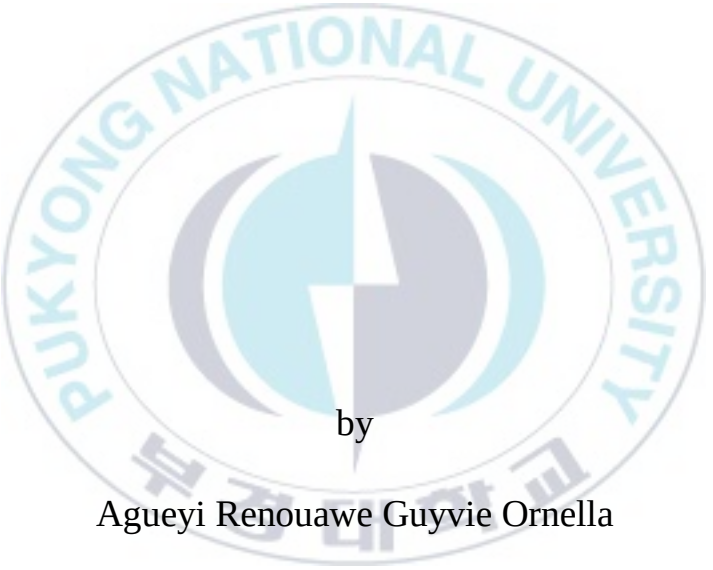
Thesis for the Degree Master of Arts

Return Spillovers between the US Stock Market and Emerging Markets in Africa



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February, 2018

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(미국주식시장과 아프리카 신흥 주식시장간의 수익률 이전효과)

Advisor: Dr. You-Tay Lee

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A thesis submitted in partial fulfillment of the requirements

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February 23, 2018

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Return Spillovers between the US Stock Market and Emerging Markets in Africa

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Abstract

The increasing involvement of foreign investors in African emerging markets, driven by the markets liberalization process, has raised questions on their sensitivity to the world events. This paper empirically examines the dynamic interactions between the U.S. stock markets and emerging stock markets in Africa. We specifically analyze return spillovers between the U.S. and the biggest stock markets in Africa, South Africa and Egypt over the period 2012-2017. This study gives a new look into the extent to which matured stock markets influence developing stock markets and provides insight to the degrees of dependency between South Africa, Egypt and the U.S. The econometric frameworks employed for this study include the vector autoregressive model (VAR), the Granger causality test and the impulse response functions. The results attest to the existence of short-term unidirectional return spillovers from the U.S. stock markets to South Africa and Egypt stock markets. The spillover effect is found to be stronger in South Africa, but more persistent in Egypt. The evidence also shows a positive relationship between South Africa and the U.S stock market over the full period of the study. However, the relationship between Egypt and the U.S. is positive at the beginning of the study period and becomes negative during the 3rd period. This means that while growth in the U.S. stock returns causes growth in South Africa stock returns,

growth in the U.S. stock returns causes returns of the Egyptian stock market to fall over the time.

Keywords: Return Spillovers, International Transmission, Markets Links, Interdependence, Markets Movements, Vector Autoregressive (VAR)

미국 주식시장과 아프리카 신흥 주식시장 간의 수익률 이전효과

초록

시장의 자유화 과정으로 인해 아프리카의 신흥 시장에 대한 외국인 투자자들의 참여는 많아지고 있지만, 세계적인 주요 사건에 어떻게 반응을 하는지 잘 알려져 있지 있다. 그리하여 본 연구에서는 선진 주식 시장과 아프리카의 미국의 주식시장 간의 상호 작용을 실증적으로 검증한다. 본 연구는 2012 년부터 2017 년까지 미국과 아프리카 최대의 주식 시장인 남아프리카 공화국과 이집트 주식 시장의 수익률 이전효과를 분석한다. 이 연구는 성숙된 주식 시장이 신흥 주식 시장에 미치는 영향의 정도에 대해 새로이 살펴보고, 미국과 남아프리카 공화국, 이집트 간의 상호의존 정도에 대해 통찰력을 제공하고자 한다. 본 연구에서는 계량경제적으로 벡터 자기 회귀 모형 (VAR), 그레인저 인과 관계(Granger causality)검증 및 임펄스 응답 함수를 사용하였다. 연구의 결과는 미국 주식 시장에서 남아공과 이집트 주식 시장으로 단기간 일방향 수익률전이를 하는 것으로 나타났다. 이전효과(Spillover Effect)는 남아프리카 공화국이 이집트에 비해 강하지만 이집트에서 더 지속적인 것으로 나타났다. 연구의 전체 기간 동안 남아프리카 공화국과 미국 사이에 양(+)의 관계가 있지만, 이집트와 미국의 관계는 연구 기간 처음에는 양(+)으로 나타나지만 제 3 분기에서는 음(-)으로 바뀌는 것으로 나타났다. 이러한 결과는 미국의 주식 수익률 상승은 남아프리카 공화국의 주식 수익률 상승으로 이어지지만 이집트 주식 시장의 수익률은 시간이 지나면 떨어지는 것을 의미한다.

키워드: 수익률 전이, 국제적 전환, 시장 연결, 상호 의존, 시장 동향, 벡터 자기 회귀 (VAR)

I. INTRODUCTION

1.1 Background of the study

Revolutionary changes in emerging financial markets over the last two decades and the shift to liberalization have enhanced the development of domestic financial systems in Africa and markets integration. Regulatory reforms related to ownership and income repatriation and the abolition of capital controls that have accompanied the liberalization process, initiated by the IMF in the 1980's in African countries, have enabled the reduction of barriers to foreign investments and have facilitated access to local markets for overseas investors (Piesse and Hearn, 2005), (Gentzoglanis, 2007), (Kambadza and Chinzara, 2012). This also made emerging African financial markets an interesting alternative for risks diversification. The involvement of foreign investors in African equity markets and the increase of capital inflows and outflows have resulted in the growth of liquidity and trading volume. From an international perspective, it has strengthened financial and trading links between African countries and the rest of the world. At the same time, the proliferation of emerging African markets' economic links has raised interest in their sensitivity to world events.

Bekaert and Harvey (2003) argue that when markets are more open to international investors, they may become more reactive to events in the world. Markets' links increase dependence between markets and expose them to movements as a result of economic events in the involved markets. When markets share strong financial and trading ties, changes in one market may provoke changes in other markets. The spillover effect is commonly employed to explain the contours of such behaviors across financial markets. In general, market

spillover refers to the impact of economic events of one market in others. The spread of financial crashes and more recently the subprime crisis in 2008 are good illustrations of spillover effects across countries (Malliaris and Urrutia, 1992), (Gębka and Serwa, 2006), (Sugimoto et al, 2014). The literature distinguishes between the spillover effect of intra-markets and inter-markets. The former describes transmissions across financial assets in one country and the latter describes inter- regional or international financial transmissions.

Market Spillover effects have interesting implications for portfolio diversification and regulatory policies. According to Ezzati (2013) spillover effects across markets have an impact on investment decisions. As markets benefit from the increase in trading as a result of returns spillovers, failure may reduce benefits from diversification as investors will have to bear high levels of risk. Understanding of cross-countries volatility spillover also helps institutional investors to formulate efficient hedging strategies. The knowledge of return and volatility spillover finally guides policymakers in the formulation and the implementation of appropriate policies aimed at maintaining the stability of financial markets and the aggregate economy (Chinzara and Aziakpono, 2009). In developed markets, international transmissions have been the center of empirical studies for decades. However, concerns have been raised recently on emerging markets. In Africa, interest on cross market movements has considerably increased since the global meltdown in 2008. Major works have documented the existence of intra–market transmission, the presence of spillovers across global indices and at least one African market, and transmissions between a developed market and an emerging market. This study provides a new look into return spillovers between matured markets and emerging African markets, focusing on the individual relationships between the U.S stock markets and the two biggest African stock markets, South Africa and Egypt from 2012 to 2017.

The main purpose of this paper is to measure the extent to which matured stock markets influence developing stock markets. More specifically, it aims at ascertaining the degree of interdependence between South Africa, Egypt and the U.S. Furthermore, the sample period is characterized by the ongoing global oil prices crisis resulting from the overproduction of oil the period prior to the crisis (2012 to 2014). As it is accepted in the literature that oil price fluctuations have impacts in countries' aggregate economies, the oil price drop implies possible and interesting behavior in the selected stock markets and it might enable us to better appreciate the structure of return movements between the U.S. and the selected African stock markets.

1.2 Organization of the Study

This paper is composed of 6 chapters and the organization of the study is described as follows:

The first chapter is the introduction that summarizes the background of the research subject, highlights the rationale for the research, and the purpose of this study.

The second chapter reviews the theoretical and empirical literature related to this study. It traces out the evolution of African financial markets over time and lists the African stock markets by market capitalization and number of listed companies. Finally, it reviews the financial and trading links of the sample African markets with global markets.

The chapter 3 puts a special emphasis on the econometric approaches that is employed to investigate the return spillovers between the US and the sample

emerging stock markets, namely: the vector autoregressive analysis (VAR), the Granger causality test to the impulse response functions (IRFs).

Chapter 4 presents the data description and analysis. This chapter provides information about the source of the data used in this study and common issues associated to daily return data. It also contains tables and comments on the data descriptive statistics, the unit test results and the returns correlation analysis.

The fifth chapter exhibits and explains the empirical results of the VAR, the Granger causality, and the impulse response functions.

The last part is the conclusion. It provides a summary of the study, the results implications and orientation for further researches. This chapter also includes the references and the appendix.

II. LITERATURE REVIEW

2.1 Theoretical and Empirical Literature

Literature of Financial spillover across markets dates back to the 1980's. The severe financial crises throughout the past four decades, and investment and trading liberalization reforms have led the evolution of the literature on markets transmissions. Before and after the 1987 financial crisis, empirical studies focused more on market spillovers between the world's major financial markets. The increasing role of emerging markets in the global financial market has brought economists to pay more attention to potential movements in emerging financial markets.

The U.S. market crash in 1987 is one of the first and most consistent illustrations of financial markets' responses to a worldwide market movement. Roll (1988) and Malliaris and Urrutia (1992) provided significant analysis describing returns transmissions between markets during and after the crisis. Through univariate regressions Roll (1988) demonstrated how 23 stock markets declined as a result of the spillover effect driven by the U.S. market crash in October 1987. In 1992 Malliaris and Urrutia (1992) investigated the relationship among 6 major stock indexes (New York, Tokyo, London, Hong Kong, Singapore and Australia) after the crash. The Granger analysis confirmed significant relationships among the indexes and unidirectional causality for the month of the crash and months after.

Eun and Shim (1989) employed the vector autoregressive (VAR) statistical framework to investigate the international transmission of stock market movements across Australia, Japan, Hongkong, UK, Switzerland, France,

Germany and Canada, with a particular interest on the effect of innovations in the U.S. on the other stock markets. The results attested to the existence of immediate transmission from The U.S. to the other markets, while no other markets could influence the U.S. stock market. Additionally, the findings exhibited minor multilateral transmissions among markets. Following the Multivariate GARCH Model, Karolyi (1995) found that the cross market volatility between New York and Toronto inferred in the magnitude and the persistence of return innovation in either markets.

In addition, Lin et al. (1994) and Peiró et al. (1998) analyzed market linkages and movements between major stock markets, with a special emphasis on the impact of different global trading hours on stock markets. Lin et al. (1994) provided evidence of correlation between Tokyo (New York) returns and New York (Tokyo), specifically, Tokyo "daytime" seemed to be correlated to New York "overnight" returns. Peiró et al. (1998) conduct an empirical study on stock market linkages and movements between New York, Tokyo and Frankfurt. The results suggested that New York was the most influencing market whereas Tokyo is the most sensitive. Likewise, in a study on return and volatility linkages between the U.S. and Germany stock markets Baur and Jung (2006) provided evidence of return spillover between the two stock markets, in particular trading times. They argued that in both markets foreign daytime returns can significantly influence the domestic overnight returns. Overall, the common evidence with the above contributions is the consistent and persistent impact of innovations in the U.S. financial markets on other matured markets throughout the time.

The integration of emerging markets with the world financial markets and the growing investment opportunities in emerging countries have motivated a number of investigations on patterns of co-movement in developing financial markets in the world. Ng (2000) empirically described how the world's two

largest markets (the U.S. and Japan) influence the Pacific-basin (Hongkong, Singapore, South Korea, Thailand and Taiwan) by analyzing the extent to which world factors and regional forces affect return volatility to small equity markets in the Pacific Basin. The outcomes of the GARCH tests attested that the influence of world factors on return volatility in the Pacific basin was greater than the regional influence. Similarly, in an empirical study on dynamic linkages between Australia and the NIC Asian stock markets, Masih and Masih (2001) substantiated the sensitivity of emerging markets returns to big sized markets such as Australia. Following the threshold vector autoregressive (TVAR) and the causality analysis, (Gębka and Serwa 2006) provided evidence that before and during the 1997 Asian financial crisis the U.S. market returns caused returns in developed stock markets as well as in developing markets in the world. The study comfirmed the existence of transmissions across the East Asian markets and indicated that Japan influenced significantly the other Asians markets.

Furthermore, Brzeszczynski and Welfe (2007) applied a factor and predictive GARCH framework to investigate the benefits from a trading strategy based on the return spillovers from international stock markets to emerging stock markets. The findings revealed that a predictive model utilizing cross-market linkage produces better forecasts than the benchmarks for the Warsaw Stock Exchange (WIG) in Poland. Diebold and Yilmaz (2009) designed a precise and separate measure based on variance decomposition in the vector autoregressive (VAR), to capture return spillovers and volatility spillovers in 19 global equity markets. The study denoted trends in return spillovers and bursts in volatility spillovers explained by the increasing financial market integration and "readily-identified" crisis events.

In an analysis of the short term and long term dependencies between stock market returns for the Gulf Cooperation Council (GCC) Countries namely: Bahrain,

Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates, Aloui and Hkiri (2014) pointed out frequent changes in the pattern of the co-movements for all the selected GCC markets at relatively higher frequencies. The VAR results indicated strong and increasing dependency between the markets during financial crisis and the impacts of the crisis on the multi-country portfolio.

In the context of Africa, the majority of studies on international markets transmissions are set after the US subprime crisis in 2008. Investigations on transmission across African emerging markets revealed a significant spillover among markets with strong economic ties. Appiah-Kusi and Pescetto (1998) substantiated this pattern of market movement in their study on volatility spillover across African stock markets. Likewise, the VAR and GARCH analysis of Kambadza and Chinzara (2012) revealed that markets that belong to the same regional economic bloc tend to exert return and volatility spillover on each other.

Similarly to Asian emerging markets, studies have proved the influence of mature economies on African emerging Markets. Lamba and Otchere (2001) were the first to empirically explore dynamic relationships between emerging market and the world equity markets from 1988 to 2000. The results of the VAR analysis denoted very low international co-movement between African markets and the world equity markets, except for South Africa and to a lesser extent Namibia. These outcomes were explained by the fact that most African markets were not integrated with the world financial markets. Almost a decade later, Chinzara and Aziakpono (2009) and Giovannetti and Velucchi(2013) demonstrated how the world major stock markets such as the U.S., the UK, Australia and China influence small sized markets such as African markets. Chinzara and Aziakpono (2009) attested, with the help of the VAR and the GARCH frameworks, the existence of return and volatility linkages between South Africa and the US, Australia, and China. Further, innovations in the US turned out to affect South

Africa the most. The same way, Giovannetti and Velucchi(2013) indicated the prevalence of the shock on Kenya, Botswana, Nigeria and South Africa from the US compared to shock from China, Germany, Japan, the United Kingdom, Netherlands, Italy, France and Belgium .

In an analysis of return and spillover across CIVETS stock markets referring to a new group of emerging countries (Colombia, Indonesia, Vietnam, Egypt, Turkey, and South Africa) Korkmaz et al. (2012) detected the presence of intra-regional and inter-regional return and volatility interdependence effects described by the structure of the causal relationships among markets. The causality test described contemporaneous spillover effects across markets, but which were relatively low.

Moreover, in a study of regional and global linkages between the MENA region (Middle East countries and North African countries) Neaime (2012) confirmed the effect of the U.S. financial crisis on emerging markets in Egypt and Morocco as a result of their strong linkages with the U.S. and the EU (European Union) countries. Sugimoto et al. (2014) investigated the spillover effect between seven African markets (South Africa, Egypt Morocco Tunisia Namibia, Zambia) and global markets (China, France, Germany, Japan, the UK and the U.S.), commodity (gold and petroleum), and nominal effective exchange rate (Euro and U.S. dollar), during the U.S. financial crisis and the European sovereign debt crisis. Whilst the evidence confirmed modest effects from commodity and exchange rate, it also suggested a severe spillover effect from global markets to individual African markets. Unlikely many papers, this study found that the aggregate spillover effects of European countries on the African markets exceeded the corresponding effects of the U.S.

2.2 Overview of the African Stock Markets

The African financial market, with the exception of the well-established indices, is in a developing stage and is considered to be the most under-developed in the world. Most African stock markets are relatively small, illiquid, and inefficient (Kambadza and Chinzara, 2012). However, adoption of technologies and extensive economical and financial reforms that took place during the last decade has brought much improvement. Despite challenges associated with low capitalization, the volume of trading, and other risk factors, the region presents multiple investment opportunities.

The history of the African financial market goes back as far as the 19th century. The Egyptian stock exchange is the oldest stock market in Africa. The Alexandria Stock Exchange was established in 1883 and the Cairo Stock Exchange in 1903. The Johannesburg Stock Exchange in South Africa was established in 1887. The Casablanca Stock Exchange in Morocco was founded in 1929, the Nigerian stock exchange in 1960, and the Tunis Stock Exchange in 1969. New exchanges, including the Stock Exchange of Mauritius (1989), the Lusaka Stock Exchange of Zambia (1994), and the Namibian Stock Exchange (1992), were created after their independence.

The number of operating stock exchanges in Africa increased from just eight in 1989, to 23 in 2007, and to 29 in 2017, reaching a total market capitalization of over $2.1 billion and $1.5 trillion respectively (Giovannetti and Velucchi, 2013). In terms of market capitalization, South Africa is obviously the leading market of the region, followed by Namibia ($137 billion), Nigeria ($114 billion) and Morocco ($55 billion). Egypt, the oldest exchange is ranked fifth of the top 5 African stock markets (Table 1) at $54 billion market

capitalization. As shown in Table 1, South Africa, Egypt, and Nigeria are the more attractive stock markets given their number of listed companies. South Africa, Egypt, Nigeria, Morocco, and Kenya realize 96 percent of average daily trade, of which South Africa represents almost 75 percent (Africa Strictly Business.com). A particular point with the African stock market is the establishment of regional stock markets to address the problem of small market size and illiquidity. Presently, we count two regional markets, namely, the Bourse des Valeurs Mobilières de l'Afrique Centrale (BVMAC) in Central Africa and the Bourse Régionale des Valeurs Mobilières (BRVM) for CFA member countries in West Africa (Table 1, Figure 1). Liberalization of the business environment, political stabilization and growth-oriented policies make the region more attractive and a good platform for international diversification investments.

<Table1> Market Capitalization and the Number of Companies Listed in the African Stock Markets

COUNTRY	MARKET CAPITALIZATION 2012	MARKET CAPITALIZATION AS OF SEP. 2013	NO. OF LISTINGS
Botswana	$53.0 billion	$54.1 billion	37
BVRM (Benin, Burkina Faso, Cote d'Ivoire, Guinea Bissau, Mali, Niger, Senegal & Togo)	$8.1 billion	$10.5 billion	72
Cape Verde	$0.1 billion	$0.6 billion	4
Cameroon	$0.4 billion	$0.2 billion	6
Egypt	$60.1 billion	$54.3 billion	232
Ghana	$30.5 billion	$28.2 billion	34
Kenya	$15.9 billion	$20.6 billion	61
Malawi	$10.6 billion	$13.0 billion	14
Mauritius	$7.1 billion	$8.5 billion	91
Morocco	$52.8 billion	$54.8 billion	75
Mozambique	$1.0 billion	$1.0 billion	3
Namibia	$144.2 billion	$136.9 billion	34
Nigeria	$57.8 billion	$114.2 billion	190
Rwanda	$1.7 billion	$1.9 billion	4
Sierra Leone	$0.0 billion	$0.0 billion	2
South Africa	$998.3 billion	$970.5 billion	388
Sudan	$2.2 billion	$1.8 billion	59
Tanzania	$8.4 billion	$14.8 billion	7
Tunisia	$8.9 billion	$8.6 billion	55
Uganda	$5.9 billion	$8.3 billion	15
Zambia	$9.4 billion	$10.2 billion	22
Zimbabwe	$4.0 billion	$5.4 billion	69

Source *Acm Insight, AFSB(Africa Strictly business.co*

2.3 African Markets Financial and Trade Links

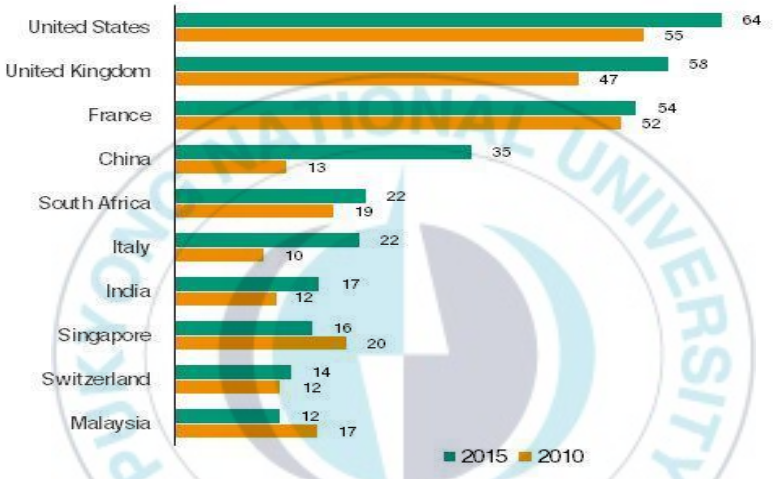
Markets' links are discussed in the literature as mechanisms of markets transmissions in the sense that the degree of a market's dependency can determine the level of exposure of markets to spillovers in one market. Simply said, economies with strong ties are subject to movements in response to innovations in other markets. For example, Piesse and Hearn (2005) empirically evidence volatility spillover among African stock markets from same regional blocs, as those countries have strong trade links. As mentioned earlier, Neaime (2012) confirms the effect of the U.S. financial crisis on emerging markets in Egypt and Morocco as a result of their strong linkages with the U.S. and EU countries.

Recently African countries have been enhancing their economic links with other markets all over the world. Beyond their historical and geographical ties with European countries, African countries strengthen their relationship with matured and emerging countries in other part of the world. This indicates the existence of possible financial movements across African countries and these countries, and it seems important to analyze the external dependencies of the continent.

The following chart displays the countries most invested in Africa by percentage of investment in 2010 and in 2015, as reported in the UNCTAD's (United Nation Conference on Trade and Development) World Investment Report 2017. Despite, the considerable increase of Chinese investments (from 13% in 2010 to 35% in 2015), Italian investments (from 10% in 2010 to 22% in 2015) and to a lesser extent the Indian's (from 12% in 2010 to 17% in 2015) and Switzerland's (from 12% in 2010 to 14% in 2015), the role of the U.S., the UK and France remain significant. Foreign investments in the region mainly come from the U.S. (from

55% in 2010 to 64% in 2015), the UK (from 47% in 2010 to 58%in 2015) and France (from 52% in 2010 to 54% in 2015).

<Figure 1> The top investor economies in Africa, 2010 and 2015



(Billions of dollars)
Source: UNCTAD, World Investment Report 2017.
Note: Numbers presented in this figure are based on the FDI stock data of partner countries.

<Table 2> Egypt FDI Inflows by Country and Industry

Main Investing Countries	**2014-2015** (%)	**Main Invested Sectors**	**2014-2015** (%)
UK	47.4	Oil Sector	53.2
UAE	10.6	Finance	3.8
USA	7	Real Estate	3.7
Belgium	5.4	Manufacturing	3.4
Saudi Arabia	2.5	Construction	1.5
France	2	Communication and information	0.5
Netherlands	1.9		
South Korea	1.8		
Germany	1.6		
Qatar	1.5		

Source: Central Bank of Egypt, Statistical Bulletin December 2016

Specifically, in Egypt foreign direct investments depend on the European Union, the United States and the Arab countries. The United Kingdom seems to lead investments and the main invested sector is the oil sector (53.2%) followed by the financial sector (3.8%) as described in Table 2.

South Africa obtains foreign direct investments (Table 3) mostly from the European Union and the United States. The more attractive sector combines Finance and Insurance Services, Real Estate and Business Services and counts 40.7% of the total inward.

<Table 3 > South Africa FDI Inflows by Country and Industry

Main Investing Countries	**2014-2015 (%)**	**Main Invested Sectors**	**2014-2015 (%)**
UK	29.5	Finance and Insurance Services, Real Estate and Business Services	40.7
Netherlands	24.2	Manufacturing	28.9
USA	4.9	Mining	15.9
Germany	3.3	Transport, Storage and Construction	10
Luxembourg	2	Trade, Catering and Accommodation	4

Source: South African Reserve Bank, Quarterly Bulletin March 2016

Additionally, the diversity of global trading partners of Egypt and South Africa as shown in Table 4, describes the effort made by African countries to enhance their economic links with the rest of the world. We observe the affluence of Middle East partner in Egypt and European Union in South Africa which can be explained by the historical and geographical ties with these areas. Nevertheless, China ($5,802M) and the United State ($5,247M) appear to lead exports in South Africa. In Egypt the presence of Italy and the United States in the top 5 export partners is non negligible.

<Table4> Egypt Export and South Export Partners

Export Partners	Volume ($)	Percentage Distribution	Export Partners	Volume ($)	Percentage Distribution
Saudi Arabia	2,027,096,432	9.53	China	5,802,847,540	8.86
Italy	1,615,613,346	7.6	USA	5,247,988,425	8.01
Turkey	1,272,011,419	5.98	Germany	4,237,095,748	6.47
USA	1,232,180,095	5.79	Namibia	3,845,774,500	5.87
UAE	1,111,976,442	5.23	Botswana	3,792,165,723	5.79
UK	951,002,474	4.47	Japan	3,644,352,407	5.56
India	896,227,733	4.21	India	3,146,768,783	4.8
Libya	572,002,940	2.69	UK	3,057,331,914	4.67
Jordan	564,676,365	2.66	Belgium	2,290,764,462	3.5
Germany	553,041,711	2.6	Zambia	2,191,438,357	3.34
Others	10,468,400,454	49.23	Others	28,262,393,709	43.14

Source: UN Comtrade (2015), globaledge.msu.ed

Moreover, given Egypt and South Africa's Portfolio investments inward, particularly equity securities, we notice that Egyptian and South African's portfolio investments are led by the U.S. Thereafter, whilst the UK (10%) share to portfolio investment equals Luxembourg (10%) in Egypt, in South Africa the Luxembourg portfolio investment (9%) overpasses the UK (7%) investments.

<Table5 > The Portfolio Investment (Equity Securities) 2012

	Total inward	1st country	2nd country	3rd country
South Africa	120,752	USA (59%)	Luxembourg (9%)	UK (7%)
Egypt, Arab Rep.	7737	USA (42%)	UK (10%)	Luxembourg (10%)

Note: US dollars, millions
Source: Coordinated Portfolio Investment Survey, 2014, IMF.

Overall, it appears that Africa in general, Egypt and South Africa specifically share financial and trade relationship mostly with the European Union, the Middle East (in Egypt), and the U.S. which leads as a country. However, a consistent study, using the appropriate statistical and econometric tools, is required to ascertain the degree of dependency between African emerging markets and their major global partners.

Most studies of financial transmissions between mature markets and African emerging markets concentrate more on the relationship between groups of global indices and an African index or only a single developed market and a single emerging market. However, in this paper we focus on return spillovers between the U.S. and the biggest African stock markets, South Africa and Egypt, from January 2012 to January 2017. Specifically, this study attempts to elucidate the following questions:

- Are there any significant dynamic interactions between the U.S. and African markets?
- Do spillovers from U.S. stock returns cause changes to emerging African stock markets?
- Do spillovers from emerging African stock returns cause changes to U.S. stock returns?
- How strong is the spillover effect between U.S. stock returns and emerging African stock returns?

- How persistent is the spillover effect between the U.S. stock market and emerging African stocks markets?

In addition, numerous empirical works employed various econometric approaches to investigate inter-markets transmissions. However, as Eun and Shim (1989), Lamba and Otchere (2001), and Chinzara and Aziakpono (2009), we apply the vector autoregressive framework, the Granger causality test and the impulse response functions to measure return spillovers from the U.S. to emerging African markets.

III. RESEARCH METHODOLOGY

Numerous empirical works employed the ARCH family (Ng, 2000; Brzeszczynski and Welfe, 2007; Chinzara and Aziakpono, 2009.), the Diebold and Yilmaz spillover (2012) measurement (Sugimoto et al, 2014), the threshold Vector Autoregressive (TVAR) (Gębka and Serwa, 2006) and various econometric approaches to explore inter-markets transmissions. However, as Eun and Shim (1989) and Lamba and Othere (2001), in this study, we apply the vector autoregressive framework, the Granger causality test and the impulse response functions to analyse returns spillovers between the US stock market and the sample emerging African stock markets.

3.1 Vector Autoregressive Analysis

The VAR is a common econometric approach used to elaborate dynamic behavior across financial markets. Introduced by Sims (1980), the VAR describes the dynamic, the magnitude, the transmission, propagation of interactions between variables. It is an extension of the univariate autoregressive model by including a collection of variables. A univariate autoregressive is a linear model that consists of a single equation describing a particular variable in which the variable is explained by its own lagged values. A VAR is a system of n-equations corresponding to n-variables in which one variable is explained by values of its own lag and values of the other variables (Stock and Watson, 2001).

This study focuses on return spillovers across emerging and developed markets. Considering the two African countries (Egypt and South Africa) and the single developed country (The United States of America) under study, we will test a two-variable VAR describing interactions between the U.S. and emerging stock markets individually hence, one system for Egypt and the U.S. and one for South Africa and

the U.S. Consequently, our VAR system derived from the VAR basic equation can be written as:

$$Y_t = C + Y_{t-i} + \varepsilon_t \quad (1)$$

$$y_{1t} = c_1 + \beta_{111}\, y_{1t-1} + \beta_{112}\, y_{2t-1} + \beta_{211}\, y_{1t-2} + \beta_{212}\, y_{2t-2} + \ldots + \beta_{p11}\, y_{1t-p} + \beta_{p12}\, y_{2t-p} + \varepsilon_{1t} \quad (2)$$

$$y_{2t} = c_2 + \beta_{121}\, y_{1t-1} + \beta_{122}\, y_{2t-1} + \beta_{221}\, y_{1t-2} + \beta_{222}\, y_{2t-2} + \ldots + \beta_{p21}\, y_{1t-p} + \beta_{p22}\, y_{2t-p} + \varepsilon_{2t} \quad (3)$$

Where Y_t is a 2 x 1 vector of stock returns for the 2 African markets distinctly, C is a 2 x1 vector of a constant, β_i are 2 x 2 matrices representing the coefficients, p is the lag length and ε_t is 2 x 1 the vector of the unpredictable innovations in each variable, uncorrelated with those of past periods. Our VAR matrix is described as follow:

$$\mathbf{Y}=\begin{bmatrix} y1t \\ y2t \end{bmatrix},\ \mathbf{C}=\begin{bmatrix} C1 \\ C2 \end{bmatrix},\ \boldsymbol{\beta}_p=\begin{bmatrix} \beta P11 & \beta P21 \\ \beta P21 & \beta P22 \end{bmatrix},\ \boldsymbol{\varepsilon}_t=\begin{bmatrix} \varepsilon 1t \\ \varepsilon 2t \end{bmatrix}$$

An initial step when running the VAR is to select the variables' optimal lag length based on the five criteria: the Akaike (AIC), Hannan-Quinn (HC), Schwarz Information (SC), the final prediction error (FPE) and the sequential modified likelihood ratio test (LR). In addition, following the standard of the empirical literature, the variables are to be of the same order of integration. In order words, when variables are I(0), stationary, a VAR in level should be performed. In case, the

variables are I (d) non stationary and co-integrated, we performed the vector error correction which is a restricted form of VAR. Finally, if the variables are non-stationary and not co-integrated, we can also run a VAR in difference. The Augmented Dicker Full, the Phillips Perron and the Kwiatkowski-Phillips-Schmidt-Shin unit root tests results in the following chapter confirms that our variables are stationary hence we use the non-restricted VAR model for our study.

Moreover, because of the numerous estimates' coefficients of the VAR model, we reported the Granger causality, the impulse response functions, along with the regression outcomes. This would make the results clear and easier to interpret. These applications are more informative and consistent. Except for the impulse response functions and the variance decomposition requiring some restrictions, the VAR enables analysis without requiring much knowledge on forces influencing the variables compared to other structural techniques. It is a relatively simple model, well specified and appropriate for our study.

3.2 Granger Causality Block exogeneity Wald test

Whilst the VAR estimates give evidence of possible interactions between variables, the Granger (1969) causality test ascertains the direction of causality between those variables. The Granger causality is a joint test of a set of variables that indicate whether lagged values of a variable significantly explain another variable in the VAR system. For example, using an x, y two-variables VAR, there is causality if x causes y past values or if y causes x past values, considering the value of x past value or the value y past values. It also helps to determine whether another lagged variable is endogenous or not in a VAR model. There should be no confusion with the Pairwise Granger causality tests which test whether an endogenous variable can be employed as an exogenous variable.

Additionally, the null hypothesis in this test is that x does not Granger-cause y or all the lags of x are excluded from the equation of y. The rejection of the null hypothesis means that x Granger causes y or y is an endogenous variable, hence there is causality of x on y. The possible outcomes of such test are no causality, unidirectional (one way) causality and bidirectional (two ways) causality. In other words, the Granger causality specifies the direction of shocks transmission between variables.

3.3 Impulse Response Functions

To examine the effects of shocks from the U.S. stock market in return of African stock markets, we performed the impulse response function analysis. The impulse response functions are graphical descriptions of the response of one variable to a standard deviation shock from another variable throughout a determined period of time. The impulse response is an n x n matrix graph with a variable giving the impulse on the one hand and a responding variable on the other hand. The impulse response functions provide information about the speed, the sign, the magnitude and the persistence of the responses (Kambadza and Chinzara, 2012). A market responds to innovation from another market if there is causality between them. Hence, the impulse response graphs trace out the causality between one variable and another or a collection of variables (Eduardo Rossi, 2006). There are many specifications of the impulse responses, the prevalent in empirical studies are the Cholesky impulse response function (Sims, 1980) and the generalized impulse response function (Koop et al, 1996; Pesaran and Shin, 1998). In this study, we apply the Cholesky impulse response function (Sims, 1980) to examine how the U.S. growth affects the sample African markets individually.

IV. DATA DESCRIPTION AND PROPERTIES

4.1 Data Source

Data used for this study comprise daily closing prices of South Africa stock market, Egypt and the United States stock markets, from 30/01/2012 to 31/01/2017. We specifically selected prices information of EGX30 index representing Egypt, FTSE South Africa index representing South Africa, and Standard and Poor's 500 index (S&P500) for the U.S. The choice of stock markets was based on the availability of the data and the fact that the selected indices are the best representatives of these countries. They are also the indices the most used in empirical studies. The sample period is characterized by the ongoing global oil prices crisis resulting from the overproduction of oil in 2012 to 2014, the period prior to the crisis. This implies possible and interesting behavior in financial markets to be explored. The dataset is fully collected from Investing.com and the prices are quoted in domestic currencies of the markets, as it reflects the reality of each market. Additionally, we converted the daily closing prices into daily returns, using the following equation:

$$r_{it} = ln(P_{it}/P_{it-1})*100 \qquad (4)$$

Where r_{it} is the natural logarithmic return of index *i* at time *t*, P_{it} the price of index *i* at time *t* (the current price) and P_{it-1} the price of index *i* at time *t-1* (the previous day).

4.2 Data Issues

Using time series data involves several issues related to the data frequency. The different non trading days and different trading time between markets constitute the

main challenges when working with daily data. However, compared to low frequency data, daily data can capture the dynamic of trading information within a day. Therefore daily data appear more attractive for analyzing markets spillovers. Monthly data and weekly data obscure information that is relevant for few days. In addition, studies using high frequency data can be really effective for policies aimed at preserving financial stability (Berben and Jansen, 2005).

Moreover, Glezakos et al. (2007:28), Chowdhury (1994) and Chang et al. (2006) recommend two approaches to address the issues of difference of time and non-trading days. Glezakos et al. (2007:28) suggest the simulation of the missing data and Chowdhury (1994) and Chang et al. (2006) propose to simply delete the non-trading days and keep the same trading days in the selected markets. Hence, in this paper we apply the latter approach to adjust our dataset.

4.3 Summary of Descriptive Statistics

The table below summarizes the descriptive statistics of the series specifically: the sample means, medians, minimums, maximums, standard deviations, skewness, kurtosis and Jarque-Bera tests. After adjustment our data count 873 observations over the full period of study. As shown in the statistics, the U.S. exhibits the highest average rate of return (0.0632), respectively followed by South Africa (0.0516) and Egypt (-0.1146). Egypt exhibits the lowest return rate, however it is the index with the highest return rate (10.0802) and the lowest return rate (-10.6013) compared to the two other markets. A recurrent characteristic in emerging stock markets is the high level of volatility in comparison to matured markets and our dataset is not an exception. The statistics report high standard deviations 1.9082 and 1.244, for Egypt and South Africa respectively, whereas the U.S. has a standard deviation of 1.0001. Except Egypt, the two other indices are negatively skewed. All series are leptokurtic with kurtosis values between 5.7838 (SA) and 13.9826 (U.S.). The Jarque-Bera tests, in line with the excess kurtosis values evidence non-normality of distributions in

form of fat tail. Overall, the data present common features of daily stock data, this in a conformity with previous empirical studies.

<Table 6> Summary of Descriptive Statistics

	South Africa	Egypt	US
Mean	0.0516	-0.1146	0.0632
Median	0.0892	-0.1454	0.0975
Maximum	5.5367	10.0801	3.8291
Minimum	-6.5332	-10.6013	-9.3907
Std. Dev.	1.2434	1.9082	1.0001
Skewness	-0.2919	0.0879	-1.2919
Kurtosis	5.7838	7.2982	13.9826
Jarque-Bera	294.2975***	673.1331***	4630.257***
Probability	0.0000	0.0000	0.0000
Sum	45.0803	-100.0053	55.1358
Sum Sq. Dev.	1349.440	3175.264	872.1119
Observations	873	873	873

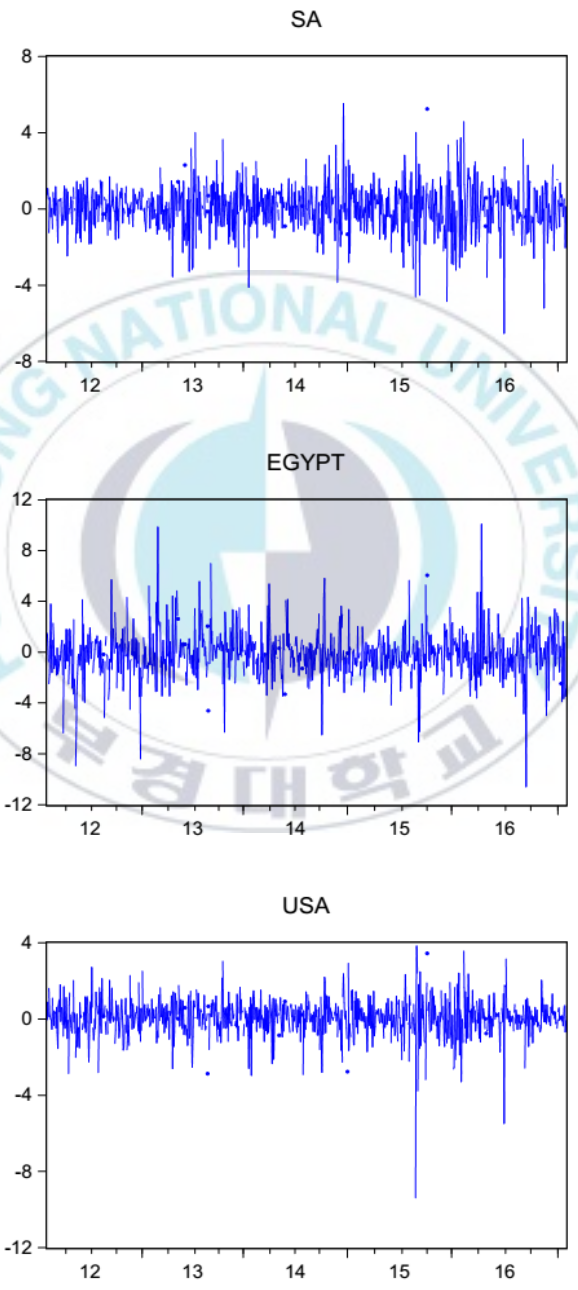
, * indicate significance at 5% and 1% level, respectively.

4.4 Daily Return series dynamic

Before we perform the unit root test, it is important to look at the dynamic of the return series over the five years of the study. The reason is the graphs indicate whether there is trend and /or intercept in the variables which is useful information to add when running the unit root tests.

Figure 2 describes graphically the characteristics and properties of the return series over the period of the study. Through the graph, we notice that the series are not trendy and do not have intercepts. We can also see that Egypt varies the most, whereas the U.S. varies the least. Additionally, the shapes of the graphs describe typical features of stationary time series. Nevertheless, more evidence from appropriate stationary tests is required to confirm the stationarity in the variables.

<Figure 2> Daily Return Series Dynamic



4.5 Unit Root Test Results

In order to test whether the data are stationary, we have conducted the Augmented Dicker Full (ADF) unit root tests, the Phillips Perron (PP) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationary tests, the standard stationary tests used in common empirical works. Table 7 displays the t-values of the 3 tests' results. The Augmented Dicker Full and the Phillips Perron reject the hypothesis of unit root at 1% significant level for all series. The Kwiatkowski-Phillips-Schmidt-Shin likewise, failed to reject the hypothesis of stationarity; we conclude that the whole distributions are stationary in conformity with the graphs in figure 2.

<Table7>Unit Root Test

	South Africa	Egypt	US
ADF	-31.42711***	-25.5381***	-29.5747***
PP	-31.9429***	-25.6741***	-30.0001***
KFPP	0.1397***	0.127***	0.1059***

, * indicate significance at 5% and 1% level, respectively.

4.6 Correlation Analysis

The correlation test results displayed, in Table 8, show evidence of correlation between the returns of the U.S. and the main African markets. Whilst correlation between U.S. stock returns and South Africa stock returns (0.4448) is close to 0.50, the correlation between Egypt stock returns and those of the U.S. (0.0217) seems

very low. However, correlation coefficients are not consistent enough to describe dynamic relationship between the variables, do not imply causality between variables and do not substantiate the existence of transmissions between markets and their direction. Consequently, dynamic econometric frameworks are needed to shed light on the magnitude, the direction, the speed and the sign of potential transmissions among the sample markets.

<Table 8> Correlation of Returns

	South Africa	Egypt	US
South Africa	1.0000		
Egypt	0.051	1.0000	
US	0.4448	0.0217	1.0000

V. EMPIRICAL RESULTS

In order to analyze return spillovers between the U.S. stock market and African emerging markets, we styled individual vector autoregressive models for the U.S. and the two well established African financial markets, South Africa and Egypt. Additionally, we determined the direction of movements by means of the Granger causality tests and finally traced out the interactions between variables using the impulse response functions**.**

5.1 Vector Autoregressive Analysis

Table 9 and Table 10 respectively report the VAR estimates measuring relationships between the U.S. and South Africa and Egypt, and their t-values. As mentioned earlier in the methodology, an initial step to estimate the VAR is the selection of the optimal lag order on the basis of the five lag length criteria.

As regards the U.S. stock market and the South African stock market, lag 3 seems the optimal lag order at measuring the spillover effect across the two markets, according to the FPE and the AIC lag length criteria. At the same time, lag 1 turned out to be significant according to the SC and HC criteria (see Table 13 in the Appendix). As a result, we decided to test the VAR at both orders. As the regression at lag1 provided the best t-values, we pursue the analysis at lag 1. The results in Table 9 confirm significant (at 5% significance level) evidence of spillovers across the U.S. and South Africa. However, the t-values (5.2652 the former and -0.1467 the latter) indicate that spillovers from the U.S. significantly affect South Africa whereas spillovers from South Africa do not provoke any changes to the U.S.

Moreover, we performed the VAR between the U.S. and Egypt at lag 2 given that the lag length selection tests were in majority significant at the 2nd order (see Table14 in the Appendix). As shown in Table 10, the t-values (2.1439 and -2.7683) substantiate that spillovers from the U.S. stock returns provoke changes to Egypt, consistent at

lag 1 and lag 2. However, at lag 1 and lag 2, the t-values (1.4990 and 1.047 respectively) attest that spillovers in Egypt do not affect the U.S. Stock market.

Given the multiple VAR coefficients due to the lag numbers, it appears difficult to draw a clear conclusion about the transmissions across the selected markets, relying only on the VAR estimates. Consequently, we believe the causality test and the impulse response findings are of significant importance.

<Table 9> Vector Autoregressive Estimates

	US	South Africa
US(-1)	-0.0086	0.2437***
	(0.0379)	(0.0463)
	[-0.2267]	[5.2652]
South Africa (-1)	0.0045	-0.1515***
	(0.0305)	(0.0372)
	[0.1467]	[-4.0722]
C	0.0636*	0.0432
	(0.0340)	(0.0415)
	[1.8707]	[1.0407]
R-squared	0.0001	0.0349
Adj. R-squared	-0.0022	0.0327
Sum sq. resids	872.0458	1301.841
S.E. equation	1.0018	1.224
F-statistic	0.0270	15.7272
Log likelihood	-1237.337	-1412.039
Akaike AIC	2.8448	3.2455
Schwarz SC	2.8612	3.2619
Mean dependent	0.0633	0.0509
S.D. dependent	1.0006	1.2445

Determinant resid covariance (dof adj.)	1.1929
Determinant resid covariance	1.1847
Log likelihood	-2548.539
Akaike information criterion	5.8590
Schwarz criterion	5.8919

( ) indicates standard errors and [ ] indicates t-statistics

*, **, *** indicate significance at 10%, 5% and 1% level, respectively.

< Table 10> Vector Autoregressive Estimates

	US	Egypt
US(-1)	-0.0095	0.1365**
	(0.0338)	(0.0637)
	[-0.2795]	[2.1439]
US(-2)	-0.0895**	-0.1766**
	(0.0339)	(0.0638)
	[-2.6422]	[-2.7683]
Egypt (-1)	0.0269	0.1354***
	(0.018)	(0.0338)
	[1.4999]	[4.007]
EGYPT(-2)	0.0188	0.0693**
	(0.0179)	(0.0338)
	[1.0469]	[2.0531]
C	0.0738**	-0.0921
	(0.0340)	(0.0641)
	[2.166]	[-1.4365]
R-squared	0.0116	0.0381
Adj. R-squared	0.0071	0.0337
Sum sq. resids	861.2997	3050.888
S.E. equation	0.9979	1.877
F-statistic	2.5445	8.578
Log likelihood	-1231.018	-1781.815
Akaike AIC	2.8382	4.1029
Schwarz SC	2.8655	4.1303
Mean dependent	0.0623	-0.1175
S.D. dependent	1.0008	1.9094

Determinant resid covariance (dof adj.)	3.5036
Determinant resid covariance	3.4636
Log likelihood	-3012.824
Akaike information criterion	6.9410
Schwarz criterion	6.9958

( ) indicates Standard errors and [ ] indicates t-statistics
, * indicate significance at 5% and 1% level, respectively.

5.2 Granger Causality /Block exogeneity Wald test

With regard to how returns of the U.S. and returns of South Africa influence each other, the block exogeneity Wald test enables us to ascertain not only the existence of the causality effect between variables but it helps us to identify the direction of the effect as well. From the p-values (0.8834 for example), in Table 11, we failed to reject, at all levels of significance, the null hypothesis that spillovers from South Africa cannot cause significant changes to the U.S. stock returns. Therefore, until the contrary is proven, we consider that spillovers from South Africa do not Granger cause changes to returns in the U.S. On the other hand, the p-values make us reject, at 1% level of significance, the null hypothesis that spillovers in the U.S. do not cause significant changes to South Africa stock returns. Hence, we accept the alternative hypothesis that spillovers from the U.S. Granger cause significant changes to South Africa. In other words, our results confirm the existence of a unidirectional causality effect between the U.S. and South Africa, specifically from the U.S. to South Africa. However, they do not support the assumption that movements in the South African stock markets cause changes to the U.S. stock returns.

<Table 11>VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: **US**			
Excluded	Chi-sq	df	Prob.
South Africa	1.955884	3	0.5816
All	1.955884	3	0.5816
Dependent variable: **South Africa**			
Excluded	Chi-sq	df	Prob.
US	31.52546***	3	0.0000
All	31.52546***	3	0.0000

*** indicate significance at 1% level, respectively.

The picture is similar for the VAR Granger causality tests between Egypt and the U.S. The results suggest a unidirectional causality effect between the U.S. and Egypt as well. From the p-values in table 12, we could not reject the null hypothesis that says that movements in Egypt stock returns cannot cause changes to the U.S. stock returns, at all significance level. Consequently, until contradictory findings are provided, we consider that spillovers from Egypt stock market do not affect the U.S. stock returns. Besides, the p-values make us reject, at 1% level of significance, the null hypothesis that says that spillovers from the US do not cause significant change in the Egyptian stock market. As a result, we accept the alternative hypothesis that says that spillovers from the U.S. Granger cause changes to Egypt stock returns. Overall, our results clearly attest the significance of the unidirectional causality between the two markets, particularly from the U.S. to Egypt. However, our evidence does not support the opposite the assumption.

<Table 12> VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: **US**			
Excluded	Chi-sq	df	Prob.
Egypt	3.839557	2	0.1466
All	3.839557	2	0.1466
Dependent variable: Egypt			
Excluded	Chi-sq	df	Prob.
US	12.36033***	2	0.0021
All	12.36033***	2	0.0021

*** indicate significance at 1% level, respectively

5.3 Impulse Response Functions Analysis

The VAR analysis corroborates with the Granger causality tests outcomes on the significance of spillovers across the U.S. and the sample African stock markets. The Granger causality tests mostly emphasize the unidirectional nature of the spillovers. The impulse response functions (IRFs), in turn, help us to describe graphically these findings and provide more information about the sign, the speed and the persistence of the responses of the two markets to spillover from the U.S. stock market. The responses of each market to the Cholesky (Sims, 1980) one standard innovations from other markets (and the same market) are displayed in figures 3 and 4.

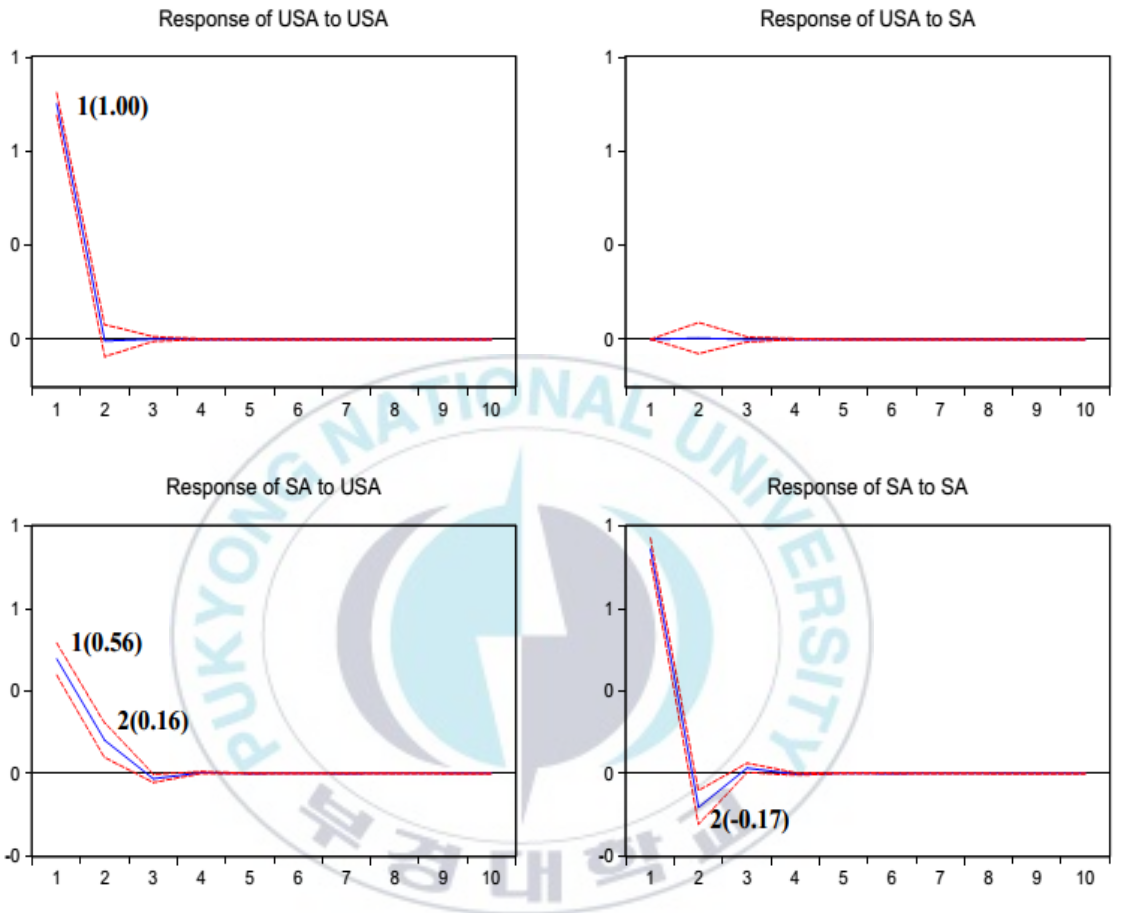
The first thing to notice is that the IRFs curves converge to zero and they fade away at the midst of the 3rd or the 4th period. The former feature of the responses reflects stationarity in the variables and confirms once more the findings of unit root tests.

The theoretical standards stipulate that one time shock should not be permanent. Thus, the impulse response graphs should all converge to zero, if not it indicates non-stationarity in variables. Besides, the markets responses to own past shocks are very high. This evidence is consistent with Giovannetti and Velucchi (2013) explaining these outcomes by the fact that markets depend on their own performance. However, in this study, we focus on inter-markets interactions.

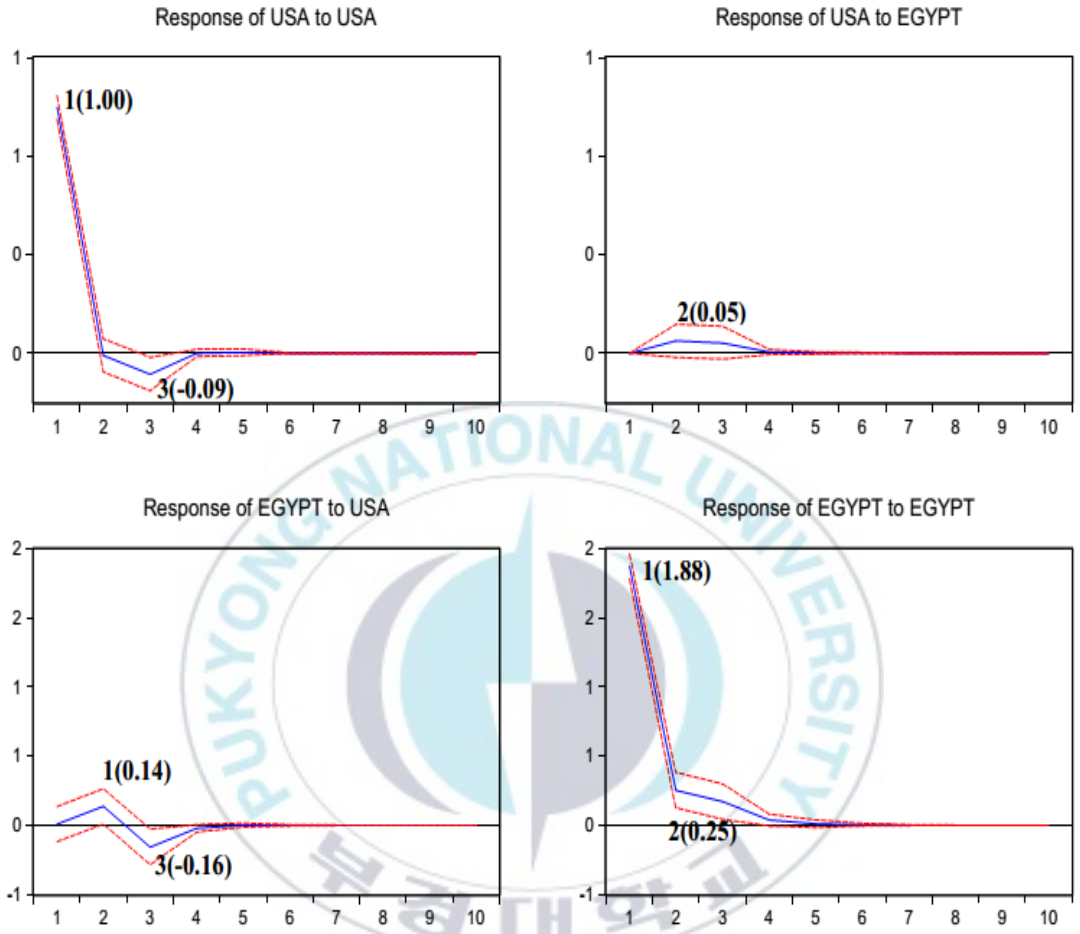
Figure 3 exhibits the responses of South Africa and the U.S. to innovations in each market. We can observe that the response of the U.S. to one standard deviation shock from South Africa is non-significant for all the period, whereas South Africa's response to innovations in the U.S. is positive, immediate and fades away in the first medium term. At the first period, South Africa stock returns responds up to 0.56% to shock in the US and at the 2nd period up to 0.16 % .The response is much smaller in the 2nd and 3rd periods than at the first period. In sum, the results deny the assumption that innovations in South Africa affect The U.S. stock returns but attest that the U.S. exert spillover on the South African stock returns .

Likewise in Figure 4, the response of the U.S. to shocks in the Egyptian stock market is extremely low (0.005) and can be considered non-significant. However, Egypt stock returns respond positively to shocks in the U.S the 2 first periods. At the midst of the 3rd period the response becomes negative and fades away at the midst of the 4th period. Additionally, the highest response reaches 0.14% and the lowest reaches -0.16%. The response of Egypt to shocks from the U.S stock returns is much smaller compare to South Africa's response but it is more persistent. In sum, the results deny the assumption that innovations in Egypt influence change in the U.S. stock market , however they confirm that the U.S. exert spillover on the Egyptian stock returns.

<Figure3> Response to Cholesky One S.D. Innovations ± 2 S.E.



<Figure4> Response to Cholesky One S.D. Innovations ± 2 S.E.



The impulse response functions graphs reveal short-term spillover between the U.S. stock return and the two emerging African markets under study. Furthermore, the IRFs confirm the existence of unidirectional spillovers effect from the US stock market to South Africa stock returns and Egypt stock returns, the same evidence is also supported by the VAR and the causality tests. Overall, the empirical results are consistent with the findings by Yonis (2011), Neaime (2012) and Karolyi (1995). Karolyi (1995), for example, argues that well matured stock markets would have strong effect on other markets.

VI. CONCLUSION

This study examines return spillovers between the U.S. stock market and emerging African markets from over the five past years. The aim of this paper is principally to give a new look to the extent to which developed stock returns influence emerging stock returns and to assess the degree of interdependence between markets. Thus, we used the daily closing price information of FTSE South Africa index, EGX30 and Standard & Poor'S 500 index representing South Africa, Egypt and the United States from. In order to estimate the magnitude, the direction, the sign, the speed and the persistence of spillovers across the selected stock markets, we carried out the vector autoregressive (VAR), the Granger causality block exogeneity test and the impulse response functions Analyses.

The results provide striking evidence of short-term unidirectional spillovers from the U.S. to the African stock markets individually. That is, spillovers from the U.S. affects South Africa stock returns and Egypt stock returns whereas spillovers from South Africa and from Egypt do not cause any changes to U.S. stock returns. As expected, the assumption that spillovers from South Africa and Egypt could provoke changes to the U.S. stock returns is not supported by the VAR, the causality tests, and the IRFs unanimously. The spillover effect in South Africa stock turned out to be stronger than Egypt but the effect was more persistent in Egypt than in the South Africa.

The evidence also suggests that there is a positive relationship between South Africa stock returns and the U.S. stock returns. This means that a growth in the U.S. stock returns might incite growth in South Africa stock returns. Likewise a crash in the U.S. stock returns exposes South Africa stock returns to downfall such as the subprime crisis affected South Africa in 2008 (Sugimoto et al, 2014); (Senbet and Otchere, 2010). Conversely, the relationship between the U.S. stock returns and Egypt though positive in the beginning becomes negative over the time. That is, as time evolves

and especially at the 3rd year, the U.S. growth causes returns of the Egyptian stock market to fall. This can be explained as the effect the ongoing oil price drop in the Egypt and the U.S., considering that more than 50% of FDI inflows in Egypt comes from the oil sector and the U.S. is one of the best oil trade partners of Egypt. We note that at the beginning of the period of study, Egypt is still rebooting its economy affected by the political unrest and the U.S. growth seems to incite growth in the Egypt stock returns. However during the 3rd period (2014) which coincides with the beginning of the oil crisis, Egypt returns started to move in the opposite direction with the U.S. stock returns. This gives rooms for further researches that could examine the direct effect of the oil crisis in return spillovers between the U.S. stock market and Egypt.

Overall, from the findings we can deduce that there are strong links between the U.S. stock market and emerging stock markets in Africa. Emerging African markets seem to depend a lot on the U.S. The South Africa stock market strongly depends on investments from the U.S. and Egypt dependency to investments from the U.S. is relatively low. This has interesting implications for both investors and policies makers. In the sense that, strong dependencies or links between markets reduces protection of markets from any global shocks whereas weak dependencies offer potential gains from international diversification (Singh et al, 2009). Consequently, adequate policy frameworks in South Africa should be enforced to prevent or reduce distortion that may arise as a result of high spillovers from the U.S. On the other hand, Egypt presents good opportunities for successful diversification as the Egyptian stock market is less exposed to risks associated with spillovers from the U.S.

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Appendix

< Table 13> VAR Lag Order Selection Criteria

Lag Length Criteria: US and SA

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2551.213	NA	1.255619	5.903383	5.914395	5.907597
1	-2531.164	39.95841	1.209881	5.866276	5.899312*	5.878920*
2	-2526.232	9.807009	1.207277	5.864121	5.919181	5.885194
3	-2520.946	10.48629	1.203693*	5.861148*	5.938232	5.890651
4	-2519.848	2.173540	1.211797	5.867857	5.966966	5.905789
5	-2515.115	9.346087	1.209746	5.866162	5.987295	5.912523
6	-2513.733	2.722863	1.217093	5.872214	6.015372	5.927005
7	-2508.874	9.549661	1.214680	5.870228	6.035409	5.933448
8	-2502.288	12.91201*	1.207445	5.864250	6.051456	5.935900

* indicates lag order selected by the criterion (each test at 5% level)

<Table14> VAR Lag Order Selection Criteria

Lag length criteria: US and Egypt

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-3015.054	NA	3.669641	6.975848	6.986860*	6.980063
1	-3002.999	24.02597	3.601931	6.957224	6.990260	6.969868
2	-2992.804	20.27230*	3.550706*	6.942900*	6.997961	6.963974*
3	-2991.587	2.415207	3.573625	6.949334	7.026418	6.978837
4	-2989.969	3.203094	3.593361	6.954840	7.053949	6.992773
5	-2987.339	5.191477	3.604772	6.958010	7.079143	7.004372
6	-2986.161	2.321581	3.628372	6.964534	7.107691	7.019325
7	-2984.314	3.630517	3.646486	6.969511	7.134692	7.032731
8	-2983.603	1.392445	3.674340	6.977118	7.164323	7.048767

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion