AFRICAN GOVERNANCE AND DEVELOPMENT INSTITUTE

A G D I Working Paper

WP/11/004

Globalization, financial crisis and contagion: time-dynamic evidence from financial markets of developing countries

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AGDI Working Paper

Research Department

Globalization, financial crisis and contagion: time-dynamic evidence from financial markets of developing countries

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April 2011

Abstract

Financial integration among economies has the benefit of improving allocation efficiency and diversifying risk. However the recent global financial crisis, considered as the worst since the Great Depression has re-ignited the fierce debate about the merits of financial globalization and its implications for growth especially in developing countries. This paper examines whether equity markets in emerging countries were vulnerable to contagion during the recent financial meltdown. Findings show: (1) with the exceptions of India and Dhaka, Asian markets were worst hit; (2) but for Peru, Venezuela and Columbia, Latin American countries were least affected; (3) Africa and Middle East emerging markets were averagely contaminated with the exceptions of Kenya, Namibia, Nigeria, Morocco, Dubai, Jordan, Israel, Oman, Saudi Arabia and Lebanon. Results have two important policy implications. Firstly, we confirm that Latin America was most prepared to brace the financial crisis, implying their fiscal and monetary policies are desirous of examination and imitation. Secondly, we have confirmed that strategic opening of the current and capital accounts based on empirical evidence for a given region/country as practiced by India is a caution against global economic and financial shocks.

Keywords: Globalization; Financial crisis; Contagion; developing countries; Equity Markets

JEL Classification*:* G10; G15; F30

1. Introduction

During the last decade the concern about regional and global integration of emerging equity markets has been largely debated. The recent global financial meltdown and economic downturn has left many analysts concerned about whether emerging markets suffered from contagion. Most of these markets were still in their infancy at the turn of the millennium, which rendered an examination of the transmission of financial

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variable movements from global crisis somewhat impractical. Therefore, regrettably effects of the US stock market crash of 1987, the Mexican peso crisis of 1994, Asian currency crisis of 1997, Russian and LTCM[2] crises of 1998, Brazilian crisis of 1999 and Turkish 2000/2001 crisis have not been fully assessed in all emerging equity markets. The recent financial crisis provides a golden opportunity for this investigation.

There are plenty of reasons a paper should be dedicated to studying the extent to which emerging financial markets have been affected by the recent global financial turmoil. Results of the study could enable analysts and policy makers to evaluate benefits of international trade and cross-border investments, and therefore attractiveness for foreign capital inflows. Findings could also provide some basis on how developing countries stand to benefit (loss) from long-run investment sources and global financial booms (as a result of external financial shocks) through financial market integration. A natural extension of results could invite policy makers to reconsider Latin American monetary and fiscal strategies in the fight against external financial shocks. Also, the validity of India's financial liberalization strategy could be of crucial importance to governments in other developing countries.[3] Therefore this study aims to assess the impact of the recent global financial shock on emerging financial markets. The rest of the paper is organized as follows. Section 2 thoroughly reviews related literature. Data and methodology for measuring contagion are presented and outlined respectively in Section 3. Empirical analysis and discussion are covered in Section 4. We conclude with Section 5.

2. Related literature
2.1 Effects of financial market integration

Financial integration between economies is believed to have two main positive impacts: the improvement of capital allocation efficiency and diversification of risks (Demyanyk and Volosovych, 2008; Coulibaly, 2009; Kose et al., 2011). However, the recent global financial crisis which is viewed by many analysts and policy makers as worst since the Great Depression has cast a dark shadow on the contagious effect of financial integration; despite its advantages. There is an extensive economics and finance literature that addresses the potential benefits of financial integration.

From a theoretical standpoint financial globalization should facilitate efficient international allocation of capital and improve international risks sharing (Kose et al., 2011). Kose et al., (2011) posit that the benefits are much greater for developing countries because they are relatively scare in capital and rich in labor sources. In effect, access to foreign capital should help them grow faster through new sources of investment. They further profess that since developing countries have more volatile output growth than advanced industrial economies, their potential welfare gains from international risk sharing are much greater. Their findings reveal that with certain identifiable thresholds in variables such as financial depth and institutional quality, the

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[2] Long-term Capital Management.

[3] Whereas the Indian current account has been opened fully though gradually in the 1990s, a more calibrated approach has been followed in the opening of the capital account and subsequently the financial sector. This approach is consistent with the weight of available empirical evidence on the benefits of capital account liberalization for acceleration of economic growth, particularly in emerging economies. Evidence suggests that the greatest gains are obtained from openness to foreign direct investment followed by portfolio investment. Benefits resulting from external debt flows are questionable until greater domestic financial market development has taken place (Henry, 2007).

cost-benefit trade-off from financial openness improves significantly once the threshold conditions are met. Much earlier Demyanyk and Volosovych (2008) in analyzing the benefits of financial integration (resulting from international risk sharing) among 25 European Union (EU) countries, presented a case for diversification of risk across EU member states if the risks are fully shared. In a nutshell they stressed that the 10 new members joining the EU would have higher gains than the long standing 15 members. The most striking indication of financial integration benefits is the case of South Africa, a country that has experienced financial autarky as a result of the embargo imposed in 1985 and removed in 1993. With respect to Coulibaly (2009), there was a significant decrease in the rates of investment, capital and output during the embargo period in South Africa as compared to pre-embargo and post-embargo periods.

During the embargo South Africa could benefit from financial isolation in event of a global financial meltdown. This implies countries in relative financial autarky as less exposed to international financial shocks. Though a prime advantage of financial integration is risk diversification, paradoxically increased financial globalization can reduce the scope for risk diversification because integrated markets tend to be more interdependent and highly correlated. Another disadvantage of financial integration could be linked to threshold factors pointed out earlier by Kose et al. (2011). Their study reveals that countries with low levels of financial depth and institutional quality do not stand to benefit from financial integration. This perspective is shared by Schmukler (2004) who stresses the importance of sound financial fundamentals and strong macroeconomic institutions, the presence of which should enable more effective management of crises and lower the probability of crises and contagion. Therefore financial globalization could itself be a source of crises.

2.2 Linkages between financial integration (globalization) and crises

We have seen that financial globalization has several potential benefits. However the recent stream of financial crises and contagion owing to growing liberalization of financial systems and integration of financial markets around the world, might lead some to suggest that globalization breeds financial volatility and crises. Though domestic factors are mostly at the origin of crises, there are different channels via which financial globalization could be related to crises.

Firstly, as pointed out by Schmukler (2004) when a country's financial system is liberalized, it becomes an object of market discipline exercised by both foreign and domestic investors. In a closed economy, only domestic investors monitor and react to unsound fundamentals, whereas in an open one domestic and foreign investors might prompt the country to achieve sound fundamentals. As elucidated earlier, the absence of sound macroeconomic, financial and institutional fundamentals could increase the probability of crises. It logically follows that antagonistic interests and views between investors (domestic and foreign) on key fundamentals might precipitate crises and reduce the ability to effectively monitor and manage them.

Secondly, even with sound domestic fundamentals and quality institutions, international financial market imperfections could also lead to crises. Among other things, these could lead to herding behavior, irrational behavior, speculative attacks, bubbles, and crashes. To put this point plainer, regardless of market fundamentals investors could speculate against a currency if they believe that the exchange rate is unsustainable; this could lead to self-fulfilling balance-of-payments. This thesis illustrated by Obstfeld (1986) has been purported by Schmukler (2004); amongst others.

Thirdly, even in the presence of sound fundamentals and absence of imperfections in international capital markets, crises might still arise owing to external

factors (Schmukler, 2004) such as determinants of capital flows (Calvo et al., 1996) and foreign interest rates (Frankel and Rose, 1996). For instance if a country becomes dependent on foreign capital, shifts in foreign capital flows could create financial issues and economic downturns. Frankel and Rose (1996) clearly point-out the role foreign interest rates play in determining the likelihood of financial crises in developing countries.

Fourthly, still borrowing from Schmukler (2004) financial globalization could lead to financial crises by contagion, namely by shocks through real links, financial links and herding-behavior or unexplained high correlations. We shall focus on this fourth example[4] within our research framework; the elucidation and definition of which are worthwhile.

2.3 Definitions and channels of contagion
2.3.1 Definitions of contagion

As yet, there is no established definition of contagion by economists. According to the World Bank, there are three main definitions of the phenomenon. Firstly, from a broad perspective contagion could be identified with the general process of stock transmission across countries. Therefore, it is worthwhile understanding that this definition does encompass both negative shocks and positive spillover effects. Secondly, contagion could be conceived as the propagation of shocks between two countries in excess of what should be expected, based on the fundamentals after considering co-movements triggered by common shocks. This second definition is somewhat restrictive only to shocks and presupposes the mastery of what constitutes the underlying fundamentals, without which an appraisal of excess co-movements is not possible. The last and more restrictive definition considers the phenomenon as the change in the transmission mechanisms that take place during a period of turmoil and could be appreciated by a significant increase in cross-market correlations. Within the framework of this study, we shall be restricted to the third definition because: (1) our study aims to investigate the global financial crisis which is a negative shock and not a positive spill-over (as opposed to the first definition); and (2) we do not master what constitutes underlying fundamentals of co-movements we are about to study (in antagonism to the second definition).

Empirically, the third definition was first proposed by Forbes and Rigobon (2002). They assessed contagion as a significant increase in market co-movements after a shock occurred in one country. With respect to this definition, the condition for contagion is a significant increase in co-movements as a result of a shock in one market. This implies, if two markets display a high degree of co-movements during the stability period, even if they are highly correlated during a crisis, if this crisis-correlation is not significant it does not amount to contagion. In the absence of a significant correlation during the crisis-period, the term 'interdependence' is used to qualify the situation between the two markets.

2.3.2 Channels of contagion

Borrowing from Schmukler (2004), three mains channels of contagion have been identified in the literature. (1) Real links which are often associated with trade links. For example if two countries are trading together and compete in the same external market, a devaluation of the exchange rate of one country deteriorates the other country's competitive advantage. In a bid to rebalance its external sectors, the loosing country

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[4] Example on the link between financial integration and crises.

would want to devalue its own currency; such is the nature of Chino-American commercial relations today. (2) Financial links come in when two economies are connected through the international financial system. For instance, let's consider leverage institutions facing margin calls. Should the value of the collateral fall as a result of a negative shock in one country, in a bid to increase their initial stock these institutions will sell some of their holdings in countries not yet affected by the shock. This gives birth to a mechanism that ripples the shocks to other countries. (3) Finally, due to herding behaviors or panics resulting from asymmetric information, financial markets might transmit shocks across markets. We shall not elaborate on the mechanics of this third type because of obvious reasons (common sense).

2.4 Measuring contagion

Many methods of measuring contagion have been proposed in the literature to appreciate the spreading of international shocks across countries. The most widely used are cross-market correlation coefficients procedures (King and Wadhwani, 1990; Forbes and Rigobon, 2002; Collins and Biekpe, 2003; Lee et al., 2007; Asongu, 2011ab), cross-market co-integration vectors changing techniques (Kanas, 1998), volatility analysis based on ARCH and GARCH models (King et al., 1994) and direct estimation of specific transmission mechanisms (Forbes, 2000). With respect to our restrictive definition of contagion we shall adopt Forbes and Rigobon (2002) in the context of Collins and Biekpe (2003)[5].

3. Data and Methodology
3.1 Data

The object of this study is to investigate correlations between the returns of the USA stock index and stock indexes of emerging countries. Taking the Dow Jones Industrial Average as the base criterion, we analyze if co-movements between the base criterion and afore mentioned financial markets were significantly strengthened during the recent global financial crisis. In et al. (2008), MacAndrews (2008), Taylor and William (2008) and more recently Ji and In (2010) all use the August 9th 2007 date as the start of the financial crisis[6].   The sample period is divided into two categories: a 14 month pre-crisis period also known as the tranquil or stable period and a 15 month crisis or turmoil period. In a bid to make our findings robust, the turmoil period is further divided into three sections[7]: the short-run or four month crisis-period (August 09, 2007 to December 06, 2007); the medium-term or eight months crisis-period (August 09, 2007 to April 10, 2008) and the long-term or 15 months crisis-period (August 09, 2007 to November 13, 2008). Weekly data used in the study is obtained from Bloomberg's database. We use local currency index return because Forbes and Rigobon (2002) have shown that using dollar or local indices will produce similar outcomes.

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[5] The hypothesis testing in 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) 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 crisis period as compared with the stable period.

[6] Date at which, BNP Paribas announced the closure of its funds that held US subprime debts.

[7] From empirical literature, the tranquil period is always longer than the turmoil period. For instance it is longer by a year, ten and a half months and nine months in Forbes & Rigobon (2002), Collins & Biekpe (2003) and Lee et al. (2007) respectively.

3.2 Methodology

Contagion is defined by Forbes and Rigobon (2002) as a significant increase in market co-movements after a shock occurred in one country[8].

The correlation coefficient is defined as:

$$\rho = \frac{\sigma_{xy}}{\sigma_x \sigma_y} \tag{1}$$

where: 'x' is the base criterion while 'y' is an emerging equity market.
Borrowing from Forbes and Rigobon (2002), the correlation coefficient is adjusted in the following manner:

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

Where:

$$\delta = \frac{\sigma_{xx}^h}{\sigma_{xx}^l} - 1$$

which appreciates the change in high-period volatility against low-period volatility. The crisis-period is used as the high volatility period and the tranquil period as the low volatility period in the calculation of this correlation coefficient adjuster. Contagion is subsequently measured as the significance of adjusted correlation coefficients in time-varying turmoil periods versus the stability period.

In empirical literature, Collins and Biekpe (2003) and Lee et al. (2007) have applied both the t-test and F-test respectively for the significance of difference in correlations. When only one coefficient is to be estimated, both tests have the same implications. Following the t-statistics, the significance of increase in correlations during the turmoil period (t) with respect to the stable(s) period is defined by:

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

Where

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

with, n_t (n_s) indicating actual observed weeks during the turmoil (stable) period.

The following hypothesis is then put to test:

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

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[8] With respect to 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 does not amount to contagion. Therefore contagion according to this definition is the presence of significant increase in co-movements after a shock. On the other hand, if the high correlation degree is not significant, the term 'interdependence' is used to describe the event.

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

4. Empirical Results
4.1 Presentation of results

Empirical results are presented below in Tables 1 and 2.

Table1: International stock indexes returns conditional (unadjusted) correlation coefficient s in 2007 financial crisis

Regions	Countries	Full period		Stable period		Short-term turmoil period				Medium-term turmoil period				Long-term turmoil period			
		ρ	σ	ρ	σ	ρ	σ	t-test	Co	ρ	σ	t-test	Co	ρ	σ	t-test	Co
Africa	**Botswana**	-0.040	0.015	0.024	0.014	0.573	0.010	**5.641***	Y	0.197	0.008	**1.675***	Y	-0.188	0.013	-2.419**	N
	Egypt	0.336	0.045	0.196	0.034	0.419	0.028	**1.968***	Y	0.212	0.028	0.154	N	0.353	0.051	**1.757***	Y
	Kenya	0.083	0.034	0.008	0.028	0.049	0.030	0.494	N	-0.178	0.038	-1.656	N	0.079	0.038	0.970	N
	Mauritius	0.302	0.030	0.003	0.028	0.001	0.024	0.039	N	-0.099	0.027	-0.922	N	0.382	0.031	**4.636***	Y
	Morocco	0.059	0.024	0.024	0.025	0.022	0.019	-0.014	N	-0.109	0.019	-1.288	N	0.051	0.021	0.294	N
	Namibia	0.376	0.037	0.417	0.024	0.558	0.034	1.219	N	0.111	0.043	-3.093***	N	0.342	0.045	-0.845	N
	Nigeria	0.027	0.038	0.095	0.032	-0.457	0.027	-5.710***	N	-0.410	0.026	-5.617***	N	-0.060	0.040	-1.743*	N
	South A	0.435	0.030	0.380	0.021	0.674	0.024	**2.641***	Y	0.238	0.031	-1.378	N	0.428	0.036	0.522	N
	Tunisia	0.258	0.016	0.129	0.014	0.183	0.009	0.462	N	0.165	0.018	0.343	N	0.341	0.018	**2.405***	Y
Middle East	**A Dhabi**	-0.069	0.030	-0.053	0.021	0.246	0.024	**2.706***	Y	-0.133	0.025	-0.761	N	-0.086	0.037	-0.356	N
	Bahrain	0.017	0.015	-0.031	0.013	0.477	0.013	**5.069***	Y	0.173	0.012	**1.998***	Y	-0.004	0.017	0.297	N
	Dubai	-0.085	0.039	-0.027	0.027	-0.160	0.031	-1.146	N	-0.173	0.030	-1.410	N	-0.126	0.048	-1.089	N
	Israel	0.264	0.028	0.531	0.023	0.697	0.019	1.444	N	0.287	0.025	-2.411**	N	0.089	0.032	-5.462***	N
	Jordan	0.015	0.031	0.044	0.020	0.148	0.016	0.893	N	0.034	0.020	-0.105	N	0.011	0.040	-0.381	N
	Kuwait	-0.085	0.026	n.a	n.a	0.681	0.014	n.a		0.106	0.013	n.a		-0.085	0.026	n.a	
	Lebanon	0.200	0.033	0.226	0.023	0.145	0.023	-0.710	N	0.181	0.021	-0.441	N	0.213	0.040	-0.155	N
	Oman	-0.217	0.031	0.112	0.016	0.013	0.019	-0.865	N	-0.261	0.028	-3.867***	N	-0.306	0.040	-5.112***	N
	Qatar	-0.133	0.040	-0.032	0.030	0.186	0.027	**1.930***	Y	-0.101	0.037	-0.653	N	-0.175	0.047	-1.595	N
	Saudi A	0.012	0.047	0.059	0.041	-0.302	0.027	-3.339***	N	-0.113	0.053	-1.681*	N	-0.002	0.052	0.522	N
Asia	**China**	0.073	0.056	0.071	0.048	0.528	0.045	**4.507***	Y	0.071	0.048	0.064	N	0.063	0.012	-0.582	N
	Dhaka	0.047	0.024	-0.275	0.020	-0.462	0.022	-6.698***	N	-0.275	0.020	-4.539***	N	-0.132	0.020	-3.289***	Y
	India	0.264	0.038	0.252	0.044	0.400	0.042	0.574	N	0.252	0.044	-0.778	N	0.212	0.048	-1.355	N
	Indonesia	0.057	0.040	0.394	0.054	0.773	0.055	**5.268***	Y	0.394	0.054	1.389	N	-0.031	0.052	-3.263***	N
	Malaysia	0.100	0.026	0.457	0.036	0.838	0.034	**6.045***	Y	0.457	0.036	**1.903***	Y	0.015	0.031	-2.832***	N
	Mongolia	0.062	0.046	-0.093	0.044	-0.175	0.056	0.665	N	-0.093	0.044	1.538	N	0.049	0.038	**3.499***	Y
	Pakistan	0.021	0.037	0.330	0.028	0.338	0.033	**2.584***	Y	0.330	0.028	**2.798***	Y	-0.031	0.042	-0.898	N
	Philippines	0.361	0.040	0.621	0.045	0.855	0.053	**7.127***	Y	0.621	0.045	**4.229***	Y	0.373	0.048	**1.749***	Y
	S. Korea	0.469	0.034	0.640	0.041	0.822	0.047	**10.324***	Y	0.640	0.041	**6.945***	Y	0.502	0.042	**5.562***	Y
	Sri Lanka	0.204	0.027	0.380	0.019	-0.100	0.021	-0.828	N	0.380	0.019	**3.997***	Y	0.288	0.027	**3.390***	Y
	Taiwan	0.429	0.035	0.415	0.040	0.836	0.041	**18.401***	Y	0.415	0.040	**5.315***	Y	0.482	0.043	**7.331***	Y
	Thailand	0.355	0.037	0.422	0.039	0.715	0.035	**5.908***	Y	0.422	0.039	**2.722***	Y	0.385	0.046	**2.698***	Y
	Vietnam	0.204	0.060	0.319	0.056	0.524	0.032	**3.842***	Y	0.319	0.056	**1.985***	Y	0.195	0.068	0.876	N
Latin America	Argentina	0.543	0.041	0.644	0.026	0.752	0.045	0.934	N	0.630	0.037	-0.136	N	0.505	0.051	-1.556	N
	Brazil	0.773	0.043	0.797	0.027	0.831	0.043	0.290	N	0.720	0.042	-0.744	N	0.765	0.052	-0.358	N
	Chile	0.690	0.034	0.588	0.020	0.721	0.040	1.154	N	0.710	0.040	1.178	N	0.703	0.043	1.281	N
	Columbia	0.475	0.032	0.336	0.026	0.381	0.030	0.386	N	0.616	0.034	**2.802***	Y	0.504	0.036	**1.896***	Y
	Costa Rica	-0.020	0.028	-0.085	0.031	-0.088	0.019	-0.025	N	-0.203	0.023	-1.140	N	-0.083	0.021	0.023	N
	Ecuador	0.030	0.029	0.085	0.015	0.010	0.005	-0.648	N	0.040	0.049	-0.431	N	0.016	0.037	-0.773	N
	Mexico	0.774	0.037	0.721	0.026	0.814	0.037	0.800	N	0.865	0.037	1.391	N	0.784	0.044	0.692	N
	Peru	0.422	0.052	-0.066	0.029	0.907	0.063	**35.962***	Y	0.693	0.054	**11.16***	Y	0.478	0.065	**7.185***	Y
	Venezuela	0.119	0.034	0.035	0.038	0.193	0.027	1.379	N	0.269	0.054	**2.313***	Y	0.159	0.030	1.385	N

The table shows the conditional (unadjusted) cross market correlation coefficients (ρ) and standard deviations for the US and other stock markets. Test statistics is obtained from t-transformations. The stable period is defined as the 14-month pre-crisis period (June 08, 2006 to August 09, 2007). The short-term turmoil period is defined as the four-month crisis period (August 09, 2007 to December 06, 2007). The medium-term turmoil period is defined as the eight months crisis period (August 09, 2007 to April 10, 2008). The long-term turmoil period is defined the fifteen months crisis period (August 09, 2007 to November 13, 2008). The full period is the stable period plus the long-term turmoil period (June 08, 2006 to November 13, 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) degrees of freedom for the t-statistics are (66+61-4); (35+61-4);(17+61-4) for the long, medium and short terms respectively. σ: represents the standard deviation.

Table 2: International stock indexes returns unconditional (adjusted) correlation coefficient in 2007 financial crisis

Regions	Countries	Full period		Stable period			Short-term turmoil period				Medium-term turmoil period				Long-term turmoil period			
		ρ	σ	ρ*stp	ρ*mtp	ρ*ltp	ρ*	δ	t-test	Co	ρ*	δ	t-test	Co	ρ*	δ	t-test	Co
Africa	**Botswana**	-0.040	0.015	0.030	0.034	0.026	0.647	-0.321	**6.747*****	Y	0.265	-0.466	**2.278****	Y	-0.197	-0.090	-2.538**	N
	Egypt	0.336	0.045	0.219	0.217	0.163	0.459	-0.202	**2.133****	Y	0.234	-0.189	0.168	N	0.296	0.475	1.498	N
	Kenya	0.083	0.034	-0.008	-0.007	-0.007	0.048	0.062	0.479	N	-0.155	0.339	-1.432	N	0.069	0.317	0.845	N
	Mauritius	0.302	0.030	-0.004	-0.003	-0.003	0.001	-0.163	0.043	N	-0.102	-0.057	-0.949	N	0.373	0.060	**4.502*****	Y
	Morocco	0.059	0.024	0.028	0.028	0.026	0.026	-0.250	-0.016	N	-0.126	-0.250	-1.489	N	0.055	-0.160	0.320	N
	Namibia	0.376	0.037	0.366	0.329	0.323	0.499	0.362	1.152	N	0.084	0.745	-2.419**	N	0.261	0.809	-0.694	N
	Nigeria	0.027	0.038	0.105	0.106	0.086	-0.492	-0.171	-6.40***	N	-0.448	-0.195	-6.38***	N	-0.054	0.225	-1.573	N
	South A	0.435	0.030	0.358	0.321	0.302	0.648	0.151	**2.604****	Y	0.198	0.471	-1.188	N	0.342	0.688	0.446	N
	Tunisia	0.258	0.016	0.166	0.117	0.117	0.233	-0.399	0.582	N	0.150	0.221	0.312	N	0.311	0.228	**2.198****	Y
Middle East	**A Dhabi**	-0.069	0.030	-0.051	-0.050	-0.041	0.235	0.107	**2.566****	Y	-0.124	0.145	-0.713	N	-0.066	0.686	-0.275	N
	Bahrain	0.017	0.015	-0.032	-0.033	-0.028	0.483	-0.033	**5.160*****	Y	0.181	-0.089	**2.095****	Y	-0.004	0.235	0.268	N
	Dubai	-0.085	0.039	-0.027	-0.166	-0.021	-0.152	0.110	-1.089	N	-0.166	0.094	-0.002	N	-0.096	0.727	-0.830	N
	Israel	0.264	0.028	0.569	0.522	0.477	0.731	-0.180	1.414	N	0.281	0.052	-2.380**	N	0.077	0.338	-4.829	Y
	Jordan	0.015	0.031	0.050	0.045	0.032	0.166	-0.204	0.998	N	0.034	-0.017	-0.106	N	0.007	1.009	-0.269	N
	Kuwait	-0.085	0.026	n.a	-0.007	n.a	n.a	n.a	n.a		n.a	n.a	n.a		n.a	n.a	n.a	
	Lebanon	0.200	0.033	0.233	0.239	0.178	0.148	-0.051	-0.727	N	0.191	-0.106	-0.463	N	0.167	0.653	-0.124	N
	Oman	-0.217	0.031	0.104	0.087	0.072	0.012	0.181	-0.796	N	-0.204	0.680	-2.92***	N	-0.201	1.453	-3.14***	N
	Qatar	-0.133	0.040	-0.035	-0.030	-0.026	0.198	-0.123	**2.063****	Y	-0.092	0.196	-0.598	N	-0.142	0.540	-1.289	N
	Saudi A	0.012	0.047	0.074	0.052	0.053	-0.366	-0.351	-4.21***	N	-0.099	0.294	-1.474	N	-0.002	0.267	-0.606	N
Asia	**China**	0.073	0.056	0.058	0.059	0.052	0.488	0.112	**4.108*****	Y	0.065	0.165	0.060	N	0.009	0.533	-0.470	N
	Dhaka	0.047	0.024	0.178	0.173	0.171	-0.510	-0.121	-8.05***	N	-0.309	-0.224	-5.27***	N	-0.148	-0.210	-3.732	Y
	India	0.264	0.038	0.223	0.266	0.256	0.272	0.559	0.426	N	0.200	0.637	-0.639	N	0.161	0.773	-1.067	N
	Indonesia	0.057	0.040	0.107	0.165	0.169	0.490	1.441	**3.566*****	Y	0.267	1.392	0.983	N	-0.021	1.287	-2.142**	N
	Malaysia	0.100	0.026	0.152	0.195	0.208	0.679	0.780	**5.338*****	Y	0.352	0.872	1.521	N	0.012	0.632	**2.222****	Y
	Mongolia	0.062	0.046	-0.203	-0.253	-0.270	-0.140	0.258	0.543	N	-0.094	-0.009	1.544	N	0.053	-0.138	**3.782*****	Y
	Pakistan	0.021	0.037	0.047	0.052	0.043	0.318	0.072	**2.420****	Y	0.342	-0.077	**2.906*****	Y	-0.026	0.382	-0.764	N
	Philippines	0.361	0.040	0.122	0.176	0.171	0.701	0.817	**6.113*****	Y	0.537	0.545	**3.712*****	Y	0.299	0.650	1.432	N
	S. Korea	0.469	0.034	0.020	0.035	0.034	0.527	1.724	**5.060*****	Y	0.477	1.348	**4.734*****	Y	0.350	1.410	**3.687*****	Y
	Sri Lanka	0.204	0.027	-0.006	-0.005	-0.004	-0.127	-0.216	-1.056	N	0.434	-0.271	**4.687*****	Y	0.286	0.017	**3.362*****	Y
	Taiwan	0.429	0.035	-0.034	-0.050	-0.048	0.639	1.028	**7.839*****	Y	0.311	0.945	**3.711*****	Y	0.355	1.105	**4.876*****	Y
	Thailand	0.355	0.037	0.109	0.121	0.111	0.605	0.374	**4.908*****	Y	0.353	0.527	**2.282****	Y	0.296	0.815	**2.087****	Y
	Vietnam	0.204	0.060	0.172	0.109	0.098	0.687	-0.327	**5.169*****	Y	0.299	0.155	**1.862***	Y	0.165	0.416	0.744	N
Latin America	Argentina	0.543	0.041	0.538	0.579	0.410	0.654	0.746	1.006	N	0.565	0.407	-0.139	N	0.293	0.976	-1.312	N
	Brazil	0.773	0.043	0.724	0.728	0.601	0.765	0.586	0.352	N	0.640	0.550	-0.843	N	0.557	0.900	-0.482	N
	Chile	0.690	0.034	0.453	0.454	0.326	0.589	1.044	1.174	N	0.577	1.035	1.189	N	0.434	1.228	1.198	N
	Columbia	0.475	0.032	0.316	0.300	0.252	0.359	0.142	0.370	N	0.567	0.289	**2.665*****	Y	0.394	0.377	1.591	N
	Costa Rica	-0.020	0.028	-0.108	-0.097	-0.123	-0.111	-0.376	-0.031	N	-0.231	-0.235	-1.294	N	-0.120	-0.309	0.033	N
	Ecuador	0.030	0.029	0.145	0.047	0.034	0.017	-0.659	-1.106	N	0.022	2.360	-0.236	N	0.006	1.517	-0.308	N
	Mexico	0.774	0.037	0.657	0.655	0.537	0.761	0.430	0.898	N	0.820	0.442	1.607	N	0.614	0.715	0.857	N
	Peru	0.422	0.052	-0.045	-0.046	-0.029	0.824	1.184	**15.092*****	Y	0.555	1.072	**7.210*****	Y	0.242	1.268	**3.117*****	Y
	Venezuela	0.119	0.034	0.042	0.037	0.044	0.229	-0.301	1.642	N	0.285	-0.114	**2.452****	Y	0.201	-0.216	**1.760***	Y

The table shows the unconditional (adjusted) cross market correlation coefficients (ρ) and standard deviations for the US and other stock markets. Test statistics is obtained from t-transformations. The stable period is defined as the 14-month pre-crisis period (June 08, 2006 to August 09, 2007). The short-term turmoil period is defined as the four-month crisis period (August 09, 2007 to December 06, 2007). The medium-term turmoil period is defined as the eight months crisis period (August 09, 2007 to April 10, 2008). The long-term turmoil period is defined the fifteen months crisis period (August 09, 2007 to November 13, 2008). The full period is the stable period plus the long-term turmoil period (June 08, 2006 to November 13, 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) degrees of freedom for the t-statistics are (66+61-4); (35+61-4);(17+61-4) for the long, medium and short terms respectively. σ: represents the standard deviation. ρ*stp, ρ*mtp, ρ*ltp denote adjusted correlation coefficients for the short, medium and long term periods respectively. δ: correlation coefficient adjuster.

4.2 Discussion of results

As shown in Tables 1 and 2, contagion results based on significant shifts in conditional (unadjusted) correlation coefficients are robust to adjusted (unconditional) correlations. From a broad point of view the following effects of the financial crisis could be observed: (1) with the exceptions of India and Dhaka, Asian markets were worst hit; (2) but for Peru, Venezuela and Columbia, Latin American countries were least affected; (3) Africa and Middle East emerging markets were averagely contaminated with the exceptions of Kenya, Namibia, Nigeria, Morocco, Dubai, Jordan, Israel, Oman, Saudi Arabia and Lebanon.

The somewhat immunity of Latin American countries to the recent global financial meltdown is not unexpected. Given its history of financial crises, this continent was the most prepared. Current conditions show that Latin America has improved since the Russian crisis, which gave countries in the continent some leeway (particularly in monetary policy) to implement measures that attenuate crisis effect. Latin America and the Caribbean countries have built up to 400 billion dollars in international reserves and they have substantially reduced their dollar-denominated debt, especially within the banking system. For instance, lower levels of debt dollarization has allowed Brazil to loosen monetary policy amid the credit crunch in ways that many countries could not in the post Russian crisis era. In the wake of the financial crisis, Latin American countries swiftly depreciated their currencies without entering the turmoil. From a fiscal perspective, many of these countries saved a considerable amount of their tax income on extra revenue from commodity bonanza at the turn of the century. For instance, Chile spent only 34% and kept the rest of increased tax collected in a special fund. Therefore even if the crisis had affected these countries, they still had the leeway of increasing spending while lowering taxes, so as to easily recover from recession.

Results from Africa are entirely not unexpected. But for Kenya, Namibia, Nigeria and Morocco, African stock markets are contaminated in at least one time horizon. This reflects the increasing connection of African markets with global capital flows. As a matter of fact, African markets are growing in size, liquidity and degree of foreign participation. Though it may be misleading to equate contagion to integration, a logical extension of results could make a case for African equity markets global integration.

Looking at the Middle East, with the exceptions of Israel, Oman and Saudi Arabia, oil exporting countries (Bahrain and Qatar) were contaminated while but for Abu Dhabi non producing states (Dubai, Jordan, Lebanon) remained unaffected. Borrowing from Anoruo and Mustafa (2007) on the relation between oil and stock prices, where causality runs from the Dow Jones Industrial Average(DJIA) to oil prices and not vice versa; the DJIA which is our base criterion in this study negatively affected oil prices which in-turn had a toll on stock markets of oil exporting countries.

While Dhaka and India in Asia remained uncontaminated, China and Mongolia were affected only in the short and long horizons respectively. Other emerging markets were contaminated at least in two time-horizons each. The unexpected speed and force with which the global financial crisis affected Asian economies could be explained from trade channels. The region has deep economic integration with the rest of the world, especially developments in the United States. A case in point is the loss in export volume growth in Western Asia from 6.4% in 2006 to -0.6 in 2007. Conversely, the fact that India was unaffected is not unexpected. This is because, India has a completely different approach to financial globalization. Whereas, the Indian current account was fully opened on a gradual basis in the 90s, a more calibrated approach has been followed to the opening of the capital account and subsequently the financial sector. This approach is consistent with the weight of available empirical evidence on the benefits of capital account liberalization for acceleration of economic growth, particularly in

emerging economies. Evidence suggests that the greatest gains are obtained from openness to foreign direct investment followed by portfolio investment. Benefits resulting from external debt flows are questionable until greater domestic financial market development has taken place (Henry, 2007).

5. Conclusion

Financial integration among economies has the benefit of improving allocation efficiency and diversifying risk. However the recent global financial crisis, considered as the worst since the Great Depression has re-ignited the fierce debate about the merits of financial globalization and its implications for growth especially in developing countries. This paper has examined whether equity markets in emerging countries were vulnerable to contagion during the recent global financial meltdown. Findings show: (1) with the exceptions of India and Dhaka, Asian markets were worst hit; (2) but for Peru, Venezuela and Columbia, Latin American countries were least affected; (3) Africa and Middle East emerging markets were averagely contaminated with the exceptions of Kenya, Namibia, Nigeria, Morocco, Dubai, Jordan, Israel, Oman, Saudi Arabia and Lebanon.

Results have two important policy implications. Firstly, we confirm that Latin America was most prepared to brace the financial crisis, implying their fiscal and monetary policies are desirous of examination and imitation. Secondly, we have confirmed that strategic opening of the current and capital accounts based on empirical evidence for a given region/country as practiced by India is a caution against global economic and financial shocks.

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