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04. April 2011

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Abstract

The recent waves of political crises in Africa and the Middle East have inspired the debate over how political instability could pose a risk of financial contagion to emerging countries. With retrospect to the Kenyan political crisis, our findings suggest stock markets in Lebanon, Mauritius and Nigeria were contaminated.

JEL Classification: G10; G15; F30

Keywords: Political crisis; Contagion; Developing countries; Equity Markets

1. Motivation

The recent Jasmine (Tunisian) and Egyptian revolutions have set pace for socio-political unrest in other Middle East and African countries. While they might have been short-lived, the Ivorian and Libyan crises which have gone on for months now could have dire economic and financial implications for said countries in particular and sub-regions in general. With much uncertainty on the direction of this wave of revolutions and political unrests in the months and/or years ahead, the need to assess how such could affect economic and/or financial development is crucial. Tunisian and Egyptian stock market operations were suspended at the onset of respective crises, leaving little room for a study based on shifts in stock market correlations. However, a parallel event in recent history which could help researchers in the same vein is the Kenyan political crisis of 2008. This study could be charming to investors and policy makers who should be interested in knowing how political crisis in one country might affect other countries financially. Findings could also quell growing concerns over whether African stock markets are integrated. This paper is organized

in the following manner: a review of related literature is seen in section 2; section 3 presents' data and outlines our methodology for measuring contagion; empirical analysis is presented in section 4; we discuss results in section 5 before concluding.

2. Related Literature

2.1 Literature on linkages between financial integration and crises

Though domestic factors have often been seen as sources of crises, financial market integration could easily propagate them to other countries and/or markets. Many links exists via which such propagation could take place.

Firstly as point out by Schmukler (2004), with the liberalization of a country's financial system, it becomes an object of market discipline exercised by both foreign and domestic investors. Whereas in a closed economy only domestic investors monitor and react to unsound fundamentals, in an opened economy domestic and foreign investors do. Consequently, the absence of sound macroeconomic, financial and institutional fundamentals could increase the probability of crises. Therefore, antagonistic interests and views between investors (domestic and foreign) on key fundamentals could precipitate crises and reduce the ability to effectively manage and monitor them.

Secondly, even with the presence of sound domestic fundamentals and quality institutions, international financial market imperfection could also bring about crises. Herding behavior, speculative attacks, irrational behavior, bubbles and crashes amongst others could be direct implications of such imperfections. For instance, regardless of market fundamentals investors could speculate against a currency if they deem its exchange rate unsustainable. This situation pointed-out by Obstfeld (1986) has been supported and purported by many authors (Schmukler, 1986; Asongu, 2011).

Thirdly, sound fundamentals and absence of imperfections in international capital markets are necessary but not sufficient conditions for the prevention of crises. External

factors (Schmukler, 2004) like determinants of capital flows (Calvo et al., 1996) and foreign interest rates (Frankel and Rose, 1996) are potential sources of crises. As pointed out by Frankel and Rose (1996), the role of foreign interest rates could be crucial in determining the likelihood of financial crises in developing countries. In the same vein, for countries dependent on foreign capital, shifts in their flows could give birth to important financial issues and economic downturns.

Last but not the least, with respect to Schmukler(2004), integration could lead to financial crisis through contagion; that is, via shocks through real links, financial links and herding behavior or unexplained high correlations. This fourth effect of integration falls within the framework of our research question.

2.2 Literature on definition and channels of contagion

2.2.1 Definitions of contagion

To this day, there is no established definition of contagion by economists. Borrowing from the World Bank, there are three main definitions of contagion. Firstly, from a broad dimension, the phenomenon could be seen with the general process of shock transmission across countries. This first definition takes account of both positive and negative spillover effects. Secondly, contagion could be understood as the propagation of shocks between two countries in excess of what should be expected with respect to fundamentals after considering co-movements triggered by common shocks. It should be pointed-out here that this second definition is somewhat restricted to only shocks and presupposes sound mastery of what constitutes underlying fundamentals. The last and most restrictive definition considers contagion as the change in transmission mechanisms which take place during a period of turmoil and could be appreciated via a significant increase in cross market correlations.

In this paper, we shall limit ourselves to the third definition of contagion because :(1) our study aims to investigate how a financial shock resulting from a political crisis could

affect other existing financial markets [1](in antagonism to the first definition); (2) our mastery of what constitutes underlying fundamentals in market co-movements we are about to study is limited (as opposed to the second definition).

From an empirical dimension, the third definition was first proposed by Forbes and Rigobon (2002). They conceived contagion as a significant increase in market co-movements after a shock has taken place in one country. According to them, the condition for contagion is a significant increase in co-movements as a result of a shock in one market. To stretch this point, if two markets display a high degree of co-movements during the stable period, even if they are highly correlated during the turmoil period, if the crisis-correlation is insignificant, then contagion has not taken place. The term "interdependence" is used to describe the situation with insignificant change in cross market correlations.

2.2.2 Channels of contagion

Borrowing from Schmukler (2004), there are three main channels of contagion identified in the literature: (1) real link often associated with trade links[2]; (2) financial links[3] and (3) the effect of herding behavior or panics resulting from asymmetric information.

2.3 Literature on the measure of contagion

In the literature, many methods for measuring contagion have been proposed to appreciate international shocks across countries. The mostly applied are cross-market correlation coefficient measures (King and Wadhwani, 1990; Forbes and Rigobon, 2002; Collins and Biekpe, 2003; Lee et al., 2007), cross-market co-integration vector changing procedures (Kanas, 1998), volatility analysis based on ARCH and GARCH techniques (King et al., 1994) and direct estimation transmission mechanisms (Forbes, 2000).

[1] The impact of the political crisis on the financial market is a negative shock and not a positive spillover.
[2] For example when two markets are trading together and compete in the same external market, a devaluation of the exchange rate of one country diminishes the other's competitive advantage. In an attempt to rebalance its external sectors, the losing country would in turn want to devaluate its own currency.
[3] When two economies are connected through the international financial system, leverage institutions facing margins call could be impelled to take actions that would ripple shocks to other countries.

In this study, we shall follow Asongu (2011) in applying Forbes and Rigobon (2002) in the context of Collins and Biekpe (2003)[4].

3. Data and Methodology

3.1 Data

We reiterate the goal of this paper is to study correlations between the returns of the Kenyan stock index and stock indexes of other markets. Taking the Nairobi Stock Index as the base criterion, we investigate if co-movements between the base criterion and said financial markets were significantly strengthened during the 2008 Kenyan political crisis. This crisis began on the 27th of December 2007[5] and ended on the 28th of February 2008[6]. The sample period is partitioned into two sets: a two-month pre-crisis (stable) period and a month crisis (turmoil) period. The pre-crisis period begins from the 01st of November 2007 to the 24th of December 2007. The crisis period ranges from the 04th of January 2008 to the 29th of January 2008. We assume here that any substantial price sensitive political implication should have occurred after the announcement of the election results (30/12/2007). More so, the full crisis period (27/12/2007 to 28/02/2008) is not assumed as the turmoil period because a stock market shock was not experienced during the entire period. As presented on figure one, the Nairobi Stock Exchange (NSE) experienced a shock from 04/01/2008 to 29/01/2008. Daily data used in the study is gotten from Bloomberg's database. Our choice of local currency index return is because; Forbes and Rigobon (2002) have shown that using dollar or local indices will produce similar outcomes.

[4] The hypothesis testing by Asongu (2011) with respect to Collins and Biekpe (2003) is slightly different from that of Forbes and Rigobon (2002) in that, the test statistics to determine contagion is not calculated using estimated sample variances. Their test statistics (Collins and Biekpe, 2003; Asongu, 2011) uses exact student statistics based on actual sample correlation coefficients. Contagion is then measured by the significance of increase in adjusted correlation coefficients during the turmoil period as compare with the stable period.

[5] Date at which, presidential elections were held.

[6] Date at which Kibaki(incumbent) and Odinga(opposition leader) signed a power sharing agreement called the National Accord and Reconciliation Act.

3.2 Methodology

Contagion as defined by Forbes and Rigobon (2002) is a significant increase in market co-movements after a shock in one country[7].

The correlation coefficient is defined as:

$$\rho = \frac{\sigma_{xy}}{\sigma_x \sigma_y} \qquad (1)$$

With: 'x' the base criterion (Kenyan Stock Market) and 'y' a developing country equity market. According to Forbes and Rigobon (2002), the correlation coefficient is adjusted in the following manner:

$$\rho^* = \frac{\rho}{\sqrt{1 + \delta [1 - (\rho)^2]}} \qquad (2)$$

Where:

$$\delta = \frac{\sigma^h_{xx}}{\sigma^l_{xx}} - 1$$

which evaluates the change in high period volatility against low period volatility. While, the crisis period is used as the high volatility period, the tranquil period is assumed to be the low volatility period in the calculation of this correlation coefficient adjuster. Contagion is eventually measured as the significance of adjusted correlation coefficients in the turmoil period versus the stable period.

Collins and Biekpe (2003) and Lee et al. (2007) have applied the t-test and F-test respectively for the significance of difference in correlations. As recently pointed out by Asongu (2011), when only one coefficient is to be estimated, both tests have the same

[7] Based on this definition, the presence of high correlation between two markets during the stable period and eventually continuous increase in the high degree of cross market co-movements at the turmoil period is not synonymous to contagion. Consequently contagion according to this definition is the presence of significant increase in co-movements after a shock. From the same lens, if the high correlation degree is not significant, the term "interdependence" is used to describe the situation.

implications. Owing to the t-statistics, the significance of increase in correlations during the turmoil period (t) with respect to the stable period is defined by:

$$t = (\rho_t - \rho_s)\sqrt{\frac{n_t + n_s - 4}{1-(\rho_t - \rho_s)^2}} \qquad (3)$$

Where

$$t_{(0.01, n_t + n_s - 4)}$$

with, *n*t (*n*s) indicating actual observed days during the turmoil (stable) period.

The following hypothesis is then tested:

$$H_o : \rho_1 - \rho_2 = 0 \ versus \ H_1 : \rho_1 - \rho_2 > 0$$

Where H_o is the null hypothesis of no contagion and H_1 is the alternative hypothesis of its presence.

4. Empirical Analysis

4.1 Graphical representation of events in the pre-crisis and crisis periods

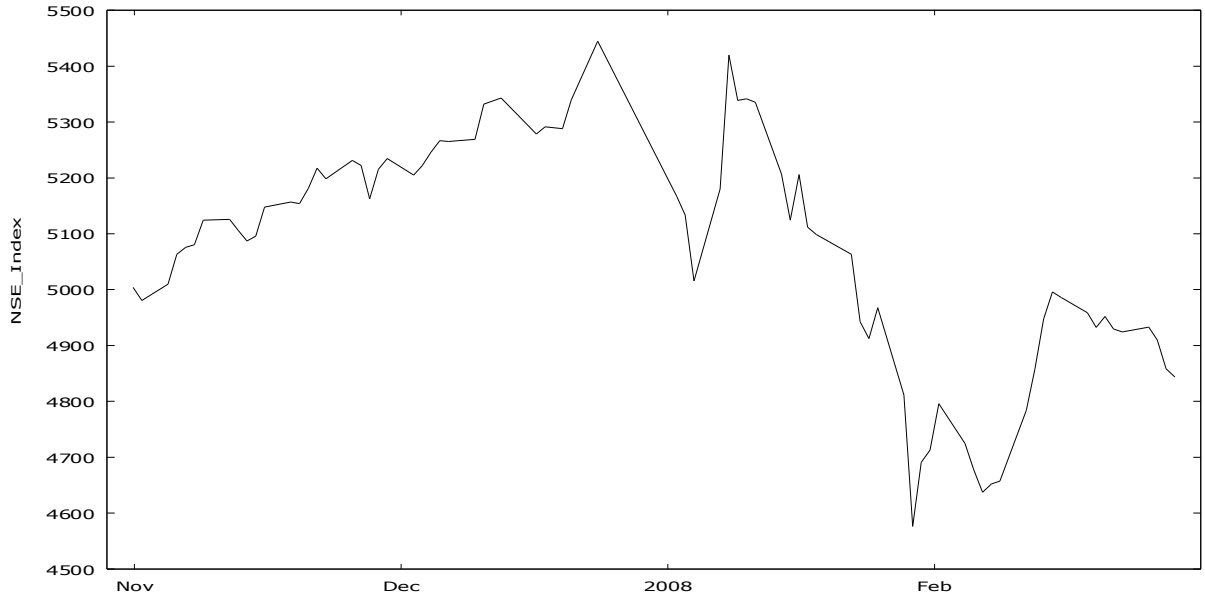

Figure 1: Nairobi Stock Exchange Index from 01/11/2007 to 29/02/2008

As observed from the graph above there are two main troughs. While the first is considered in the stable period of our analysis, the second fully appreciates the incidence of the political crisis. The shock in the stock market eases and ends towards the turn of January. It might be interesting to point-out that, the full effect of the shock was somewhat diluted by the January-effect[8].

4.2 Empirical results

Table 1: International stock indexes returns' conditional (unadjusted) correlation coefficients in 2008 Kenyan Political crisis

Countries	Full period		Stable period		Turmoil period			
	ρ	σ	ρ	σ	ρ	σ	t-test	Co
Botswana	-0.072	0.004	-0.081	0.005	0.034	0.002	0.845	N
Egypt	-0.125	0.016	-0.093	0.012	-0.108	0.022	-0.106	N
Lebanon	0.134	0.021	-0.134	0.023	0.249	0.019	**3.014*****	Y
Mauritius	0.053	0.011	-0.187	0.011	0.222	0.012	**3.263*****	Y
Morocco	-0.384	0.010	-0.263	0.007	-0.120	0.010	1.053	N
Namibia	0.083	0.021	0.191	0.019	-0.015	0.024	-1.529	N
Nigeria	-0.432	0.011	0.020	0.006	-0.405	0.006	**-3.418*****	Y
South A	-0.014	0.016	0.139	0.013	-0.143	0.022	**-2.134****	Y
Tunisia	-0.115	0.004	0.099	0.004	-0.096	0.005	-1.450	N

The table shows the conditional (unadjusted) cross market correlation coefficients (ρ) and standard deviations for the Kenyan and other stock markets. Test statistics is obtained from t-transformations. The stable period is defined as the 2-month pre-crisis period (November 01, 2007 to December 24, 2007). The turmoil period is defined as the one-month crisis period (January 04, 2008 to January 29, 2008).. The full period is the stable period plus the turmoil period (November 01, 2007 to January 29, 2008) . Contagion (Co) occurs (Y) when the test statistics is greater than the critical values. No contagion (N) occurs when the test statistics is less than or equal to the critical value.*, **, ***: represent significance at 10%, 5% and 1% respectively. (nt+ns-4) degree of freedom for the t-statistics is (19+38-4). σ: represents the standard deviation.

Table 2: International stock indexes returns' unconditional (adjusted) correlation coefficients in 2008 Kenyan Political crisis

Countries	Full period		Stable period		Turmoil period				
	ρ	σ	ρ*	σ	ρ*	σ	δ	t-test	Co
Botswana	-0.072	0.004	-0.119	0.005	0.049	0.002	-0.533	1.242	N
Egypt	-0.125	0.016	-0.069	0.012	-0.079	0.022	0.847	-0.079	N
Lebanon	0.134	0.021	-0145	0.023	0.268	0.019	-0.149	**3.303*****	Y
Mauritius	0.053	0.011	-0.177	0.011	0.211	0.012	0.112	**3.071*****	Y
Morocco	-0.384	0.010	-0.223	0.007	-0.101	0.010	0.425	0.895	N
Namibia	0.083	0.021	0.169	0.019	-0.013	0.024	0.285	-1.348	N
Nigeria	-0.432	0.011	0.019	0.006	-0.391	0.006	0.084	**-3.27*****	Y
South A	-0.014	0.016	0.105	0.013	-0.108	0.022	0.764	-1.585	N
Tunisia	-0.115	0.004	0.085	0.004	-0.082	0.005	0.377	-1.230	N

The table shows the unconditional (adjusted) cross market correlation coefficients (ρ) and standard deviations for the Kenyan and other stock markets. Test statistics is obtained from t-transformations. The stable period is defined as the 2-month pre-crisis period (November 01, 2007 to December 24, 2007). The turmoil period is defined as the one-month crisis period (January 04, 2008 to January 29, 2008).. The full period is the stable period plus the turmoil period (November 01, 2007 to January 29, 2008) . Contagion (Co) occurs (Y)when the test statistics is greater than the critical values. No contagion (N) occurs when the test statistics is less than or equal to the critical value.*, **, ***: represent significance at 10%, 5% and 1% respectively. (nt+ns-4) degree of freedom for the t-statistics is (19+38-4). σ: represents the standard deviation.

[8] The January Effect is a calendar related anomaly where financial markets experience prices increase

5. Discussion of results

As table 1 shows correlation coefficients increased significantly for Lebanon, Mauritius, Nigeria and South Africa during the turmoil period. Botswana, Egypt, Morocco, Namibia and Tunisia did not demonstrate substantial increase in variance from the stable to the crisis period. But for results of South Africa that are inconclusive with respect to significant adjusted correlation computations (as presented on table 2), Lebanon, Mauritius and Nigeria were contaminated. As an investment decision implication, while the positive correlations in Lebanon and Mauritius imply negative price-effects, the negative correlation experienced in Nigeria indicates investing in the Nigerian stock market in response to the Kenyan political crisis would have been beneficial; ceteris paribus.

6. Conclusion

This study has examined whether the 2008 Kenyan political crisis influenced the stability correlation structure of African and neighboring stock markets. Using Forbes and Rigobon (2002) methodology in the context of Collins and Biekpe (2003), we have shown that, political instability in Africa doesn't have isolated within-country financial effects. Our findings also support the thesis on growing integration of African stock markets. Though the concept of financial integration has far perceived benefits of risk spreading and allocative efficiency if returns from regional financial markets are stable and not correlated, the event of a crash in one market due to a political factor could severely be detrimental to international portfolio diversification. Within the framework of our study, while Lebanon and Mauritius experienced such negative spillovers, investors in Nigerian Stock Exchange benefited from the crisis; ceteris paribus.

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