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Financial contagion in African emerging economies

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Financial contagion in African emerging economies.

By

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A dissertation submitted to the Wits Business School, Faculty of Commerce, Law and Management, in partial fulfilment of the requirements in candidacy for the of degree

Master of Management in Finance and Investments

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DESSERTATION DECLARATION

I declare this dissertation is my unaided work submitted for the degree Master of Management in Management in Finance and Investments at the Wits Business School, Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg. The dissertation has not been submitted before for any degree or examination at any other university.



Asabea Shirley Ahwireng-Obeng

15th day of May 2013

DEDICATION

To the educationists among who I have been privileged to grow. This work is dedicated to my grandfather, who did not live to see me accomplish my dream, my late auntie, who persuaded on me to pursue my finance degree and, my nuclear family, for their prayers, care and support.

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ABSTRACT

The 2008 sub-prime financial crisis, which originated from the United States, caused immense stress in emerging economies. Studies have suggested that, one of the direct causes that deepened and dispersed the turmoil is globalization. Still, there is increased likelihood that globalisation will continue to be a factor threatening the stability of emerging economies since interconnectedness among African emerging countries with themselves and the rest of the world, for example, continues to increase. The growing incorporation of African emerging countries with the global economy translates to an increased vulnerability to crisis from other markets. Thus, it is imperative for emerging countries to develop financial safety measures which will permit the pursuit of globalization without compromising financial and economic stability. This study first investigates whether contagion is present in African emerging economies; where present, it seeks the cause of the contagion - fundamentals or herd-driven behaviour by investors. Next, the connections between African emerging countries and nations which colonised them are explored as a source of increased vulnerability. Lastly, a threshold in which a balance from the risk of contagion and the benefits between integration is sought. Aided by a dynamic set of contagion, vulnerability and herd behaviour models, panel data analysis is considered the appropriate econometric technique for the study. Empirical results suggest the presence of contagion in African emerging countries. The vast majority of African emerging economies are significantly vulnerable to contagion from both regional and global markets. Herd behaviour is found to be present for the sample of five African countries at varying intensities. Nigeria is the least vulnerable to contagion, followed by Kenya. South Africa, Egypt and Mauritius are the lowest with vulnerability index rankings of 3, 4 and 5 respectively. These results also indicate that integration had been beneficial to African emerging countries. Results suggest that random walk elements must be used in modelling equity returns of African emerging markets. A risk/return balance between contagion and integration would be a wise preoccupation. Furthermore, improvement in the legal system, better governance and a stable political environment will lessen the burden of contagion in African emerging countries.

TABLE OF CONTENTS

DESSERTATION DECLARATION ii

DEDICATION iii

ACKNOWLEDGEMENTS iv

ABSTRACT v

TABLE OF CONTENTS vi

LIST OF DIAGRAMS vii

LIST OF TABLES xi

CHAPTER 1: INTRODUCTION 1

1.1. Context of the study 1

1.2. The research problem 4

1.3. Purpose of the study 5

1.4. Overview of methodology 6

1.5. Significance of the study 8

1.6. Outline of the study 8

CHAPTER 2: LITERATURE REVIEW 9

2.1. Introduction 9

2.2. Background literature 10

2.3. African stock markets 12

2.4. Financial contagion 17

2.4.1. Models of contagion 20

2.5. Financial integration 22

2.6. Emerging market research 26

2.6.1. What are Emerging Markets? 27

2.7. Summary 29

CHAPTER 3: METHEDOLOGY 30

3.1. Introduction 30

3.2. Hypothesis and model 30

3.2.1 Hypothesis 30

3.2.2 Model specification. 31

3.2.2.1 Unit root test 31

3.2.2.2 An adjusted correlation coefficient and bootstrap test for contagion 33

3.2.2.3 A model of threshold and vulnerability to financial contagion 36

3.2.2.4 A model of herd behaviour and Cont-Bouchaud Model 41

3.3 Data and variables 44

3.3.1. Dependent variables 44

3.2.2. Independent variables 44

3.4. Data and sample selection 46

3.4.1. Construction of variables 47

3.4.1.1. Stock market capitalisation to GDP Gross Domestic Product (GDP) ratio 47
3.4.1.2. Current account balance as a percentage of GDP 47
3.4.1.3 External debt to colonised country as a percentage of GDP 48
3.4.1.4 Political stability 48
3.5 Estimating methods 49
3.5.1 Sensitivity analysis 49
3.6 Conclusion 50

CHAPTER 4: DATA ANALYSIS AND INTERPRETATION 51
4.1. Introduction 51
4.2. Descriptive statistics of panel data. 52
4.3. Unit root tests 56
4.4. An adjusted correlation coefficient and bootstrap test for contagion 58
4.5. A model of threshold and vulnerability to financial contagion 61
4.6. Test for contagion 63
4.7. Herd behaviour 65
4.8. Vulnerability index 72
4.8.1. Exchange rate 73
4.8.2. External debt 74
4.8.3. Current account 75
4.8.4. Growth rate of exports 76
4.8.5. Political stability 76
4.9 Conclusion 77

CHAPTER 5: SUMMARY AND CONCLUSIONS 79
5.1. Introduction 79
5.2. Possible onclusions 80
5.3. Recommendations 82

REFERENCES 86

APPENDICES 101

LIST OF DIAGRAMS

DIAGRAM **PAGE**

Diagram 4.1: Stock market returns of African emerging markets over complete sample period..... 54

Diagram 4.2: Excess return of African emerging market..... 65

LIST OF TABLES

TABLE **PAGE**

Table 3.1: Indicators and weights applied in vulnerability indices..... 39

Table 3.2: Summary of explanatory variables used by various authors of empirical literature of contagion..... 44

Table 3.3: Transparency International's 2011 Corruption Perceptions Index..... 48

Table 4.1: Logged summary descriptive statistics for the entire sample of African emerging markets..... 51

Table 4.2.1: Tranquil Pre-crisis period from 01/ 01/ 2005 to 31/07/2007..... 53

Table 4.2.2: Crisis period and beyond from 01/08/2007-01/09/2012..... 53

Table 4.3: Empirical results for the Augmented Dickey Fuller (ADF) test and the Phillips-Peron (PP) test for the whole sample period..... 56

Table 4.4: A bootstrap test for contagion..... 59

Table 4.5: Estimation outcomes of the parameters of vulnerability-regional factor..... 61

Table 4.5.1: Estimation outcomes of the parameters of vulnerability-global factor..... 61

Table 4.6: Time series fixed time effect test for contagion..... 63

Table 4.7: Measurements of the dependent variables for each nominated African emerging country..... 71

Table 4.8.: Vulnerability index results of specified African emerging countries..... 72

CHAPTER 1: OVERVIEW OF STUDY

1.1 Context of Study

The Mexican debt crisis of 1982, the 1994 Mexican peso crisis, the 1997 Asian crisis, the consequent Brazilian and Russian crises of 1998 and the most recent 2008 subprime mortgage crises have presented a wealth of data which may be used to analyze the transmission of financial shocks from one market to another (Das, 2003).These crises originated in a single country but had devastating effects on entire regions and in some cases the global marketplace.

Since financial liberalization, which occurred in the latter part of the 1980's, emerging markets have enjoyed greater prominence in the global economy. As investors seek higher risk and returns, emerging markets have become essential participants in global growth, to such an extent that their return performance has surpassed that of developed economies (Banegas, 2011; IMF, 2010). The 2008 sub-prime financial crisis in particular, has ignited recent discussion about crisis in one country causing crises in other countries. For example, the recent massive job losses in South Africa have been blamed on the housing debt market failure in the United States (US). One may wonder how a country, such as the US, which is geographically relatively far away, can have a significant impact on continents distant from the Americas. This has led to growing investigations into the financial linkages that exist between countries. In light of these observations, the notion of contagion has increasingly become the center of debates among academics and practitioners.

According to Taimur & Ilan (1999) contagion occurs when the ill fate of one country transmits to other susceptible countries. Financial contagion is a circumstance during which financial difficulties in an economy bring about financial problems in ordinarily healthy economies. The context of this study recognizes contagion as a crisis which originates in one

emerging market economy and is diffused to another emerging market economy or an entire region (Das, 2003).

Wyplosz (2001) discovered that capital mobility and external financial liberalization have greater effects on the destabilization of emerging economies than their developed counterparts. The concurrent shifts of markets may be attributed to shared external variables, trade linkages, or third-market competition related spillovers which are increased by globalization or market sentiments (Taimur & Ilan, 1999). Additionally, Das (2003) notes that globalization has increased the likelihood and frequency of contagion. It does not appear that globalization in Africa or world-wide globalization is going to subside. In fact, literature suggests that markets are becoming more integrated than ever before. Literature by financial theorists (Aghion, Bolton & Dewatripont, 2000; Das, 2000; Schmukler & Zoido-Lobaton, 2001) has ascertained that factors other than fundamentals promulgate contagion. Herding behavior explains contagion among economies which are not linked by fundamentals. This, however, is contrary to the view of Clark & Huang (2006) that only financial fundamentals should be used to explain contagion. This research study adopts the stance of Das (2003) that financial fundamentals and investor behavior are sources of financial contagion, as this allows for a more holistic view of financial contagion in emerging African markets.

If a large negative shock hits a country, the financial market may choose to default, causing an increase in interest rates of international capital markets (Clark & Huang 2006). Markets with similar degrees of global indebtedness will then be more susceptible to external shocks and may cause an increase in international debt interest rates which may lead to financial crises with a wider spread (Clark & Huang 2006). The process involved in resolving such a crises necessitates currency depreciation (Das, 2003). It would follow then that if a crisis in a specific East African emerging market escalates, nearby markets will instantaneously face strain because their exports are now uncompetitive in relation to neighboring markets. Furthermore, these neighboring markets will not be viewed as attractive destinations for foreign direct investment (FDI). This may have dire consequences for a region as emerging

markets are known to compete among themselves to attract flows of FDI in efforts to maintain their industrial activity. The trickledown effect is a downward force on the value of assets and the possible development of a crisis-like state of affairs for them (Das, 2000).

The potential for elevated returns from emerging African markets is compelling to global investors and financiers, and is imperative for growth in African markets (Kehl, 2007). Risk management measures and efforts to prevent and manage contagion are thus important for the control of financial contagion in markets broadly and African emerging markets specifically. Financial risk brings about uncertainty and the possibility of suffering losses for the key party in a financial transaction, or the possibility of deviation between the actual and expected proceeds under the influence of various unstable factors (Song & Li, 2008).

Masson (1998) asserts that it is possible for any of the above mentioned factors to cause financial contagion. It is therefore crucial that the particular elements propelling distress in the markets are identified for policy makers and to manage and investors to take into account in their investment decision-making. Furthermore, the extent of correlation between markets must be determined before contagion is said to take place. If historical data shows that the cross-correlation of markets is high, then the transmission of an acute shock or crises from the distressed market to others should be expected. If appreciable increases in the correlations among markets occur then some contagion may be considered. If not, the markets may merely be reacting to each other. Should correlations among markets change significantly after a crisis has commenced, contagion is said to have occurred (Baig & Goldfajn, 1999).

Integration of financial markets has caused an increase in the short term capital flows in and out of African emerging markets but, not to the same extent as other emerging markets (such as Asia) . Collins & Biekpe (2003) attribute this to the relatively small volume of listed companies in the African markets, with the exception of South Africa. Furthermore, the authors suggest that the low foreign investment ceilings, limited country funds and low

levels of development in these markets would not subject them to the same extent of contagion as their more developed counterparts. The increase in global integration has been beneficial to the growth of many markets and economies including those of Africa. Bekaert, Harvey & Lumsdaine (2002) demonstrate that subsequent to integration, equity markets tend to grow more, increase in liquidity and volatility, decrease their cost of capital, improve credit ratings, appreciate in real exchange rates, and experience higher economic growth. However, these benefits of integration also increase the likelihood of contagion. This study extends the discourse of contagion in African emerging markets to highlight possible ways in which the crises can be contained and/ or managed in the region.

1.2 The Research Problem

Investors are increasingly looking to emerging markets to reap the benefits of portfolio diversification (Ismailescu, 2008); therefore, crises in emerging capital markets could have adverse effects on investors holding emerging market securities. The literature proposes that the competitive rates of return which emerging markets have presented are an appealing investment prospect for foreign investors (Abumustafa, 2007).These markets offer exciting investment return prospects for foreign investment and international finance (Kehl, 2007) But, this increasing interest in and attraction to emerging markets has been linked to escalating unease about high levels of volatility and volatility overflows between emerging markets which may cause the undermining of securities and a decrease of FDI (Buchanan, English & Gordon, 2011). The outcomes of excessive volatility, volatility spillovers and the devaluation of securities can cause a decline in sustainable growth rates and living standards (Das, 2003). According to Kehl (2007) important aspects of emerging markets in Africa continue to receive limited research. The African region has not received adequate literature about advances in international capital flows and the collected works about the issue are thin. Other studies have examined Africa's aggregate private capital flows but have failed to distinguish between emerging and frontier African countries. This implies that policy measures to manage capital flows in and out of Africa do not take account of distinctive characteristics of these two categories (Kodongo & Ojah, 2012). Easterly and Levine (1998) found that the credibility of the policies followed in one African

country has a huge impact on the stability and vulnerability to contagion on its neighbors. Further studies into what policies individual countries and groups of countries can take to alleviate or prevent contagion will allow policy makers to mitigate its negative effects. The problem in the limited research means also that reactive rather than proactive measures are taken when a contagion occurs. Therefore, the data generated in this study and their policy implications will enable policy makers to make informed evaluations and adopt country and group specific strategies to safeguard emerging African markets from adverse effects of financial contagion.

The increasing integration of African markets into the rest of the world is beneficial for Africa's growth and development. However, integration and globalization make African markets more susceptible to the affliction of external shocks which may create adverse effects on Africa's economic growth. This disjuncture must be addressed so that policy makers, investors and other stakeholders can fine-tune procedures and strategies which enable them to gain the benefits of integration while circumventing contagion exposures as much as possible. The crux of the research problem is the lack of knowledge of financial contagion in African emerging markets which therefore prevent policymakers from making explicit, informed evaluations and strategies to safeguard emerging African markets from the adverse effects of financial contagion.

1.3 Purpose of the study

The research investigates the problem of financial contagion in African markets. It examines specific mechanisms which contribute to financial contagion in African emerging markets. Furthermore, the study explores why some crises spread and cause contagion while others do not. An understanding of the vital function of these markets will alert leaders, policymakers and citizens of actions which need to be taken to help shape markets and to make these markets less vulnerable to financial contagion. Therefore, in studying these issues the following specific questions will be addressed.

1) Is contagion in African emerging markets determined by fundamentals or herd-driven behavior? 2) Are the contagion effects due to the historically intimate relationships? 3) Can an emerging market in Africa enjoy the benefits of integration without experiencing contagion? 4) To what extent must markets be integrated before being vulnerable to contagion?

1.4 Overview of Methodology

A quantitative analytical approach is used in this study. Five African countries are covered in the study namely Nigeria, Egypt, South Africa, Kenya and Mauritius. The countries are selected according to maturity of capital markets, geographic location, availability of data and the cultural dissimilarities to each other. Secondary data used in the study are obtained from Standard and Poor's, IMF Working Papers, government departments, annual reports and index services (Diamantopoulos & Schlegelmilch, 2000). The study period will stretch over two phases: the pre-crises period which is from January 1 2003 to July 7 2007 and, the crises period which extends from January 1 2008 to May 15 2012. The data will comprise of average weekly stock prices (closing prices from Tuesday to Tuesday) of the capital markets for the five selected countries. Weekly data is used to circumvent possible bias due to non-synchronous trading among the selected countries. Additionally, descriptive statistics will be applied to the sample.

Contagion has typically been measured by three unique methods: analysis of cross market correlation coefficients, cointegration and Vector auto regression (VAR). Dummy variables will be used to measure herd behavior. Cross-market correlation coefficients are measured by the change of the simple correlation coefficient in periods where a market is experiencing turmoil. The method measures the correlation in a country variable between markets during a pre-turmoil and post-turmoil. This method is employed by King and Wadhwani (1990) when they carried out a test of stock market correlations among US, UK and Japan. The approach was also utilized by Calvo and Reinhart (1996) when they tested for stock market contagion subsequent to the Mexican peso crisis. Both studies found that

correlations elevated subsequent crises and therefore, a presence of contagion (Collins & Biekpe, 2003).

A model of threshold and vulnerability to financial contagion is the second test to be used in the study. The purpose of the test is to evaluate the specified African emerging markets vulnerability to financial contagion. Joint vulnerability using, the multivariate test of contagion as presented by Baur and Fry (2006) was measured. The fixed time effect of the model captures time-varying joint positive and negative movements across markets that are not explained by the loading factors over the period of study. The vulnerability index supplements the joint variability technique and a Cont-Bouchaud Model of herd behavior displayed the degree of herd behavior present in the sample (Baur and Fry, 2006). A threshold regression model will be used to assess the degree to which integration of the selected African markets can occur before contagion is reached during pre-crises and post-crises periods (Shively, 2001).

Herd behavior of investors has been scrutinized through the use of dummy variables. Such an approach is valuable in the study because it can accommodate qualitative information and, allow for this information to be evaluated in a quantitative manner. Four dummy variables are selected for this study and to investigate herd behavior in financial contagion. They are external debt to colonized country, market capitalization to GDP ratio, political stability and current account balance as a percentage of GDP (Kehl, 2007) .

The Microsoft Excel, SPSS data entry method and Stata are programs which will be used, and results will be verified by Mr Chi of the statistics department of The University of the Witwatersrand in Johannesburg, South Africa.

1.5 Significance of the study

The findings of this study should enhance understanding of the broader financial situation of markets. Investigation into contagion in emerging markets is beneficial to domestic and foreign investors, and local policy makers. Kehl (2007) grasps the importance of studies such as this when he expresses how practitioners and academics of finance and investment are of the agreement that the growth and development of African emerging markets is critical for the growth of developing Africa. Thus, this study broadly participates positively in the growth and development of African emerging markets. This study seeks to generate information and empirical data that will strengthen the position of academics, leaders, politicians, and policy makers in ensuring the growth of developing Africa through the control and management of contagion in African emerging markets.

1.6 Outline of the study

Chapter 2 presents a fuller literature review of the study. The concepts of contagion, globalization, financial integration, risk management and emerging markets are a prominent feature in this chapter. The methodology of the study is presented in chapter 3. Thorough analyses and interpretation of the results populates chapter 4. Finally, conclusions, recommendations and implications of the study appear in Chapter 5.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Comprehension of theories of financial contagion is an essential foundation for the empirical testing of the contribution of contagion to the economic growth and development of African emerging countries. Given that the intention of this research is to study the presence and existence of financial contagion in African emerging markets, it is imperative to present appropriate theory prior to measuring. The desire to examine financial contagion in African emerging markets brings into focus the intricacy encompassing this topic. Nhamo (2011) suggests that such complexity cannot be decomposed from a simple assessment of the wide range of theories on emerging markets, crisis transfers and African economies. Instead, this requires identifying a network of theories that may help to discover how the main conceptual issues are related and the phenomena tested empirically. An approach of this kind is valuable as it affords one to scrutinise, evaluate and rationalise information to establish a justified and informed deduction, recommendations and/or policy suggestions.

The following review, therefore, offers concepts, constructs and theories concerning financial contagion, emerging markets and African stock markets. This is conducted with the awareness that a theory will assist one to recognise which concept or construct has logical relevance to a particular phenomenon and if so how (Bhattacherjee, 2012). Among the constructs to be examined are those relating to financial contagion, such as regional integration and characteristics of African stock markets and the seminal findings of Nurkse's (1944) narrative of competitive devaluations. The applicability of the theories to the study is described in conjunction with the deliberations and debates surrounding them.

2.2 Background Literature

Literature suggests that the main avenues of financial contagion are real interdependence, similar early circumstances of markets and financial linkages (Pretorius & de Beer, 2004). Therefore, contagion has an increased likelihood in markets which partake in bilateral trade or trade competition in third markets to a relatively large degree. Financial linkages occur directly and indirectly and are sources of contagion (Pretorius & de Beer, 2004). The notion of contagion can be complex to compute. It is commonly described as the dispersal of market disturbances from one market to another (Collins & Biekpe, 2003). Contagion sources are divided into two categories: financial fundamentals and investor behavior. Financial fundamentals occur due to spillovers as a consequence of normal interdependencies between economies. Investor behavior explains the behavior of investors and cannot be explained by fundamentals (Collins & Biekpe, 2003). This can explain why economies with no fundamental linkages are also affected by contagion. A rational account for this phenomenon would be that herding behavior triggers the exit of investors from economies which do not share fundamental linkages (Das, 2003).

The 2008 financial crisis that was prompted by the sub-prime mortgages from the United States hit the global economy with a vengeance. Despite the knowledge that the global economic crisis originated from industrialized nations, it has caused stress in emerging economies. According to Kap-Yong (2009), one of the direct causes that deepened and dispersed the turmoil of the recent 2008 financial crises is globalization. He adds that there is an elevated likelihood that it will continue to be a factor threatening the stabilization of emerging economies. Financial globalization, described as global connections through cross-border capital flows and asset holdings, has developed into an increasingly pertinent issue for emerging markets as they incorporate financially with the entire world (Kose, Ayhan, Eswar & Prasad, 2010).

The relevance of financial globalization to emerging economies has intensified for numerous reasons including the result of its altering composition on the balance sheets of countries,

its task in the spread of global financial shocks, it's advantages regarding the financial development of international risk sharing and smoothing of the business cycle, and the repercussions of the above on prudential and macroeconomic policies (Levy-Yeyati & Williams, 2011). Still, the assumption that the degree to which globalization influences asset prices and more broadly, economic functioning is associated with the actual intensity and sensitivity of the cross-border flows is reasonable. Mishkin (2007) argues that intuitively, more closely dispersed financial integration could encourage the diffusion of shocks in financial centers to developing, emerging and peripheral advanced markets, thus establishing a secondary supply of financial (and eventually real) instability. It is therefore imperative for emerging countries to develop foreign currency and financial safety measures which will permit the pursuit of globalization without compromising financial and economic stability (Kap-Young, 2009).

Despite the ample knowledge of the characteristics of emerging economies, there appears to be no broad and clearly accepted definition for this group of economies. For example, the International Monetary Fund (IMF) typically positions countries into three categories: advanced economies, developing countries, and countries in transition. Therefore, emerging market economies are not overtly defined, though the term is extensively used (Blejer & Skreb, 2002). Wijnholds and Kapteyn (2001), describe emerging markets plainly as developing nations that have access to private capital flows. Literature points out that there are fundamental dissimilarities between developed and emerging markets in their characteristics. Developed markets tend to be more efficient and liquid than developing or emerging market economies (Andjelic, Djcikovic & Radisic, 2010). Also, in comparison with developed markets, emerging markets are reputed to engage in financial market reforms, experience recurrent external and internal financial shocks, make frequent credit rating changes, face high levels of country risk, engage in an elevated level of insider trading and suffer fluctuations in courses of foreign currency exchange rate (Bekaert & Harvey, 1997).

Andjelic et al, (2010) take note of the important role financial risk management has assumed under the conditions of the recent 2008 global financial crisis. Therefore, viewed

from a financial standpoint, risk is related to the undesirable effects of environmental uncertainties on the earnings development of corporate business activities. Financial risk more specifically, is the risk linked with the requirements and promises occurring out of the utilization of added debt finance. Hence, the increase of risk could result in an elevated probability of bankruptcy. One should note however that, at any given level of business risk, the probability of bankruptcy will be positively related to the company's financial risk (Abor, Sarpong-Kumankoma, Fiawoyife & Osei, 2009).

2.3 African stock markets

Africa is a continent composed of 54 countries. The continent is culturally and economically diverse with financial systems which are as assorted as the countries themselves. Holistically, the African continent has been, and remains, the most economically poor territory of the world (Allen, Otchere and Senbet, 2011). However, the economies appear to be improving. Theobald (2012) suggests that instead of being viewed as the continent of corruption, civil war and disease, Africa has made enormous advances in the development of its institutions. He goes on to express the evidence of this in the increasing number of healthy, stable democracies that have handed over power to new democratically elected governing parties without conflicts. This does not express an absence of distress or challenges on the continent but, it does reveal the resounding opportunities and promise held by Africa.

Growth and advancement in the African continent extends to its capital markets. Massa (2009) contends that prior to the 2008 sub-prime crises, which caused a global financial meltdown, the equity market sector in Africa expanded and developed in an extremely short time. This concurs with the findings of Senbet and Otchere, (2008) that there has been swift growth in the quantity of stock exchanges and a boom of stock market capitalisation over the last two decades. Now, there are approximately twenty three stock exchanges including two regional stock exchanges functioning in Africa (Nkontchou, 2010) from a mere five stock exchanges twenty years ago (Allen et al,2011). Nkontchou (2010) takes an

optimistic stance on African stock markets when he postulates that these markets are becoming bigger players in the provision of capital for the private sector, mostly in sub-Saharan telecommunication and financial services. He adds that African stock markets also perform a critical role in making available alternative investment opportunities for savings. The previous point was seen in Nigeria where the majority of the banking sector's recapitalisation was attained by directing local savings into the stock market (Bakare, 2011) .

Stock markets, more specifically stock exchanges, are the primarily mechanisms for trade and exchange of stocks. The appeal and value of stock markets to Africa can be understood when one appreciates the many functions carried out by stock markets (Senbet and Otchere, 2008). Enisan and Olufisayo (2009) suggest that by improving the collection of financial instruments accessible to savers who want to diversify their portfolios, African stock markets support the mobilisation of domestic savings. They afford share ownership opportunities and provide investment outlets to foreign and domestic savings. Thus, in volatile environments, such as those of many African countries, stock markets act as more than savings and capital mobilisation mechanisms- they support and assist tasks such as the allocation and distribution of risk between market participants (Senbet and Otchere, 2008). The above findings of some of the functions of stock market are in agreement with the results of studies by Levine and Zervos (1998) as they imply that the establishment and development of African stock markets will positively influence growth of the continent through the enhancement of productivity and capital accumulation. Allen et al, 2011);Magnusson and Wydick (2002) echo this sentiment in their assertion that the expectation of stock markets is to increase the speed of economic growth by amplifying the quality and quantity of investment and enhancing domestic savings. Odera (2012) endorses the suggestions of these authors by acquiescing that stock markets have the ability to positively affect economic growth by motivating individuals to save and also by providing firm financing avenues.

The notion that financial development fosters growth was initially proposed by Schumpeter (1912). Numerous other authors (Goldsmith, 1969; Mckinnon, 1973; Shaw, 1973) are in

agreement that financial development is essential for the achievement of economic growth. However, Senbet and Otchere (2008) suggest that the belief that stock markets in Africa will lead to economic growth is based on data from other regions and that studies on stock markets in Africa is limited. Yet, Yartey and Adjasi (2007), while cautioning the weak correlations due to the control of extraneous variables, find that African evidence is congruent with the accessible evidence from other international settings. On the other hand, authors such as Massa (2009) suggests that although stock market development could be a means for economic growth and thus assist African nations overcome growth bottlenecks, Africa has obvious inhibitors. Senbet and Otchere, (2008) point out that in spite of the brisk development in African stock markets, they continue to be illiquid and thin, with the exception of Egypt and South Africa. Moreover, the continent's average market capitalisation, excluding South Africa, is considerably less than that its Asian counterparts of similar size and maturity. Furthermore, in the majority of African stock markets, only a small number of stocks are traded, and these stocks frequently denote a substantial segment of the aggregate market capitalization (Piesse and Hearn, 2005; Andrianaivo and Yartey, 2010). Odera (2012) suggests that non-active stocks of African stock markets are subject to severe informational and disclosure inadequacies. Findings such as this lead authors such as Jefferis and Smith (2005) to conclude that the majority of African stock markets are inefficient, insinuating that all available information is not reflected in stock prices. This suggests that stocks are not consequently priced correctly at their value at equilibrium. Nkontchou (2010) reiterates concerns with the deficiency in information when he observes that notwithstanding recent achievements, the progression of African financial markets is hampered by a lack of correct data which impedes the institutions and governments from developing and executing adequate strategies. Moreover, Senbet and Otchere, (2008) assert that management and guidance by regulatory authorities of African stock markets is frequently insufficient.

Critics of stock markets in Africa such as Singh(1997) emphasize that in healthy stock markets pricing and takeover mechanisms bring about lesser rates of long term investments and increases in short term investments. The author goes on to advise that in African stock markets irrational and even deviant incentives are used to reward managers for profitable

financial engineering rather than rewards for establishing new prosperity by means of organic growth. Odera (2012) notes that this occurs due to the especially speedy reaction of prices to an assortment of information types which influence financial market expectations. Thus, Binswagner (1999), implies that prices on African stock markets have a tendency to be extremely volatile and enable investors to receive profits in brief time periods. Complications, such as those mentioned above, in the effectiveness and efficiency of African stock markets are present and persistent in the continent because of the macroeconomic volatility and relatively weak regulatory institutions of African countries (Odera, 2012).

The effectiveness and efficiency of African stock markets rely heavily on institutions and this idea has been supported by a sizeable body of evidence (Andrianaivo and Yartey, 2010). It has been established that legal systems which exemplified contract enforcement, openness and the safeguard of property rights are essential characteristics for capital market development (Billmeier and Massa, 2009). Pogano (1993) for instance, suggests that the presence of rules, guidelines and transparency in African markets amplifies investor confidence and has a substantial positive influence on the progression of the continents financial markets. Pistor, Raiser and Gelfer (2000) highlight the critical value of efficiency of legal establishments in African financial development. These findings are in harmony with implications of Jayusuriya (2005) that volatility in many African markets tends to be lessened by sounder institutions. Moreover, Lombardo and Pagano (2000) demonstrate that the total returns of a stock market are positively correlated, in stock markets, with less government corruption, reverence and regard for law, efficient judicial systems and little risk of repudiation of contracts and nationalization. According to Mlambo and Biekpe (2007), certain African stock markets were founded against the milieu of feeble legislative and regulatory structures thus elucidating, to a certain extent, why various African stock markets are unable to contend with capital market dynamics. Mlambo and Biekpe (2007) illustrate these inadequacies in their proposition that many African stock markets possess insufficient or non-existent legislation to prevent insider trading. The deficit has augmented the view that African stock markets are not efficient thus negatively affecting investment. It is worthy to note however, that International Monetary Fund (IMF) (2003) established substantial progress in numerous African nations in terms of institutional and regulatory

structures which oversee and regulate fiscal capacity building and investment. One may deduce that continuations of such trends are worthwhile strides for African stock markets as they become bigger players in the global stock market arena.

Jefferis and Smith (2005) established that the increasing size of African stock markets is due to the capacity these markets have for elevated returns and diversification benefits which are brought about by low correlations with other markets. Allen et al (2011), note that this occurs is in spite of the profound hardship confronted by African stock markets. As mentioned, with the exception of Egypt and South Africa, African stock markets are the slightest of all regions in the world in terms of market capitalization and quantity of listed firms. Yartey and Adyasi (2007) also observed these attributes are hindrances to the development of African stock markets.

Odera (2012), identifies low liquidity as a further impediment to the growth and development of African stock markets. Allen et al, (2011) define liquidity as a gauge which indicates the overall trading activity of a market. This implies that there is greater difficulty for local markets with their own trading system, market analysis and brokers to be supported in view of the minimal business volume. According to Kenny and Moss (1998), a 1995 survey indicates that of the twelve most illiquid stock exchanges, eight were in Africa. The authors account this severe volatility to the slight size disposition, liquidity deficiency and frequently erratic economic and political situations. Nevertheless, Odera (2012) recommends that several of the bottlenecks that restricted the increased involvement of foreign investors looking to participate in African markets increasingly are being reduced. In support of Odera (2012), Jefferis and Smith, (2005) suggest that numerous African countries have liberalised their exchange controls on both capital and current accounts thus easing the entry and exit of investors.

Beck (2010) argues that the main avenue for an increased rate of growth of African stock markets is through enhancements in the allotment of resources and productivity growth. It

is against this backdrop that Beck, Fuchs, Cull, Fuchs, Getenga, , Gatere, Randa and Trandafir (2010) indicate concerns that, following over 10 years of financial and macroeconomic restructurings, the superficiality of finance in Africa is disturbing. This shallowness is particularly distressing given the potential African stock markets have to nurture and promote economic growth and achieve the Millenium Development Goal of reducing poverty levels by half by 2015 (Report on the Millennium Development Goals, 2012).

2.4 Financial Contagion

Theory suggests that as markets become more accessible to foreign investors and exchange regulations are eased, their susceptibility to big and abrupt extractions of capital is amplified (Sander and Kleimeier, 2003). Recent history, such as the Mexican crisis of 1994, the East Asian crisis of 1997/1998 and the Russian crisis of 1998, present evidence of numerous contagious crises (Kaminsky, Reinhart and Vegh, 2003). This matter is of direct relevance to African markets. Those markets that are more integrated into the global economy are more susceptible to the costs of contagion, which may outweigh the benefits of integration (Collins and Abrahamson, 2004). Pretorius and De Beer (2004) observe that ever since the Asian crisis of 1997, contagion has grown as a topic under hefty deliberation.

Contagion may broadly be expressed as the diffusion of a crisis to a certain country or market because of the occurrence of its own financial and real interdependence with countries or markets already suffering crisis (Calvo and Reinhart, 1996). According to Kaminsky et al, (2003) contagion is an incidence where meaningful instantaneous consequences take place in an amount of countries, subsequent to an event, explicitly, when the after-effects are swift, and severe and can advance over a period of days or even hours. This 'fast and furious' reaction explained by Kaminsky et al (2003) juxtaposes situations in which the early response to news is relatively subdued. Literature by Fratzscher (2000) only defines 'pure contagion', which relates to crisis set in motion by a crisis somewhere else and which cannot be rationalized by fundamentals. Still, Mosson, (1999); Forbes and Rigobon, (2002) express contagion as the transmission of unforeseen indigenous

shocks to an added market or country, which leads to an escalation in correlation during times of financial crisis. However, Asongu (2011), argues that there is yet to be a conventional description of contagion by economists. The author suggests that it is possible that the phenomenon of contagion be viewed through the broad activity of shock transmission through countries.

Literature differentiates the various meanings of financial contagion. Naouri, Khemi and Liouane (2010) suggest that Eichengreen, Rose and Wyplosze (1996) developed the most frequently used definition of financial contagion. The above authors assess contagion as a meaningful rise in the probability of crisis in one country moulded by episodes of crisis in an alternative market or country. Forbes and Rigabon (2001) succinctly point out that the precise definition of contagion must be differentiated from preceding fallacies and suggest the use of the expression 'shift-contagion' as an alternative to the word 'contagion'. The authors add that the phrase 'shift-contagion' is rational because it makes clear that contagion stems from movements in cross-market linkages and also, the new term escapes making suggestions about the manner that the movement occurs. Forbes and Rigobon (2001) however, continue to elude the value of awareness that the above definition of contagion is not recognized on a world wide scale. The authors corroborate their cautioning by suggesting the argument by other economists that if a shock to one market should imply the presence of cross-market relationships. Claessens and Forbes (2001) have a contrasting view of what constitutes contagion. They argue that countries with strong linkages among themselves are not necessarily constituents of financial contagion and that contagion ought to be expressed as a rise in cross-market connections subsequent to a shock in some country. Clark and Huang (2006) go further by proposing their own model of contagion which is developed largely from fundamentals and the negative externality outcomes brought about by a default. In comparison with prevailing literature on financial contagion, together with, Alghion, Bolton and Dewatripont (2000), Allen and Gale (2000), Goodhart and Huang (2000), Huang and Xu (2000), Kodres and Pritsker (2002), Masson (1999) and others, the model of contagion proposed by Clark and Huang (2006), emphasizes the value of fundamentals and the framework of the international financial system. Their model states that the interest rate in the international capital market rises when a deeply indebted

country is struck by a sizeable adverse shock. Should there be other countries with indebtedness of similar intensities, and consequently are also susceptible to external shocks, this surge of the interest rate on international debt could act as a trigger for financial crisis. Clark and Huang (2006) model of contagion also stresses the crucial role of the negative externality in international capital markets and is not dependent on the consequences of coordination malfunctions, disproportion of information or self-fulfilling processes as highlighted by Diamond and Dybvig (1983). Other authors however, focus on the many facets of financial contagion.

Baig and Goldfayn (1998) suggest that the label 'contagion' is too extensive because of the vast array of shock forms that are able to move throughout boarders, all with greatly divergent policy effects. On the other hand, Masson (1997) emphasises the many different notions of contagion and proposes that the concurrent shifts of markets can be accounted for through an understanding of a markets' trade linkages, external factors or spill overs associated with third market competition, or market sentiments. Masson (1997) adds that though some of the forces mentioned above my indeed lead to a contagious financial crisis, it is of vital importance that the forces propelling market chaos are identified. A severe and sudden shift in one market will have an abrupt modification of magnitude in other markets, if the markets have a historical cross correlation. Trade linkages, financial linkages and herding behaviour (Kaminsky et al, 2003) are theories of contagion and substantiate the judgments of Masson (1997). It is worthy to note that Clark and Huang (2006) appear to be part of a small group of authors who find substance in fundamentals when terming contagion. Fratzscher (2000) explicitly rejects a country's fundamentals as a factor in the transmission of a crisis and thus rejects fundamentals as a variable in defining financial contagion. Rather, the author places importance on the proximity of the other countries to the country where financial calamity arises. A relatively contemporary model which also discards any significance of fundamentals in contagion is proposed by Sbracia and Zaghini (2001). It is a second-generation model which emphasises currency crises and appreciates the role of unexpected actions of speculators which cause currency devaluations with no preceding decline in economic fundamentals.

The World Bank (2004) proposes a description of contagion which, among other things, can be appreciated as the spread of shocks between a pair of countries beyond what is typical in terms of fundamentals after, co-movements sparked by common shocks are considered. One must be aware however, that this definition is, to some extent, limited to shocks and assumes a thorough, unblemished understanding of what represents fundamentals.

2.4.1 Models of contagion

Some contagion models stress the behaviour of investors that bring about the prospect of fads and herding. Kaminsky et al (2003) note that such instances are conceivable and suggest 'irrational exuberance' as an example of such behaviour. Irrational exuberance affects the actions of financial markets and capital flows and aggravates upswings and downswings of markets. Other models emphasize economic linkages through finance or trade links (Lowell, Neu and Tong, 1998).

Trade Linkages: Gerlach and Smetts (1996) point out those existing models of contagion have recharged the Nurkse (1944) landmark narrative of competitive devaluations. Nurkse claimed that a devaluation places pressure on other countries to devalue (Kaminsky et al, 2003). Naouri et al, (2010) explain that such models are dependent on the reality that devaluation in a country possibly will decrease competitiveness of prices in relation to partner country competitors thus damaging the country's trade balance. Market actors may begin to perceive economic weakness in a country or market due to the injured trade balance leading to a loss of trust and subsequently the drawing out of their capital from countries involved. Kaminsky et al, (2003) suggests that in a situation such as this, devaluation in the succeeding country is a choice bought about by policy, the outcome of which is anticipated to be helpful because it stimulates expenditure-switching. The insinuation of this kind of model, empirically, is that one is required to examine a large amount of trade between the 'synchronised' devalues. Yet, the findings of Lahiri and Végh (2003) suggest that this interpretation does not take into consideration the fact that central

banks frequently endure immense efforts to escape a devaluation. Despite the weaknesses found in contagion models based on trade linkages, Eichengreen et al (1996) confirm that trade links are a great assistance in the description of contagion patterns in twenty industrial countries during the period 1959 -1993. The matching deduction was made by Glick and Rose (1999) in their scrutiny of contagion and trade links for a sample of 161 countries.

Financial Linkages: Contagion models which are rooted on financial linkages recognise that a crisis is able to diffuse from the first country or market to another if the pair of countries has economic characteristics which are alike. Financial linkages describe contagion in various models, each related with a certain theory, specifically: financial market institutional practices, direct financial linkages and herd behaviour and informational asymmetries (Hernandez and Valdes, 2001). This study however, utilizes direct financial linkages and financial market institutional practices in the explanation of contagion, and utilise herd behaviour as an entirely different group of contagion models.

Herd behaviour: Caetano and Yoneyama (2011), suggest that the sub-prime mortgage financial crisis of 2008 acted as impetus for a herding effect with several agents attempting to enhance their own performances which face common hazards. Models which are founded on herd behaviour regard the occurrence of contagion to be a consequence of phenomenal behaviour. Naoui et al (2010) suggest that contagion can be owed to extreme arbitration processes, which indicate the propensity of investors to modify their portfolios with the purpose to extend their usefulness. Dehove (2003) suggests 'herd behaviour' as a setback caused by information asymmetry. He adds that herd behaviour can be typified as having greater ambiguity and costs which drives investors to take on mimetic like behaviour. On the other hand, Lowell et al (1998) group the higher costs which cause investors to assume this mimetic behaviour into a characteristic of another contagion model: the heightened awareness model. This model blends breaks in information with vulnerable fundamentals. Here, it is argued that information and investigations of each separate emerging market is either too costly for investors to get hold of or of questionable quality.

Perhaps one can appreciate this probable confusion between the two models as Lowell et al (1998) suggest that the two models are very closely related. The primary difference however, is that in a heightened awareness situation countries that go through crises usually have weak fundamentals. Unlike the contagion herd-behaviour models posited by Lowell et al (1998), Naoui et al (2010), and Dehove (2003), Benerjee (1992) do not regard fundamentals in his explanation of contagion herd-behaviour. Banerjee (1992) extends a model to assess the repercussions of decisions that are motivated by the behaviour of others. He suggests that the behaviour of other investors could suggest possibly crucial data that they possess that is not publically available (Banerjee, 1992). This sequential decision making proposes that people are cognisant of what others before them are doing thus, causing herding behaviour, even when private information suggests a dissimilar action.

2.5 Financial Integration

Financial integration involves the synchronisation of legislations such as accounting and bankruptcy laws, the formation of regional self-regulatory interventions and regulatory exchange commissions, and monetary procedures which are coordinated. The final position of regionally integrated markets should be for a market accounting reporting systems, regulations, settlement depository systems and clearance to be consistent with international standards (Senbet and Otchere, 2008). According to Hartzenberg (2011) the African paradigm adheres to linear market integration, where consecutive, progressive integration of goods, labour and capital markets occurs, and ultimately monetary and fiscal integration. The point of departure is typically a free trade area, trailed by a customs union, a common market, and later integration of fiscal and monetary affairs to institute an economic union.

Senbet and Otchere (2008) recognize that regional and sub-regional integration of capital markets increasingly is being used as a means to surmount the shortcomings of disjointed capital markets. Irwin (2005) and Okealaham (2005) add that integration and formal synchronisation of emerging African stock markets is likely to support the continent to

prevail over its primary challenges. Severe illiquidity, informational inefficiencies and thin trading volumes plague the African continent (Ntim, Opong, Jo and Dewater, 2008). However, according to Buch (2001) and De Bondt (2000) economic literature shows that more profound financial market integration intensifies the diffusion of monetary policy and monetary shocks throughout associated economies in a monetary union. Das (2003) reiterates these observations in his finding that with globalisation and regional integration comes a crucial obstacle, being the contagion effect. This entails that as one economy generates a crisis, it is spread to another or even to the entire region in a situation where the economy is open and integrated with the global economy.

Lugangwa (2006) contests that regional integration will increase the visibility of African stock markets by causing a considerable enhancement of the scope of African stock markets. Similarly, Fish and Bilkpe (2002) propose, for instance, that due to economies of scale, regional integration will bring about expansions in trading volumes. Irving (2005) uses an example of Southern African and Eastern African stock exchanges to show that regional integration and cooperation in Africa can offer a more profound degree of financial deepening and expand investors' choice of securities. This is due to the outcome of an increased availability of financial products and services and this appears to be a typical advantage of regional integration (Irving 2005 and Lugangwa, 2006). Insight such as those proposed above are key to ones understanding of contagion in emerging African markets because, as suggested by Senbet, 1998 and Yartey and Adjasi (2007), regionalization of African stock markets is likely to increase the mobilisation of global and domestic financial resources to supply funds to regional firms and at the same time infusing more liquidity into the markets. Grande, John and Senbet (2008) cautiously point out that while regional integration and financial globalisation can be beneficial for capital markets, these mechanisms also make regions and countries vulnerable to global exposure risk. This point is refined by Andersen and Moreno (2005) when they posit that deepened financial integration may entrench the validity of foreign exchange markets. The consequence of such may be increased by the establishment of contemporary risk management practices. Packer and Wooldridge (2003) acknowledge that with such a situation, comes an increase in the risk of illiquidity as market participants stop trading or escalate reservation price in the

midst of stress in a market. It may even be that due to prudential requirements and other stimuli, market participants are impelled to ease their positions. Conversely, Ntim et al, (2008) advocate that the growth and advancement of foreign exchange markets may be fostered by globalization, which is likely to improve a markets resistance to shocks.

Das (2003) proposes a less optimistic viewpoint about financial globalisation in emerging markets. He suggests that the financial globalization process has produced numerous exchange rate-related complications for emerging market economies. Chang and Velasco (2000); Calvo (2002) attribute this finding to the fact that several domestic and international markets are imperfect and suffer from maladies including: asymmetric information, markets, bubbles, noise trading, multiple equilibrium, moral hazard and contagion.

McKinnon and Pill (1999) also recognise market imperfections in global financial markets as possible causes of emaciating consequences of market fundamentals. The authors affirm that moral hazards such as market imperfections triggered the occurrence of crisis in many emerging markets. Propositions by authors such as Hartzenburg (2011) are in harmony with the above findings as he notes that very few success stories about regional integration in Africa exist. He suggests that African regional integration agreements are typically elaborate arrangements with impractable time frames. A Sharp contrast of this opinion is asserted by Das (2003) that regional integration in Africa is rational and could be of immense benefit, particularly since the continent is characterised by tiny markets, tiny economies and tiny countries. Odera (2012) agrees with the proposition of Das (2003) in his recognition that regional integration is likely to resolve fragmentation hindrances of African stock exchanges given that the number of national exchanges in integrated markets is less.

Yartey and Adjasi (2007) also appreciates the role regional integration can play in diminishing the negative effects of the fragmented African stock exchanges while reducing the adverse cascading effects of regional integration. The authors suggest that, and in agreement with Senbert (1998); Yartey and Adjasi (2007), Irving (2005) and others, the

primary advantage of regional integration is improved liquidity. Yartey and Adjasi (2007), however, recognise cost efficiency and price discovery as the primary benefits of regional integration. These benefits are informed by orders by investors which can be carried out without the assistance of a broker and because only one listing fee payment is required in integrated exchanges (Senbet and Otchere, 2008.). Moreover, a collective of human and economic capital is channelled in integrated markets thus, bringing together the human and economic capital skills of many markets. The market consequently gains from valuable and assorted collection of skills (Claessens, Klingebiel and Schmukker, 2002).

Odera (2012) boldly suggests that regional integration lessens implements in markets because all settlement systems, trading and operations clearing are synchronised. However, while complexities in markets may be reduced after integration, Das (2003) suggests that external components begin to have an increasing influence on a country's domestic economy to such an extent that financial globalization can persuade the functioning of the emerging market economy albeit a lack of market imperfections. Das (2003) argues that as African markets become more integrated regionally and with the globe, the markets become dependent on capital inflows. It is probable that sudden movement in a flow of capital will trigger a dip in the business cycle or even a domestic financial crisis. Therefore, when regional or global integration occurs, changes in the bearing of global flows of capital may not indicate the actual domestic fundamentals of the receiver (Das, 2003).

Prasad et al (2003) posits that it is difficult to determine a strong association between growth and financial integration, even when evidence is carefully scrutinised. Prasad et al (2003) suggests that evidence of financial integration alleviating fluxes in consumption in terms of income is scarce despite suggestions of theory that financial integration is likely to group risks across borders. The above proposition reinforces suggestions of Schmukler (2004) in his postulation that it is possible for integration to bring about financial crisis by means of contagion.

Andersen and Moreno (2004) propose that it is still unclear as to whether or not financial integration has impeded or stimulated the development of domestic financial markets. On the one hand, many domestic markets have had foreign investors purchasing their domestic currency as opposed to dollar denominated paper. Andersen and Moreno (2004) credit this to the exposure to foreign competition. Moreover, Goldstein and Turner (2004) highlight that there have been surges in the volumes of bond trading and in outstanding domestic debt securities in emerging markets. On the other hand however, current studies by McCauley and Jiang (2004) suggest that there is added scope for enhancing liquidity in emerging markets.

2.6. Emerging market research

Kearney (2012) recognises that the past two decades have experienced a mushrooming of sustained research about the emerging markets of the world. The author attributes this focus to the fact that the greater part of the world's land and people incorporate emerging markets. Moreover, emerging market research is a captivating multidisciplinary field that comprises subjects as diverse as sociology, anthropology, history and geography in addition to the typical business disciplines (Kearney, 2012). Despite the mass of research on emerging markets, Mivenda (2000) suggests that most literature is afforded to American and Asian emerging markets. Furthermore, the author notices that "... the lion markets of Africa are rarely listed alongside the tiger markets of the Far East or the Puma markets ..." (Mivenda 2000:5).

Fifield, Lonie, Power and Sinclair (1999) presented a study on the criteria used to express the concept of emerging markets and highlighted the behaviour of equity markets. Bekaert and Harvey (1997, 2003) assessed inquiries into finance in emerging markets by concentrating on countries with the longest available scope of data and relied on data from the International Finance Corporation's (IFC), emerging market database. Other authors have composed surveys of emerging market research topics. Phylaktis (2006) highlighted the topics of market integration, asset management, corporate finance and contagion.

Whereas Khilji (2003) focused on financial crises and Lien and Zhang (2008) examined derivative markets. Contemporary studies by Fan, Wei and Xu (2011) present an authoritative summary of how critical institutional dynamics in emerging markets are. The study shows the extent of financial development, the quality of government and the degree of state ownership.

Kehl (2007) posits that research including that mentioned above is of great importance because the international acknowledgement of a country as 'emerging' has the capacity of increasing twofold the inflow of foreign investment. Also, outcomes of research on emerging markets can assist countries to assimilate with recent developments in international financial firms (Kehl, 2007).

2.6.1 What are Emerging Markets?

The term emerging markets was initially made use of in 1981 by a World Bank economist, Antoine van Agtmall, when the organisation was proposing the foremost mutual fund investment in developing countries (Khanna and Palepu, 2011). Kearney (2012) notes that despite the widespread use of the term there is no consensus on the operational or theoretical definition of what an emerging market actually is. Kehl (2007) agrees with Kearney (2012) in his assertion that in spite of the noticeable significance of emerging markets, there is no parsimonious nor clear account of what composes an emerging market. Still, authors such as Khanna and Palepu (2011) suggest that the term has become ubiquitous in foreign policy, the media and trade discussions and recognizes how extensively descriptions of the term vary. Barry and Lockwood (1995) echo the sentiments of many authors when he suggests that it is regrettable that no globally recognised definition of an emerging capital market exists. Thus, the categorisation of countries as emerging is rather random, and as a result reclassification occurs regularly by an array of financial institutions which use various methodologies and groupings. For instance the Financial Times Stock Exchange (FTSE) utilizes a particular country classification review procedure to recognise 13 emerging markets. Bloomberg's' Morgan Stanley Capital

International (MSCI) emerging market index is composed of 26 countries in 3 areas divided into: the Americas as one division, Europe, the Middle East as another and Africa as the third. The disparities between the two indices are that the United Arab Emirates (UAE) is included in the FTSE while the MSCI omits the UAE and includes Argentina, Israel, Jordan, South Korea and Venezuela (Kehl, 2007).

The International Finance Corporation (IFC) expresses an emerging market as '... one which is found in a developing country...' and the World Bank typically uses the terms stock and capital markets interchangeably (International Finance Corporation ([IFC]), 1994, Mwenda; 2000. Kehl (2007) implies that regrettable these descriptions are too ambiguous to be of value and are disputed by other authors. For example The Economist and Forbes periodicals which frequently trace emerging market activities, are of the opinion that nearly all developing countries do not have markets at all. Analysis such as this does this has unevenly adverse consequences for African countries by nearly totally eliminating dialogue of African markets. Kehl (2007) encompass the thoughts of the vast majority of emerging market authors when he suggests that recent notions of emerging markets continue to be ambiguous, bias, very impractical for creditors and global investors, and frequently incorrect.

Barry and Lockwood (1995) propose that the primary characteristics of emerging markets are elevated volatility, extreme mean returns and exceptional diversification opportunities. Layaarde-Segot and Lucey (2005) also note the international diversification prospects of emerging markets as a key characteristic of these markets. However, Kearney (2012) finds the fairly well-developed physical financial infrastructure and weaker accounting systems and processes as more noteworthy traits of emerging markets. In fact, Kearney (2012) appreciates that the volatility and international diversification opportunities are a result of the financial infrastructure. Thus Kearney (2012) implies that volatility is a secondary trait of emerging markets. Ojah (2012) offers a crisp and concise definition of emerging markets as '*...countries where financial markets are emerging from the dominant role of government in funding production.*' This definition appreciates the impact that government has over the

development of a market and implicitly appreciates the functions of intermediaries. On the other hand, Sabal (2002) highlights wealth distribution, political and economic situations, level of education and per capita gross national product as key attributes of emerging markets. Sabal (2002) appears to place greater importance on socio-economic factors of a market.

2.7 Conclusion

The primary purposes of this chapter was to outline the theoretical foundations and nexuses of emerging markets, contagion, stock markets in Africa and regional integration in Africa. This has been achieved with the outcome that one theory is inept in accounting for the vital network of linkages that are distinct of this area of research. The meaning of the term emerging markets initially employed in 1981 by World Bank economist, Antoine van Agtmall, Herd behaviour, financial contagion and Nurkse's rendition of devaluation are among some of the theories relevant to emerging markets examined here.

The study has found that empirical evidence tends to overlook factors which propel financial contagion in African emerging markets specifically as opposed to emerging markets in general. Some studies simply test for the presence or absence of financial contagion among emerging countries without considering the degree of contagion if it is indeed present. Moreover, studies ignore how the establishment of a point of balance between financial contagion and integration and the possible benefits of a fine-tuned relationship between these two variables. A wealth of findings exists in the literature, with the majority of studies establishing contagion in emerging markets. The disparity between contagion and integration is the cause of contagion. Economic fundamentals, such as, herd behaviour are among some causes found. The diverse variable specifications, econometric modelling techniques, dissimilar timeframes assumed in the studies and countries included in the study generate the variances in findings. In Chapter 3 emphasis is transferred to a comprehensive analysis of the methodology employed in this study.

CHAPTER 3: METHODOLOGY

3.1. Introduction

The objective of this section is to ascertain whether financial contagion is indeed present in African emerging markets and if so whether it is caused by fundamentals or herd driven behaviour. Further, this section examines weather or not the effects of contagion are owed to historically close relationships among countries. The crucial point at which financial integration leads to financial contagion is identified to ascertain whether an African emerging market can reach a threshold where it reaps the benefits of integration without falling prey to the adverse consequences of contagion.

3.2 Hypothesis and model

Four models of analysis are cultivated in this section informed mostly by insights from the literature review chapter. The four key models consist of 1) a model testing the presence of contagion in African emerging countries; 2) a model of threshold, testing the extent to which African emerging countries enjoy integration ahead of being vulnerable to contagion; (3) a model testing the dependence of African emerging countries among themselves and developed economies; 4) a model examining herd behaviour in African emerging countries.

3.2.1 Hypotheses

The theoretical framework of contagion and the empirical literature guides the formulation of the following hypotheses:

H1: Contagion exists in African emerging countries.

H2: Economic and financial fundamentals are the dominant account for contagion in African emerging countries as opposed to herd-driven behaviour.

H3: African emerging countries with historically close relationships with a country which experiences a financial crisis are most susceptible to the adverse effects of contagion.

H4: There is a critical level of interdependence necessary before vulnerability to contagion is reached.

The increase in globalisation and consequent interdependence of economies increase the co-movements in stock market prices. Thus, one would expect financial crises in a market to influence the stock prices in another market. The assumption is that changes in global financial conditions would alter fundamentals and market sentiment causing volatility in the market. While one would expect also that countries with closer historical ties will transmit shocks to each other and from each other faster and more severely, there are many variables which may prevent or accelerate this phenomenon.

3.2.2 Model specification

A panel regression analysis where heterogeneity across units over time is examined is used. This approach captures the behaviour of the panel in different economic situations and is useful in tracking the financial and economic variations in behaviour at certain time periods. It is also valuable in tracing the patterns of stock markets against macroeconomic and financial indicators. Whilst a cross sectional analysis would explain the behaviour of panel data, the selected time series cross sectional analysis is more suitable in explaining the performance of panel data during crisis and non-crisis periods. Relevant statistical work has been concluded for all panel data.

3.2.2.1 Unit root test

In this section the unit root tests are carried out for the data as a build-up process to the adjusted correlation coefficient and bootstrap test for contagion. Though the bootstrap element of the contagion test will address the issue of findings suffering from the problem

of spurious regression if the data is non-stationary (Granger and Newbold, 1974), the unit root test is worthy as a measure of robustness. Unit root tests have become a crucial point of departure for empirical macroeconomic research because as argued by Nelson and Plosser (1982),nearly all macroeconomic time series possess a unit root.

Since the examination of cointegration is implicitly carried out later in this section there is a need for establishing the maximum order of integration for data presented. Unit roots tests are conducted to determine the stationarity or otherwise of the stock market indices. The unit roots tests are performed on log levels of the stock market indexes using the Philips Perron (PP) and Augmented Dickey Fuller (ADF) tests.

3.2.2.1 a) Augmented Dickey-Fuller test

The Augmented Dickey-Fuller (ADF) test is an extension of the standard Dickey-Fuller test. It tests the presence or otherwise of a unit root in a time series. The standard DF test assumes that the series follows an auto-regressive process of order one, AR(1) while in the ADF test the time series is assumed to follow an AR(p) process. Therefore, if the series were to follow an AR (p) process and the standard DF test is applied, the auto-correlation of the residuals from the standard DF test will refute the results. The ADF test solves this hindrance by adding *p* lagged difference terms of the dependent variable on the right side of the test regressions (Forgha, 2012).

The model under investigation is:

$P_t = \theta p_{t-1} + \varepsilon_t$ *where* ε_t with $\varepsilon_t \sim IID\ (0, \sigma^2)$..... (3.1)

where P_t is the natural logarithm of the index prove at time *t*. If $\theta = 1$, the process shows a unit root. The ADF text examines whether or not $\theta = 1$ and it is carried out according to three distinct regression equations. Only two of three equations are tested:

$$\Delta p_t = \beta_1 + \beta_2 t + \pi p + \sum_{j=1}^{k} \gamma_j \Delta p_{t-j} + u_{1t} \quad \text{(i)}$$

$$\Delta p = \beta_1 + \pi p_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta p_{t-j} + u_{2t} \quad \text{(ii)}$$

where the first difference of the price index's log is Δp_t, β_1 is a constant, β_2, π and γ are estimated coeficients, k is the number of lagged differences and u_t is the error term. Equation (i) contains a constant and trend term being β_1 and $\beta_2 t$ respectively. Equation (ii) however, includes a constant term only. The Schwarz Information Criterion is applied in order to ascertain the number of k lagged differenced to be added (). The null hypothesis is that the series contains a unit root. That is $\pi = 0$.

The ADF test transforms the variable to be examined such that:

$$p_t = \theta p_{t-1} + \varepsilon_t \rightarrow p_t - p = \theta p_{t-1} - p + \varepsilon_t \rightarrow \Delta p_t = (\theta - 1) p + \varepsilon_t \rightarrow \Delta p_t = \pi p_{t-1} + \varepsilon_t;$$

3.2.2.1 b) Phillips- Perron Test

The Phillips- Perron (1988) (PP) test is of a better-quality than the ADF test. Its superiority is due to the adjusted test statistics in the PP test which cater for serial correlation by means of the Newey and West (1997) covariance matrix. It permits heterogeneity and weak dependence of the error term (Pfaff, 2008). The null hypothesis of this test is that the variable possesses a unit root. The lag structure is determined using the Akaike Information Criterion (AIC). The regression equations of the test are:

$$p_t = \mu + \beta \left(t - \frac{1}{2} T\right) + \alpha\, p_{t-1} + \varepsilon_t \quad \text{(iii)}$$

$$p_t = \mu + \alpha\, p_{t-1} + \varepsilon_t \quad \text{(iv)}$$

where p_t is the log of the price index at time t, μ is a constant, β and α are estimated coefficients and ε_t is the error term. A constant term μ and a linear trend term $\beta(t\text{- }1/2T)$ are shown in equation (iii) whereas equation (iv) includes constant term only. The null hypothesis is that the series contains a unit root, that is α =1.

3.2.2.2 *An adjusted correlation coefficient and bootstrap test for contagion*

There is a relatively sizeable body of empirical work for the test of financial contagion in the course of financial crisis. The seminal methodology employed to examine simultaneously declining stock markets over categorised periods was to compare correlation coefficients with a benchmark (Longing and Slink, 1995). However, it has been found that outcomes from this approach are prone to bias due to heteroscedasticity in the markets studied (Forbes and Rigbon, 2002). An additional problem is that simple tests which are based on changes of coefficients may have low power (Dungey and Zhumabekova, 2001). Lastly, the bi-variate coefficient analysis suggests that such analysis is restricted to only pairs of markets, and ignores the fact that markets are part of a wider financial system (Baur and Fry, 2005).The returns in different countries are examined using a simple linear model:

$$r_{i,t} = \beta r_{j,t} + \varepsilon_t \tag{3.2}$$

where *j* indicates the ground-zero country in which the crisis stems. For this study, this country is the United States. Character *i* indicates the country into which the crisis may or may not have been transmitted. An assumption is made that the correlation of $r_{j \text{ and }} \varepsilon_t$ is zero and the variance of ε is a constant K. Thus, if the relationship between the returns were to change substantially, β would change and this would indicate the presence or absence of a statistical change of the correlation coefficient p_i of the ground-zero country *(j),* and the stock market returns of country *i*. This implies that in high volatility periods, such as crisis periods, the measure of p_i will increase as volatility increases, and the true correlation will be overestimated by p_i.

A seminal paper, Forbes and Rigobon (2002) draws attention to the fact that the conventional comparison of correlation coefficient is biased due to heteroscedasticity in market returns during crisis periods. The authors have consequently suggested a methodology to correct for that bias as follows: (i) Consider the basic conditional correlation coefficient between country 1 (the crisis country) and 2 (the baseline country).

$$p = \frac{\sigma_{1,2}}{\sigma_1 \sigma_2} \tag{3.3}$$

(ii) The finding of Forbes and Rigobon (2002) is introduced to overcome the problem of biased due to heteroscedasticity in market returns during crisis periods. The simple remedy is found in the equation:

$$p^* = \frac{p}{\sqrt{1+\delta\left[1-(p)^2\right]}} \tag{3.4}$$

Where δ signifies the relative elevation of the variance δ_j of the ground-zero country's return r_j examined for two intervals: the tranquil, low volatility period and the crisis, high volatility period, as presented in equation 3.3. The character δ is found by the equation:

$$\delta = \frac{\sigma_j^h}{\sigma_j^l} - 1 \tag{3.5}$$

This test for contagion is guided by the comparison of the correlation coefficient in the tranquil, low volatility phase with the adjusted correlation coefficient in the high-volatility crises period p_i^h . Rather than assuming bivariate normality of the data, a bootstrapping technique is used to formulate the critical values of this test. Sample pairs of the stock market indices from the pre-crisis (n_l) and the crisis sample (n_h) are used respectively . A pre-crisis correlation (p_i^l) and a crisis correlation (p_i^h) are calculated from the bootstrapped sample before the crisis is corrected for by means of equation (3.2). A test statistic is then obtained by computing the difference between the adjusted crisis correlation $p_{i,m=1}^h$ and the pre-crisis correlation $p_{i,m=1}^l$.

Two test statistics are drawn upon to determine the difference between coefficients'. A test on the Fisher transformation is implemented, however since this approach carries the assumption of normality it will probably suffer from a lack of robustness since it is well known that the stock market returns of emerging markets tend to be skewed. The analysis, therefore follows the suggestion by Collins and Biekpe (2003) and complements the former analysis with an exact t-test based on actual sample correlation coefficients. The following equation guides the method:

$$t = (p_x - p_y)\sqrt{\frac{n_1 + n_2 - 4}{1-(p_x - p_y)^2}} \qquad (3.6)$$

Where $t(0.05, n_1 + n_2 - 4)$

The process is repeated 465 times (m=1 to 465) and establish the critical values for 1% and 5% from the histogram of test statistics (Kleimeier, Lehnert and Verschoor, 2003). Therefore, a test of significance will then be run on the adjusted crises correlation coefficient. If the value for $[p_i^{h*} - p_i^{l}]$ is greater than the bootstrapped critical value, the null hypothesis of interdependence is rejected. Therefore, the null hypothesis for no contagion may be tested as:

H_o: $\rho NC(x_i, Y_i) = \rho C(x_i, Y_i)$ no contagion

H_1: $\rho NC(x_i, Y_i) < \rho C(x_i, Y_i)$ contagion

The use of an adjusted correlation coefficient circumvents the overestimation dilemma. Bootstrapping and the use of a larger crisis period in the study alleviate the problem of power and size. However, the problem of bias may show itself in the differences in time zones between observations when stock prices are synchronised at different times due to variations in speed of transmissions and time zones. To ensure robustness of results, the

above test is carried out on a number of splits. This empirical analysis relies on data from the International Monetary Fund for selected countries.

3.2.2.3 *A model of threshold and vulnerability to financial contagion*

The purpose of this section is to test the notion that vulnerability to financial contagion intensifies as an African emerging market approaches some threshold in size and integration into the world. The results of the test for contagion in African emerging countries during the 2008 sub-prime crises will be drawn upon in this section. Aggregating the outcomes into a vulnerability index affords one the opportunity to rank the five African emerging countries according to their sensitivity to international financial crisis. Lastly, the vulnerability indices and the indicators of integration and stock market development are pooled into an ordered logit model. Significance levels and odds ratios are expected to suggest that the size, liquidity and integration of the markets examined contain some explanatory power in moulding their vulnerability to financial contagion.

a) Joint vulnerability

As a measure of robustness, a second alternative test for financial contagion in African emerging economies is run. However, instead of using the previous adjusted correlation coefficient and bootstrap test for contagion, the multivariate test of contagion as presented by Baur and Fry (2006) is used. The basis of this test is a panel data model which controls for general vulnerabilities by means of the addition of both emerging market equity and world indices. The framework is a simple regression model of the form:

$$y_{i,t} = \alpha_i + \gamma_t + \beta_{i1}\tau_{global,t} + \beta_{i2}\tau_{emerging,t} + \varepsilon_{i,t} \qquad (3.7)$$

Where: $y_{i,t}$ is the return of country i at time t and $\tau_{global,t}$ and $\tau_{emerging,t}$ are global and emerging market elements respectively. The model comprises a constant α_i, for each country return vector y_t and a fixed time effect γ_t which is defined for a period of K days across all the countries. This fixed time influence is examined in relation to a base time period and is able to capture contagion. The character $\varepsilon_{i,t}$ provide the error terms and it is

assumed that $\varepsilon_{i,t}$ are independent and independently distributed with a mean and unit variance of zero (Lagoarde-Segot and Lucey, 2012). The model is estimated as a least-squares dummy variable model (Greene, 2002).

Contagion and general vulnerabilities can be distinguished here by considering the relative significance of the regressors in comparison to the fixed time effects. The model assumes that vulnerabilities are present in both crisis and the benchmark periods and captures the systematic connections among the equity markets of each country, emerging markets and the world. Within the context of this model, the fixed time effect encapsulates time-varying joint positive and negative movements across markets that are not explained by the loading factors over the period of study.

The reasoning then is that wherever these fixed time effects extend past a particular threshold, contagion is present, thus drawing attention to the fact that asset prices are governed by a considerable unexplained common factor. The threshold is attained if and when the test-statistic of an estimate of the fixed effect is significant at the 5% level. A noteworthy benefit of this procedure is that the model can elude the sample selection bias because contagion is endogenously determined (Pesaran and Pick, 2004). Evidence of joint contagion is presented through the estimation of global interdependencies since the panel model is multivariate.

Two test-statistics are drawn upon to assess the significance of the difference between coefficients when the correlation-based methodology is used. In the work of Forbes and Rigobon (2002), a test based on the Fisher Transformation is the starting point in computing the test-statistic. However, the assumption of normality is carried by this approach and this may cause a lack of robustness when stock market returns are skewed, which is the case in most African emerging economies. Therefore, as suggested by Collins and Biekpe (2003), the finite sample properties of the statistic will supplement the inquiry through the use of a precise test-statistic based on the correlation coefficients of the actual sample.

b) The vulnerability index

The aim of this section is to construct, from the underlying tests performed above, country indices which exhibit the sensitivity to financial contagion of each of the five African emerging countries in the study. The sample period involved is too short to employ sophisticated econometric procedures to validate the approach, but is illustrative of the susceptibility of African emerging countries to financial contagion.

Aggregate indices of country risk have been used extensively in both the public and private sector to evaluate the attractiveness of countries as an investment hub. The World Bank utilizes risk-rating models to consider the credit risk of a country (World Bank, 2012). Similarily, the OECD applies an outline which obtains a measure of the association of a country with the global pricing of export credits. The framework aims to classify non-member countries into seven risk groups and includes four sets of variables namely, financial and macroeconomic indicators; records of debt servicing and political elements. The OECD model uses flexible weights in the realization of such indices, for example, a weak result on debt-related variables will cause the overall score to be modest, regardless of the result of the other indicators. Table 3.1 displays the indicators and weights applied in the computation of vulnerability indices in the study.

Table 3.1: *Indicators and weights applied in vulnerability indices*

Indicator		-0.2	-0.1	0	1	2
Code	**Weight**					
Xra	W1	20<x	5<x ≤ 20	5≥ x > -5	-5 ≥ x > -20	x ≤ -20
Debt	W2	*	x ≤ 20	20 < x ≤ 30	30 < x ≤ 40	x >40
Cab	W3	x>4	2 < x ≤ 4	-2 < x ≤ 2	-4< x ≤ -2	-4 ≥ x
Gx	W4	x>10	10 ≤ x< 5	0< x ≤ 5	-5< x ≤ 0	-5 ≥ x

*Shaded box indicates no points gained for negative real interest rates.

xra = Percentage appreciation of the domestic currency against the US dollar over one year.

debt = External debt to colonised country as a % of GDP. GDP is converted into US dollars using an exchange rate based on the World Bank Atlas method29

cgdp = Current account balance as a percentage of GDP

gx = Growth of exports over past four quarters (US dollar value) minus average annual growth over 2005-2011 (in percentage)

The weighting system follows the algorithm:

- W1 = W2 = W3 = W4

Judgemental application, together with consultation of applicable literature, informed the selection and weights of the indicators. The same weights were employed to each economy. Such an approach may appear arbitrary or simplistic however, it is considered best to fulfil the limited aim of establishing the rank and variables which contribute to vulnerability to contagion in the sample African emerging economies, particularly the 2008 sub prime banking crisis.

An alternative considered was to construct, from the underlying tests performed above, an individual index which exhibits the sensitivity to financial contagion of each of the five African emerging countries in the study. The method is used by Lagoarde-Segot and Lucey, (2012). For numerous reasons the use of a single index of vulnerability to contagion was decided against. One motivation is the problem of information about the individual underlying indicators being unnoticed. Also, the nature of risks varies and it is unsuitable to combine different types of risk (Hilbers, Moretti and Krueger ,1999). The index also appears to be more suited for examination of contagion over longer time periods that currently used. The index is as follows:

$$INDEX_i = \alpha \frac{\sum_{c=1}^{C}\sum_{m=1}^{M} CONTAGION_i}{M.C} + \beta \frac{\sum_{c=1}^{C}\sum_{m=1}^{M}(1-p_i)}{M.C} \quad (3.8)$$

where C is the number of crisis, M is the number of methodologies, $CONTAGION_i$ denotes the contagion dummies for country i, and p_i the test p-value. α and β are weights for each component of the index.

3.2.2.4 A model of herd behaviour and Cont-Bouchaud Model

The methodology presents a technique for detecting herd behaviour which causes turbulence in financial markets even when news and excess increases of volatility of returns are absent. Herd behaviour is distinguished from spurious herd behaviour in this model. It defines the phenomenon of herd behaviour as a consequence of an overt intent by investors to mimic the behaviour of other investors (Kononovicius and Gontis, 2012). This should be differentiated from spurious herding where clusters faced with similar information and decision problem sets take similar decisions (Park,2011).

The study expands on the Cont-Bouchaud model, which is characteristic of a percolation model, to include examination of the effect of herd behaviour on volatility and trading volume. It is assumed that the financial market has N agents and the i_{th} $(1 \leq i \leq N)$ agent trades in an asset whose price at time t is p_t. The state of agent *i* is signified by $\xi_i = \{+1, -1, 0\}$ which corresponds to the purchase of $\xi_i = \{+1\}$, selling $\xi_i = \{-1\}$, or waiting $\xi_i = \{0\}$.

Agents can be connected or isolated via links that form a cluster which shares the same information. In the initial stages, all agents are inactive, however they are instigated through a chain reaction of other linked agents. Specifically, at time *t*, an agent begins to either sell the asset or buy the asset with probability a :

$$P(\xi_i = +1) = P(\xi_i = -1) = a \tag{3.9}$$

Then, the action is instantly imitated by all of the agents in the same cluster, thus making a connection and establishing several networks. The aggregate state of the cluster is given by:

$$S_t = \sum_{i=1}^{N} \xi_t^i \tag{3.10}$$

where $S_t > 0$ signifies that excess demand in markets raises price and $S_t < 0$ signifies that an excess supply in markets reduces price. Volatility is influenced by the size of the cluster. Subsequent to trading, the cluster is fragmented into isolated agents. All of the agents belonging to this cluster become inactive once the cluster collapses with probability $P(\xi_i = 0) = 1 - 2a$ and this repeated process produces herd behaviour (Park, 2011).

In this percolation model the price evolves as the following equation:

$$p_{t+1} = p_t + \frac{1}{\lambda} \sum_{i=1}^{N} \xi_t^i \tag{3.11}$$

where λ is the excess demand needed to move the price by one unit and is a parameter measuring the sensitivity of price to fluctuations in excess demand. When considering the cluster size, the equation can be rewritten by returns:

$$r = p_{t+1} - p_t = \frac{1}{\lambda} \sum_{h=1}^{k} \omega^h \xi_t^h = \frac{1}{\lambda} \sum_{h=1}^{n_c} \zeta_t^h \tag{3.12}$$

where ω^h signifies the size of cluster h. is ξ_τ^h is the individual demand of each agent who belongs to the cluster h. n_c is the number of clusters, and ζ_t^h is equal to $\omega^h \xi_\tau^h$. The price change probability density function will then be:

$$f(r=v) \underset{|v|\to\infty}{\sim} \frac{1}{v^{5/2}} e^{v/v_0} \tag{3.13}$$

as suggested by Cont and Bouchaud (2000) its' kurtosis is presented by:

$$\kappa(r) = \frac{2c+1}{\mathcal{N}(1-c/2)A(c)(1-c)^3} \tag{3.14}$$

where c is a parameter which specifies the level of clustering among agents, $A(c)$ is normalization constant with a value nearing 1, and N is the average quantity of orders obtained in the course of a certain amount of time. Therefore, as N decreases, excess kurtosis increase, resulting in larger fluctuations of returns. Herd behaviour in financial markets produces an increase of high volatility of returns. Assuming λ is constant, the volatility depends on parameter a. For example, for a →1 each agent makes his investment decision individually. Therefore, large clusters are not built, and herd behaviour is not produced. If one were to juxtapose, for small, a << 1, information asymmetry in financial markets blocks agents from making independent investment decisions. An increase in internal connectivity is caused from this, which leads to large clusters and herd behaviour. Therefore, according to this interpretation, and the interpretation used in this study, the herding parameter can be defined as:

$$H = \frac{1}{a} - 1 \tag{3.15}$$

where no herding occurs for a = 1(H = 0), and herding is produced for a < 1(H > 0).

3.3 Data and variables

This section defines and explains the choice of dependent and independent variables, sample, sample selection and estimating methods.

3.3.1 Dependent variable

The level of real gross domestic product (GDP) has been used in some studies as the dependent variable (Clark and Huang, 2006), while other studies have used interest rates rather than GDP (Baig and Goldfajn, 1999). The choice of equity market indices is used and relies on the fact that of the two primary channels of financial intermediation in African emerging economies- banks and the stock market- equity markets (stock markets) experience less moral hazard and adverse selection problems than debt financing and banks. Thus, in the light of asymmetric information, equity indices would give a more genuine account of the market behaviour (Levine and Zervos, 1995). Moreover, variations in stock prices tend to be inversely related to volatility thus, creating room for richer analysis and deductions for this study (Bekaert and Wu, 2000).

3.3.2 Independent variable

There are several explanatory variables that can be incorporated in a study of the financial contagion - country vulnerability nexus. The many combinations of variables in any single regression are as many as the number of regressions themselves (Nhamo, 2011). According to Clark and Huang (2006) fundamentals in the form of stocks of international debt in the study of contagion are very important. Meanwhile, Claessens and Forbes (2000) view macroeconomic policies such as exchange rate flexibility, capital controls and debt maturity as the most valuable indicators of a country's vulnerability to contagion. It will also be useful to capture effects specific to a country by including dummy variables (Sala-i-Martin, Doppelhofer and Miller, 2004). The control variables assumed in this study are illustrative of those found in contagion, African stock market and emerging market literature. Table 3.1 is a summary of variables that have been included in contagion literature.

Table 3.2: Summary of explanatory variables used by various authors of empirical literature of contagion.

Variables in study	Variables by Kehl (2007)	Variables by Bae, Karolyi & Stulz(2003)	Variables by Clark & Huang(2006)	Variables by Lagoarde-Segot & Lucey (2012)
External debt to colonised country	Political stability	Index returns	Stocks of international debt	Market capitalization to GDP ratio
Market capitalisation to GDP ratio	Economic stability	Exchange rate	Severity of debt servicing requirements	Number of listed firms
Political stability	Local market	Interest rate	Interest rate on debt	Value traded in dollars
Current account balance as a percentage of GDP	Labour cost	X	X	Liquidity as measured by turnover ratio
	Transparency	X	X	X
	Legal framework	X	X	X
	Skilled labour	X	X	X
	Infrastructure	X	X	X
	Quality of life	X	X	X
	Government support	X	X	X

Up to thirty explanatory variables are exhibited in table 3.1. These variables have been used in the literature for an array of reasons. One is cautious not to add unconnected variables in this study and therefore use a more prudent specification in which only variables that are reasoned to be significant in the study of African emerging markets are used. The first column of table 3.1 displays the independent variables nominated in the study.

3.4 Data and sample selection

The African emerging economies of Egypt, South Africa, Nigeria, Kenya and Mauritius, as suggested by a Muhanji and Ojah (2011) and Nhamo (2011), are used in this study. Countries were eliminated due to lack of data and relative stock market development. DataStream is the source of data as it presents a rich array of data from the World Bank and IMF.

The sample data consists of the following:

- The Johannesburg Stock Exchange (JSE) All Share Equity Market Index, The Nigerian Securities Exchange (NSE) All Share Equity Market Index, The Nairobi Stock Exchange (NSE), 20 Shares Equity Market Index, The Alexandra Stock Exchange EGX 30 Equity Market Index (EGX) and The Stock Exchange of Mauritius Equity Market Index (SEMDEX).
- Standard and Poor's 500 (S&P 500), which is a leading indicator of United States equities
- The Morgan Stanley Capital International Europe Australasia and Far East (MSCI EAFE), which is recognised as the leading benchmark for the measurement of international equity performance of developed countries outside of the United States of America (Morgan Stanley, 2012).

Data covers monthly index prices for the period between 01 January 2005 and September 2012. Annual data in a study such as this would not be appropriate as advised by Folster and Henrekson (2001). This period is separated into two sub-periods to enable inspection of the potential variations in the co-movement of the indices.

The assumption is made that the burst of the sub-prime bubble occurred on 01 August 2007. Therefore, the total period is divided into the following sub-periods:

- the Tranquil Pre-crisis period from 01/ 01/ 2005 to 31/07/2007 and,
- the Crisis period and beyond from 01/08/2007- 01/09/2012

The stock market index observations total 465, consisting of 93 observations per country. The sample for the Tranquil Pre-crisis period comprises 155 observations and 310 observations for the Crisis period and beyond. Observations of the MSCI EAFE and S&P 500 total 93 for each index.

3.4.1 *Construction of variables*

The review above assisted in the identification of the dependent and independent variables which feature in regression analysis relating to contagion, dependence and vulnerability to contagion. Concentration is now shifted to the measurement of these variables. This process is carried out cautiously, with the awareness that the nominated variables or proxies regularly influence the result of estimation.

3.4.1.1 Stock market capitalisation to GDP Gross Domestic Product (GDP) ratio

According to Andrianaivo and Yartey (2010) the deflated value of listed shares relative to GDP is represented by stock market capitalisation. The authors add that it is assumed that there is a positive correlation between market size and the ability to diversify risk and mobilise capital. The mean of two consecutive year end market capitalisation measures are used as an estimate of mid-year market capitalisation value. This is due to the fact that GDP is computed over the year and market capitalisation is measure at the end of a year. A measurement taken without this technique would bring about stock flow problem. Stock market capitalisation to GDP ratio is supplied by the World Bank.

3.4.1.2 Current account balance as a percentage of GDP

The current account can be stated as the difference between the value of exports of goods and services and the value of imports of goods and services (IMF, 2012). The variable informs the amount of national savings relative to investment (IMF, 2012) and complements the examination of external debt.

3.4.1.3 *External debt to colonised country as a percentage of GDP*

According to Muhanji and Ojah (2011) the effective management of external debt is closely related to the successful management of external shocks and hence the helpful management of contagion. Indicators used may be seen as quotas of solvency of the country since the stock of debt at a particular time relative to the emerging country's ability to pay off the outstanding balance may be the difference between the ability to buffer a shock or not.

The measure identifies the degree to which the emerging country is linked to its former colonisers. The emerging markets which have a higher degree of trade and external debt as a percentage of GDP with their former colonised country are seen as being more closely tied to their economies than those countries without close ties. This variable enlightens one about the degree of dependency of each country in the sample. One may reason that a higher ratio of external debt of the colonised country to GDP signifies greater dependency on the former coloniser and thus, higher vulnerability to contagion. Values of each of the two variables are supplied by the World Bank.

3.4.1.4 *Political stability*

It has been found that political unrest affects economic growth both directly and indirectly (Campos and Karanasos, 2008). Asongu (2011) finds that transmissions in the international financial market occur during financial crisis, however, the effect of political crises also have an important role to play in the transmissions.

The Corruption Perceptions Index ranks countries and regions according to their perceived degree of public sector corruption. It is an aggregate indicator that mixes various sources of information about corruption. Transparency International's 2011 Corruption Perceptions

Index is used. The CPI ranks countries on a scale of zero to 10, the higher the scores the lower the country's level of corruption.

Table 3.3: *Transparency International's 2011 Corruption Perceptions Index*

Country	Score	Rank
Egypt	2.9	3
Kenya	2.2	1
Nigeria	2.4	2
Mauritius	5.1	5
South Africa	4.1	4

Source: http://www.transparency.org/

3.5 Estimating methods

This section addresses econometric methods used to estimate the models presented earlier in the chapter. In order for the study to achieve its objective, time series cross sectional analyses will be used and the estimating methods presented below are meant to address the accuracy of the findings of the study.

Filtration of the data is carried out in order to eliminate dependence overtime: dt = (X't, Y't). Since this study is not necessarily measuring growth, the ordinary least squared method of estimation is adopted. This method is preferred to the Generalised Method of Moments (GMM) technique because the GMM is not designed for a small amount of cross sectional units (Andrianaivo and Yartey, 2010).

3.5.1 Sensitivity analysis

Sensitivity of the results regarding estimations is scrutinised to evaluate the robustness of the results. This is carried out through assessments about whether the exclusion or inclusion of constants particular to a country makes any difference to estimated parameters.

3.6 Conclusion

In this chapter, the models of analysis are specified, test variables are defined and a suitable estimation technique is defined. Several models have been specified, including a basic test for contagion. This is followed by models that seek to capture the interaction of vulnerability to contagion and financial integration. The estimation techniques include the OLS. The models offered in this chapter form the pillars of analysis in chapters four and five.

CHAPTER 4: ANALYSIS AND INTERPRETATION

4.1. Introduction

Panel data procedures are used to analyse data for five countries which are split into two sub periods: pre-crisis and crisis periods. The aim is to analyse the characteristics and trends of financial markets in the selected African emerging market equity indexes. Specifically, the presence or otherwise of financial contagion in the sample data is investigated and the intricacies behind the results are evaluated. Time series, panel data is exploited in this section to gain deeper insight into the markets. As with preceding empirical studies on stock return behaviour in African markets, monthly data is used in the analysis (Appiah- Kusi and Menyah, 2003). The data set is balanced which is another reason to dismiss the use of the Generalised Method of Moments (GMM) and the least squares dummy variable model (LSDV). The utilisation of both static and dynamic analysis techniques is useful in ensuring the robustness of the results to the methods of estimation. Results presented in this chapter are valuable in the derivation of policy recommendations.

The remainder of the chapter is arranged as follows: in section 4.2, descriptive statistics are used to summarise important variables in the panel. The data set is investigated in section 4.3. Sections 4.4, 4.5 and 4.6 are devoted to the analysis of contagion in the sample and interpretation of the findings. Section 4.9 brings the chapter to a close with a summary.

4.2. Descriptive statistics of panel data.

Summary statistics for the five African emerging countries and the S & P 500 indices are presented in Table 4.1 below. The table shows summary statistics of the equity market indices for the entire sample in the two sub periods. The natural logarithm is used in the computation of descriptive statistics as suggested by Nelson (1991) and Alagidede (2011).

The highest monthly mean return of the total sample period occurs in Nigeria (10.27) with Mauritius producing the lowest mean return (7.2). Expectedly, the smallest mean return for Kenya corresponds with the lowest standard deviation. According to Guo (2000) the risk/return trade-off is the equilibrium between the appeal for the greatest possible return for the lowest possible risk. Therefore, hopes and beliefs of higher risk levels related to a certain investment will fetch greater returns as compensation for the superior risk expected. Alternatively, investments with comparably lower degrees of expected risk would entail that investors accepting lower levels of returns. Table 4.1 suggests that Kenya, in light of its high standard deviation, hence risk, signifies superior potential returns. Similarly, it means higher potential losses. The standard deviations in Table 4.1 appear high for the remainder of the countries (0.33 for Mauritius and 0.34 for Nigeria) inferring that investors in African emerging markets must be accepting higher risks as exchange for greater potential returns.

Table 4.1: *Logged summary descriptive statistics for the entire sample of African emerging markets*

Country	**Kenya**	**Nigeria**	**South Africa**	**Egypt**	**Mauritius**
Mean	8.3	10.27	10.14	8.71	7.23
Standard Error	0.02	0.03	0.02	0.02	0.03
Median	8.30	10.12	10.21	8.73	7.39
Standard deviation	0.19	0.34	0.25	0.27	0.33
Sample variance	0.03	0.12	0.06	0.07	0.11

Kurtosis	-0.78	-0.32	0.24	-0.22	-0.88
Skewness	-0.09	1.04	-0.97	0.36	-0.73
Jarque-Bera (JB)	98841.3	2933.1	225.8	2014.6	31573.0
Confidence level (95%)	0.04	0.07	0.05	0.05	0.06

Source: From field data

The kurtosis for Kenya, Nigeria and Mauritius exceed the threshold of 0.3 which indicates that the returns of these countries have flatter tails than would be probable in the case of a normally distributed variable. With the exception of South Africa, all the returns are negatively skewed therefore rejecting the Jarque-Bera (JB) test for the assumption of normality for the sample. The predominance of negatively skewed distributions of the sample data suggests that the data exhibit non-normality. The null hypothesis of Kurtosis for normal distribution is rejected due to the Kurtosis coefficients, thus suggesting a leptokurtic distribution of the returns. Rejection of the null hypothesis is harmonious with that of Simons and Laryea (2005), and Mollah (2007). The findings of the distributional properties of return are similar to those of Alagidede (2011) in that they appear to indicate extreme observations. The maximum kurtosis in the sample occurs in Mauritius (-0, 88), followed by Kenya (-0.87).

The summary statistics for the monthly stock market returns over the two sub periods are presented in Table 4.2. The average market return during the pre-crisis and post-crisis periods is positive for all stock markets. All indices in the sample increased in the period during and after the crises except for Kenya. This may be due to the relatively low drop in diaspora remittances, the boost in tourism in Kenya at the time due to the weaker shilling and the drop in horticulture on which Kenya relies for income as well as the decrease in capitalisation during the 2008 subprime crisis, as suggested by Kambadza and Chinzara (2012). Oddly, despite the increase in the mean return of South Africa's index during the crisis period, it experienced a notable decrease in risk measures such as standard deviation and variance suggesting greater integration of South Africa into the advanced economies (US) from where the crisis originated. The overall high standard deviation corroborates the common observation of riskiness in emerging markets (Forgha, 2012). This observation is

consistent with the postulation of Kambadza and Chinzara (2012) and Piesse and Hearn (2005) that the majority of African stock markets, with the exception of South Africa and Egypt are volatile, small and illiquid due to their early stage of development. This partly answers the apparent mean variance resilience of South Africa.

Table 4.2: *Logged summary statistics for the monthly stock market returns over the two sub periods.*

Table 4.2.1: Tranquil Pre-crisis period from 01/ 01/ 2005 to 31/07/2007

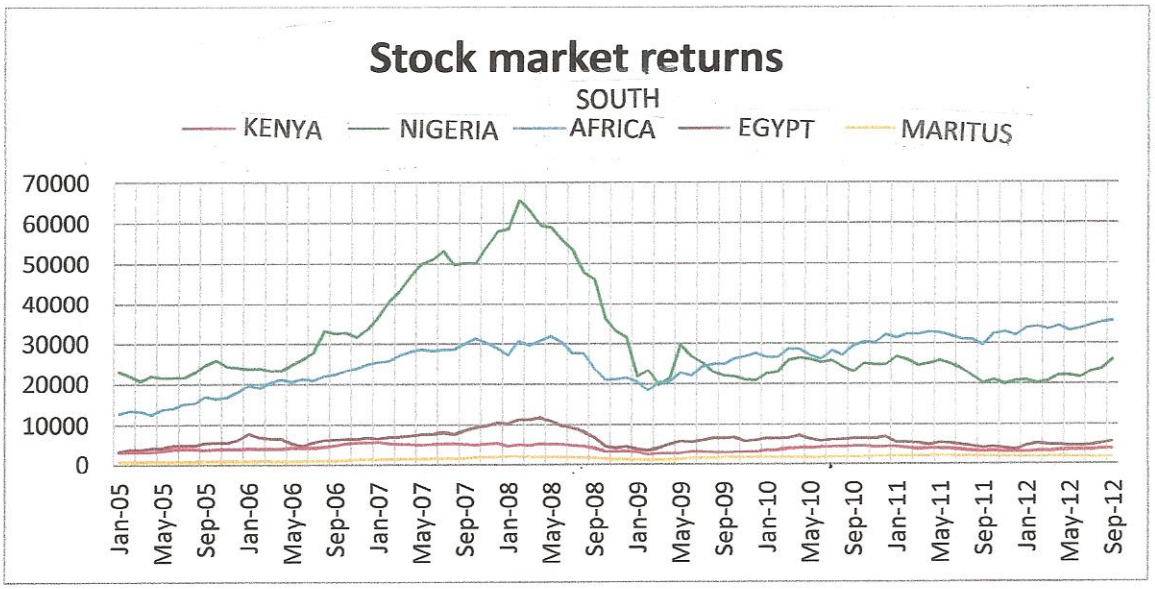
Country	Kenya	Nigeria	South Africa	Egypt	Mauritius
Mean	8.36	10.25	9.88	8.67	6.83
Standard error	0.03	0.05	0.05	0.04	0.04
Standard deviation	0.18	0.28	0.26	0.23	0.23
Sample variance	0.03	0.08	0.07	0.05	0.05
Kurtosis	-0.81	-0.34	-1.16	-0.68	-1.01
Skewness	-0.04	0.94	-0.19	-0.59	0.75
Confidence level (95%)	8.43	10.35	9.97	8.75	6.91

Table 4.2.2: Crisis period and beyond from 01/08/2007- 01/09/2012

Country	Kenya	Nigeria	South Africa	Egypt	Mauritius
Mean	8.30	10.27	10.14	8.72	7.24
Standard error	0.02	0.04	0.03	0.03	0.04
Standard deviation	0.19	0.35	0.26	0.28	0.34
Sample variance	0.04	0.12	0.07	0.08	0.11
Kurtosis	-0.78	-0.32	0.24	-0.23	-0.89
Skewness	-0.09	1.05	-0.98	0.36	-0.74
Confidence level (95%)	0.04	0.07	0.05	0.06	0.07

Diagram 4.1 is a graphical representation of the time series behaviour of the various price indices under examination. The values are unlogged purposely to offer a more intuitive perspective of the relative market values of each index. The diagram presents the evolution of each index during the period under analysis. Business cycle trends in the selected markets are depicted in the graph.

Diagram 4.1: *Stock market returns of African emerging markets over complete sample period.*



Mauritius, Egypt and Kenya experienced slight market activity during the periods January 2005 to June 2005. Thereafter Kenya, and to a greater extent Egypt, began a bullish assent till around December 2005 before assuming a downward trend about one year later. Nigeria and South Africa also shared a comparable trend in market activity with a quieter market in the initial stages of the period to a bullish trend which peaked around December 2007. The Mauritius stock exchange had a relatively stable return during the sample period. Two major trends can be seen in the Nigerian Stock Exchange (NSE) during the sample period – a steep bullish trend which peaked in January 2008 and a deep bearish period which hit an all-time low in early 2009. Generally, the time period selected displays evidence of regular business cycles in the equity indices for the five countries and the S&P

500 index. The summary statistics indicate positive average monthly return for all the indices in the sample. All return series are considerably skewed except for the S&P 500. The result closely relates, however, not completely to the propositions and findings for Kambadza and Chinzava (2012) that a similar reflection amongst the four largest economies on the African continent (SA, Egypt, Nigeria and Morocco) possess negatively skewed stock returns, while all other countries display positively skewed distributions.

4.3 Unit root tests

The application of unit root tests is inspired by the proposition of Nelson and Plosser (1982) that such evaluations have become a necessary foundation in empirical macroeconomic research. The authors argue that virtually all macroeconomic time series have a unit root. Furthermore, unit root tests necessitate the error structure to be individually independent and identically distributed (Bernard,Eaton, Bradford and Kortum, 2000). Thus, the concentration is on inspecting whether the time series data have transitory or permanent shocks (Nhlamo, 2010).

Empirical results for the Augmented Dickey Fuller (ADF) test and the Phillips-Perron (PP) test for the entire sample period are exhibited in Table 4.3. The ADF, PP t-statistics and p-values are revealed for the level and first-differenced series of the natural logarithm of the index prices, as suggested by Vitali and Mollah (2011). The null-hypothesis of non-stationarity is tested against the alternative of stationarity by the two tests expressed.

Table 4.3: *Empirical results for the Augmented Dickey Fuller (ADF) test and the Phillips-Perron (PP) test for the whole sample period*

Country	Variable	ADF		PP		First diff ADF	First diff PP	Test Diagnosis
		t	p	t	p			
Kenya	Nairobi Securities Exchange 20 Shares Equity Market Index	-2.51	0.32	-2.23	0.47	1.12**	-7.68**	I(1)
Nigeria	Nigerian Securities Exchange All Share Equity Market Index	-2.11	0.53	-1.65	0.76	-1.45**	-4.91**	I(1)
South Africa	Johannesburg Stock Exchange All Share Equity Market Index	-2.33	0.41	-2.17	0.50	-1.01**	-8.29**	I(1)
Egypt	Alexandra Stock Exchange EGX 30 Equity Market Index	-2.8	0.19	-2.32	0.422	1.99**	-9.01**	I(1)
Mauritius	Stock Exchange of Mauritius Equity index	-2.58	0.28	-2.11	0.53	-0.06**	-9.43**	I(1)

*Reject the null hypothesis of unit root at the 10% level.
** Reject the null hypothesis of unit root at the 5% level.
NB* the null hypothesis under the KPSS test is that of stationarity.

Table 4.3 also displays a test based on the Augmented Dickey-Fuller test for the random walk hypothesis. The null hypothesis of the unit root cannot be rejected for any of the stock returns in the sample of African emerging countries. These results are consistent with those of Nyong (2005) in the examination of 13 African emerging markets. According to Nyong (2005) rejection of the random walk hypothesis, as evident in Table 4.3 is due to autocorrelation which is the reason why investors are not adverse to risk. Fargha (2012) attributes this to the competence difficulty gap and information asymmetry. Rejection of the null hypothesis occurs at all levels and indicates that the price index series in log form are non-stationery. In contrast, the null hypothesis is convincingly rejected for the series'

first differences, being, the return which is a necessary, but not sufficient condition for a random walk process (Vitali & Mollah, 2011).

Taken as a whole the tests for a unit root presented above offer substantiation of the random walk hypothesis for the African emerging economies under investigation. The above unit root test provides intuition into the behaviour of African emerging stock market returns. The findings point out that future price alterations of the index returns under investigation cannot be predicted using past price modifications (Opong, Danquah, and Sam,2008). Moreover, the unit root test is valuable to a study of contagion because it assists in the identification of the types of shocks propelling stock prices. Therefore, if the generating practice is dictated by permanent elements and thus possesses no mean-reversion, it is probable that it is a random walk. Shocks to a series from an initial equilibrium will bring about escalating deviations from its long-run equilibrium (Karemera, Ojah and Cole, 1999). Also important to studies of contagion is the help that the establishment of a unit root has on the design of policy by stakeholders. Vis-à-vis the test for herd behaviour that is to follow, the unit root test affords one the interpretation of the equity return series which, according to Poterba and Summers (1998) is most appropriately elucidated by the effect of the market's noise traders.

Karemera et al (1999) are among the main scholars who caution the power of the ADF and PP test citing that the tests lack power and probably will not reject the random walk hypothesis when required.

4.4 An adjusted correlation coefficient and bootstrap test for contagion

A measure commonly used to examine the relationships between stock market returns is the correlation on coefficient (Naouri, Khemiri and Liouane, 2010). When the correlation increases significantly during a crisis period, it is reasoned that contagion has occurred. The hike in the correlation implies that there is an increase of the strength of a transmission

mechanism or associations between two markets. However, only if the increase is statistically significant is the relationship between stock markets one of contagion. If there is no statistical significance, there is merely interdependence not contagion. Many meticulous interpretations of the correlation ρ and its' estimate exist (Rogers and Nicewander, 1988; Rovine and von Eye, 1997).

The correlation ρ or its estimate is of particular importance as it completely explains the dependence structure of a pair of random variables (Stove, Tjostheim & Hufthammer, 2010). A study by Collins and Biekpe (2003) demonstrated that the unadjusted correlation coefficients indicate that some markets, including minor markets like Mauritius, exhibited evidence of contagion from the originating country (Hong Kong) in the 1997 Asian crisis. According to Collins and Biekpe (2003) amendments to the correlation coefficients provide more initiative findings. This technique, however, has been criticized by Corsetti, et al (2002) due to its 'arbitrary' and 'unrealistic' constraints on the variance of country-specific shocks. Table 4.4 shows results for a bootstrap test for contagion carried out on the sample data. It is a combination of the adjusted coefficient proposed by Forbes and Rigobon (2002) and a bootstrap methodology prescribed by Stove, et al (2010) to address the criticisms of Corsetti et al (2002).

Table 4.4: *A bootstrap test for contagion.*

Source USA	Pre crisis		Post crisis				Boot strapped test statistic	t-student	Contagion
	ρ^l	σ	ρ^h	σ	ρ^{h*}	$\rho^{h*} - \rho^l$			
USA-Kenya	0.88	0.03	-0.73	0.03	-0.70	-1.58	0.00	2.25	Y
USA-Nigeria	0.93	0.07	-0.76	0.14	-0.73	-1.66	0.00	5.34	Y
USA-South Africa	0.96	0.06	-0.36	0.07	-0.33	-1.29	0.002	1.72	Y
USA-Egypt	0.85	0.05	-0.52	0.07	-0.48	-1.33	0.007	4.18	Y
USA-Mauritius	0.96	0.05	-0.21	0.11	-0.19	-1.15	0.269	3.75	Y

*ρ^h = Adjusted correlation coefficient)
Y = presence of contagion

Table 4.4 exhibits also the unadjusted (ρ) and the adjusted (ρ^*) correlation coefficients for the sample of African emerging countries prior to, during and after the sub-prime mortgage crisis. As Table 4.4 reveals, the cross- market unadjusted correlations between the US and remaining countries in the sample prior to the turmoil period are greater than those during and after that period. Also, the volatilities of all stock index returns during the post crisis period surpassed those during the pre- crisis period.

A simple test statistic, as presented in equation (3.6) is applied to the correlation coefficients shown in Table 4.4. The results suggest that contagion is present in all emerging countries in the sample. Therefore, Kenya, Nigeria, South Africa, Egypt and Mauritius experienced contagion during the sample period and thus, the 2008 sub-prime mortgage crisis. These findings are consistent with those of Collis and Biekpe (2003) who found that contagion was present in South Africa, Egypt, Morocco and Namibia during the 1997 Asian crisis.

Outcomes of the adjusted crises correlation co-efficient also indicate contagion in all African emerging countries of the sample. This is evident from the calculated value for $[\rho_i^{h*}-\rho_i^l]$

being larger than the bootstrapped critical value. It is found, in sum, that the sample African emerging markets experienced financial contagion during the 2008 subprime crisis. Findings suggest grounds for the notion that more sizeable, integrated markets in Africa tend to suffer from contagion more severely than their smaller, less integrated counterparts. (Collins and Biekpe, 2003). The results exhibited in Table 4.4 contradict the findings of Forbes and Rigobon (2002) that South Africa did not experience contagion in their sample period. This may be due to structural and political differences from the period of the current study and that of Forbes and Rigobon (2002) as well as dissimilarities in measuring methods. A table of t-values indicates that the absolute value of the calculated t is larger than the critical t at both the 5% and 1.% level of significance.

Collins and Abrahamson (2006) examine the driving forces of contagion in Africa and suggest that the force behind South Africa's experience of contagion during the 1997 Asian turmoil was resources. This offers insight into Africa's contagion experience. Resources alone account for approximately 47.1% of market capitalisation in South Africa thus accounting at least in part, for some contagion features of South Africa (Kambadza and Chinzava, 2012).

4.5 A model of threshold and vulnerability to financial contagion

Results for the model, which is specified in equation (3.7), are presented. Estimation outcomes of the parameters of vulnerability are exhibited in Table 4.5 and Table 4.5.1. Outcomes of the fixed time effects are presented in Appendix A. Contained in the tables are the date, the estimated coefficients and their corresponding t-values. The R^2 is a measure of goodness of fit. The measure suggests the comparative success of the regression models in predicting the values of the samples' dependent variable. The bottom panel of the table conveys an R^2 of 69.31 and a F statistic of 15.8 for the model. The model is useful as it is a panel data model which, through the insertion of both a regional and a world equity index, constraints shared vulnerabilities (Baur and Fry, 2005). The significance of the fixed time effect captures the contagion. The fixed time effect is an approximation of the time-varying

joint movements in African emerging markets which is not justified by the global or regional factors. Should the fixed time effect extend past the threshold of the calculated t-value, there is signal of a sizeable, unaccountable common element that is understood as contagion. If the t statistic of an estimate of γ^{*t} is significant at the 99% level, the threshold is considered reached. It is worthy to note that while there is dissimilarity between interdependence and contagion, it is suspected that interdependence, to some extent is a prerequisite for the presence of contagion since a disease can only be spread through some contact (Baur and Fry, 2005).

Table 4.5: *Estimation outcomes of the parameters of vulnerability-regional factor*

Regional factor (S&P Emerging market index)	β^i **1**	**t-value**
Kenya	0.07	1.18
Nigeria	0.2	1.45
South Africa	0.85	18.63
Egypt	0.43	4.22
Mauritius	1.24	20.05

Table 4.5.1: *Estimation outcomes of the parameters of vulnerability-global factor*

Global factor (S&P 500)	β^i **2**	**t-value**
Kenya	0.82	7.69
Nigeria	0.8	3.34
South Africa	0.64	3.88
Egypt	0.44	2.47
Mauritius	-0.63	-5.83

R Square of 0.69
F statistic of 15.80 (<0.005)
The p-value of the F-statistic is given in parenthesis.

The results indicate that vulnerabilities are, in large part, notable in all of the countries in the sample. The S&P 500 indices which encapsulate global vulnerabilities is most significant for the larger more liquid indices in the sample, namely South Africa, Egypt, Nigeria and

Kenya. The relatively high t-value of Kenya relative to the global factor (S&P 500 index) may be due to comparably higher levels of information asymmetry (Levine and Zervous, 1998 ;Ojah,2012). The weaker institutional framework found in Kenya will invariably make the market more vulnerable to externalities, as it is evident in Table 4.5.

The parameter estimate of Kenya is 0.82 with a t-value of 7.69. Intriguingly, the data of the current study indicate a lack of significance of world returns to the vulnerability of Mauritius. However, Mauritius displays the greatest significance to regional vulnerability with a parameter of 1.24 and a t-value of 20.05. This is probably due to a greater reliance on regional trade linkages as opposed to global trade linkages which possibly highlights financial instead of economic linkages. A further line of reasoning would be that, of the sample African emerging markets, Mauritius has the least number of listed companies; and thus less open with the global factor. In the same vein, the large significance of South Africa to regional vulnerabilities may be viewed as evidence of its relative economic and financial importance to regional (African) vulnerability. Such reasoning concurs with that of Andrianivo and Yartey (2010) who posit the domination of the Johannesburg Stock Exchange of South Africa in the region, in terms of market capitalisation and liquidity, with the Alexandra Stock Exchange in Egypt maturing at a fast pace.

4.6 Test for Contagion

Table 4.6 exhibits the time series fixed time effect over the period, 3 January 2005 to 29 September 2012. The coefficient estimates of the model are presented in the first panel of the figure while the second panel displays the t-values related to each estimate. The last panel reveals the matching 99% critical values. Joint contagion for equity returns is evident in distinct indices at the 99% level. The parameter estimates of the fixed time effects are generally large in absolute terms and are inclined to cluster when contagion is evident. Contagion episodes correspond to the months of April 2007 through to July 2008 with the four months prior to the cluster showing signs near contagion.

Table 4.6: *Time series fixed time effect test for contagion*

k	Date	$\gamma^{t*} + k$	t- value
1	05-Jan	-0.38	0.65
2	05-Feb	-0.37	0.64
3	05-Mar	-0.38	0.65
4	05-Apr	-0.37	0.65
5	05-May	-0.32	0.62
6	05-Jun	-0.28	0.61
7	05-Jul	-0.26	0.60
8	05-Aug	-0.21	0.58
9	05-Sep	-0.18	0.57
10	05-Oct	-0.17	0.57
11	05-Oct	-0.15	0.56
12	05-Dec	-0.09	0.54
13	06-Jan	-0.08	0.53
14	06-Feb	-0.10	0.54
15	06-Mar	-0.10	0.54
16	06-Apr	-0.14	0.56
17	06-May	-0.14	0.55
18	06-Jun	-0.08	0.53
19	06-Jul	-0.05	0.52
20	06-Aug	0.05	0.48
21	06-Sep	0.10	0.46
22	06-Oct	0.12	0.45
23	06-Nov	0.15	0.44
24	06-Dec	0.17	0.43
25	07-Jan	0.22	0.41
26	07-Feb	0.23	0.41
27	07-Mar	0.25	0.40
28	07-Apr	0.29	0.38
29	07-May	0.31	0.38
30	07-Jun	0.24	0.40
31	07-Jul	0.33	0.37
32	07-Aug	0.35	0.36
33	07-Sep	0.39	0.35
34	07-Oct	0.41	0.34
35	07-Nov	0.45	0.33
36	07-Dec	0.47	0.32
37	08-Jan	0.45	0.33
38	08-Feb	0.50	0.31
39	08-Mar	0.48	0.32
40	08-Apr	0.49	0.31
41	08-May	0.46	0.32
42	08-Jun	0.41	0.34
43	08-Jul	0.35	0.36
44	08-Aug	0.27	0.39
45	08-Sep	0.10	0.46
46	08-Oct	-0.07	0.53
47	08-Nov	-0.07	0.53

k	Date	$\gamma^{t*} + k$	t- value
48	08-Dec	-0.10	0.54
49	09-Jan	-0.26	0.60
50	09-Feb	-0.26	0.60
51	09-Mar	-0.20	0.58
52	09-Apr	-0.12	0.55
53	09-May	-0.03	0.51
54	09-Jun	0.00	0.50
55	09-Jul	0.03	0.49
56	09-Aug	0.02	0.49
57	09-Sep	0.02	0.49
58	09-Oct	-0.01	0.50
59	09-Nov	0.01	0.50
60	09-Dec	0.04	0.48
61	10-Jan	0.06	0.48
62	10-Feb	0.07	0.47
63	10-Mar	0.15	0.44
64	10-Apr	0.13	0.45
65	10-May	0.11	0.46
66	10-Jun	0.11	0.45
67	10-Jul	0.14	0.44
68	10-Aug	0.13	0.45
69	10-Sep	0.16	0.44
70	10-Oct	0.19	0.43
71	10-Nov	0.19	0.42
72	10-Dec	0.16	0.43
73	11-Jan	0.15	0.44
74	11-Feb	0.16	0.44
75	11-Mar	0.12	0.45
76	11-Apr	0.15	0.44
77	11-May	0.16	0.44
78	11-Jun	0.12	0.45
79	11-Jul	0.07	0.47
80	11-Aug	0.01	0.50
81	11-Sep	-0.01	0.51
82	11-Oct	0.00	0.50
83	11-Nov	-0.04	0.52
84	11-Dec	0.00	0.50
85	12-Jan	0.04	0.48
86	12-Feb	0.03	0.49
87	12-Mar	0.03	0.49
88	12-Apr	0.05	0.48
89	12-May	0.05	0.48
90	12-Jun	0.05	0.48
91	12-Jul	0.08	0.47
92	12-Aug	0.12	0.45
93	12-Sep	0.15	0.44

While there are 11 months during which contagion is established it only signifies about 11.82% of the monthly observations in the fixed effects window. The remaining 88.28% have equity market prices which are determined by regional and global vulnerabilities. The benefit of such a method to evaluating contagion is that contagion or interdependencies can be distinguished on a monthly basis. This is in contrast to techniques such as that of Forbes and Rigabon (2002) who are only able to establish either interdependence or contagion as justification of a crisis. The results from the sample suggest that although awareness of vulnerabilities and interdependencies are valuable, instances of contagion on only specific months occur. Insight of such extreme volatility provides intuitive value into the behaviour of African emerging economies. Moreover, the results juxtapose those of Corsetti, Pericoli and Sbracia (2002) who restrict contagion to a subgroup of markets. All markets in the study are affected by contagion during the sample period.

Baur and Fry (2005) highlight that the contagion phenomenon is not merely negative. The authors continue to assert that there have been approximately equal numbers of positive and negative contagion episodes in recent history and that contagion episodes of positive contagion have been large in absolute terms. Such findings are noteworthy and cannot be ascertained directly by way of correlation coefficient assessments of contagion which, by construction can only be one sign. Results such as those found above have strong implications for optimal portfolio allocation and investor diversification since decisions about the diversification of portfolios are centred on appraisals of the direction and intensity of the co movement of asset prices.

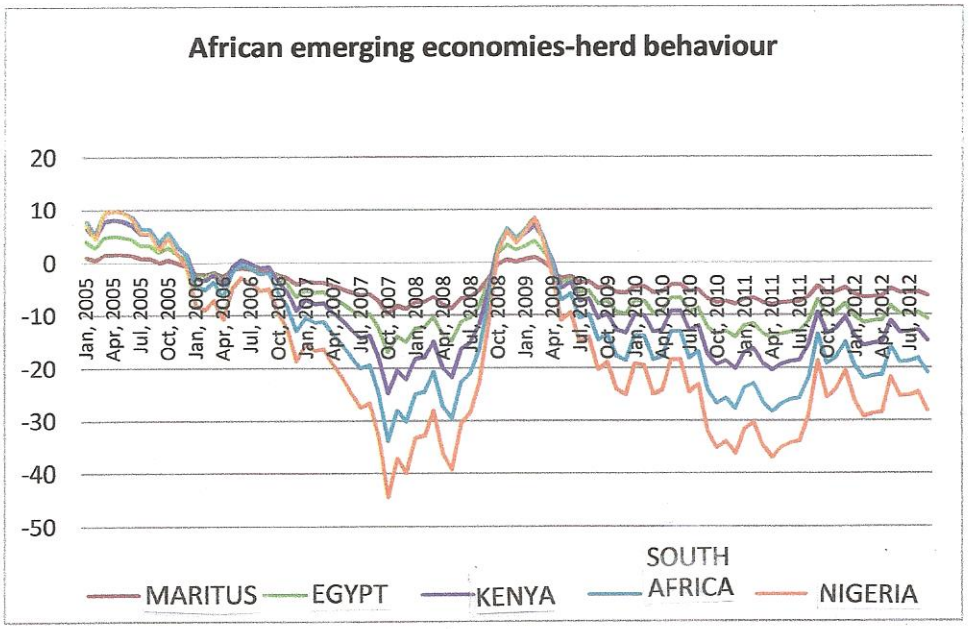
4.7 Herd behaviour

The 2008 financial crisis appears to have caused an upsurge in academic and professional publications suggesting improvements of the economic and financial policies in countries (Farmer and Foley,2009). While the concept of herd behaviour in financial markets is not novel, the last few crises have brought about more refined models to explain and evaluate the phenomenon. Agent-based modelling is identified as a key tool, which could improve

the understanding of financial markets thus leading to more effective policy-making and applications (Bouchaud, 2008). There are many creative agent-based methods of modelling financial markets (Chakraborti, Toke, Patriarca, and Abergel,2011). Cristelli, Pietronero, and Zaccaria (2010) suggest that superior financial market models are tractable, that is, have an analytical solution, and realistic that is, incorporate the true behaviour of the individual trader.

The measure of volatility is represented by a parameter –a- which is the benchmark return of an emerging markets economy. The S&P Emerging Market Index is utilised as a benchmark. Periods which contain returns in excess of the benchmark will be found to experience herd behaviour. The log returns of each index is the starting point of the evaluation. Diagram 4.7 displays the excess return of African emerging markets benchmarked against S & P Emerging market index.

Diagram 4.2: *Excess return of African emerging market*



Those results are intuitive. According to Economou, Kostakis and Philipas (2010) herd behaviour, is one of behavioural finance's most interesting concepts. Park (2009) suggests

that herd behaviour in financial markets causes an increase in volatility of returns. Further, Pooley and Hutchison (2009) shows that during the subprime crisis of 2008, emerging markets experienced more volatility in their financial markets than the US, being the country in which the crisis originated. This is understandable in light of the findings of Senbet and Otchere (2008) that the infrastructural bottlenecks including slow trading and settlement systems reduce information production and turnover activity, thus volatility. Appendix C displays the number of listed companies, turnover and market capitalisation of the selected African emerging countries. According to Laderkarl and Zervous (2004), the findings of relatively lower turnover ratio, market capitalisation and lesser number of listed companies impact the minimum expected returns and the investment flows into the African Emerging Markets. Drawing from the Cont-Bouchard model of herd behaviour and volatility, one may reason that an increase or decrease in expected return of African emerging markets can be attributed to herd behaviour caused by information asymmetry in financial markets which restrict agents from forming investment decisions independently (Park, 2011). Thus, during episodes of increased volatility, the chances of independent trading tend to be low and the probability of herding will be high, bringing about a small amount of orders and increasing the volatility in the market. Congruently, high volatility induced by herd behaviour reduces considerably from a flow of public information, which causes the clusters to break down (Park, 2011).

Such findings are of particular importance to African emerging economies since, as alluded by Ojah and Mokoaleli-Mokoteli (2010), such markets suffer from information asymmetry. Ahmadu-Bello and Rodgers (2011) present further substantiation of the presence of herd-behaviour related contagion in African markets. The authors attribute this standing to the presence of foreign banks in the region and argue that foreign banks can be positioned as a chance for herd behaviour related contagion if they sell off assets or decrease support to domestic banks. The ability to act as a channel for contagion lies in the fact that most foreign banks have headquarters in advanced economies which incurred great losses during the 2008 subprime crisis (Kasekende, Ndikumana and Rajhi, 2009).

The measure of volatility is represented by parameter "a" which is the benchmark return of an emerging market economy. The S&P emerging market index is utilized as a benchmark. Periods with a return in excess of the benchmark, minus the value of 1 will be found to experience herd behaviour.

Mauritius experienced a relatively high excess return from the beginning of the sample period till approximately November 2006 where there was a steady decline of excess returns to 10 units of the benchmark. The decline continued till October 2007 where excess returns reached their lowest point of 28 units of the benchmark. Extreme downside volatility continued till August 2008 which is approximately the official declaration of the financial crisis originating in the US. A steady increase in excess returns continued from August 2008 till January 2009 where excess returns gradually declined in a stepwise manner reaching a point of -20 units to the benchmark in April 2011. Excess returns continue to increase although volatility each month can be observed.

Herding behaviour, irrational behaviour and speculative attacks may be direct outcomes from institutions which lack quality infrastructure. A lack of sound domestic fundamentals may also bring about occurrences of herding behaviour and speculative attacks (Asongu, 2011). For example, irrespective of market fundamentals, investors may decide against a currency if they feel that its exchange rate is untenable. Obotfeld (1986) and Schumkler (2004) support this view in their discussion of herd behaviour and the need for sensible domestic fundamentals.

South Africa, as the largest economy in Africa, seems to have fared relatively well in terms of herd behaviour specifically and contagion in general. The speculative real estate market began a steep decline prior to strongly affected property sectors in the US, Ireland and Denmark. However, the cost of the speculation felt by South Africa was offset, at least partly by what Bond (2008) identifies as ideological advance by delegitimizing the economic liberalisation philosophy embraced during 1994-2008 governments and Thabo Mbeki. The

exchange control in South Africa makes certain that a sturdy degree of liquidity remains within the country's financial market. A further factor which insulates South Africa from a relatively high degree of herd behaviour has been the ban of some exotic financial products. For example, banks may not bridge transactions that are not connected to South Africa.

Regardless of the myriad of negative indicators, the Johannesburg Stock Exchange (JSE) shows sustained high levels of equities from August 2012. This is as international and domestic investors deflect from herd behaviour produced by noise. Herd behaviour in South African financial markets appears to have stabilized from approximately April 2010 to the end of the sample period. Stabilisation has occurred in the presence of events such as the Marikana mine tragedy and subsequent calls for nationalism by the expelled African National Congress youth leader Julius Malema. Lucas (2012) accredits the robust reaction of South Africa's financial market to international investors who seek alternatives to the battered European markets.

The Nigerian stock market appears to have deviated from the benchmark return relatively minimally. Nigeria, second to Egypt has the smallest range of deviations from the excess returns of the S&P emerging markets index. According to Dialoke (2011) the Nigerian stock market was subject to herd behaviour and ignorance due to the fact that the stock market would tend towards the mean. The investors did not take the unsustainability of the rapid growth of the Nigerian stock market into account. This disregard for the medium term viability of stock prices meant numerous stocks with unproven fundamentals were over-priced due to excessive speculation and herd behaviour. Findings from the sample period concur with those of Dialoke (2011) that herd behaviour is present in Nigeria.

The management and council of the Nigerian Securities Exchange were disposed of during the 2008 subprime crisis. The Securities and Exchange Commission (SEC) dismissed the former president of the NSE, Alhaji Aliko Dangate and Director General Prof Ndi Okereke Onyiuke among others. The action affected the NSE and news of it caused investors to

become apprehensive about the Nigerian market, viewing it as unstable. Shareholders resorted to herd behaviour by dumping their shares and worsening market conditions (Adamu, 2009). Resistance, which Nigeria may possess due to the country's relatively strong fundamentals was eroded by such herd behaviour and is evident in the dip in excess returns and finding of herd behaviour from September 2008. The strongest recording of herd behaviour in the sample occurred in May and June 09 with measures of -2, 35 and -2, 95 respectively.

Massa and te Velde (2008) find that Kenya, Nigeria and Mauritius have performed remarkably well over the past few years, consequently attracting a growing share of portfolio inflows. Results in the current study show that the economies affected most by herd behaviour during the sample period were Mauritius, South Africa and Egypt. The finding slightly opposes that of Massa and te Velde (2008) who found South Africa, Nigeria and Kenya to be most affected by herd behaviour during a similar time frame. The sample period indicates excess returns of Kenya to be stable. A steady increase of excess returns occurred from June 2008 at -4, 10 units below the benchmark, before recording an excess return of around 0.80 a month later. This brief and sharp recovery may be due to a lagged reaction to the announcement of the subprime crisis in 2008.

Trade and tourism sectors in Kenya comprise the second biggest share of GDP, therefore a drop in the GDP may be due to a reluctance of foreign tourists to visit Kenya for vacation in light of financial crisis. (Massa and te Velde, 2008). The 2008 post-election crisis within Kenya would have also been a deterrent for tourists and may have contributed to a decrease in trade in the short term. (Massa and te Velde, 2008). The consequent recovery of the excess return approximately one month later may be, in part, due to the World Bank's 'Doing Business' report which ranked Kenya among the top 10 global reformers. The announcement of Kenya's rank in late 2008 may have improved investor confidence in Nairobi as investors frantically searched for new channels of investments. Herd behaviour seems to be present in Kenya during the sample period since H>O for many months. These findings are consistent with that of Adida, Oduor and Onwonga (2012) who find herd

behaviour present in Kenyan financial markets. The evidence of Kithinji and Ngugi (2011) is echoed in results from the sample period. The performance of the Nairobi Securities Exchange was affected by the political activities and expectations immediately prior to the election period. This is evident in the rapid change in the measure of herd behaviour. The poor performance prior to the election may be attributed to panic and investor anxiety associated with pre-election activities.

Egypt, as the most mature financial market in Africa, has a population of approximately 80 million people. The average age is 24 years and is representative of 5% of the population (Radsch, 2012). Thus, it is not surprising that the social media and internet usage have increased two fold since 2008. Herd behaviour was evident in Egypt as trending topics on social media portals helped to generate media awareness and garner information. Such dissemination of ideas and opinions about the Mubarak regime brought about an outbreak of protests which attracted millions of people into Egypt's streets and brought the economy to a halt. (Voice of America, 2012). The stock exchange, banks and many businesses were closed for almost three weeks. Egypt's stock market plummeted 10% in one day, the largest decline in a single day ever experienced by Egypt. The financial markets were also downgraded by certain ratings agencies (Financial Times, 2011).

The internet enabled the rapid and effective dissemination and self-publishing of information, arguably bringing about herd behaviour which trickled into Egypt's financial markets. Indeed, herd behaviour is found to be present in Egypt with the greatest loss accounted to herd behaviour coinciding with the April 2008 uprising and January 2011 strikes. Noteworthy is that data shows a positive increase in the strength of Egypt's herd behaviour at the announcement of the subprime crisis in 2008. This is similar to the case of Kenya in which herd behaviour measures increased around the time of the announcement of the 2008 sub-prime crisis and may be caused by investors seeking safer investments in Egypt as the US and most advanced markets' stocks declined. (Financial Times, 2012)

4.8 Vulnerability index

Events such as the Asian (1997) and Russian financial crisis in 1998 directed widespread research into variables that can be worthy proxy measures of vulnerabilities of emerging economies in the face of crisis (Hawkins and Klau, 2000). Demirgüç-Kunt and Detragiache (1998) conclude that banking crises are likely to erupt during periods of weak macroeconomic environments, and more so when inflation is high and growth low. Therefore, countries are most vulnerable to contagion when the above conditions are present and persist. Hardy and Pazarbaşioğlu (1998), and Eichengreen and Rose (1998) emphasize the significance of inadequate international reserves, recessions, high real interest rates and excessive credit growth in a country's vulnerability to financial crisis.

The scoring system adopts that of Caisse des Dépots et de Consignations (Deposits and Consignments Fund) and is mapped into five bands, with a value of –2, –1, 0, 1 and 2 respectively. Therefore, each variable has a maximum least score of two and each index a lowermost score of ten. Thus, it is straightforward to see which indicators lead to increased vulnerability in each index. Table 4.8 presents the corresponding measurements of the variables for each African emerging country in the sample. Limitations of the approach , such as its insensitivity to slight changes in index scores, are addressed in Chapter 5.

Table 4.7: *Measurements of the dependent variables for each nominated African emerging country*

Country	Currency appreciation %	External debt to GDP ratio	Current account to GDP	Growth in exports	Political stability
Kenya	1.40	21.67	-12.20	2.00	2.2
Nigeria	3.67	17.9	11.60	-10.00	2.4
South Africa	-7.67	291.56	-3.30	7.00	4.1
Egypt	-5.70	1517.81	-1.20	0.27	2.9
Mauritius	-1.25	2062.06	-9.80	-0.03	5.1

Table 4.8.: *Vulnerability index results of specified African emerging countries*

Country	Indicator values	Index number	Rank
Kenya	0+0+0+2+1	3	2
Nigeria	(-0.2)+ (0.1)+ 0+ 1+2	2.7	1
South Africa	1+1+2+ (-0.1) +(-0.1)	3.8	3
Egypt	0+0+1+2+2	4	4
Mauritius	(-0.2)+ 0+2+ 2+2	5.8	5

Table 4.8: indicates that, of the sample

4.8.1 Exchange rate

The most obvious indication of an economy under pressure is a large depreciation of its exchange rate (Hawkins and Klau, 2000). However, authorities may be able to circumvent the effect on the exchange rate by increasing exchange rates and reducing international reserves if macroeconomic fundamentals are sound. The appreciation of the African emerging market currency implies that the country will be able to purchase a greater amount of a certain currency, US dollar in this case. This is beneficial, for instance, to migrant workers or those who wish to send remittances to African emerging economies. Thus, economies such as Nigeria have benefited from an appreciation of exchange rate (3.67%) with regard to remittances from migrant workers. The exchange rate is particularly important in assessing a country's vulnerability to contagion because should the domestic currency increase, the whole economy will be affected. A higher currency for the African emerging market also implies that the exports of the country will become more expensive and imports relatively cheaper. Therefore, the demand for imported goods will increase but, domestic exports will reduce. Such a scenario may instigate pressure to lower the cost of production including wages. As most countries in Africa, both emerging and frontier, are exporters of primary goods, a currency appreciation could stifle the export industry which, in turn, would increase vulnerability of the country to contagion because a buffer will not be present. South Africa shows a depreciation relative to the US dollar of its exchange rate (-7.67) implying that its exports will be cheaper and imports relatively more expensive.

4.8.2 External debt

External debt should not surpass 40% of gross national product (GNP) or 200% of exports (Wang, 2004). This conventional rule pertains to the avoidance of an external debt crisis (Williamson, 2000). Greater measures of external debt hamper the investment and growth of an economy because large amounts of funds are allocated towards the service of debt instead of the development of an economy. In this regard, Mauritius and Egypt are in the worst position in comparison to the rest of the sample due to the high levels of external debt to exports they exhibit. Interest payments which come with the debt augment the problem of high external debt faced by many African countries. Sachs (2005) affirms that the Structural Adjustment Programs and other similar programs left Africa poorer by the late 1960's than ever before. The author suggests that the colonial ties to African countries are a major factor in the sustained dependency and debt commitments which stifle the growth of African countries. Incidentally, the two African economies with the highest external debt measures are also the bottom most ranked of the sample in terms of vulnerability to contagion.

External debt financing through banks presents additional risks to financial stability. Wang (2004) suggests that bank debt does not only affect the risks of financial stability directly, but also indirectly by escalating contagion through the exposure of its creditor banks in foreign countries to numerous shocks which are observed in differences in the perceived creditworthiness of the creditor bank's domestic country. Former colonial powers have strong ties with African countries. Such relationships which have been long established allow the former colony easy access to set up banks and other businesses in the African country. This is possible by virtue of knowledge of the culture, language and terms of conducting business. The propensity to borrow externally from the developed nations means that more debt will be taken by African countries from particular advanced economies, hence, increasing the dependency the African country has on the former colonisers.

While bank-driven contagion shocks may affect the chances of financial crises , it is more inclined to affect an economy when the banking system of a country is more integrated into global markets. Therefore, South Africa would be more affected by bank-driven contagion shocks than a less integrated country such as Mauritius. This is evident in Appendix C and Table 4.8 where South Africa has a rating in terms of vulnerability to eternal debt that is very similar to that of Mauritius despite the large differences in stock market capitalisation, liquidity and number of listed companies. Action Aid (2009) subscribe to the same line of reasoning in their assentation that more integrated African economies are more susceptible to the transmission of external shocks than their less integrated counterparts.

4.8.3 Current account

The difference between the value of exported goods and services and the value of imported goods and services indicates the current account (Ghosh and Ramakrishnan, 2012). A deficit then implies that a country imports more goods and services than it exports. The current account also comprises net income and transfers from abroad, for instance, such as foreign aid. However, such measures encompass a relatively small portion of the total. Since the current account may also be conveyed as the variance between national savings and investment, a current account deficit may indicate a low degree of national savings comparative to investment, an elevated rate of investment or both . The majority of African emerging countries lack capital to match their rich investment opportunities due to low levels of savings. The inevitable result is a current account deficit. Private capital typically moves from developing to advanced economies, such as the US, which operates on a current account deficit. Emerging market economies, like those in the sample, tend to run surpluses.

The current account of the sample shows a bleak portrait. While in 2011 Nigeria had a small external current account surplus, the overall sample shows large deficits that are beyond the threshold level of 3% of GDP (Frimpong and Oteng-Abayie, 2010). More insight can be

aobtained by separating oil and non-oil countries. Countries most endowed with natural resources, are usually less vulnerable to financial contagion. One may therefore deduce that Nigeria and other natural resource rich countries may have gained from episodes of high commodity and oil and prices (Massa and te Velde,2008). However, vulnerability may increase considerably should a deterioration in economic growth or a prolonged oil price shock occur (IMF, 2012). According the (IMF, 2012), given Nigeria's robust financial starting position, timely policy engagements should be able to deflect future sustainability problems. High external debt and fiscal deficits may also constrain governments from carrying out measures to address the negative impacts of contagion and financial shocks.

4.8.4 Growth rate of exports

The growth rate, according to BIS (2011), is amongst the most frequent indicators used in the assessment of the progress of an economy. Investors, producers and trade negotiators utilise such indicators in their comparison of attractive countries for investment. While the indicator is useful in evaluating the export growth of an African emerging country, it does not clarify the source of growth (Montoro and Rojas-Suarez ,2012). Surprisingly, the country which is ranked the least vulnerable to contagion, Nigeria, has the poorest measure of growth of exports. This substantiates the notion that the growth of exports measure is useful in evaluation the overall state of the economy but, should be supplemented with other measures. Egypt, as the second largest market in terms of market capitalisation exhibits the highest measure of growth of exports despite the political upheaval present in the country since 2008 (IMF,2009).

4.8.5 Political stability

Political unrest has been established as an important determinant of economic growth both directly and indirectly (Campos and Karanasos, 2008). Collins and Biekpe (2003) found that political instability in Africa had far reaching effects which permeated the boundaries of the

country of transmission. Furthermore, Asongu (2011) supports the proposition of increasing integration of African stock markets. One may find that while a political crisis in one country may produce negative spill overs , investors in another African country may benefit from the crisis, ceteris paribus (Ong'ayo,2008). It is important to be cognisant of the fact that political crisis in Africa may have negative effects on the entire continent in the longer term as investors display herd behaviour. If the returns from Kenya, Nigeria, South Africa, Egypt and Mauritius are uncorrelated and stable, the occurrence of a crash in one market due to a political event could be to the harsh detriment of international portfolio diversification. Asungu (2011) also shows that the financial market transmissions also occur outside of financial crises however, the effects of such negative transmissions are increased when the political environment is unstable.

The political stability ranking of the sample indicates the degree of stability within the country. Levine(2004) addresses the investability of a country and implies that countries which present a less hospitable environment for potential investors are less investable. Hence, the countries ranked lower in their political stability are seen as less investable and the effect on foreign portfolio inflows adds to the vulnerability of a country. Inefficient portfolio inflows increase poverty levels and the need for external debt and initiate a vicious cycle of indebtedness, dependency and vulnerability to contagion (Aisen and Veiga, 2011).

4.9 Conclusion

The association between financial contagion, selected African emerging countries, spanning 2005-2012 is investigated in the chapter. The random walk hypothesis is supported for the African emerging economies under investigation. The general findings of the analysis are that financial contagion is present the in Kenya, Nigeria, South Africa, Egypt and Mauritius economies and are harmonious with the outcomes of Collis and Biekpe (2003). Results from the adjusted correlation coefficient and bootstrap test for contagion concur with those of the model of threshold and vulnerability to financial contagion proposed by Baur & Fry (2005). Findings suggest that in general, vulnerabilities are notable in all of the countries in

the sample. The time series fixed effect test for contagion corroborates the findings of contagion in the sample. However, the presence of contagion was found in 11 months of the sample therefore establishing the presence of contagion during 11.82% of the sample. Herd behaviour is found to exist, at varying degrees during sample period. The greatest recording in the sample occurred in May and June 09 with measures of -2, 35 and -2, 95 respectively.

Percentage appreciation to the US dollar, external debt to GDP ratio, current account to GDP, growth in exports and political stability are nominated indicators of an African emerging countries' vulnerability to financial contagion. The least vulnerable to financial contagion is Nigeria, the most vulnerable being Mauritius. Factors such as the differences in natural endowments, external debt and exchange rate of each country were found to influence the ranking of the sample

Overall, there is clear evidence provided in this chapter, that results differ very slightly depending on the test for contagion employed. The dynamic framework used in the evaluation confirmed that financial contagion was present during the 2008 subprime crisis and that such occurrences assume different mechanisms such as herd behaviour. Mechanisms can be easily transmitted through historical relationships.

CHAPTER 5: SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND IMPLICATIONS

5.1. Introduction

The aim of this dissertation is to investigate contagion in emerging markets, specifically African emerging markets, at the aggregate level in order to understand the equity market dynamics. The study is motivated by the generally increasing move by emerging countries to protect their markets from the negative effects of financial contagion bought about primarily by the increasing interconnectedness of emerging African economies with global financial markets. Some of the consequences of the increasing integration among African emerging economies and the rest of the world could be widespread contagion if there are no explicit policies in place to protect markets from the various vulnerabilities. Current studies stress the need for contagion guidelines to be explored and implemented by emerging countries. However, scarce studied have focused on how contagion can be handled specifically in African emerging countries Therefore, to address this gap the following questions are answered :1) Are the driving forces of financial contagion in African emerging economies due to fundamentals or herd behaviour by investors? 2) Are the effects of contagion due to historically strong relationships among the emerging countries and their Western counterparts? 3) Can African emerging markets experience integration without the adverse effects of contagion? 4) To what extent must markets be integrated before being vulnerable to the negative effects of contagion?

5.2. Summary

This dissertation explores whether the driving force behind contagion in African emerging markets is caused by fundamentals or herd driven behaviour by investors. Next, the notion of contagion due to historical relationships among African countries and their western colonial powers was examined. The question of whether African emerging countries can strike a threshold where the benefits of integration are experienced while the least exposure to contagion can be suffered was investigated. A key contribution is in the empirical chapter where monthly data from five African emerging countries over a seven

year period are considered. The study explores an eclectic range of five African emerging economies hence complementing the existing literature by tapping new ground in terms of countries that have not been studied in such a context before. The exploration of recent country level data from the World Bank provides insight. Advancing from the bootleg test for contagion, the multivariate test for contagion at the macro level uses up to date joint vulnerability and index techniques to test for contagion. Then, vulnerabilities among the five African emerging countries were investigated, as suggested by Baur and Fry (1995). This was followed by a dynamic percolation model wherein the presence of herd behaviour was examined using the Cont-Bouchaud Model for herd behaviour.

The unit root test investigated informational efficiency with regard to its theoretical foundations in the five African emerging economy's stock markets for policy making. Theory holds clear and definite inferences for investment strategies intended to exploit the returns of securities, contingent on whether or not the returns follow random walks. To discover the nature of investments for the five African emerging markets, the Philips Perron (PP) and Augmented Dickey Fuller (ADF) tests were adopted. The multivariate test for contagion used panel data analysis methods. Common vulnerabilities which may be present through financial and economic linkages were controlled against by the fixed effect methodology. It tests the idea that vulnerability to financial contagion increases as an emerging market reaches a certain threshold in size and integration into the world. First, each stock market was tested for contagion during the sample period. Tests included the Fry and Baur (2006) approach. A vulnerability index in which variables representing each markets vulnerability to contagion were ranked. Aggregating the outcomes into a vulnerability index affords the opportunity for the countries in the sample to be ranked according to their sensitivity to global financial crises. Herd behaviour was assessed by means of a percolation model, which was extended by Cont and Bouchaud (2000) and a technique for identifying days with herd behaviour is used.

5.3. Conclusion

Results suggest that equity returns in the five African emerging markets are consistent with the RWH and that most of the markets analysed are weak-form efficient. On the whole, the results of the tests for contagion suggest that contagion is present in all five of the African emerging markets and that the bigger, the more integrated, Egypt and South Africa, being the most susceptible to contagion. Contagion due to herd behaviour is established 11.82% for the time of the sample period. Thus, equity market prices during the remaining period are determined by fundamentals. Hence, contagion in African markets, according to the analysis is mostly determined by fundamentals. However, herd behaviour has a role to play in contagion which cannot be ignored. Further, the results indicate that the economies with the highest recordings of herd behaviour during the sample period were Mauritius and South Africa. Nigeria, second to Egypt has the smallest range of deviations from the excess returns of the S&P emerging markets index. Results from the fixed-effect panel regression suggest that both the world and emerging market indices are significant in describing co-movements among the African emerging markets. However, the global market index is less significant as seen in the rejection of its significance in the Mauritius market. The large significance of South Africa to regional vulnerabilities indicates the country's strong share of the African emerging markets total capitalization. Also, the higher significance seen among the sample and the developed market proxy means that the bulk of economic relations of the sample countries occur with developed countries as opposed to with each other. Such a method of examining contagion is advantageous in that it allows one to differentiate between positive and negative contagion and identification of the starting place of the contagion is not required. The market most vulnerable to contagion appears to be Mauritius, followed by Egypt.

The findings suggest further that former colonial powers, through historical relationships, have strong links with their former African colonies. One can reason that the lengthy

interaction among African countries and their colonies facilitates greater ease in borrowing and debt activities among the countries. The susceptibility for African countries to borrow externally from their former colonies means that contagion effects are elevated if the African countries still have strong external relationship with their former colonial nations. However, it is possible for emerging markets in Africa to reap the rewards of integration while managing contagion problems. This study found also that of the sample, countries which experienced large depreciations in exchange rates, had external debt of more than 40 % of its GNP or 200% of exports where more at risk to contagion. Mauritius and Egypt were found to be at a high risk because of their high levels of external debt. However, South Africa is at a higher risk due to its greater integration with the world market. . South Africa, the most globally integrated economy of the sample, benefits from exposure to the global market, however, the country appears to buffer contagion by its policies to control capital flight. Therefore, the possibility of a balance between integration and contagion vulnerability lies to a large extent in the external debt, current account, growth rate of imports and political stability of the African country. Those with the most favourable measures of the above variables will be able to strike a balance between integration and contagion. Findings reveal furthermore that factors such as elections, abrupt changes in stock market leadership and access to information increased the intensity and frequency of herd behaviour days detected. Outcomes of the tests carried out also find that those more mature stock markets, such as those of South Africa and Egypt, are more able to tolerate herd behaviour.

5.4. Recommendations

Investors should base their equity forecast returns using random walk elements and not by basing their predictions using systematic past information of the markets. This will facilitate more favourable gains from investors and thus increase their attraction to the African emerging countries and aid in economic growth, liquidity of the market and a favourable exchange rate and current account, all of which have been found to buffer an African emerging country from contagion effects. The establishment of contagion in the sample

suggests that the economic variables mentioned above must be strengthened to defuse contagion effects.

From Appendix A, comparison between the size, number of listed companies and turnover ratio of each country of the sample suggests that the size, liquidity and integration of the sample emerging markets are valuable elements in capturing at least, some degree of explanatory power in a country's vulnerability to financial contagion. African emerging markets must improve their investiblility so as to increase the turnover, liquidity and market activity which will facilitate the markets development and aid in its ability to withstand contagion pressures. This implies that the scarcity and unreliability of financial data, unstable governmental policies and high volatility of economic variables must be defused to make African emerging markets more robust in the world stage. Since contagion has been found to be driven both by fundamentals and herd driven behaviour, stabilisation of key economic variables such as external debt must be lower than that of developed counterparts to act as a buffer during high economic uncertainty. As alluded above, stringent capital flight policies must be put in place to reduce drastic flight out of the market. Governments of the African emerging economies must ensure the effective dissemination of information by requiring the publication of financials of all publicly listed companies. This will assist with information asymmetry and address the negative effects of herd behaviour by investors.

More robust political conditions and institutional supervision must be adopted by African emerging economies to assist in predicting a countries' vulnerability to financial contagion, but it is problematic to capture such qualitative factors empirically. While the test performed offers insight into the presence of herd behaviour in the sample, a more advanced test statistic to detect days of herd behaviour would be valuable to a study of this nature. Additionally, a stochastic volatility depiction of herd behaviour may be a more reliable model since it takes the asymmetric influence of herd behaviour on price variations into consideration.

Export promotion strategies, such as tax rebates for domicile export companies, must be fostered by African emerging economies to enable them to be on a par with relatively successful African emerging countries such as South Africa. Better exchange rate management strategies should be adopted by decreasing the consumption of imports, which typically lead to indebtedness. Rather, investment goods which can be utilised in the production sector must be imported. These actions will ensure that the import of investment goods to be used in production attach value to primary products prior to their export and assist in reversing the hostile terms of trade of the vast majority of African countries . Moreover, the reliance of African emerging countries on their historical colonial masters will be lessened by such actions since it will enhance GDP as well as increase exports which are essential for debt repayments.

Those countries endowed with national resources should inject any surplus gained from favourable commodity price shocks into investments which will secure foreign exchange and translate into growth. This will act as a cushion against applicable external shocks for the countries. Third, there is a pressing need to tackle governance issues, especially political stability, in African countries because a stable political environment is imperative for the attainment of less consumption imports and increased export earnings and reduced consumption imports which ultimately strengthen a countries stance in the global marketplace. Findings in this study also suggest that the institutional infrastructure of an African emerging market has an important bearing on its experience of herd behaviour by investors. More stringent policies which prevent the flight of capital form an economy may be a useful consideration for those countries experiencing detrimental levels of herd behaviour. For instance,

The combinations of industries which form the equity market indices used in the study are different for each country on the sample. It is possible that the variances and consistencies in the weights appointed to the different sectors influence the correlation among the

market indices more than co-movements of the markets. It is also acknowledged that the benchmark indices tend to apportion more weight towards the financial sector. Additionally, certain African markets, such as Kenya, place heavy weightings on consumer goods, such as food and beverages. Mauritius, on the other hand, possesses substantial weightings on cyclical services, for example hotels. An alteration which corrects the discrepancies in the composition of the indices used would be a beneficial and more precise measure of both contagion and integration.

The precise prediction of financial crises, as shown in the previous chapters, rests on dynamics such as trade, exchange rate, the credibility of the individual African emerging market and sentiment of market and country investors. Therefore, the ability to foresee financial crises tends to be impossible. Instead of producing specific predictions, which are likely to be false, the tactic used aims to rank the sample of African emerging economies according to those most vulnerable to experiencing pressure form a financial crisis. A valuable starting point is the use of some reasonably straightforward and uncomplicated summary indices of vulnerability. However, econometric results would be useful in determining the predictive power of the selected indicators. Results attained from the leading indicators are generally in harmony with the major results of other reports on warning systems of financial contagion. However, a more progressive study of the early-warning system may be achieved through the addition of further economic indicators and by adjusting the thresholds, in certain instances.

An expansion of this notion suggested above show that there may be a more distinct relationship between financial market integration and financial contagion than has been eluded in prior chapters. However, any conclusions about the links between contagion, financial market integration and foreign investor participation would require more rigorous scientific investigation than is presented.

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7. APPENDICES

Appendix A

Market capitalisation as a percentage of GDP, number of listed companies and turnover ratio of sample.

Kenya			
Year	Market capitalisation (as % of GDP)	No of listed companies	Turnover ratio
2005	34.06	52	9.8258
2006	50.55	45	14.632
2007	49.14	45	10.641
2008	35.76	44	11.831
2009	35.17	47	4.5889
2010	44.91	47	8.5984
2011	30.34	54	7.1197

Nigeria			
2005	17.24	214	11.45
2006	22.34	202	13.64
2007	52.04	212	28.15
2008	24.04	213	29.30
2009	19.76	214	11.00
2010	25.85	215	12.53
2011	16.64	196	9.21

South Africa			
2005	228.85	399	11.457
2006	273.94	388	13.642
2007	291.27	401	28.153
2008	179.38	422	29.304
2009	249.04	425	11.006
2010	278.53	410	12.538
2011	209.61	401	9.2123

Egypt			
2005	88.83	770	31.14
2006	86.96	656	48.7
2007	106.75	544	38.7
2008	52.74	375	70.3
2009	47.59	333	58.63
2010	37.68	215	42.89
2011	21.20	211	34

Mauritius			
2005	41.65	52	6.04
2006	55.29	45	4.42
2007	72.70	45	7.96
2008	35.70	44	8.85
2009	53.70	47	8.06
2010	66.96	47	6.35
2011	57.80	54	8.00

Appendix B

Excess returns of African emerging markets						
Date	MS Emerging	Kenya	Nigeria	South Africa	Egypt	Mauritius
Jan-05	7.01	1.03	3.04	2.45	1.15	-0.42
Feb-05	7.59	0.48	2.41	1.92	0.68	-0.99
Mar-05	6.59	1.48	3.35	2.91	1.68	0.02
Apr-05	6.50	1.58	3.50	2.94	1.84	0.07
May-05	6.62	1.54	3.35	2.91	1.74	-0.05
Jun-05	6.90	1.39	3.08	2.66	1.58	-0.32
Jul-05	7.47	0.82	2.51	2.16	1.01	-0.87
Aug-05	7.49	0.79	2.55	2.15	0.99	-0.85
Sep-05	8.20	0.05	1.91	1.53	0.41	-1.48
Oct-05	7.73	0.55	2.43	1.98	0.90	-1.03
Oct-05	8.37	-0.08	1.73	1.36	0.25	-1.66
Dec-05	8.88	-0.59	1.21	0.92	-0.13	-2.19
Jan-06	10.43	-2.09	-0.36	-0.54	-1.45	-3.71
Feb-06	10.55	-2.24	-0.47	-0.69	-1.68	-3.81
Mar-06	10.20	-1.88	-0.14	-0.28	-1.38	-3.46
Apr-06	10.92	-2.62	-0.86	-0.96	-2.12	-4.20
May-06	9.71	-1.33	0.41	0.22	-1.12	-3.01
Jun-06	9.31	-0.95	0.86	0.65	-0.84	-2.57
Jul-06	9.56	-1.20	0.68	0.39	-0.92	-2.79
Aug-06	9.93	-1.52	0.48	0.07	-1.19	-3.11
Sep-06	9.90	-1.41	0.49	0.12	-1.13	-3.03
Oct-06	10.86	-2.28	-0.47	-0.80	-2.06	-3.88
Nov-06	11.55	-2.92	-1.19	-1.47	-2.76	-4.42
Dec-06	12.75	-4.11	-2.33	-2.63	-3.90	-5.66
Jan-07	12.14	-3.48	-1.63	-2.00	-3.33	-5.01
Feb-07	12.40	-3.81	-1.79	-2.24	-3.52	-5.23
Mar-07	12.37	-3.83	-1.69	-2.16	-3.49	-5.16

Apr-07	13.00	-4.44	-2.24	-2.75	-4.09	-5.77
May-07	13.50	-4.98	-2.68	-3.24	-4.54	-6.30
Jun-07	14.11	-5.56	-3.27	-3.86	-5.15	-6.84
Jul-07	14.69	-6.11	-3.81	-4.43	-5.67	-7.39
Aug-07	14.50	-5.91	-3.68	-4.24	-5.54	-7.22
Sep-07	15.88	-7.33	-5.06	-5.57	-6.81	-8.54
Oct-07	18.16	-9.65	-7.34	-7.81	-9.01	-10.71
Nov-07	16.74	-8.18	-5.84	-6.42	-7.56	-9.23
Dec-07	17.31	-8.71	-6.34	-7.04	-8.05	-9.79
Jan-08	15.94	-7.48	-4.96	-5.72	-6.70	-8.36
Feb-08	15.94	-7.41	-4.85	-5.61	-6.60	-8.33
Mar-08	14.94	-6.45	-3.89	-4.64	-5.60	-7.40
Apr-08	16.62	-8.04	-5.63	-6.29	-7.25	-9.10
May-08	17.21	-8.66	-6.23	-6.84	-7.90	-9.67
Jun-08	15.40	-6.85	-4.47	-5.08	-6.21	-7.88
Jul-08	14.94	-6.45	-4.06	-4.71	-5.81	-7.48
Aug-08	13.73	-5.29	-2.96	-3.50	-4.69	-6.32
Sep-08	11.37	-3.03	-0.63	-1.29	-2.51	-4.01
Oct-08	8.45	-0.32	2.05	1.50	0.01	-1.26
Nov-08	7.56	0.55	2.85	2.40	0.78	-0.49
Dec-08	8.06	0.11	2.30	1.92	0.37	-0.98
Jan-09	7.46	0.61	2.53	2.47	0.80	-0.42
Feb-09	6.88	0.93	3.18	2.94	1.31	-0.05
Mar-09	7.83	0.11	2.07	2.09	0.51	-0.85
Apr-09	9.14	-1.20	0.84	0.80	-0.59	-2.11
May-09	11.04	-3.08	-0.74	-1.01	-2.35	-3.87
Jun-09	10.71	-2.61	-0.51	-0.71	-2.06	-3.45
Jul-09	11.90	-3.81	-1.76	-1.80	-3.17	-4.60
Aug-09	11.70	-3.66	-1.66	-1.58	-2.89	-4.39
Sep-09	12.93	-4.92	-2.93	-2.81	-4.11	-5.52
Oct-09	12.66	-4.63	-2.67	-2.48	-3.81	-5.23

Nov-09	13.67	-5.60	-3.72	-3.47	-4.99	-6.27
Dec-09	13.89	-5.80	-3.95	-3.66	-5.16	-6.47
Jan-10	12.77	-4.59	-2.74	-2.58	-3.95	-5.31
Feb-10	12.82	-4.62	-2.78	-2.63	-4.02	-5.41
Mar-10	13.99	-5.68	-3.83	-3.72	-5.16	-6.59
Apr-10	13.88	-5.53	-3.70	-3.62	-4.96	-6.45
May-10	12.67	-4.32	-2.50	-2.46	-3.88	-5.29
Jun-10	12.63	-4.25	-2.49	-2.45	-3.92	-5.22
Jul-10	13.92	-5.52	-3.76	-3.67	-5.17	-6.47
Aug-10	13.60	-5.20	-3.50	-3.39	-4.83	-6.15
Sep-10	15.43	-6.99	-5.38	-5.14	-6.63	-7.96
Oct-10	16.10	-7.65	-5.97	-5.78	-7.29	-8.57
Nov-10	15.82	-7.43	-5.70	-5.50	-7.01	-8.27
Dec-10	16.36	-7.96	-6.24	-5.98	-7.49	-8.78
Jan-11	15.35	-6.95	-5.15	-5.00	-6.71	-7.74
Feb-11	15.10	-6.75	-4.93	-4.72	-6.47	-7.49
Mar-11	15.95	-7.68	-5.84	-5.57	-7.34	-8.35
Apr-11	16.41	-8.11	-6.28	-6.01	-7.89	-8.78
May-11	16.07	-7.76	-5.91	-5.68	-7.45	-8.43
Jun-11	15.84	-7.55	-5.71	-5.47	-7.25	-8.19
Jul-11	15.72	-7.49	-5.64	-5.37	-7.20	-8.11
Aug-11	14.70	-6.55	-4.70	-4.36	-6.26	-7.12
Sep-11	12.55	-4.45	-2.64	-2.25	-4.22	-5.00
Oct-11	14.01	-5.85	-4.06	-3.63	-5.61	-6.47
Nov-11	13.65	-5.59	-3.75	-3.25	-5.35	-6.12
Dec-11	12.92	-4.85	-2.98	-2.55	-4.73	-5.38
Jan-12	14.11	-6.04	-4.16	-3.68	-5.67	-6.60
Feb-12	14.75	-6.65	-4.84	-4.31	-6.17	-7.27
Mar-12	14.63	-6.51	-4.69	-4.21	-6.11	-7.13
Apr-12	14.60	-6.43	-4.60	-4.15	-6.09	-7.11
May-12	13.25	-5.05	-3.25	-2.84	-4.80	-5.75

Jun-12	13.99	-5.77	-4.01	-3.56	-5.53	-6.51
Jul-12	13.97	-5.76	-3.92	-3.52	-5.48	-6.50
Aug-12	13.89	-5.63	-3.81	-3.42	-5.31	-6.46
Sep-12	14.63	-6.34	-4.46	-4.15	-5.96	-7.19

Appendix C

months highlighted in red denote herd behaviour months

Herd behaviour					
Date	Kenya	Nigeria	South Africa	Egypt	Mauritius
Jan-05	-0.03	-0.67	-0.59	-0.13	-3.40
Feb-05	1.06	-0.58	-0.48	0.47	-2.01
Mar-05	-0.33	-0.70	-0.66	-0.41	43.74
Apr-05	-0.37	-0.71	-0.66	-0.46	13.14
May-05	-0.35	-0.70	-0.66	-0.43	-21.59
Jun-05	-0.28	-0.68	-0.62	-0.37	-4.17
Jul-05	0.22	-0.60	-0.54	-0.01	-2.15
Aug-05	0.27	-0.61	-0.54	0.01	-2.18
Sep-05	0.18	-0.48	-0.35	1.45	-1.68
Oct-05	0.82	-0.59	-0.49	0.11	-1.97
Oct-05	-13.13	-0.42	-0.26	2.97	-1.60
Dec-05	-2.69	-0.17	0.08	-8.83	-1.46
Jan-06	-1.48	-3.80	-2.85	-1.69	-1.27
Feb-06	-1.45	-3.12	-2.44	-1.59	-1.26
Mar-06	-1.53	-8.03	-4.58	-1.72	-1.29
Apr-06	-1.38	-2.16	-2.04	-1.47	-1.24
May-06	-1.75	1.46	3.52	-1.89	-1.33
Jun-06	-2.05	0.16	0.53	-2.19	-1.39
Jul-06	-1.83	0.48	1.59	-2.09	-1.36
Aug-06	-1.66	1.10	13.99	-1.84	-1.32
Sep-06	-1.71	1.04	7.64	-1.89	-1.33
Oct-06	-1.44	-3.14	-2.25	-1.48	-1.26
Nov-06	-1.34	-1.84	-1.68	-1.36	-1.23
Dec-06	-1.24	-1.43	-1.38	-1.26	-1.18
Jan-07	-1.29	-1.61	-1.50	-1.30	-1.20

Feb-07	-1.26	-1.56	-1.45	-1.28	-1.19
Mar-07	-1.26	-1.59	-1.46	-1.29	-1.19
Apr-07	-1.23	-1.45	-1.36	-1.24	-1.17
May-07	-1.20	-1.37	-1.31	-1.22	-1.16
Jun-07	-1.18	-1.31	-1.26	-1.19	-1.15
Jul-07	-1.16	-1.26	-1.23	-1.18	-1.14
Aug-07	-1.17	-1.27	-1.24	-1.18	-1.14
Sep-07	-1.14	-1.20	-1.18	-1.15	-1.12
Oct-07	-1.10	-1.14	-1.13	-1.11	-1.09
Nov-07	-1.12	-1.17	-1.16	-1.13	-1.11
Dec-07	-1.11	-1.16	-1.14	-1.12	-1.10
Jan-08	-1.13	-1.20	-1.17	-1.15	-1.12
Feb-08	-1.13	-1.21	-1.18	-1.15	-1.12
Mar-08	-1.15	-1.26	-1.22	-1.18	-1.14
Apr-08	-1.12	-1.18	-1.16	-1.14	-1.11
May-08	-1.12	-1.16	-1.15	-1.13	-1.10
Jun-08	-1.15	-1.22	-1.20	-1.16	-1.13
Jul-08	-1.16	-1.25	-1.21	-1.17	-1.13
Aug-08	-1.19	-1.34	-1.29	-1.21	-1.16
Sep-08	-1.33	-2.59	-1.77	-1.40	-1.25
Oct-08	-4.10	-0.51	-0.33	113.17	-1.79
Nov-08	0.80	-0.65	-0.58	0.28	-3.02
Dec-08	0.8	-0.56	-0.48	1.68	-2.02
Jan-09	0.64	-0.60	-0.60	0.25	-3.36
Feb-09	0.07	-0.69	-0.66	-0.24	-21.50
Mar-09	0.8	-0.52	-0.52	0.96	-2.17
Apr-09	-1.83	0.20	0.26	-2.71	-1.47
May-09	-1.32	-2.35	-1.99	-1.43	-1.26
Jun-09	-1.38	-2.95	-2.41	-1.49	-1.29
Jul-09	-1.26	-1.57	-1.55	-1.32	-1.22
Aug-09	-1.27	-1.60	-1.63	-1.35	-1.23

Sep-09	-1.20	-1.34	-1.36	-1.24	-1.18
Oct-09	-1.22	-1.37	-1.40	-1.26	-1.19
Nov-09	-1.18	-1.27	-1.29	-1.20	-1.16
Dec-09	-1.17	-1.25	-1.27	-1.19	-1.15
Jan-10	-1.22	-1.36	-1.39	-1.25	-1.19
Feb-10	-1.22	-1.36	-1.38	-1.25	-1.18
Mar-10	-1.18	-1.26	-1.27	-1.19	-1.15
Apr-10	-1.18	-1.27	-1.28	-1.20	-1.16
May-10	-1.23	-1.40	-1.41	-1.26	-1.19
Jun-10	-1.24	-1.40	-1.41	-1.25	-1.19
Jul-10	-1.18	-1.27	-1.27	-1.19	-1.15
Aug-10	-1.19	-1.29	-1.30	-1.21	-1.16
Sep-10	-1.14	-1.19	-1.19	-1.15	-1.13
Oct-10	-1.13	-1.17	-1.17	-1.14	-1.12
Nov-10	-1.13	-1.18	-1.18	-1.14	-1.12
Dec-10	-1.13	-1.16	-1.17	-1.13	-1.11
Jan-11	-1.14	-1.19	-1.20	-1.15	-1.13
Feb-11	-1.15	-1.20	-1.21	-1.15	-1.13
Mar-11	-1.13	-1.17	-1.18	-1.14	-1.12
Apr-11	-1.12	-1.16	-1.17	-1.13	-1.11
May-11	-1.13	-1.17	-1.18	-1.13	-1.12
Jun-11	-1.13	-1.18	-1.18	-1.14	-1.12
Jul-11	-1.13	-1.18	-1.19	-1.14	-1.12
Aug-11	-1.15	-1.21	-1.23	-1.16	-1.14
Sep-11	-1.22	-1.38	-1.44	-1.24	-1.20
Oct-11	-1.17	-1.25	-1.28	-1.18	-1.15
Nov-11	-1.18	-1.27	-1.31	-1.19	-1.16
Dec-11	-1.21	-1.34	-1.39	-1.21	-1.19
Jan-12	-1.17	-1.24	-1.27	-1.18	-1.15
Feb-12	-1.15	-1.21	-1.23	-1.16	-1.14
Mar-12	-1.15	-1.21	-1.24	-1.16	-1.14

Apr-12	-1.16	-1.22	-1.24	-1.16	-1.14
May-12	-1.20	-1.31	-1.35	-1.21	-1.17
Jun-12	-1.17	-1.25	-1.28	-1.18	-1.15
Jul-12	-1.17	-1.25	-1.28	-1.18	-1.15
Aug-12	-1.18	-1.26	-1.29	-1.19	-1.15
Sep-12	-1.16	-1.22	-1.24	-1.17	-1.14

Appendix D

Kenya

Indicator		-0.2	-0.1	0	1	2
Code	**Weight**					
Xra	W1			X		
Debt	W2	*		x		
Cab	W3					X
Gx	W4			x		
Pol	W5				X	

*Shaded box indicates no points gained" for negative real interest rates.

South Africa

Indicator		-0.2	-0.1	0	1	2
Code	Weight					
Xra	W1				X	
Debt	W2	*				X
Cab	W3				X	
Gx	W4		X			
Pol	W5		X			

*Shaded box indicates no points gained" for negative real interest rates.

Nigeria

Indicator		-0.2	-0.1	0	1	2
Code	**Weight**					
Xra	W1			X		
Debt	W2	*	X			
Cab	W3	X				
Gx	W4					X
Pol	W5				X	

*Shaded box indicates no points gained" for negative real interest rates.

Egypt

Indicator		-0.2	-0.1	0	1	2
Code	Weight					
Xra	W1					X
Debt	W2	*				X
Cab	W3			X		
Gx	W4			X		
Pol	W5				X	

*Shaded box indicates no points gained" for negative real interest rates.

Mauritius

Indicator		-0.2	-0.1	0	1	2
Code	Weight					
Xra	W1	20<x		X		
Debt	W2	*				X
Cab	W3					X
Gx	W4					X
Pol	W5	X				

*Shaded box indicates no points gained" for negative real interest rates.

Appendix E

Country	Appreciation %	External debt to GDP ratio	Current account to GDP	Growth in exports	Political stability
Kenya	1.40	21.67	-12.20	2.00	2.2
Nigeria	3.67	17.9	11.60	-10.00	2.4
South Africa	-7.67	291.56	-3.30	7.00	4.1
Egypt	-5.70	1517.81	-1.20	0.27	2.9
Mauritius	-1.25	2062.06	-9.80	-0.03	5.1