Adeleke (2011) actually obtains the value of 0.237, but since he uses quarterly data, the figure is divided by 3 to express it in its monthly value.

will require a premium on equities that are significantly exposed, or will be willing to pay a price for those that fall slightly as naira depreciates (slightly exposed). This depicts that the cost of capital of Nigerian firms will increase by about 20% per annum as a result of exchange rate risk that they are exposed to. Consequently, negatively exposed Nigerian firms are expected to hedge exchange rate risk while positively exposed firms need not hedge exchange rate risk (Du, 2010).

Being an open economy (mainly import-dependent) that is trying to reduce regulations of its exchange rate market, Nigerian firms are expected to be exposed to exchange risk. However, this constitutes a bigger problem when firms are unable to fully hedge their foreign exchange risk exposure and/or when investors fail to diversify away exchange risk in their portfolio of investments. The combined effect of these problems is therefore higher cost of capital for Nigerian firms.

The general result is what has been discussed so far. But as parts of the methodological and theoretical contributions of this thesis, it will be relevant to discuss the dynamics of the results (third objective) and see how sensitive the results are to some of the methodological issues employed in this thesis. It is also important to analyse how the results perform under the newly constructed liquidity-adjusted ICAPM as against the traditional ICAPM. Hence, subsequent discussions are categorized according to some important methodological issues reviewed earlier and applied in the empirical tests.

5.2.2. Sensitivity of results to the measures of exchange rate

Three measures of exchange rates are employed in this thesis, two of which have been used in earlier studies (nominal bilateral rate with US and REER) while the third, PPP deviation, is introduced in this study following the argument in the literature that it is also relevant when domestic inflations rates are stochastic (Dumas and Solnik, 1995 and Pilbeam, 2006:182). The use of the bilateral rate happens to be the most popular in the literature while that of REER is recently introduced in the works of Carrieri and Majerbi (2006) and Chaieb and Errunza (2007) for EMs with random inflation rates[168]. Therefore, this sub-section examines how the use of REER and PPP deviation affect

[168] The measure of exchange rate used in Harvey (1995) is closest to Effective Exchange Rate (EER) but the price level is not adjusted for.

the results of the nominal bilateral exchange rate discussed in the preceding sub-section.

Generally, it is observed that the percentage of firms that are exposed to PPP deviation risk is about 60% and the average exposure coefficient is -1.05. These are lower than the corresponding values of 80% and -1.67 documented under the bilateral definition of exchange rate. Equally, the price of PPP-deviation risk is found to be lower at -0.985 when compared to that of -1.654 reported under the nominal bilateral exchange risk price. One major implication of this result is that even though both are bilateral rates of naira against the US dollars, the fact that price movements are controlled for in the PPP deviation measure reduces exposure and risk premium.

This therefore confirms the finding of Moerman and Dijk (2010) that the use of nominal exchange rate is likely to overstate exchange risk prices, since part of the observed price will be that of inflation risk. However, it contrasts with that of Asaolu (2011) that exposure to the real bilateral naira-dollar rate is about 88%. Besides, the section on 'exchange rate policies in Nigeria' in the background chapter shows that in the period of changing nominal exchange rates, the measures of real exchange rates are still relatively stable. This then justifies why exchange rate exposure and the risk premium are lower in the measures of real exchange rates.

The results obtained using REER risk are quite at variance with those of the other two earlier definitions. In particular, it is found that only 12% of Nigerian firms are exposed to exchange rate risk when REER is used and since almost all of these firms exhibit positive exposure, the average exposure coefficient is positive (0.29). This is similar to the result of Harvey (1995) who records exposure coefficient to be 0.360 for the Nigerian market[169]. Consequently, the price of REER risk is positive with a monthly value of 0.233%, implying that investors in the Nigerian stock market expect that firms with positive exposure (those whose returns rise as real value of naira depreciates against the Nigerian trading partners) should yield a monthly premium of 0.233%.

[169] Apart from the issue of different scope, the slight drop in exposure can be explained by the fact that Harvey (1995) uses EER, but this thesis controls for price movements by using REER under which exposure is expected to be lower.

This result therefore connotes that when a trade-weighted definition of exchange rate is adopted, and price movements are controlled for, it is most likely that depreciation will lead to higher returns and positive exchange risk price. It is however important to note that very few Nigerian firms[170], specifically, 24(12%) are exposed to REER risk. Also, that exposure to a trade-weighted exchange rate risk is lower has also been established by earlier studies like Dominquez and Tesar (2001), Muller and Verschoor (2006) and Dahlquist and Robertsson (2001).

Moreover, an addition from the findings of this thesis is that when such trade-weighted rates are adjusted for inflation, the coefficients of risk exposure and risk prices become positive. Hence, having controlled for inflation, the few positively exposed firms tend to attract a premium, rather than pay one. This may be due to the fact that firms which are exposed to REER risk in Nigeria are mostly small and their values are less sensitive to exchange risk which makes them appear as offering a premium over large firms during depreciation.

5.2.3. Sensitivity of results to the level of aggregation

Two forms of disaggregation are applied to firms' characteristics, namely; size and sector. First, it is found that when firms are classified into four groups based on the quartile distribution of their market capitalization, a larger percentage of small firms are exposed to measures of exchange rate risk that adjusts for inflation. However, larger firms display higher average sensitivity to all exchange rate risk measures. It is therefore found that exchange risk prices rise with firms' size while all the three measures are priced in the largest group of firms.

Despite that small firms are exposed to both the REER and PPP deviation risks, these risks are diversifiable in them. But a condition under which the PPP deviation is priced in the small firms is to control for their exposure to liquidity risk. This is understandable as small firms are largely illiquid (Pastor and Stambaugh, 2003 and Acharya and Pedersen, 2005).

These findings support the literature that sensitivity to exchange rate risk is likely to be higher in larger firms as they are more likely to be involved directly in the foreign

[170] The discussions in subsequent sub-sections will identify other features of these firms.

exchange market [He and Ng, 1998, Dominguez and Tesar, 2001b; Dahlquist and Robertsson, 200l and Carrieri and Majerbi, 2006]. Also supported is the view that exchange risk price is likely to be significant and higher in larger firms (Doukas et al, 1999). Carrieri and Majerbi (2006) equally show that the pricing of exchange rate risk is explained by large firms in EMs. Further, what the present thesis contributes in this area is that the pricing of exchange risk among small EMs firms can be enhanced when their liquidity status are taken into cognizance.

Second, the classification of the analysis in this thesis into financial and non-financial sectors also shows some important results. It is documented that a higher percentage of firms in the non-financial sector are significantly exposed to exchange risk, especially when measures of exchange rate that control for inflation (for example REER and PPP deviation) are used. This implies that measures of real exchange rate are more relevant to the real sector of the Nigerian economy than the financial sector. This is consistent with the findings of Asaolu (2011) that the Nigerian non-financial sector is more exposed than the financial sector.

However, a point of departure from Asaolu (2011) is that those exposed firms in the financial sector are much more sensitive to all forms of exchange rate risk and consequently, the price of exchange rate risk is higher in the financial sector. A result that can partly be explained by the fact that the financial sector is mainly constituted by firms with high market capitalisation (large firms) and partly because the sector is much more exposed to exchange risk as documented earlier.

Therefore, given what is documented in the background chapter[171], it is possible that the limit on share prices movements does not allow foreign investors to costlessly diversify foreign exchange risk on their own personal account. Moreover, the fact that they have most of their investments generally in large firms and particularly in financial firms will make them demand a high exchange risk premium from these categories of firms.

[171] The sub-heading on 'institutional barriers and market structure' in the background chapter shows that foreign investors prefer that the current 5% limit rule on share price movements in Nigeria should be applicable only to small firms while share prices of highly capitalised firms be allowed to change freely (SEC, 2009).

5.2.4. Sensitivity of results to episodes of exchange rate changes

The pattern of results obtained differs across the three episodes of exchange rate changes. It should be recalled that descriptive analysis in the background chapter has already shown that periods of depreciation in Nigeria are also periods of larger exchange rate fluctuations. Therefore, going by the argument of Priestley and Odegaard (2001), these periods of depreciation should be that of larger exchange rate exposure. One aspect of the evidence in this thesis supports this argument while another aspect suggests otherwise.

On the one hand, it is established that the number of firms that are exposed to exchange risk during the first period of depreciation is far larger than those that are exposed during the currency appreciation period. Equally, during the crisis period, the associated sharp depreciation significantly raises exposure and consequently raises the price of exchange risk. This is in line with earlier studies that have documented that exchange risk tends to be relatively undiversifiable during period of instability and weak currencies (Aquino, 2005 and Di Iorio and Faff, 2002); and that exchange risk price is likely to be negative during this period (Choi et al, 1998; Priestly and Odegaard, 2004 and Chaieb and Errunza, 2007)[172].

On the other hand, the relatively few firms that are exposed during the period of appreciation are so sensitive to exchange risk that the average exposure coefficient rises significantly. This may be explained by the fact that this period represents a booming era in the NSE and a period of high influx of foreign portfolio investment into the equity segment. Since major portfolio investors are known to trade often (Schwartz and Shapiro, 1992), they are therefore expected to be highly sensitive to exchange rate changes in this period.

The Nigerian evidence therefore shows the tendency for exchange risk to be priced both in the periods of currency appreciation and currency depreciation. This evidence is more likely to be obtained when the appreciation period happens to be an era of high inflow of foreign capital and when the depreciation period is also an economic crisis

[172] However, unlike the work of Men and Yang (2009), the evidence on Nigeria shows that exposure increases significantly during crisis.

period. Therefore, it may not be a particular episode of exchange rate changes that is responsible for the changes in exchange risk exposure and pricing; it may actually be the activities and behaviours of some influential market participants during a particular episode of exchange rate changes[173].

Furthermore, it is found that large firms in general and financial firms in particular are more sensitive to exchange rate risk during the periods of depreciation and crisis. Also, the positive price of REER risk essentially occurs during crisis which may be because firms that are exposed to REER risk are mostly small and since their values are less sensitive to exchange risk, they appear to offer a premium during the crisis period.

5.2.5. Evidence on market risk

The results show that about 7% of Nigerian firms are significantly exposed to the world market risk and the average exposure coefficient is positive (0.197), but there are variations in exposure according to firm characteristics. For instance, 4% of non-financial firms are exposed while 11% of financial firms are exposed. In the same vein, while only 2% of the smallest firms are exposed, up to 16% of the largest firms are exposed. These patterns show that firms that enjoy higher foreigners' participation[174] are relatively more exposed to the world market risk. Moreover, the price of world risk is generally positive in line with the positive risk-aversion argument (Lucas, 1978 and A-D, 1983).

Although the highest world price of 0.16% in Nigeria is lower than those found in the literature on developed market, it is still within the range documented for EMs by Carrieri and Majerbi (2006), and it is now significant when compared with what is documented by Harvey (1995) in the pre-liberalisation era of the Nigerian capital market. As earlier presented in the sub-heading on 'institutional barriers and market structure' in the background chapter, the Nigeria market now enjoys higher foreigners' participation and some Nigerian firms are now cross-listed on other stock exchanges around the world.

[173] It should be recalled from the background chapter of this thesis that there was a huge foreign capital inflow during the booming era and a correspondingly high divestment during the crisis era.

[174] The chapter on background of study shows that firms with high foreigners' participation are generally those with high market capitalisation (large firms) and particularly financial firms.

Similarly, the price of world market risk is relatively higher when inflation-corrected exchange rate measures are used; this is likely due to high inflation rate in Nigeria. However, it is discovered that market risk is generally priced in large firms and particularly in financial firms as they enjoy relatively higher foreign participation. Unexpectedly, both exposure to and the price of world market risk become negative during the period of appreciation, but a closer look at the results shows that this result is associated with small and non-financial firms with negligible foreign ownership.

Finally, exposure and pricing of world market risk are highest during crisis and this is similar to the findings of Chaieb and Errunza (2007). This thesis also goes ahead to show that the higher price observed during crisis is traceable to the financial sector; possibly because this sector was the worst-affected during the financial crisis[175]. However, these prices need not be as high as they appear if liquidity risk during crisis is controlled for.

5.2.6. Effect of the estimated model: ICAPM vs Liquidity-Adjusted ICAPM

This sub-section discusses how much empirical support the liquidity-adjusted ICAPM developed in this thesis has over the traditional ICAPM. The inclusion of liquidity risk in the model of IAPM used in this thesis has been shown to offer some benefits. It is generally observed that its inclusion slightly reduces exposure to exchange rate risk as well as its prices, thereby confirming the *a priori* expectation in the theoretical framework. One major implication of this is that if liquidity price is not adjusted for, its price will reflect in exchange risk price and therefore makes the latter bigger. Further, its impact on the model of IAPM is enhanced when analyses are broken down according to different episodes of exchange rate changes. For instance, in the period prior to the crisis, exchange rate risk appears diversifiable, especially when the PPP deviation and REER definitions are used, unless liquidity risk is adjusted for.

In terms of the coefficients of the liquidity risk themselves, it is documented that a few firms are generally exposed to liquidity risk. Moreover, while smaller firms are more sensitive to liquidity risk during appreciation period, the larger firms are the ones that are more sensitive during the crisis period. It is also documented that liquidity risk is

[175] The chapter on background to the study shows that while the market capitalisation of Nigerian firms fell drastically during the crisis, firms in the financial sector were the most adversely affected.

priced in the Nigerian stock market with a negative premium. This is consistent with the *a priori* expectation that in order to hedge against an unfavourable shift in a state variable assumed to aid consumption[176], risk-averse utility maximisers will demand less of an asset the more positively correlated its returns are with the state variable.

Furthermore, liquidity risk is usually priced among the firms in the non-financial sector; however, during the global financial crisis period, the risk also became non-diversifiable (priced) among the firms in the financial sector in Nigeria. Finally, it is shown that firm size and price of liquidity risk can serve as proxies, such that when firms are already separated on the basis of firms' size, the effect of liquidity risk will disappear.

[176] In this case, liquidity.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

In this chapter, all the findings so far are summarised and conclusions are drawn on the issues of exchange risk exposure and exchange risk pricing in the Nigerian stock market. Moreover, a number of recommendations are derived from the conclusion drawn from the findings of the thesis and in the last section; some limitations of the thesis are identified.

6.1. Summary

This thesis is written to determine the extent of exchange-risk exposure of Nigerian firms and the existence and magnitude of the risk premium required by risk-averse investors for bearing exchange risk in 200 firms listed on the Nigerian Stock Exchange between January 2000 and December 2009.

Background information highlights some important policy and institutional developments in the NSE that now determine its present state. Also discussed are some recent developments aimed at enhancing activities and encouraging capital inflow into the Nigerian stock market as well as some of the market's performance characteristics.

It is reported that many laws and regulations have been made to guide the operations on the Nigerian stock market and improve on their outcomes. However, there are still some areas that require further attention, especially in the areas of information disclosure and transaction costs. It is further shown that the size and liquidity of the Nigerian stock market are still relatively low, though improving in the period of this analysis, save for the global financial crisis period. However, its low correlation with the major markets of the world positions it as a potential destination for foreign capital inflow.

Preliminary analysis suggests that exchange risk is more relevant in the period of naira depreciation and that inflation rate in Nigeria is relatively more volatile than that of an

economy like the US. It is also observed that during periods of naira depreciation, exchange rate overshoots its PPP value, but in periods of stable price levels, naira tends to appreciate more steadily. One major impact of all these is that in most of the years, returns to foreign investors (denominated in dollar terms) are lower, and more varied, than naira returns, thereby suggesting that foreign investors are at a disadvantage when exchange rates fluctuate.

Furthermore, having recognised the low, though rising, liquidity and its close relationship with high transaction costs experienced in the Nigerian stock market, this thesis discusses the need to consider market-wide liquidity as a state variable in an asset pricing model as argued by Pastor and Stambaugh (2003), Chorda et al (2000) and Hasbrouck and Seppi (2001) and therefore incorporates liquidity risk into the standard A-D (1983) IAPM so as to reflect the dynamic adjustment of expectations in the Nigerian market (Merton, 1971; 1973; Breeden, 1979). This approach is also consistent with the background information that investors have preference for liquid (large firms) assets in Nigeria.

Using the Fama and MacBeth (1973) two-pass methodology, exchange rate exposure and price are determined for firms listed on the Nigerian stock market. Also borrowing from recent literature, this thesis determines if exchange risk exposure and risk prices vary by firm size (Carrieri and Majerbi, 2006) and episodes of exchange rate changes (Priestley and Odegaard, 2004). In addition, contributions are made to the literature by examining if exposure and price vary between the financial and non-financial sector as the former happens to be the one that attracted most of foreign capital inflow into Nigeria during the period of study.

Another contribution is that apart from the use of bilateral and trade-weighted exchange rate often adopted in the literature, the PPP deviation measure of exchange risk is also tested in this thesis since this has been argued to be relevant in economies where inflation rates are random (Sercu, 1980; Dumas and Solnik, 1995 and Pilbeam, 2006:182).

In summary, the answer to the ***first objective*** of this thesis shows that majority of the Nigerian firms are exposed to exchange rate risk. Therefore, the first hypothesis of no significant exposure is rejected. Expressly, it is documented that over 80% of the Nigerian firms are exposed to the measure of nominal bilateral exchange rate risk;

over 60% are exposed to the PPP deviation risk and just about 12% are exposed to the REER risk. Exposure is mostly negative among Nigerian firms thereby depicting them as net importers that fail to hedge their exchange risk exposure, a feature of an import-dependent economy with undeveloped hedging mechanisms.

These findings therefore suggest that this wide exposure of Nigerian firms will translate to higher cost of capital if this risk is undiversifiable in the portfolio of international investors. The second set of evidence in this thesis then focuses on this.

Empirical analysis of the ***second objective*** of this thesis further shows that exchange rate risk is not diversifiable (that is, priced) among Nigerian firms; thereby rejecting the second hypothesis of no significant pricing of exchange risk. The average monthly risk price for bilateral rate risk, for instance, is -1.654% (annualised to be -20%). This value implies that risk-averse investors see negative exposure of Nigerian firms as a risk and are willing to accept a lower monthly excess return of up to 1.654% on positively exposed firms (net exporters).

Conversely, the same result can be interpreted to mean that investors require a premium on investment in stocks that are negatively exposed, or will be willing to pay for those that fall less as naira depreciates. Consequently, the cost of capital of Nigerian firms will increase by about 20% per annum as a result of exchange rate risk that they are exposed to.

These findings of the thesis are in line with what have been documented in earlier studies from other parts of the world. Likewise are some of the other findings that exposure and price fall when a measure of trade-weighted exchange rate is used; that exposure and price increase with firm size and also change significantly during exchange rate depreciations. However, the application of the adapted theoretical framework and methodology on the Nigerian market offers some new evidence that distinguish the present thesis. Some of these are summarised in what follows.

Nigerian firms are now more exposed to exchange rate risk than what is documented by Harvey (1995) that the exposure of Nigerian firms to exchange risk in the pre-liberalisation era of the Nigerian capital market was small and insignificant.

It is observed that a larger percentage of small and non-financial firms are exposed to measures of real exchange rate risk; implying that measures of real exchange rate are more relevant to the real sector of the economy, but these risks are diversifiable among them, except when their liquidity status is adjusted for. This is likely to be explained by low liquidity state and lack of preference of global investors for these types of stocks. Conversely, the financial sector is much more sensitive to all forms of exchange rate risk, especially during crisis, and the price of exchange rate risk is higher in the financial sector. A result that can be partly explained by the fact that the financial sector is mainly constituted by large firms and partly because the sector is much more exposed to exchange risk.

Moreover, the agreement in the literature that exposure to a trade-weighted exchange rate risk is lower than bilateral rates (Dominquez and Tesar, 2001; Muller and Verschoor, 2006; and Dahlquist and Robertsson, 2001) is therefore modified by the outcome of the present thesis. The new evidence shows that the exposure coefficient may not only be lower, there may also be a sign change when a real trade-weighted exchange rate measure is used. This may be due to the fact that firms that are exposed to REER risk in Nigeria are mostly small and their values are less sensitive to exchange risk which makes them appear as offering a premium over large firms during depreciation.

In addressing the ***third objective*** of the dynamics of foreign exchange risk prices, the evidence in this thesis shows that exchange risk in Nigeria is priced both in the appreciation and the depreciation periods. This contrast with earlier studies that document that exchange risk matters most in periods of currency depreciation (Aquino, 2005 and Di Iorio and Faff, 2002) and those that find constant exchange risk exposure even during the recent global financial crisis (Men and Yang, 2009).

In the case of Nigeria, exchange risk price becomes higher during crisis period as well as in period of high inflow of foreign capital. This can be explained by high sensitivity of foreign investors to exchange risk in the period when a lot of them came into Nigeria and this corresponds to the appreciation period. In other words, it may not be a particular episode of exchange rate changes that is really responsible for changes in

exposure and pricing; it may be the activities and behaviours of some influential market participants during a particular episode of exchange rate changes[177].

Finally, it is generally observed that the inclusion of liquidity risk in a model of IAPM slightly reduces the exposure to and the price of exchange rate risk, especially when analyses are broken down according to different episodes of exchange rate changes. For instance, in the period prior to the crisis, exchange rate risk is diversifiable, especially when the PPP deviation and REER definitions are used, but the reverse holds when liquidity risk is adjusted for.

6.2. Conclusion

This thesis tests two hypotheses that the investors in the Nigerian stock market are not exposed to exchange risk and that exchange risk is not priced in the Nigerian stock market. In concluding the thesis, the results obtained show that most firms in Nigeria are negatively exposed to exchange rate risk; thus, as they fail to hedge their risk exposure, their values reduce as naira depreciates. This widespread exposure is found to be undiversifiable (priced), therefore yielding a risk premium which consequently raises the cost of capital of the firms. Therefore, the two null hypotheses are rejected.

This outcome is more likely to occur in periods when the stock market and the foreign exchange market are less regulated and the activities of foreign investors are significant in the domestic market, whether in the form of investments or divestments. In addition, there is the tendency for foreign exchange exposure and price to be higher generally in large firms and particularly in financial firms; as they are likely to enjoy a higher foreigners' participation.

Conversely, small firms generally and non-financial firms in particular tend to be exposed to the measures of exchange rate risk that adjust for inflation rates. Therefore, these measures of real exchange risks are undiversifiable among these categories of firms, most especially when their illiquidity states are taken into cognizance.

[177] The background chapter of this thesis provides evidence of a huge foreign capital inflow during the booming era and a correspondingly high huge outflow during the crisis era.

6.3. Recommendations

This thesis shows that Nigerian firms are significantly exposed to exchange risk which they fail to fully hedge; and since portfolio investors are unable to diversify away this risk, it earns a premium which raises the cost of capital of Nigerian firms. The following recommendations are therefore made as attempts to addressing this situation.

On the one hand, it is important that whenever the monetary authority is trying to move towards a more market-determined exchange rate system, it should also bear in mind that exchange risk is more associated with floating exchange rate regimes and removal of barriers to international transactions (Hekman, 1981; Jorion, 1991; Doukas et al, 1999; Priestley and Odegaard, 2004 and Du, 2010). Hence, the desirability of a more market-determined exchange rate regime should be balanced against the associated potential increase in the cost of capital to Nigerian firms.

In this regard, the new WDAS-FWD market that was approved by the CBN at the end of March, 2011 can provide a means of hedging foreign exchange risk. Also, the proposal by the NSE over the years to introduce new products like derivatives such as futures and options (NSE Factbook, 2008) needs to be given a renewed attention[178]. However, in order to derive utmost benefits from the usage of such securities, attention should be paid to issues relating to sensitising end-users, not necessarily banks, and developing local capacities in the areas of appropriately pricing these sophisticated financial assets. In addition, when improving on the new structure, it is also important to take into cognisance the following factors;

a. As shown in the literature, significant exposure suggests market imperfection and incompleteness (A-D, 1983 and Dominguez and Tesar, 2001a). Thus, if the Nigerian stock market is made more perfect and complete, it will be possible for portfolio investors to costlessly hedge or diversify foreign exchange risk on their own personal account (Hekman, 1981) and firms will not have to bother about hedging their exchange risk exposure. Hence, present attention given to re-building the market in the post-crisis period should be intensified and

[178] A new plan by the SEC is to introduce financial options in 2013 and financial futures in 2015 (Oteh, 2012)

effective structure should be put in place with a view to reducing the occurrence of share price manipulations often experienced in the time past. It is also important to adequately address the problems identified in the background chapter under the sub-section on 'settlement process'. These problems include; delay in the verification of transfer certificates by registrars, unnecessarily lengthy issuance procedure, incomplete electronic process and the monopoly of NSE and the collapse of NSE infrastructure (SEC, 2009).

b. Deriving from the above, it is equally crucial to duly deliberate upon the effect on foreign exchange risk exposure and pricing of the current 5% share price movement limit rule, the newly proposed 1% up and 5% down limit rule and the foreign investors' suggestion of applying the 5% rule only to small firms but allowing the prices of highly capitalised firms to change freely. This is because the evidence in this thesis suggests that the restrictions on price movement may affect the magnitude of the required premium on foreign exchange risk.

c. Attention should be paid to the moral hazard problem that may ensue if the monetary authority decides to actively manage exchange rate. This is because when exchange rate is pegged, firms expect low volatility in exchange rates; and because they will fail to hedge, their exposure may rise (Eichengreen and Hausmann, 1999; Burnside et al, 2001 and Schneider and Tornell, 2004). Hence, the monetary authority needs to be cautious so that its effort to reduce exchange rate risk does not turn out to be the major cause of the same risk.

d. It is when domestic purchasing power uncertainty is negligible that forward exchange transactions can remove the impact of exchange risk variability (A-D, 1984). Hence, regulatory authorities need to pay attention to changes in the general price level in order for the new forward exchange derivative market to be effective. This point is quite important given the finding that exposure to and prices of nominal exchange rate are greater than those of real exchange rate. This therefore implies that part of the exchange risk premium is accounted for by the high domestic inflation rate.

e. It is shown that the activity of foreign portfolio investors, both during the time when they make huge purchase and huge sales, is associated with the incident of exchange risk exposure and pricing. This suggests close monitoring of their

activities and ensuring that their huge demand does not significantly take prices away from their fundamental values, but rather helps revaluate securities prices.

f. In using hedging facilities to manage exchange rate exposure, it should be realised that the benefit is only relevant in the short-run as in the long run, a currency will move towards its PPP value thereby naturally eliminating the risk (Levi, 1996; 306).

On the other hand, the finding of this thesis that exchange rate risk is significantly priced in the NSE suggests that Nigerian firms need to pay special attention to their foreign exchange exposure. This does not exclude firms that are not involved in external trade as they also may be exposed when they compete for factors of production and share of the market with firms that are exposed by their international operations. It should also be realised that unexposed firms need not hedge because this will only reduce their return volatility but leave their expected returns constant (Vassalou, 2000).

Moreover, it is advisable that the big firms, also those in the financial sector, should commit more resources to their exchange risk management as investors tend to require relatively higher risk premium from these groups.

Finally, firms can also make use of internal hedging mechanism. The literature has it that exchange risk can be eliminated in firms whose internal operations tend to balance long and short positions in currencies (Hekman, 1981). Firms can reduce, or even eliminate, their exposure when they employ internal hedging mechanisms like the currency of invoicing, sourcing and mixed-currency invoicing (Levi, 1996). Specifically, firms can negotiate to pay for their importations in naira (invoicing in naira), they can ensure that the country where they sell most of their goods is also the country where they import from and/or have the target of opening branches abroad[179].

[179] No doubt, some of this may be difficult to achieve by firms in a developing country like Nigeria. However, they also suggest that the local firms need to consider the long term goal of foreign expansion.

6.4. Agenda for future research

The findings of this thesis have some implications for further studies. Such studies will therefore be expected to improve the existing knowledge about foreign exchange-risk pricing when they consider some of the followings.

First, despite the fact that investors may also be exposed to country risk (UNCTAD, 1999 and Bartram and Dufey, 2003), this thesis solely considers foreign exchange-risk, following the argument in the literature that it is more amenable to economic analysis (Adler and Dumas, 1983 and Pilbeam, 2006: 182). However, that the intercept terms in all the pricing regressions are significant implies that other risks may also be important. Thus, a study is needed on the pricing of country risk in Nigeria and a good start for such a study is to consider the work of Bailey and Chung (1995). Such studies may also have to consider issues around market structure, firm ownership and governance as they may be among the priced risks in a market like Nigeria.

Second, exchange risk as presented in the thesis, appears as an undesirable phenomenon to be completely hedged. But this needs not be so, especially if one considers the argument by Black (1989) that investors actually add to their expected returns by taking some currency risk in their portfolio. Therefore, exchange risk is not supposed to be fully hedged. The question that arises then is to determine the optimal hedging rule for firms and investors operating in the Nigerian stock market. The present thesis does not address this.

Third, apart from just ascertaining the existence of exchange risk exposure and pricing, some recent studies in this area are examining the determinants of risk exposure in some markets. Although this thesis has been able to show that factors like episodes of exchange rate changes, activities on the stock market, firm size and whether firms are in the financial sector as likely determinants, future studies will be required to empirically determine the influence of these factors as well as other factors.

Fourth, the thesis is not specifically on the cost of capital of Nigerian firms, but it offers an important insight into why the cost of capital in Nigeria has been considered high. However, it would have been equally informative if the cost of capital of Nigeria

firms can be decomposed so that exchange rate risk can be evaluated in terms of its relative contribution.

Fifth, the earlier recommendation that firms should attempt to improve and use their internal mechanisms to hedge exchange rate risk (Hekman, 1981 and Levi, 1996) will be further buttressed if it can be established that multinational firms that are currently operating in Nigeria are really employing their internal structures to balance their long and short positions in currencies. Hence, further studies are necessary on the exposure of multinationals (Jorion, 1990; Doukas et al, 1999 and Dominguez and Tesar, 2001a) in Nigeria.

Sixth, it will be important if further studies can be carried out to analyse how the relationship between firms' fundamentals and their share price influence the nature of exchange risk exposure and pricing. This is necessary because if share prices fail to reflect company's real value, then the documented exposure and premium coefficients may wrongly state the exchange risk actually faced by these firms. Another closely related issue is to go beyond what the stock market shows and take a survey of Nigerian firms on how they really view, measure and respond to exchange-risk[180].

Seventh, the measure of liquidity used in this thesis (turnover) also has its limitations. Although turnover seems helpful in explaining cross-sectional differences in liquidity, it may not capture time variation in liquidity. It is possible for volume traded to still be high when liquidity is low (Pastor and Stambaugh, 2003). These suggest that in the future when more reliable data will be available on measures of turnover like the bid-ask spread in Nigeria, the results obtainable from the liquidity-adjusted ICAPM may improve. It will also be important to test the validity of the Liquidity-Adjusted ICAPM using the Amihud (2002) measure of liquidity for Nigeria.

Lastly, an important argument in the literature is that large variations in exposure across test assets are needed in estimating the risk premia (Ferson and Harvey, 1994 and Dahlquist and Robertsson, 2001); hence, firm-level data as used in this thesis provides the opportunity to capture these variations (Doukas et al, 1999 and Carrieri and Majerbi, 2006). The firm-level analysis is also preferred to portfolios analysis as the latter has been shown to result in ambiguous results (He and Ng, 1998; Dahlquist

[180] Admittedly, this will be quite some tasks.

and Robertsson, 2001; Dominguez and Tesar, 2001a and Carrieri and Majerbi, 2006). These notwithstanding, it has been found that firm-level data are prone to measurement error, hence the need to first group assets into portfolios prior to estimation (Fama and MacBeth, 1973 and Dahlquist and Robertsson, 2001).

In addition, analysis based on portfolio will enable the use of conditional[181] asset pricing models which are currently gaining popularity, but it has been shown that such models are difficult with firm-level data (Choi and Rajan, 1997). It will therefore be informative if the results in this thesis can be juxtaposed against fully conditional models by further studies.

[181]It is important to note the following points. It has been argued that because of the relative underdevelopment of EMs and the important role exchange rates play in them, unconditional models are more relevant for them (Carrieri and Majerbi, 2006 and Antell and Vaihekoski, 2007). However, the fact that this thesis also examines the dynamics of exchange risk prices by carrying out different estimations for different period makes it 'conditional' in some sense (Choi et al, 1998). This is further explained in the sub-section on "time-varying exchange risk exposure and pricing (conditional models)" under the review of methodology.

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APPENDICES

APPENDIX A: FEES CHARGEABLE BY SEC AND NSE

Table A-1. Registration fees and minimum capital requirements of market operators and facilities

S/N	Operators/Facilities	Registration Fees(₦)		Minimum Capital Requirement (₦)	
		2007	2011	2007	2011
	A. Market Operators				
1	Application form	5,000		-	-
2	Broker	100,000	20,000	1,000,000,000	40,000,000
3	Dealer	100,000	20,000	1,000,000,000	30,000,000
4	Broker/Dealer	100,000	20,000	1,000,000,000	70,000,000
5	Corporate sub-broker	50,000	20,000	50,000,000	5,000,000
6	Individual sub-brokers	-	5,000	-	500,000
7	Underwriter	200,000	30,000	2,000,000,000	100,000,000
8	Issuing house	200,000	50,000	2,000,000,000	150,000,000
9	Registrar	100,000	20,000	500,000,000	50,000,000
10	Fund/ Portfolio manager	100,000	20,000	500,000,000	20,000,000
11	Insurance coy as underwriter in Pub.issues	-	30,000	-	-
12	Corporate investment adviser	100,000	20,000	5,000,000	5,000,000
13	Individual investment adviser	20,000	5,000	500,000	500,000
14	Commodities broker	100,000	20,000	40,000,000	40,000000
15	Sponsored individual	10,000	1,000	-	-
16	Banker to an issue	100,000	20,000	By CBN	By CBN
17	Trustee	100,000	20,000	40,000,000	40,000,000
18	Rating agency	100,000	20,000	20,000,000	20,000,000
19	Capital market consultant (corporate)	100,000	20,000	5,000,000	5,000,000
20	Capital market consultant (partnership)	50,000	20,000	2,000,000	2,000,000
21	Capital market consultant (individual)	20,000	5,000	500,000	500,000
22	Venture capital company	50,000	50,000	20,000,000	20,000,000
	B. Market Facilities				
23	Stock Exchange	100,000	100,000	500,000,000	500,000,000
24	Commodity Exchange	100,000	100,000	500,000,000	500,000,000
25	Clearing, settlement and custodial agency	100,000	100,000	1,000,000,000	500,000,000
26	Capital trade point	25,000	25,000	20,000,000	20,000,000
27	National Association of Securities Dealers and other S.R.O.s	100,000	100,000	-	-
28	Market Maker	-	-	2,000,000,000	-

Source: SEC Rule and Regulations, 2007 and 2011.

Table A-2. Registration fees for securities

SN	ITEM	CHARGES	
	SECURITIES	**2007**	**2011**
1	**Collective Investment Scheme other than Community Savings, Esusu, etc., (flat rate)**	₦35,000.00	₦35,000.00
2	**Filing fee for registration of securities (flat rate)**	₦10,000.00	₦10,000.00
3	**Registration fees of securities of public companies and processing fees on offer for sale**		
	First Tier Market:		
	For the first half a billion worth of securities offered	0.60%	1%
	Next half a billion	0.45%	0.75%
	Above one billion	0.30%	0.5%
	Second Tier Market:		
	Flat rate for securities offered	0.50%	0.50%
	Bonus issue (of nominal value of shares)	1.00%	1.00%
4	**Fees on Federal/State/Local Government bonds and debentures of public limited companies:**		
	Primary market (registration fee)	0.30%	0.15%
	Secondary market transaction	0.06%	0.1%
5	**Authorisation fee for units of the fund of unit trust scheme:**		
	First ₦10 million	0.10%	0.10%
	Next ₦10 million	0.075%	0.075%
	Above ₦20 million and up to ₦40 million	0.050%	0.050%
	Any sum thereafter	0.025%	0.025%
	Annual supervision fee (gross income of the fund)	0.25%	-
6	**Registration of real estate investment funds**		
	First ₦50 million	0.10%	0.10%
	Next ₦50 million	0.075%	0.075%
	Above ₦100 million and up to ₦200 million	0.050%	0.050%
	Any sum thereafter	0.025%	0.025%
	Annual supervision fee (gross income of the fund)	0.025%	-
7	**Registration of Venture Capital funds**		
	First ₦100 million	0.100%	0.100%
	Next ₦100 million and up to ₦400 million	0.075%	0.075%
	Above ₦400 million and up to ₦900 million	0.050%	0.050%
	Any sum thereafter	0.025%	0.025%
	Annual supervision fee (gross income of the fund)	0.250%	-
8	**Processing fee for schemes of merger/acquisition and take-over**		
	Filling fee for pre-merger notice	N50,000.00	N50,000.00
	First ₦500 million share capital	0.60%	1.0%
	Next ₦500 million share capital	0.45%	0.75%
	Any sum thereafter	0.30%	0.50%
9	**Registration of existing securities (for public companies whose securities are not yet registered)**		
	First ₦500 million (of paid-up share capital)	0.60%	1.0%
	Next ₦500 million	0.45%	0.75%
	Any sum thereafter	0.30%	0.5%
	OTHERS		
	S.E.C. Fees on Market Deals		
	Payment to SEC by broker/dealer on every security traded on the Exchange (payable by buyer) (market value of Security)	0.15%-0.30%	1.0% N5,000.00
	Filing fee for proxy materials	N5,000.00	
10	***Fees for inspection, copying and certifying records kept by S.E.C.:***		
	(a) Inspection of any document	N500.00	N500.00
	(b) (1) Certification of any document—first page	N100.00	N100.00
	(b) (2) Certification of any document – every subsequent page	N25.00	N25.00
	(c) Photocopying (each page)	N10.00	N10.00

Note: These fees are subject to review by the Commission from time to time.
Source: SEC Rule and Regulations, 2007 and 2011.

Table A-3. Penalties/fines

SN	ITEM	CHARGES	
		2007 (₦)	**2011 (₦)**
1	**Late filing fee:**		
	First two weeks (corporate body)	2,000.00	2,000.00
	Sponsored individuals (each)	1,000.00	1,000.00
	Every subsequent day the default subsists (Corporate body/per day)	1,000.00	1,000.00
	Every subsequent day the default subsists **(**Sponsored individual/per day)	500.00	500.00
2	**Late filing of allotment returns (above MRR on cumulative balance of issue proceeds)**	2%	2%
3	**Failure by a company to file Form S.E.C. 1A:**		
	Within 30 days of concluding any transaction involving foreign portfolio investment (flat)	50,000.00	50,000.00
4	**Late filing of quarterly/yearly returns (per day for the period of default)**	2,000.00	2,000.00
	Non-filing of quarterly/yearly returns (per day for the period of default)	5,000.00	5,000.00
5	**Late remittance of S.E.C. fees on market deals:**		
	Per day for the first 30 days	1,000.00	
	Per day Btw. 30&90 days,	2,000.00	
	Abv. 90 days: the operator shall be referred for enforcement action		
6	**Underpayment**		
	Underpayment of SEC fees:	-	3months NIBOR +2% compounded interest monthly
	Further default:	-	Referred for enforcement action
7	**Failure to seek prior approval of SEC before issuing securities**		
	Per day for the period of default: up to	5,000.00	5,000.00
8	**Failure to attend registration meeting:**		
	This attract a fine that is an equivalent amount of the registration fee for the function applied for		

Note: These fees are subject to review by the Commission from time to time.
Source: SEC Rule and Regulations, 2007and 2011

Table A-4. NSE fee structure (2011)

a. Bonds (government/ corporate)
- Application Fee: 0.15%
- Listing fee: Based on table A-5[182]
- CSCS Eligibility Fee: 0.0125%

b. Funds (memorandum listings/ unit trust)
- Application Fee: 0.3%
- Listing Fee: Not required
- CSCS Eligibility Fee: Not Required

c. Listing by way of introduction
- Application Fee (Companies who did Private placement)
  0.3% of Share capital Pre-Private placements @ Par (50k); **+**
  0.3% of Private Placement share cap @ Private Placement Price
- Application Fee (Companies who did not do private placement)
  0.3% of Share Capital @ Par of .50k
- Listing Fee: Based on table A-5
- CSCS Eligibility fee: 0.0125% @ Listing (Based on Listing Price)

d. IPOs/ rights/ / Placing /ETFs / M&As
- Application Fee: 0.3% of Market cap / Scheme Shares
- Listing Fee: Based on table A-5
- CSCS Eligibility Fee: 0.0125%

e. Bonus issues
- Listing Fee: Based on table A-5
- CSCS Eligibility Fee: 0.0125% (calculated based on closing price as at date of AGM).

f. Alternative securities market – ASeM
- Application Fee: ₦100,000.00 flat (One Hundred Thousand Naira Only) or equivalent
- Listing Fee: ₦200,000.00 flat (Two Hundred Thousand Naira Only) or equivalent
- CSCS Eligibility Fee: 0.0125%

g. Delisting fee
- 0.3% of market capitalisation of minority shareholding only (calculated based on the highest market price within the last 6 months).

Source: NSE listing requirements (2011)

[182] Annual listing fees for equities are graduated based on market capitalization to a maximum of ₦4.2million (four million two hundred thousand naira only) or its equivalent for the main board only. Equally, other securities in respect of which listing is maintained inclusive of nominal transfers maximum of 2.75% of consideration or its market capitalization whichever is higher

Table A-5. Market capitalisation/nominal value fees graduation metrics[183]

S/N	START (₦)	END (₦)	FEE (₦)
1	Below	50,000,000	189,000
2	50,000,001	60,000,000	204,120
3	60,000,001	70,000,000	230,580
4	70,000,001	80,000,000	275,940
5	80,000,001	90,000,000	321,300
6	90,000,001	100,000,000	347,760
7	100,000,001	120,000,000	434,700
8	120,000,001	140,000,000	468,720
9	140,000,001	160,000,000	487,620
10	160,000,001	180,000,000	510,300
11	180,000,001	200,000,000	529,200
12	200,000,001	220,000,000	570,780
13	200,000,001	240,000,000	593,460
14	240,000,001	260,000,000	616,140
15	260,000,001	280,000,000	638,820
16	280,000,001	300,000,000	657,720
17	300,000,001	320,000,000	703,080
18	320,000,001	340,000,000	725,760
19	340,000,001	360,000,000	748,440
20	360,000,001	380,000,000	771,120
21	380,000,001	400,000,000	793,800
22	400,000,001	500,000,000	816,480
23	500,000,001	650,000,000	839,160
24	650,000,001	800,000,000	850,500
25	800,000,001	1,000,000,000	888,300
26	1,000,000,001	2,000,000,000	907,200
27	2,000,000,001	3,000,000,000	945,000
28	3,000,000,001	4,000,000,000	1,020,600
29	4,000,000,001	5,000,000,000	1,096,200
30	5,000,000,001	6,000,000,000	1,171,800
31	6,000,000,001	7,000,000,000	1,247,400
32	7,000,000,001	8,000,000,000	1,323,000
33	8,000,000,001	9,000,000,000	1,360,800
34	9,000,000,001	10,000,000,00	1,400,000
35	10,000,000,001	11,000,000,000	1,540,000
36	11,000,000,001	12,000,000,000	1,680,000
37	12,000,000,001	13,000,000,000	1,820,000
38	13,000,000,001	14,000,000,000	1,960,000
39	14,000,000,001	15,000,000,000	2,100,000
40	15,000,000,001	16,000,000,000	2,240,000
41	16,000,000,001	17,000,000,000	2,380,000
42	17,000,000,001	18,000,000,000	2,520,000
43	18,000,000,001	19,000,000,000	2,660,000
44	19,000,000,001	20,000,000,000	2,800,000
45	20,000,000,001	40,000,000,000	2,940,000
46	40,000,000,001	60,000,000,000	3,080,000
47	60,000,000,001	80,000,000,000	3,220,000
48	80,000,000,001	100,000,000,000	3,360,000
49	100,000,000,001	120,000,000,000	3,500,000
50	120,000,000,001	140,000,000,000	3,640,000
51	140,000,000,001	160,000,000,000	3,780,000
52	160,000,000,001	180,000,000,000	3,920,000
53	180,000,000,000	200,000,000,000	4,060,000
54	Above 200,000,000,001		4,200,000

Source: NSE listing requirements (2011)

[183] These fees are subject to changes from time to time

Table A-6. Transaction fees (2011)[184]

Type	Description	Buy side (%)	Sell side (%)
Fees	NSE fee	-	0.30
	CSCS fee	-	0.30
	Trade alert fee	0.06	0.06
	SEC fee	0.30	-
	Subtotal	**0.36**	**0.66**
Taxes (NSE, CSCS, SEC)	VAT	5.00	5.00
	Stamp duty	0.075	0.075
OTHER	Brokerage commission	0.75-1.35 + VAT	0.75-1.35 + VAT

Source: NSE listing requirements (2011)

[184] Every transaction in respect of which commission is chargeable by members shall be reported to the NSE as may from time to time be prescribed by NSE. There is no capital gains tax requirement on capital market transactions while withholding tax is at 10% only.

APPENDIX B: RETURN AND RISK PROFILE OF NIGERIAN FIRMS IN PERIODS OF EXCHANGE RATE DEPRECIATION AND APPRECIATION

Table B-1. Return and risk of Nigerian firms (first depreciation period)

Sector	Naira Returns (%)		Dollar Return (%)		Naira Excess Returns (%)			Dollar Excess Returns (%)		
	Mean	SD	Mean	SD	Mean	SD	Sharpe Ratio	Mean	SD	Sharpe Ratio
Panel A: NSE Industrial Classification										
Agriculture	0.04	8.82	-0.73	8.92	-0.23	8.84	-0.03	-0.99	8.94	-0.11
Airline	-2.04	6.49	-2.91	6.85	-2.30	6.46	-0.36	-3.17	6.82	-0.47
Automobile	1.52	11.45	0.78	11.82	1.25	11.47	0.11	0.50	11.84	0.04
Banking	1.63	16.02	0.90	16.42	1.36	16.00	0.08	0.63	16.40	0.04
Breweries	2.94	24.81	2.12	24.05	2.66	24.82	0.11	1.85	24.07	0.08
Building Material	1.67	12.77	0.92	13.24	1.39	12.78	0.11	0.65	13.24	0.05
Chemical and Paints	1.66	17.39	0.91	17.49	1.38	17.38	0.08	0.63	17.48	0.04
Commercial Services	-0.65	2.10	-1.39	3.51	-0.92	2.16	-0.43	-1.66	3.55	-0.47
Computer&Office Equip	-1.37	8.54	-2.10	8.95	-1.64	8.53	-0.19	-2.37	8.95	-0.27
Conglomerates	2.15	16.12	1.39	16.22	1.88	16.10	0.12	1.12	16.20	0.07
Construction	0.47	12.60	-0.29	12.80	0.19	12.58	0.02	-0.56	12.78	-0.04
Engineering Technology	-0.13	10.29	-0.88	10.54	-0.41	10.28	-0.04	-1.15	10.53	-0.11
Food beverages&tobac	1.32	10.91	0.57	11.23	1.05	10.92	0.10	0.30	11.23	0.03
Footwear	0.04	10.62	-0.71	10.85	-0.23	10.63	-0.02	-0.99	10.86	-0.09
Foreign Listing	0.19	5.06	-0.58	5.38	-0.09	5.05	-0.02	-0.85	5.37	-0.16
Healthcare	-0.18	12.44	-0.93	12.58	-0.45	12.45	-0.04	-1.21	12.58	-0.10
Industrial/Domestic	1.01	30.22	0.27	30.42	0.73	30.23	0.02	-0.01	30.43	0.00
Insurance	1.43	16.01	0.68	16.22	1.16	16.00	0.07	0.41	16.21	0.03
Machinery	0.00	0.95	-0.75	2.57	-0.27	0.96	-0.28	-1.02	2.59	-0.40
Packaging	0.12	11.80	-0.63	11.93	-0.15	11.80	-0.01	-0.90	11.94	-0.08
Petroleum Marketing	2.84	16.63	2.04	16.48	2.56	16.64	0.15	1.76	16.49	0.11
Printing and publishing	1.18	12.46	0.41	12.59	0.91	12.44	0.07	0.14	12.57	0.01
Real estate	3.39	13.54	2.61	13.62	3.12	13.55	0.23	2.34	13.63	0.17
Second tier	0.11	4.40	-0.65	4.87	-0.16	4.40	-0.04	-0.92	4.87	-0.19
Textiles	-0.46	8.94	-1.18	9.50	-0.73	8.94	-0.08	-1.45	9.50	-0.15
Panel B: Size Classification										
1st quartile(lowest)	0.03	10.56	-0.73	10.48	-0.25	10.56	-0.02	-1.01	10.48	-0.10
2nd quartile	0.57	17.47	-0.20	17.68	0.29	17.47	0.02	-0.47	17.68	-0.03
3rd quartile	1.50	16.44	0.77	16.64	1.22	16.44	0.07	0.49	16.63	0.03
4th quartile(highest)	3.38	15.40	2.63	15.70	3.13	15.39	0.20	2.38	15.70	0.15
Panel C: Sectoral Classification										
Non-financial	0.87	14.97	0.12	15.08	0.60	14.97	0.04	-0.16	15.08	-0.01
Financial	1.54	16.01	0.80	16.33	1.27	16.00	0.08	0.53	16.31	0.03
Panel D: All Firms										
Total	**1.02**	**15.21**	**0.27**	**15.36**	**0.75**	**15.21**	**0.05**	**-0.01**	**15.36**	**0.00**

Source: Author's computation: underlying month-end data from NSE Daily Official List, various issues

Table B-2. Return and risk of Nigerian firms (appreciation period)

Sector	Naira Returns (%)		Dollar Return (%)		Naira Excess Returns (%)			Dollar Excess Returns (%)		
	Mean	SD	Mean	SD	Mean	SD	Sharpe Ratio	Mean	SD	Sharpe Ratio
Panel A: NSE Industrial Classification										
Agriculture	4.93	22.13	5.34	22.27	4.62	22.11	0.21	5.03	22.25	0.23
Airline	-0.47	2.52	-0.09	2.71	-0.78	2.51	-0.31	-0.40	2.71	-0.15
Airline Services	22.21	52.11	23.03	52.11	21.82	52.10	0.42	22.63	52.09	0.43
Automobile	3.81	28.79	4.21	28.89	3.50	28.78	0.12	3.90	28.89	0.14
Banking	3.60	23.87	3.98	24.03	3.30	23.86	0.14	3.68	24.02	0.15
Breweries	2.75	18.84	3.15	19.05	2.44	18.84	0.13	2.84	19.05	0.15
Building Material	3.02	18.01	3.41	18.08	2.71	18.00	0.15	3.11	18.07	0.17
Chemical and Paints	10.73	60.11	11.19	60.57	10.42	60.10	0.17	10.88	60.56	0.18
Commercial Services	6.44	27.21	6.91	27.77	6.13	27.19	0.23	6.60	27.76	0.24
Computer&Office Equip	8.20	49.47	8.62	49.75	7.89	49.47	0.16	8.31	49.75	0.17
Conglomerates	6.11	26.82	6.53	27.07	5.80	26.82	0.22	6.22	27.06	0.23
Construction	6.70	22.73	7.13	22.97	6.40	22.72	0.28	6.82	22.96	0.30
Engineering Technology	7.38	52.81	7.79	53.13	7.07	52.80	0.13	7.48	53.12	0.14
Food beverages&tobac	1.54	15.05	1.93	15.15	1.23	15.05	0.08	1.63	15.15	0.11
Footwear	7.72	27.41	8.13	27.49	7.42	27.40	0.27	7.82	27.49	0.28
Foreign Listing	0.04	10.95	0.53	11.16	-0.24	10.96	-0.02	0.25	11.17	0.02
Healthcare	6.13	36.09	6.54	36.32	5.82	36.09	0.16	6.24	36.31	0.17
Hotel and Tourism	0.54	7.94	0.87	8.10	0.18	7.96	0.02	0.52	8.12	0.06
Industrial/Dom	7.92	46.79	8.35	47.11	7.61	46.79	0.16	8.05	47.11	0.17
Insurance	5.28	31.08	5.69	31.32	4.97	31.07	0.16	5.38	31.31	0.17
Machinery	0.00	0.96	0.39	1.20	-0.30	0.98	-0.31	0.08	1.21	0.06
Maritime	9.38	32.03	9.92	32.10	8.98	32.02	0.28	9.51	32.10	0.30
Packaging	5.34	25.20	5.76	25.39	5.03	25.20	0.20	5.45	25.39	0.21
Petroleum Marketing	4.86	24.94	5.27	25.08	4.55	24.94	0.18	4.96	25.07	0.20
Printing and publishing	4.59	18.74	5.00	18.89	4.29	18.72	0.23	4.70	18.88	0.25
Real estate	3.42	13.86	3.82	13.97	3.11	13.85	0.22	3.51	13.96	0.25
Second tier	2.19	17.45	2.59	17.69	1.89	17.45	0.11	2.29	17.69	0.13
Textiles	2.76	20.64	3.17	20.81	2.45	20.64	0.12	2.86	20.80	0.14
Panel B: Size Classification										
1st quartile(lowest)	1.20	22.39	1.57	22.55	0.90	22.39	0.04	1.26	22.55	0.06
2nd quartile	3.94	29.82	4.35	30.06	3.65	29.81	0.12	4.05	30.05	0.13
3rd quartile	7.33	38.35	7.74	38.63	7.04	38.35	0.18	7.44	38.63	0.19
4th quartile(highest)	6.46	27.26	6.92	27.42	6.13	27.25	0.22	6.59	27.41	0.24
Panel C: Sectoral Classification										
Non-financial	4.85	30.61	5.27	30.83	4.54	30.61	0.15	4.96	30.82	0.16
Financial	4.38	27.46	4.78	27.66	4.08	27.45	0.15	4.47	27.65	0.16
Panel D: All Firms										
Total	**4.74**	**29.91**	**5.15**	**30.12**	**4.44**	**29.90**	**0.15**	**4.84**	**30.11**	**0.16**

Source: Author's computation: underlying month-end data from NSE Daily Official List, various issues

Table B-3. Return and risk of Nigerian firms (second depreciation –crisis period)

Sector	Naira Returns (%)		Dollar Return (%)		Naira Excess Returns (%)			Dollar Excess Returns (%)		
	Mean	SD	Mean	SD	Mean	SD	Sharpe Ratio	Mean	SD	Sharpe Ratio
Panel A: NSE Industrial Classification										
Agriculture	-1.70	19.38	-2.67	20.06	-1.84	19.38	-0.10	-2.81	20.05	-0.14
Airline	0.00	0.00	-1.21	3.41	-0.17	0.11	-1.46	-1.38	3.39	-0.41
Airline Services	-6.37	18.91	-7.32	19.30	-6.50	18.91	-0.34	-7.46	19.30	-0.39
Automobile	-1.99	20.33	-3.08	20.78	-2.14	20.32	-0.11	-3.24	20.77	-0.16
Banking	-3.49	39.91	-4.44	40.38	-3.63	39.93	-0.09	-4.57	40.39	-0.11
Breweries	-1.11	9.72	-2.16	10.44	-1.24	9.73	-0.13	-2.30	10.45	-0.22
Building Material	0.06	18.77	-1.00	19.23	-0.08	18.78	0.00	-1.14	19.24	-0.06
Chemical and Paints	-3.73	9.89	-4.80	10.40	-3.87	9.88	-0.39	-4.93	10.39	-0.47
Commercial Services	-1.08	5.73	-2.15	7.06	-1.21	5.73	-0.21	-2.28	7.05	-0.32
Computer&Office Equip	0.06	16.19	-1.06	16.59	-0.09	16.17	-0.01	-1.20	16.58	-0.07
Conglomerates	-2.54	19.01	-3.58	19.39	-2.67	19.02	-0.14	-3.71	19.40	-0.19
Construction	-2.07	17.64	-3.11	18.05	-2.20	17.64	-0.12	-3.24	18.05	-0.18
Engineering Technology	-3.61	12.66	-4.50	13.30	-3.76	12.65	-0.30	-4.65	13.29	-0.35
Food beverage&tobac	-0.39	19.75	-1.44	20.38	-0.54	19.75	-0.03	-1.58	20.39	-0.08
Footwear	0.80	11.76	-0.50	12.59	0.65	11.75	0.06	-0.65	12.58	-0.05
Foreign Listing	-6.01	26.85	-7.09	26.98	-6.14	26.86	-0.23	-7.22	26.99	-0.27
Healthcare	-2.38	16.94	-3.49	17.41	-2.52	16.94	-0.15	-3.63	17.41	-0.21
Hotel and Tourism	1.01	6.05	-0.11	6.99	0.88	6.02	0.15	-0.24	6.97	-0.03
Industrial/domestic	-1.56	14.40	-2.75	14.91	-1.71	14.38	-0.12	-2.90	14.90	-0.19
Insurance	-4.48	37.68	-5.41	38.17	-4.62	37.68	-0.12	-5.56	38.17	-0.15
Machinery	0.00	0.00	-1.12	3.23	-0.13	0.11	-1.21	-1.25	3.22	-0.39
Maritime	-7.09	27.08	-7.93	27.38	-7.22	27.10	-0.27	-8.06	27.40	-0.29
Packaging	-0.44	7.42	-1.57	7.95	-0.58	7.41	-0.08	-1.70	7.94	-0.21
Petroleum Marketing	-3.59	17.98	-4.59	18.51	-3.72	17.97	-0.21	-4.72	18.49	-0.26
Printing and publishing	-1.22	18.14	-2.20	18.69	-1.35	18.15	-0.07	-2.33	18.69	-0.12
Real estate	0.87	20.03	-0.08	20.65	0.74	20.03	0.04	-0.21	20.65	-0.01
Second tier	-0.87	8.36	-2.02	8.84	-1.01	8.35	-0.12	-2.15	8.83	-0.24
Textiles	-4.00	9.79	-5.07	10.50	-4.17	9.78	-0.43	-5.24	10.48	-0.50
Panel B: Size Classification										
1st quartile(lowest)	-0.35	7.97	-1.52	8.59	-0.50	7.96	-0.06	-1.67	8.58	-0.19
2nd quartile	0.54	13.65	-0.58	14.05	0.40	13.63	0.03	-0.72	14.03	-0.05
3rd quartile	-2.83	24.06	-3.89	24.53	-2.96	24.05	-0.12	-4.02	24.53	-0.16
4th quartile(highest)	-3.13	26.28	-4.11	26.73	-3.27	26.29	-0.12	-4.25	26.74	-0.16
Panel C: Sectoral Classification										
Non-financial	-1.67	15.43	-2.75	15.92	-1.81	15.43	-0.12	-2.89	15.92	-0.18
Financial	-4.00	38.77	-4.94	39.24	-4.14	38.77	-0.11	-5.08	39.25	-0.13
Panel D: All Firms										
Total	**-2.17**	**22.54**	**-3.21**	**22.98**	**-2.31**	**22.54**	**-0.10**	**-3.35**	**22.98**	**-0.15**

Source: Author's computation: underlying month-end data from NSE Daily Official List, various issues

APPENDIX C: CLASSIFICATION OF EMPIRICAL STUDIES BY FRAMEWORK AND ESTIMATION PROCEDURES

Table C-1. Classification of earlier studies

S/N	ESTIMATION PROCEDURES	THEORETICAL FRAMEWORK	
		IAPT	IAPM
1	Fama and MacBeth (1973) procedure (OLS or GLS)	Roache and Merritt (2006)	Dahlquist and Robertsson (2001); Acharya and Pedersen (2005); Wu (2008)
2	Iterated Non-Linear Seemingly Unrelated Regressions (Gibbons, 1982; McElroy and Burmeister, 1988)	Jorion (1991); Choi and Rajan (1997); Choi et al (1998); Doukas et al (1999); Priestley and Odegaard (2004); Roache and Merritt (2006)	
3	Beta-representation with GMM	Di Iorio and Faff (2002)	Ferson and Harvey (1994); Vassalou (2000); Carrieri and Majerbi (2006)
4	Stochastic Discount Factor with GMM		Dumas and Solnik (1995); Choi et al (1998)
5	Parsimonious multivariate GARCH (De Santis and Gerard, 1997)		De Santis and Gerard (1998); Antell and Vaihekoski (2007); Chaieb and Errunza (2007); Saleem and Vaihekoski (2007); Jacobsen and Liu (2008); Moermann and Dijk (2010)

Source: Author's computations from literature survey

APPENDIX D: DISTRIBUTION OF COEFFICIENT OF EXPOSURE TO THE WORLD MARKET FACTOR ACCORDING TO FIRM SIZE, SECTOR AND EPISODES OF EXCHANGE RATE CHANGES

Table D-1. Cross-sectional distribution of coefficient of exposure to the world market factor β_m by Nigerian firms according to size (Jan. 2000-Dec. 2009)

Measure of Exchange rate and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
1ST QUARTILE								
Bilateral without liquidity risk	50	-.900	-.065	-.047	.028	1.644	2	-
Bilateral with liquidity risk	50	-.916	-.060	-.043	.027	1.661	2	-
REER without liquidity risk	50	-.956	-.033	-.013	.083	1.582	1	-
REER with liquidity risk	50	-.880	-.032	.002	.087	1.596	1	1
PPP-Dvn without liquidity risk	50	-.874	-.081	-.045	.028	1.644	-	-
PPP-Dvn with liquidity risk	50	-.867	-.049	-.001	.035	1.662	-	-
2ND QUARTILE								
Bilateral without liquidity risk	50	-1.006	-.181	.025	.180	1.011	1	-
Bilateral with liquidity risk	50	-.984	-.163	.042	.186	1.042	2	-
REER without liquidity risk	50	-.954	-.119	.081	.231	.892	1	-
REER with liquidity risk	50	-.942	-.126	.083	.221	.915	2	-
PPP-Dvn without liquidity risk	50	-.961	-.158	.048	.196	.999	1	-
PPP-Dvn with liquidity risk	50	-.940	-.155	.052	.198	1.030	1	-
3RD QUARTILE								
Bilateral without liquidity risk	50	-.936	-.230	.034	.293	1.021	3	-
Bilateral with liquidity risk	50	-.935	-.276	.015	.296	1.025	2	-
REER without liquidity risk	50	-.828	-.196	.098	.318	1.095	3	-
REER with liquidity risk	50	-.827	-.196	.124	.383	1.313	2	-
PPP-Dvn without liquidity risk	50	-.889	-.261	.029	.310	1.077	1	-
PPP-Dvn with liquidity risk	50	-.888	-.269	.028	.314	1.085	1	-
4TH QUARTILE								
Bilateral without liquidity risk	50	-.465	.160	.456	.659	2.065	7	-
Bilateral with liquidity risk	50	-.516	.188	.454	.665	1.804	7	-
REER without liquidity risk	50	-.150	.244	.582	.829	2.387	8	-
REER with liquidity risk	50	-.158	.246	.582	.833	2.336	9	-
PPP-Dvn without liquidity risk	50	-.383	.196	.483	.709	2.202	7	-
PPP-Dvn with liquidity risk	50	-.434	.205	.481	.719	1.940	7	-

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table D-2. Cross-sectional distribution of coefficient of exposure to the world market factor β_m by Nigerian firms according to sector (Jan. 2000-Dec. 2009)

Measure of Exchange rate and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
NON-FINANCIAL								
Bilateral without liquidity risk	146	-1.006	-.097	.050	.221	1.024	7	-
Bilateral with liquidity risk	146	-.984	-.124	.051	.217	1.064	7	-
REER without liquidity risk	146	-.956	-.067	.105	.259	1.428	6	-
REER with liquidity risk	146	-.942	-.069	.118	.284	1.463	8	-
PPP-Dvn without liquidity risk	146	-.961	-.104	.060	.222	1.148	3	-
PPP-Dvn with liquidity risk	146	-.940	-.090	.077	.237	1.180	3	-
FINANCIAL								
Bilateral without liquidity risk	54	-.936	-.163	.300	.716	2.065	6	-
Bilateral with liquidity risk	54	-.935	-.157	.295	.739	1.804	6	-
REER without liquidity risk	54	-.828	-.102	.409	.807	2.387	7	-
REER with liquidity risk	54	-.827	-.066	.411	.796	2.336	6	1
PPP-Dvn without liquidity risk	54	-.889	-.198	.314	.696	2.202	6	-
PPP-Dvn with liquidity risk	54	-.888	-.207	.310	.715	1.940	6	-

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table D-3. Cross-sectional distribution of coefficient of exposure to the world market factor β_m by Nigerian firms according to episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
ALL FIRMS								
Depreciation without liquidity risk	182	-1.330	-.068	.093	.269	3.760	8	1
Depreciation with liquidity risk	182	-1.361	-.053	.090	.244	3.810	9	1
Appreciation without liquidity risk	199	-7.324	-1.108	-.534	.189	9.623	2	17
Appreciation with liquidity risk	199	-7.188	-1.100	-.538	.182	5.343	2	16
2nd Depreciation without liquidity risk	181	-1.076	-.017	.283	.448	15.470	28	2
2nd Depreciation with liquidity risk	181	-1.070	-.027	.196	.408	2.197	28	2

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table D-4. Cross-sectional distribution of coefficient of exposure to the world market factor β_m by Nigerian firms according to size and episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
1st Quartile								
Depreciation without liquidity risk	49	-.360	.001	.034	.044	.610	3	-
Depreciation with liquidity risk	49	-.376	-.001	.033	.050	.614	3	-
Appreciation without liquidity risk	50	-7.324	-1.140	-.906	.002	1.304	-	4
Appreciation with liquidity risk	50	-7.188	-1.147	-.890	.001	1.303	-	5
2nd Depreciation without liquidity risk	47	-.945	.014	.424	.151	15.470	16	-
2nd Depreciation with liquidity risk	47	-.951	.012	.126	.142	2.197	16	-
2nd Quartile								
Depreciation without liquidity risk	49	-.840	-.137	.107	.204	3.760	2	1
Depreciation with liquidity risk	49	-.941	-.137	.105	.201	3.810	3	1
Appreciation without liquidity risk	50	-7.128	-1.788	-.754	.261	2.993	-	6
Appreciation with liquidity risk	50	-6.975	-1.837	-.720	.243	3.045	-	5
2nd Depreciation without liquidity risk	48	-1.076	-.096	.029	.102	.791	8	-
2nd Depreciation with liquidity risk	48	-1.070	-.098	.023	.094	.777	8	-
3rd Quartile								
Depreciation without liquidity risk	48	-1.330	-.222	.104	.429	1.240	2	-
Depreciation with liquidity risk	48	-1.361	-.225	.110	.432	1.267	2	-
Appreciation without liquidity risk	50	-5.611	-1.674	-.816	.297	2.091	-	5
Appreciation with liquidity risk	50	-5.436	-1.652	-.805	.257	1.707	-	4
2nd Depreciation without liquidity risk	38	-.781	-.255	.047	.360	1.614	-	2
2nd Depreciation with liquidity risk	38	-.783	-.209	.051	.352	1.568	-	2
4th Quartile								
Depreciation without liquidity risk	36	-.730	-.077	.137	.368	1.150	1	-
Depreciation with liquidity risk	36	-.793	-.129	.121	.338	1.100	1	-
Appreciation without liquidity risk	49	-3.145	-.413	.358	.734	9.623	2	2
Appreciation with liquidity risk	49	-4.914	-.439	.280	.797	5.343	2	2
2nd Depreciation without liquidity risk	48	-.574	.161	.586	.972	1.726	4	-
2nd Depreciation with liquidity risk	48	-.589	.225	.552	.923	1.593	4	-

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table D-5. Cross-sectional distribution of coefficient of exposure to the world market factor β_m by Nigerian firms according to sector and episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period and inclusion of liquidity risk	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
NON-FINANCIAL								
Depreciation without liquidity risk	141	-.840	-.041	.096	.221	3.760	6	1
Depreciation with liquidity risk	141	-.941	-.040	.096	.216	3.810	7	1
Appreciation without liquidity risk	145	-7.324	-1.222	-.691	.133	2.993	2	13
Appreciation with liquidity risk	145	-7.188	-1.219	-.656	.127	3.045	2	13
2nd Depreciation without liquidity risk	142	-.945	-.034	.149	.309	2.231	26	1
2nd Depreciation with liquidity risk	142	-.951	-.037	.139	.285	2.197	26	1
FINANCIAL								
Depreciation without liquidity risk	41	-1.330	-.180	.084	.382	1.170	2	-
Depreciation with liquidity risk	41	-1.361	-.182	.071	.372	1.162	2	-
Appreciation without liquidity risk	54	-5.537	-.868	-.114	.432	9.623	-	4
Appreciation with liquidity risk	54	-5.436	-.922	-.219	.420	5.343	-	3
2nd Depreciation without liquidity risk	39	-1.076	.011	.770	.693	15.470	2	1
2nd Depreciation with liquidity risk	39	-1.070	.017	.402	.703	1.557	2	1

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

APPENDIX E: DISTRIBUTION OF COEFFICIENT OF EXPOSURE TO THE LIQUIDITY RISK ACCORDING TO FIRM SIZE, SECTOR AND EPISODES OF EXCHANGE RATE CHANGES

Table E-1. Cross-sectional distribution of coefficient of exposure to the liquidity risk β_q by Nigerian firms according to size (Jan. 2000-Dec. 2009)

Measure of Exchange rate	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
1ST QUARTILE								
Liquidity risk with Bilateral	50	-.025	-.005	-.002	.000	.033	-	2
Liquidity risk with REER	50	-.032	-.005	-.002	.000	.034	1	1
Liquidity risk with PPP-Dvn	50	-.030	-.006	-.002	.000	.040	-	1
2ND QUARTILE								
Liquidity risk with Bilateral	50	-.129	-.011	-.003	.001	.130	2	-
Liquidity risk with REER	50	-.021	-.010	-.002	.001	.030	1	-
Liquidity risk with PPP-Dvn	50	-.020	-.012	-.003	.001	.030	2	-
3RD QUARTILE								
Liquidity risk with Bilateral	50	-.029	-.011	-.002	.007	.028	2	2
Liquidity risk with REER	50	-.031	-.008	-.001	.009	.029	2	1
Liquidity risk with PPP-Dvn	50	-.030	-.011	-.002	.007	.030	2	1
4TH QUARTILE								
Liquidity risk with Bilateral	50	-.155	-.009	.002	.005	.488	1	1
Liquidity risk with REER	50	-.086	-.010	.006	.006	.494	3	2
Liquidity risk with PPP-Dvn	50	-.130	-.011	-.001	.005	.490	1	1

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table E-2. Cross-sectional distribution of coefficient of exposure to the liquidity risk β_q by Nigerian firms according to sector (Jan. 2000-Dec. 2009)

Measure of Exchange rate	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
NON-FINANCIAL								
Liquidity risk with Bilateral	146	-.129	-.006	-.003	.001	.130	3	3
Liquidity risk with REER	146	-.062	-.006	-.002	.001	.060	4	1
Liquidity risk with PPP-Dvn	146	-.070	-.007	-.003	.001	.060	3	1
FINANCIAL								
Liquidity risk with Bilateral	54	-.155	-.013	.003	.007	.488	2	2
Liquidity risk with REER	54	-.086	-.013	.006	.009	.494	3	3
Liquidity risk with PPP-Dvn	54	-.130	-.016	.000	.007	.490	2	2

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table E-3. Cross-sectional distribution of coefficient of exposure to the liquidity risk β_q by Nigerian firms according to episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
ALL FIRMS								
Liquidity risk during 1st Depreciation	183	0.000	.000	.000	.000	0.000	20	8
Liquidity risk during Appreciation	199	-.267	-.026	-.007	.001	.635	3	10
Liquidity risk during 2nd Depreciation	181	-.840	-.047	-.032	.003	.190	2	10

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table E-4. Cross-sectional distribution of coefficient of exposure to the liquidity risk β_q by Nigerian firms according to size and episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
1st Quartile								
Liquidity risk during 1st Depreciation	49	.000	.000	.000	.000	.000	2	4
Liquidity risk during Appreciation	50	-.111	-.014	-.009	.000	.028	-	2
Liquidity risk during 2nd Depreciation	47	-.062	-.001	.002	.001	.190	-	-
2nd Quartile								
Liquidity risk during 1st Depreciation	50	.000	.000	.000	.000	.000	5	1
Liquidity risk during Appreciation	50	-.082	-.032	-.004	.000	.402	-	4
Liquidity risk during 2nd Depreciation	48	-.358	-.016	-.013	.007	.059	2	1
3rd Quartile								
Liquidity risk during 1st Depreciation	48	.000	.000	.000	.010	.000	5	3
Liquidity risk during Appreciation	50	-.267	-.037	-.020	.011	.092	1	2
Liquidity risk during 2nd Depreciation	38	-.840	-.071	-.064	.001	.070	-	4
4th Quartile								
Liquidity risk during 1st Depreciation	36	.000	.000	.000	.010	.000	8	-
Liquidity risk during Appreciation	49	-.103	-.020	.004	.007	.635	2	2
Liquidity risk during 2nd Depreciation	48	-.605	-.103	-.060	.005	.035	-	5

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

Table E-5. Cross-sectional distribution of coefficient of exposure to the liquidity risk β_q by Nigerian firms according to sector and episodes of exchange rate changes (Jan. 2000-Dec. 2009)

Period	No. of firms	Min	Q_1 (25)	Mean	Q_3 (75)	Max	N^+	N^-
NON-FINANCIAL								
Liquidity risk during 1st Depreciation	142	.000	.000	.000	.000	.000	14	6
Liquidity risk during Appreciation	145	-.111	-.020	-.008	.000	.402	1	8
Liquidity risk during 2nd Depreciation	142	-.583	-.025	-.022	.002	.059	2	6
FINANCIAL								
Liquidity risk during 1st Depreciation	41	.000	.000	.000	.010	.000	6	2
Liquidity risk during Appreciation	54	-.267	-.036	-.004	.013	.635	2	2
Liquidity risk during 2nd Depreciation	39	-.840	-.097	-.070	.007	.190	-	4

Note: N^- reports the number of firms with negative exposure and N^+ reports the number of firms with positive exposure at the 5% level of significance

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

APPENDIX F: FIRMS THAT ARE POSITIVELY EXPOSED TO REER MEASURE OF EXCHANGE RISK

Table F-1. Positively exposed firms to REER measure of exchange risk

SN	SECTOR	COMPANY	Size Quartile	Exposure Without Liquidity Risk		Exposure With Liquidity Risk		
				β_m	$\beta_{\pi(reer)}$	β_m	$\beta_{\pi(reer)}$	β_q
1	AGRICULTURE	OKOMU OIL	3	0.229	0.855**	0.231	0.83**	-0.004
2	AGRICULTURE	PRESCO PLC	3	0.135**	2.072**	1.313**	2.068**	-0.001
3	BREWERIES	INTERNATIONAL BREWERIES	3	-0.401	1.527**	-0.4	1.525**	0.000
4	BUILDING MATERIAL	NIGERIAN WIRE IND.	1	0.061	0.346**	0.06	0.349**	0.000
5	COMMERCIAL SERVICES	TRANS NATIONWIDE EXPRESS	2	-0.375	1.022**	-	-	-
6	HEALTHCARE	CHRISTLIEB	1	-	-	0.087*	0.334**	0.000
7	CONSTRUCTION	COSTAIN	3	0.66	2.095**	-	-	-
8	INSURANCE	LAW UNION & ROCK	3	-0.021	1.373**	-0.015	1.322**	-0.008
9	INSURANCE	U N I C	3	-0.31	1.737**	-0.31	1.743**	0.001
10	MACHINERY	NIG. SEW. MACH. MAN. COMP.	1	0.061	0.313**	0.06	0.315**	0.000
11	MACHINERY	STOKVIS	1	0.089**	0.392***	0.088**	0.395***	0.000
12	PETROLEUM MARKETING	TOTALFINAELF	4	0.382**	0.743**	0.376**	0.783**	0.006**
13	PRINTING AND PUBLISHING	DAILY TIMES	1	0.043	0.389***	0.042	0.391***	0.000
14	PRINTING AND PUBLISHING	UNIVERSITY PRESS	2	0.67*	1.499**	0.676*	1.44**	-0.01
15	TEXTILES	ABA TEXTILE MILLS	2	0.088*	0.284**	-	-	-
16	TEXTILES	ASABA TEXTILE MILL	2	0.086*	0.322**	0.084*	0.326**	0.000
17	SECOND TIER	ANINO INTL.	1	0.067*	0.331**	0.066	0.334**	0.000
18	SECOND TIER	FLEXIBLE PACKAGING	2	0.067*	0.331**	0.066	0.334**	0.000
19	SECOND TIER	KRABO	1	0.067*	0.331**	0.066	0.334**	0.000
20	SECOND TIER	NEWPAC	1	0.061	0.321**	0.06	0.323**	0.000
21	SECOND TIER	ROKANA	1	0.081*	0.323**	0.08*	0.324**	0.000
22	SECOND TIER	SMURFIT /SMART PRODUCT	1	0.058	0.289**	0.578	0.291**	0.000
23	SECOND TIER	TROPICAL PET. PRODUCTS	1	0.033	0.324**	0.033	0.315**	-0.001
24	SECOND TIER	UDEOFSON GARMENT FACT.	1	0.067*	0.331**	0.066	0.334**	0.000
25	SECOND TIER	UNION VENTURES & PET.	1	0.061	0.299**	0.06	0.305**	0.001
26	SECOND TIER	W. A. ALUM. PRODUCTS	1	0.067*	0.331**	0.066	0.334**	0.000

*Note: *, ** and *** depict significance at the 10%, 5% and 1% levels respectively*

Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank

APPENDIX G: FIRM-LEVEL RETURNS AND EXPOSURE TO RISK FACTORS BY NIGERIAN FIRMS (JAN. 2000-DEC. 2009)

Table G-1. Returns and exposure of Nigerian firms (Jan. 2000-Dec. 2009) [185]

SN	Sector	Company	Quartile-sized[186]	Panel A				Panel B[187]				
				Naira Returns (%)		Dollar Returns (%)		Risk Exposure				
				Mean Returns	*Standard Deviation*	*Mean Returns*	*Standard Deviation*	R^2	$\beta_{m(world)}$	$\beta_{\pi(₦/\$)}$	$\beta_{q(liquidity)}$	*Intercept*
1	AGRICULTURE	ELLAH LAKES	1	2.52	16.32	2.21	16.70	0.0453	0.126	-1.484***	-0.002	2.242
2	AGRICULTURE	GROMMAC	1	3.51	23.32	3.25	23.54	0.0209	0.115	-1.36***	-0.01	3.479
3	AGRICULTURE	LIVESTOCKS FEEDS	2	0.29	22.34	0.06	22.74	0.0829	0.183	-2.755***	-0.005	0.346
4	AGRICULTURE	OKITIPUPA OIL	1	1.86	6.89	1.55	7.54	0.1829	0.000	-1.384***	0.000	1.432**
5	AGRICULTURE	OKOMU OIL	3	1.81	15.20	1.51	15.53	0.0545	0.114	-1.488***	-0.006	1.664
6	AGRICULTURE	PRESCO PLC	3	2.27	20.62	2.19	20.85	0.1466	1.02**	-2.883**	0.000	1.486
7	AIRLINE	ALBARKA	2	-0.69	2.49	-0.85	3.20	0.3803	0.046	-0.849***	0.001	-1.195***
8	AIRLINE	ADC	2	-0.90	4.66	-1.15	5.17	0.2189	-0.16	-1.024***	0.001	-1.538***
9	AIRLINE SERVICES	AIRLINE SERVICE &LOGISTIC PLC	4	2.53	40.77	2.10	41.30	0.0496	-0.516	-2.097*	0.058	1.267
10	AIRLINE SERVICES	NIG. AVIATION HANDLING COY	4	5.20	34.54	4.98	34.92	0.1245	1.064*	-3.252***	-0.049	6.765

[185] It should be noted that not all the firms in this table existed throughout the period of study. Inclusion of any firm is done according to the discussions in the sub-section on "criterion for security inclusion and level of aggregation" under the methodology section. Also, because analyses in chapter five are broken down into three sub-periods, the firms used in the last sub-period (April, 2008 to December, 2009) in that chapter will be those that currently exist.

[186] In order to classify firms into the four quartile groups, the average market capitalisation of each firm for the period under study was computed. Firms were sorted on this values in ascending order and the first 50 firms fell into the first quartile (smallest firms) while the last 50 firms fell into the fourth quartile (largest firms). Hence, the smallest firms are represented by '1' while the largest firms are represented by '4' along this column.

[187] This panel reports the exposure coefficients to each of the three risk factors, namely; world market risk (β_m), exchange risk (β_π) and liquidity risk (β_q) obtained from the first pass regression, $r_t = \alpha + \beta_m r_{m,t} + \beta_\pi r_{\pi,t} + \beta_q r_{q,t} + \varepsilon_t$. In order to save space, the results presented here are only for the entire period and just the nominal bilateral naira-dollar exchange risk is used.

11	AUTOMOBILE	DUNLOP NIG	3	1.83	39.63	1.59	39.96	0.026	0.0227	-2.761***	-0.004	1.813
12	AUTOMOBILE	INCAR NIG.	2	2.92	14.62	2.57	14.73	0.0234	0.073	-0.893***	0.004	2.239
13	AUTOMOBILE	INTRA MOTORS	1	0.22	1.83	-0.04	2.77	0.5821	0.08*	-0.924***	0.001	-0.313*
14	AUTOMOBILE	R T BRISCOE	3	2.97	20.88	2.69	21.27	0.0485	0.034	-1.939**	-0.009	2.999
15	AUTOMOBILE	REITZCOT NIG.	1	2.20	12.03	1.94	12.27	0.0446	0.012	-1.086***	-0.006*	1.957
16	BANKING	ACCESS BANK NIGERIA PLC	4	3.65	20.57	3.38	20.91	0.1079	0.845**	-2.264***	-0.006	3.553*
17	BANKING	AFRIBANK NIG.	4	1.34	18.80	1.08	19.20	0.1079	0.393	-2.318***	-0.018***	1.831
18	BANKING	CHARTERED BANK	4	1.53	14.62	1.20	14.81	0.0599	0.028	-1.354	-0.013*	1.767
19	BANKING	COOPERATIVE DEV.BANK	3	1.39	18.56	1.04	18.68	0.0537	-0.204	-1.109	0.021	-0.054
20	BANKING	COOPERATIVE BANK	3	3.53	26.24	3.30	26.83	0.0619	-0.105	-3.123**	0.015	2.531
21	BANKING	DIAMOND BANK NIGERIA PLC	4	2.18	23.34	2.09	23.67	0.1369	1.118	-2.458***	0.000	1.691
22	BANKING	FIDELITY BANK PLC	4	1.01	19.66	0.91	20.10	0.162	0.968	-2.352***	-0.155	0.855
23	BANKING	FIRST BANK	4	0.93	13.65	0.66	14.21	0.1276	0.357	-2.009***	-0.001	0.723
24	BANKING	FIRST CITY MONUMENT BANK	4	1.78	16.35	1.67	16.74	0.2168	1.140***	-1.997***	-0.008	1.496
25	BANKING	FSB	3	-0.08	16.90	-0.40	17.24	0.0193	-0.324	-1.018	0.002	-0.724
26	BANKING	GUARANTY TRUST BANK	4	2.45	12.72	2.17	13.18	0.1743	0.636**	-1.831***	0.006	2.01*
27	BANKING	HALLMARK BANK PLC	3	1.36	14.36	0.99	14.34	0.0815	-0.023	-0.671	0.022**	-0.206
28	BANKING	INTER. MERCHANT BANK	3	2.24	20.37	1.97	20.88	0.0656	0.0986	-2.559*	0.000	1.999
29	BANKING	FINBANK BANK	4	1.97	32.28	1.74	32.61	0.0522	0.450	-3.009***	0.000	1.923
30	BANKING	INTERCONTONTINENTAL	4	0.56	19.87	0.49	20.28	0.1379	0.88*	-2.815**	0.001	-0.297
31	BANKING	IBTC	4	3.27	21.25	3.20	21.66	0.1266	0.264	-2.939*	-0.016	3.108
32	BANKING	LIBERTY BANK	3	-1.12	9.07	-1.44	9.65	0.1376	-0.241	-1.597*	0.006	-1.773

33	BANKING	LION BANK	3	2.82	19.55	2.53	20.01	0.1454	0.392	-2.52***	0.028*	1.354
34	BANKING	NAL MERCHANT BANK	3	1.97	22.04	1.70	22.50	0.0557	-0.935	-2.093	0.000	1.61
35	BANKING	OCEANIC BANK PLC	4	9.57	75.88	9.55	76.52	0.0278	1.062	-3.907**	-0.09	10.979
36	BANKING	OMEGA BANK	3	0.97	14.80	0.83	15.61	0.148	0.862*	-2.208	-0.014	0.962
37	BANKING	SAVANNAH BANK	1	-0.50	6.10	-0.82	6.67	0.2244	-0.039	-1.488***	0.002	-0.986
38	BANKING	TRADE BANK	3	2.49	21.83	2.15	22.02	0.0605	1.025**	-1.329*	-0.004	2.417
39	BANKING	TRANS INTL. BANK	3	0.18	17.31	-0.15	17.14	0.0033	-0.114	-0.216	0.004	-0.636
40	BANKING	U B A	4	1.43	16.74	1.17	17.02	0.2124	1.071***	-2.201***	0.013**	0.834
41	BANKING	UNION BANK	4	0.58	14.70	0.28	14.96	0.0862	0.294	-1.58***	-0.013	0.753
42	BANKING	UNIVERSAL TRUST BANK	3	-0.86	11.88	-1.21	12.02	1.0523	-0.151	-0.86***	0.011*	-1.97
43	BANKING	WEMA BANK	4	0.74	17.77	0.45	18.16	0.0537	-0.174	-1.776***	0.003	0.234
44	BANKING	ZENITHBANK	4	1.41	18.00	1.34	18.42	0.2411	1.236**	-2.556***	-0.018	1.19
45	BANKING	BANK PHB	4	3.56	40.86	3.34	40.99	0.0522	1.323	-1.874	-0.028	4.004
46	BANKING	SKYE BANK	4	11.55	72.69	11.43	73.31	0.3311	1.804	-3.962	0.488	0.518
47	BREWERIES	CHAMPION BREWERIES	2	5.82	40.08	5.40	38.89	0.0075	0.447	0.66	-0.015	5.728
48	BREWERIES	GOLDEN GUINEA BREWERIES	2	-0.71	7.62	-1.02	7.99	0.134	-0.058	-1.078***	-0.010*	-0.764
49	BREWERIES	GUINNESS NIG.	4	2.29	11.53	1.98	11.89	0.119	0.444**	-1.436***	0.001	1.883*
50	BREWERIES	INTERNATIONAL BREWERIES	3	3.01	24.31	2.78	24.88	0.0986	-0.626	-3.142***	-0.004	2.915
51	BREWERIES	JOS INTER. BREWERIES	2	2.51	15.85	2.19	16.13	0.0319	-0.083	-1.226***	-0.002	2.155
52	BREWERIES	NIGERIAN BREWERIES	4	1.71	12.62	1.36	12.64	0.0557	0.500**	-0.578	0.005	1.061
53	BREWERIES	PREMIER BREWERIES	1	0.40	9.31	0.03	8.87	0.0072	0.140	-0.08	0.000	-0.21
54	BUILDING MATERIAL	ASHAKACEM	4	2.00	21.92	1.76	22.54	0.1039	0.669	-2.718***	-0.001	1.974

55	BUILDING MATERIAL	BENUE CEM. COMPANY	4	4.19	23.55	3.87	23.68	0.0299	0.397	-1.44***	0.006	3.598
56	BUILDING MATERIAL	CEMENT CO. OF NORTH NIG.	4	3.83	23.67	3.51	23.82	0.0299	0.497	-1.335***	-0.006	3.736*
57	BUILDING MATERIAL	CERAMIC MANU. NIG.	1	0.00	0.00	-0.26	2.12	0.9755	0.009	-0.941***	0.000	-0.516***
58	BUILDING MATERIAL	NIGERCEM	2	2.21	8.40	1.89	8.91	0.0883	0.162	-1.074***	0.000	1.805**
59	BUILDING MATERIAL	NIGERIAN ROPES	2	1.98	13.33	1.65	13.52	0.0383	0.203	-1.029***	-0.001	1.599
60	BUILDING MATERIAL	NIGERIAN WIRE IND.	1	-0.02	1.20	-0.35	2.54	0.7629	0.003	-0.95***	0.000	-0.491***
61	BUILDING MATERIAL	W/A PORTLAND (LAFARGE) CEM.	4	1.57	15.88	1.33	16.48	0.1627	0.428	-2.638***	-0.007	1.725
62	CHEMICAL AND PAINTS	AFRICAN PAINTS	1	7.08	57.38	6.83	58.05	0.0211	-0.916	-3.059**	0.013	6.232
63	CHEMICAL AND PAINTS	BERGER PAINTS	2	1.63	19.14	1.36	19.59	0.0673	-0.215	-2.121***	0.006	1.046
64	CHEMICAL AND PAINTS	CAPL	3	3.61	17.87	3.36	18.57	0.109	0.271	-2.544***	-0.001	3.499**
65	CHEMICAL AND PAINTS	D. N. MEYER	2	7.12	59.90	6.85	60.38	0.0142	0.800	-2.405**	-0.014	7.533
66	CHEMICAL AND PAINTS	IPWA	2	6.23	59.20	5.95	59.71	0.0179	-0.984	-2.595**	-0.017	6.474
67	CHEMICAL AND PAINTS	NIGERIAN GERMAN CHEMICALS	2	3.42	26.55	3.09	26.51	0.0139	0.185	-1.246	-0.004	3.17
68	CHEMICAL AND PAINTS	PREMIER PAINTS	2	3.42	19.83	3.11	20.13	0.0435	-0.365	-1.463***	-0.129*	3.431*
69	COMMERCIAL SERVICES	TRANS NATIONWIDE EXPRESS	2	2.35	18.37	2.08	19.02	0.0935	-0.520	-2.229***	-0.009	2.312
70	COMPUTER& OFFICE EQUIP.	ATLAS NIG.	1	4.76	58.40	4.53	58.90	0.0107	-0.743	-1.973	-0.015	4.565
71	COMPUTER& OFFICE EQUIP.	HALLMARK PAPER PRODUCTS	1	4.04	38.20	3.73	38.42	0.0065	-0.067	-1.332***	-0.001	3.645
72	COMPUTER& OFFICE EQUIP.	NCR (NIGERIA)	2	4.49	32.35	4.20	32.75	0.0211	-0.203	-1.983***	0.006	3.880
73	COMPUTER& OFFICE EQUIP.	THOMAS WYATT NIG.	2	1.48	17.04	1.19	17.37	0.0714	0.398	-1.765***	-0.002	1.269
74	COMPUTER& OFFICE EQUIP.	TRIPPLE GEE & COMP.	2	3.86	31.95	3.60	32.35	0.037	0.214	-2.482***	0.012	3.170
75	COMPUTER& OFFICE EQUIP.	WTN	1	0.00	6.27	-0.32	6.74	0.1355	0.024	-1.056***	-0.002	-0.373
76	CONGLOMERATES	A. G. LEVENTIS NIG.	3	2.76	24.32	2.49	24.70	0.0442	-0.221	-2.092***	0.011	1.991

77	CONGLOMERATES	C F A O NIG.	2	2.22	18.11	1.93	18.14	0.0625	0.148	-1.147	0.023**	0.608
78	CONGLOMERATES	CHELLARAMS	3	3.92	15.51	3.62	16.06	0.0804	-0.300	-1.874***	-0.002	3.619**
79	CONGLOMERATES	JOHN HOLT	2	3.89	28.78	3.63	29.28	0.0467	0.044	-2.583***	0.130	3.176
80	CONGLOMERATES	P Z INDUSTRIES	4	2.33	16.38	2.01	16.53	0.0348	-0.180	-1.205**	0.007	1.565
81	CONGLOMERATES	S C O A NIG.	3	4.34	26.93	4.06	27.37	0.0427	-0.211	-2.401***	0.003	3.896
82	CONGLOMERATES	U A C N	4	3.42	20.28	3.12	20.51	0.0281	0.528	-1.6***	-0.002	3.241
83	CONGLOMERATES	UTC	3	3.17	27.46	2.84	27.54	0.0292	-0.548	-1.242***	-0.018	3.32
84	CONGLOMERATES	UNILEVER NIGERIA PLC	4	1.81	14.15	1.53	14.44	0.1278	0.496*	-1.891***	0.002	1.475
85	CONSTRUCTION	ARBICO	2	3.99	20.61	3.68	20.94	0.0311	0.126	-1.517***	-0.006	3.836*
86	CONSTRUCTION	CAPPA & D'ALBERTO	3	2.79	16.22	2.50	16.97	0.0801	-0.057	-1.98**	-0.010*	2.834
87	CONSTRUCTION	COSTAIN	3	5.44	30.15	5.21	30.52	0.0772	0.399	-3.228***	-0.023**	6.282**
88	CONSTRUCTION	G. CAPPA	3	1.14	12.09	0.84	12.48	0.0711	-0.030	-1.426***	-0.002	0.809
89	CONSTRUCTION	JULIUS BERGER NIG.	4	1.96	18.27	1.65	18.50	0.0577	0.375	-1.587***	0.008	1.298
90	CONSTRUCTION	ROADS NIG.	1	1.04	6.23	0.72	6.71	0.1789	0.065	-1.046***	-0.010***	0.965
91	ENGINEERING TECHNOLOGY	INTERLINKED TECHNOLOGIES	1	1.20	7.59	0.87	7.98	0.1089	-0.123	-1.057***	-0.005	0.923
92	ENGINEERING TECHNOLOGY	NIG. WIRE &CABLE	2	2.56	27.15	2.28	27.42	0.0632	-0.003	-2.218***	0.004	2.085
93	ENGINEERING TECHNOLOGY	ONWUKA HI TEK IND.	1	4.85	59.31	4.73	59.79	0.0103	-0.787	-1.808	-0.025	5.045
94	FOOD BEVERAGES& TOBACCO	7 - UP BOTTLING COMPANY	4	3.26	16.41	2.97	16.86	0.0707	-0.105	-1.906***	0.004	2.739*
95	FOOD BEVERAGES& TOBACCO	BEVERAGES (WEST AFRICA)	2	0.00	0.00	-0.26	2.12	0.9755	0.009	-0.941***	0.000	-0.516***
96	FOOD BEVERAGES& TOBACCO	CADBURY NIG.	4	0.57	13.70	0.27	13.83	0.0652	0.208	-1.396*	-0.005	0.42
97	FOOD BEVERAGES& TOBACCO	FERDINAND OIL MILLS	1	1.94	15.00	1.61	15.23	0.0398	-0.295	-1.134***	-0.004	1.497
98	FOOD BEVERAGES& TOBACCO	FLOUR MILLS	4	2.45	17.67	2.22	18.20	0.1718	0.664	-2.84***	-0.006	2.652

99	FOOD BEVERAGES& TOBACCO	N. NIG. FLOUR MILLS	3	2.26	18.77	1.91	18.83	0.0364	0.127	-0.673	0.021***	0.913
100	FOOD BEVERAGES& TOBACCO	NATIONAL SALT CO. NIG.	4	-1.68	18.88	-1.95	19.14	0.0717	0.554	-1.801***	0.000	-1.89
101	FOOD BEVERAGES& TOBACCO	NESTLE FOODS NIG.	4	2.40	11.34	2.14	12.12	0.1932	0.081	-2.274***	-0.002	2.233**
102	FOOD BEVERAGES& TOBACCO	NIG. BOTTLING COMPANY	4	1.27	12.81	0.98	13.25	0.1051	0.324	-1.682***	0.000	0.984
103	FOOD BEVERAGES& TOBACCO	P S MANDRIDES	2	0.06	6.03	-0.26	6.46	0.1642	0.166	-0.96***	0.006	-0.644
104	FOOD BEVERAGES& TOBACCO	TATE INDUSTRIES	1	0.00	0.00	-0.26	2.12	0.9755	0.009	-0.941***	0.000	-0.516***
105	FOOD BEVERAGES& TOBACCO	UNION DICON SALT	3	1.07	20.85	0.77	21.01	0.026	0.182	-1.385***	0.000	0.691
106	FOOTWEAR	FOOTWEAR&ACCESSORIES MAN.	2	4.11	25.94	3.78	26.18	0.0522	-0.127	-1.557***	0.032**	2.338
107	FOOTWEAR	LENNARDS NIG.	1	3.12	13.25	2.82	13.71	0.0851	0.238	-1.549***	-0.008	3.092**
108	HEALTHCARE	ABOSELDEHYDE	1	2.14	14.94	1.81	15.12	0.0352	0.256	-1.012***	-0.006	1.945
109	HEALTHCARE	BCN	1	0.88	3.40	0.55	4.27	0.3731	0.033	-1.088***	-0.001**	0.471
110	HEALTHCARE	CHRISTLIEB	1	0.11	1.12	-0.23	2.41	0.766	0.027	-0.885***	0.000	-0.388***
111	HEALTHCARE	EKOCORP	2	2.14	22.16	1.82	22.39	0.0234	-0.171	-1.422***	-0.004	1.849
112	HEALTHCARE	EVANS MEDICAL	2	0.99	19.17	0.68	19.37	0.0326	0.003	-1.327**	-0.011	1.014
113	HEALTHCARE	MAY & BAKER NIG.	3	4.77	57.61	4.54	58.16	0.0227	-0.365	-3.259***	-0.029	5.704
114	HEALTHCARE	MORISON INDUSTRIES	2	3.98	25.66	3.68	26.00	0.0335	-0.224	-1.806***	-0.014	4.137
115	HEALTHCARE	NEIMETH INTL. PHARM.	2	1.35	28.75	1.08	29.06	0.0302	0.053	-2.116***	-0.008	1.369
116	HEALTHCARE	PHARMA DEKO	2	1.94	19.44	1.59	19.50	0.0084	-0.060	-0.748*	-0.002	1.511
117	HEALTHCARE	SMITHKLINE BEECHAM NIG.	4	3.80	24.19	3.56	24.68	0.0671	0.244	-2.648***	-0.007	3.917*
118	HOTEL AND TOURISM	TOURIST	4	0.70	7.32	0.55	7.70	0..1004	0.115	-0.985***	0.006	0.006
119	INDUSTRIAL/DOM	ALUMINIUM EXTRUSION	2	3.15	18.11	2.85	18.40	0.0514	-0.272	-1.702***	-0.005	2.92
120	INDUSTRIAL/DOM	ALUMINIUM MAN. OF NIG.	2	8.86	63.40	8.56	64.02	0.0087	1.042	0.09	-0.018	9.453

121	INDUSTRIAL/DOM	B.O.C. GASES	3	6.71	59.08	6.46	59.60	0.0209	1.008*	-2.592**	-0.025	7.613
122	INDUSTRIAL/DOM	EPIC DYNAMICS	1	0.62	9.26	0.28	9.58	0.0584	-0.026	-0.963***	-0.003	0.222
123	INDUSTRIAL/DOM	FIRST ALUMINUM NIG.	3	1.05	20.44	0.77	20.69	0.0452	-0.268	-1.831***	0.000	0.696
124	INDUSTRIAL/DOM	LIZ-OLOFIN & COMPANY	1	8.03	47.05	7.67	47.17	0.011	-0.391	-1.301	-0.023	8.29
125	INDUSTRIAL/DOM	NIG. ENAMELWARE COMPANY	2	7.46	58.02	7.19	58.58	0.012	0.420	-2.437**	-0.014	7.845
126	INDUSTRIAL/DOM	NIG. YEAST&ALCOHOL MAN. PLC.	1	0.75	10.21	0.49	10.49	0.0576	0.224	-1.032***	-0.002	0.421
127	INDUSTRIAL/DOM	OLUWA GLASS COMPANY	2	2.54	27.97	2.20	28.27	0.0154	-0.239	-1.288**	-0.009	2.345
128	INDUSTRIAL/DOM	VITAFOAM NIG.	3	0.86	14.24	0.60	14.80	0.1264	0.006	-2.245***	-0.005	0.786
129	INDUSTRIAL/DOM	VONO PRODUCTS	2	0.47	18.82	0.16	19.07	0.0288	-0.086	-1.338**	-0.006	0.262
130	INSURANCE	A I I C O	3	1.80	29.49	1.56	29.82	0.0522	0.569	-2.599***	0.002	1.588
131	INSURANCE	B A I C O	2	3.53	23.55	3.27	23.80	0.0199	-0.271	-1.394***	0.000	2.924
132	INSURANCE	CONFIDENCE INSURANCE	1	0.98	17.58	0.67	17.92	0.0342	-0.242	-1.319***	-0.005	0.703
133	INSURANCE	CORNER STONE	3	1.46	21.56	1.16	21.71	0.2	-0.111	-1.709**	-0.007	1.338
134	INSURANCE	CRUSADER	3	2.44	20.76	2.15	21.09	0.0571	-0.077	-1.888***	-0.017**	2.756
135	INSURANCE	GNI	3	-0.47	17.25	-0.63	17.76	0.1307	0.411	-2.281***	0.010	-1.119
136	INSURANCE	GUINEA	2	0.90	17.02	0.65	17.69	0.1178	-0.147	-2.507***	-0.012	1.095
137	INSURANCE	LASACO	3	1.68	21.04	1.40	21.40	0.0591	0.230	-1.931	-0.016*	2.025
138	INSURANCE	LAW UNION & ROCK	3	0.66	19.74	0.41	20.24	0.0917	-0.206	-2.519***	-0.012*	0.846
139	INSURANCE	LINKAGE	3	1.13	20.83	1.19	21.40	0.1259	-0.039	-3.35***	-0.019	0.925
140	INSURANCE	MUTUAL BENEFITS ASSURANCE	3	3.32	32.60	3.17	33.06	0.053	0.504	-2.972***	-0.024	3.649
141	INSURANCE	N E M	3	2.29	23.69	2.03	24.05	0.068	0.458	-2.208***	0.017	1.447
142	INSURANCE	NIGER	3	4.91	51.44	4.58	51.63	0.0127	-0.638	-1.614	-0.022	5.254

143	INSURANCE	PRESTIGE	3	2.36	19.04	2.04	19.25	0.0363	-0.242	-1.373***	0.01	1.493
144	INSURANCE	ROYAL EXCHANGE ASSURANCE	3	0.56	17.36	0.24	17.52	0.0435	-0.352	1.18*	0.013	-0.444
145	INSURANCE	SECURITY ASSURANCE	2	3.76	40.77	3.54	41.30	0.0165	0.704	-1.751*	-0.013	4.151
146	INSURANCE	STANDARD ALLIANCE	4	1.43	23.34	1.42	23.69	0.0657	0.198	-2.657***	0.013	0.402
147	INSURANCE	SUN	1	5.57	59.96	5.36	60.44	0.0162	1.661	-0.437	-0.007	6.167
148	INSURANCE	TOWERGATE	1	0.45	7.56	0.06	7.42	0.0382	-0.228	-0.546	0.000	-1.121
149	INSURANCE	U N I C	3	2.34	24.96	2.18	25.65	0.1656	-0.587	-4.374***	-0.003	2.434
150	INSURANCE	WEST AFRICAN PROV. INS. COMP.	3	4.35	21.00	4.12	21.46	0.0462	0.043	-2.323***	-0.006	4.208*
151	INSURANCE	CONTINENTAL REINSURANCE	4	-0.12	26.32	-0.44	26.80	0.1005	0.198	-2.427*	-0.036	1.002
152	MACHINERY	NIG. SEW. MACH. MAN. COMP.	1	0.00	0.84	-0.32	2.31	0.8497	0.007	-0.911***	0.000	-0.466***
153	MACHINERY	STOKVIS	1	0.00	0.90	-0.32	2.35	0.8351	0.027**	-0.916***	0.000	-0.465***
154	MARITIME	JAPAUL OIL&MARITIME SERVICES	4	2.73	30.95	2.71	31.28	0.1063	0.636	-3.164**	-0.063	3.517
155	PACKAGING	ABPLAST	1	1.63	13.74	1.31	14.04	0.0404	-0.019	-1.173***	-0.005	1.38
156	PACKAGING	AVON CROWN CAPS&CONTAINERS	3	3.74	25.07	3.42	25.23	0.0215	0.369	-1.326**	-0.004	3.554
157	PACKAGING	BETA GLASS	3	1.77	17.82	1.46	18.04	0.0474	-0.318	-1.558***	0.004	1.147
158	PACKAGING	C M B /NAMPAK	2	3.94	25.81	3.67	26.26	0.0443	-0.389	-2.261***	0.003	3.452
159	PACKAGING	POLY PRODUCTS	2	3.78	26.19	3.49	26.51	0.0294	-0.304	-1.876***	0.001	3.326
160	PACKAGING	STUDIO PRESS	1	1.30	5.41	0.97	5.90	0.1752	-0.007	-1.043***	0.002	0.723
161	PACKAGING	VAN LEER/GRIEF CONTAINERS	1	1.73	15.99	1.41	16.33	0.0294	-0.055	-1.203**	-0.001	1.329
162	PACKAGING	W A GLASS IND.	2	0.40	2.08	0.07	2.94	0.474	0.046	-0.863***	0.000	-0.07
163	PETROLEUM MARKETING	AFRICAN PETROLEUM	4	1.92	19.65	1.63	19.97	0.0501	-0.155	-1.818***	0.009	1.188
164	PETROLEUM MARKETING	AFROIL	2	6.72	31.95	6.42	32.29	0.0302	0.494	-1.889**	-0.017	7.114**

165	PETROLEUM MARKETING	CONOIL	4	1.19	17.75	0.89	18.10	0.0441	-0.245	-1.575**	-0.001	0.821
166	PETROLEUM MARKETING	ETERNA OIL& GAS	3	4.92	31.66	4.53	31.38	0.0054	-0.392	-0.259	0.015	3.693
167	PETROLEUM MARKETING	MOBIL OIL	4	1.30	11.80	0.98	12.01	0.0524	0.121	-1.091	0.004	0.669
168	PETROLEUM MARKETING	OANDO	4	2.09	15.38	1.79	15.74	0.0693	0.158	-1.571**	-0.012	2.211
169	PETROLEUM MARKETING	TEXACO	4	2.00	17.45	1.70	17.59	0.0557	0.265	-1.583**	0.007	1.362
170	PETROLEUM MARKETING	TOTALFINAELF	4	1.55	9.70	1.24	10.07	0.1181	0.268	-1.302***	0.005	0.981
171	PETROLEUM MARKETING	AGIP	4	-0.27	20.15	-0.98	20.31	0.0283	0.412	-0.95	0.002	-0.344
172	PRINTING AND PUBLISHING	ACADEMY PRESS	2	2.23	15.03	1.90	15.22	0.0493	0.457**	-0.959**	-0.007	2.116
173	PRINTING AND PUBLISHING	DAILY TIMES	1	0.28	1.22	-0.04	2.78	0.7728	-0.021	-1.05***	0.000	-0.174
174	PRINTING AND PUBLISHING	LONGMAN	3	3.23	19.90	2.97	20.16	0.1017	0.584	-2.269**	-0.014*	3.626*
175	PRINTING AND PUBLISHING	UNIVERSITY PRESS	2	3.22	21.78	2.96	22.22	0.0849	0.475	-2.436***	-0.013	3.564*
176	REAL ESTATE	UACN PROPERTY DEV.	4	2.96	14.88	2.67	15.13	0.088	0.408	-1.565**	0.009*	2.297*
177	TEXTILES	ABA TEXTILE MILLS	2	-0.40	1.74	-0.74	2.77	0.5964	0.036	-0.885***	-0.002	-0.804***
178	TEXTILES	AFPRINT	2	2.52	29.43	2.32	29.94	0.088	-0.139	-3.74***	-0.013	2.973
179	TEXTILES	ASABA TEXTILE MILL	2	-0.12	0.70	-0.46	2.37	0.8919	0.0239	-0.937***	0.000	-0.62***
180	TEXTILES	E N P E E	2	-0.17	4.69	-0.32	5.05	0.1923	-0.065	-1.169***	-0.002	-0.618
181	TEXTILES	NIG. TEXTILE MILL	1	-0.02	0.23	-0.18	1.86	0.9515	0.013	-0.989***	0.000	-0.556***
182	TEXTILES	UNITED NIG. TEXTILES	3	1.61	22.34	1.35	22.84	0.0622	-0.316	-2.371***	0.004	1.117
183	FOREIGN LISTING	M-NET/SUPERSPORT	2	0.14	4.36	-0.33	4.67	0.1973	0.189**	-0.807***	0.001	-0.362
184	FOREIGN LISTING	ECOBANK TRANSACTIONAL CORPORATED	1	-3.20	22.21	-3.52	22.50	0.0394	0.129	-1.219**	0.033	-4.1***
185	SECOND TIER	ADSWITCH	4	2.97	29.20	2.66	29.46	0.0161	-0.029	-1.536***	-0.008	2.873

186	SECOND TIER	AFRIK PHARMA	1	0.01	1.37	-0.32	2.62	0.7238	-0.002	-0.954***	0.000	-0.463***
187	SECOND TIER	ANINO INTL.	1	0.00	0.00	-0.33	2.20	0.9756	0.011*	-0.931***	0.000	-0.473***
188	SECOND TIER	CAPITAL OIL	1	2.94	23.62	2.67	24.22	0.0862	-0.873	-2.502***	-0.005	2.739
189	SECOND TIER	CUTIX	1	4.47	24.00	4.33	24.58	0.0256	-0.058	-2.054	-0.001	3.934
190	SECOND TIER	FLEXIBLE PACKAGING	2	0.00	0.00	-0.33	2.20	0.000	0.011*	-0.931***	0.000	-0.473***
191	SECOND TIER	JULI	1	2.84	19.22	2.50	19.50	0.0249	-0.154	-1.226***	-0.005	2.524
192	SECOND TIER	KRABO	1	0.00	0.00	-0.33	2.20	0.9756	0.011*	-0.931***	0.000	-0.473***
193	SECOND TIER	NEWPAC	1	0.04	0.45	-0.28	2.29	0.9346	0.005	-0.95***	0.001*	-0.427***
194	SECOND TIER	RAK UNITY PET. COMP.	1	0.70	13.75	0.37	14.00	0.0466	-0.362	-1.000***	-0.006	0.409
195	SECOND TIER	ROKANA	1	0.16	1.07	-0.17	2.50	0.8131	0.025***	-0.959***	0.001**	-0.295***
196	SECOND TIER	SMURFIT PRINT/SMART PRODUCT	1	0.05	1.11	-0.28	2.49	0.7986	0.006	-0.948***	0.001*	-0.419***
197	SECOND TIER	TROPICAL PET. PRODUCTS	1	0.31	1.81	-0.02	2.92	0.6177	-0.021	-0.979***	-0.002*	-0.098
198	SECOND TIER	UDEOFSON GARMENT FACT.	1	0.00	0.00	-0.33	2.20	0.9756	0.011*	-0.931***	0.000	-0.473***
199	SECOND TIER	UNION VENTURES & PET.	1	0.20	1.26	-0.13	2.37	0.7051	0.009	-0.855***	0.000	-0.308***
200	SECOND TIER	W. A. ALUM. PRODUCTS	1	0.00	0.00	-0.33	2.20	0.9756	0.011*	-0.931***	0.000	-0.473***

*Note: *, ** and *** depict significance at the 10%, 5% and 1% levels respectively*
Source: Author's computation: underlying month-end data from NSE Daily Official List, World Bank Databank and MSCI Databank