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REACTIONS OF THE CAPITAL MARKETS TO THE SHOCKS BEFORE AND DURING THE GLOBAL CRISIS

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Abstract *This paper explores reactions to the stock markets shocks during quiet and turbulent times. In our investigation we use daily values of 28 stock exchanges indexes: 14 from developed markets and 14 from emerging markets. We find the global crisis induced, for most of the indexes, significant changes in the reactions to the shocks. The results also indicate different behaviors of indexes from developed markets in comparison with the indexes from emerging markets.*

Keywords Efficient Markets, Underreaction, Overreaction, Global Crisis

JEL classification *G01, G02, G14*

Introduction

In the last decades, several researches analyzed the behavior of the financial assets returns after the shocks. There are two main approaches of this subject: Efficient Market Hypothesis (EMH), Overreaction Hypothesis (OH) and Underreaction Hypothesis (UH).

Efficient Market Hypothesis presumes that investors behave rationally so prices reflect immediately all the available information (Fama, 1970). As a consequence, there are not return reversal for the days that follow a shock. Overreaction Hypothesis and Underreaction Hypothesis are related to the behavioral finance, which presume that investors don't act always rationally and psychological factors influence their decisions. OH describes a situation where the market participants overreact to the positive shocks (caused by unexpected and extreme good news) and to the negative shocks (caused by unexpected and extreme bad news) correcting their behavior lately (De Bondt and Thaler, 1985). Such evolutions could be exploited by employing a contrarian strategy in which past loser stocks are bought and past winner stocks are sold (Chan,1988). UH describes a situation where the investors underreact to the shocks and adjust their behavior in the next days

(Jegadeesh and Titman, 1993). These circumstances could be exploited by momentum strategies which consist in buying the past winner stocks and selling the past loser stocks (Yu and Chen, 2011).

Empirical researches investigated the reaction to the shocks of stock prices from various financial markets. De Bondt and Thaler (1985) studied monthly returns of New York Stock Exchange common stocks for the period between January 1926 and December 1982, founding evidences in the favor of OH. Jegadeesh and Titman (1993) documented the underreaction presence on the US capital market. Lasfer et al. (2003) tested OH for indexes from 40 developed and emerging markets for a period between 1989 and 1997. Their results failed to prove the overreaction of stock prices. Spyrou et al. (2005) examined reactions to the shocks of four indexes from London Stock Exchange for the period 1989 to 2004. They found evidences in favor of EMH for large capitalization stock portfolios and in favor of UH for medium and small capitalization stock portfolios. Norli et al. (2009) and Morad and Salehi (2011) identified overreaction of stocks from Bursa Malaysia and from Tehran Stock Exchange.

Some papers approached the circumstances which influence the stock returns reactions to shocks. Lasfer et al. (2003) found significant differences between the developed and the emerging markets regarding stock prices behavior in the periods following sharp changes. Norli et al. (2011) studied the reactions to shocks of stock prices from Bursa Malaysia over the period between January 1998 and December 2009. They found that overreactions were more pronounced during the South East Asian Financial Crisis from 1997-1998 and during the actual Global Crisis that started in 2008 than during more quiet times.

In this paper we investigate the reactions of stock prices to shocks before and during the actual global crisis. We employ daily values of representative indexes for the stock markets from a group of 28 countries.

The remainder of the paper is divided into three main areas: the second part describes the data and methodology employed in our investigation, the third part presents the empirical results and the fourth part concludes.

Data and Methodology

In our investigation we use daily closing values of the stock market indexes from 28 countries for a time period between January 2000 and December 2011. We use MSCI Index Base Dates to classify these indexes into two broad categories: developed markets and emerging markets. For each index we split the sample of data into two sub-samples:

- first sub-sample, corresponding to a pre-crisis period, from 1st of January 2000 to the 15th of September 2008 (when it was announced the bankruptcy of Lehman Brothers);

- second sub-sample, corresponding to the global crisis period, from the 16th of September 2008 to the 31st of December 2011.

For each index i we compute the raw return ($r_{i,t}$) by the formula:

$$r_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} * 100 \qquad (1)$$

where $P_{i,t}$ and $P_{i,t-1}$ are closing price of index i on the days t and t-1, respectively.

We identify the positive and negative shocks following the method used by Lasfer et al. (2003). We consider that a positive shock occurs in a day t^+ if the following condition is satisfied:

$$r_{i,t^+} > AVG(r_{i,[-60;-11]}) + 2 * STD(r_{i,[-60;-11]}) \qquad (2)$$

where r_{i,t^+} is the return of the index i from the day t^+, AVG ($r_{i,[-60;-11]}$) is the average daily returns for a period that starts 60 days before the day t^+, and ends 11 days before the day t^+, while STD ($r_{i,[-60;-11]}$) is the standard deviation for the same period.

We consider that a negative shock occurs in a day t^- if the following condition is satisfied:

$$r_{i,t^-} < AVG(r_{i,[-60;-11]}) - 2 * STD(r_{i,[-60;-11]}) \quad (3)$$

where r_{i,t^-} is the return of the index i from the day t^-.

We extract the autonomous shocks from the positive or negative shocks we detected by excluding the successive shocks. We define a successive shock as one that occurs less than 10 days after an autonomous shock.

In order to identify over, under and efficient reactions we calculate the post-shocks abnormal returns ($AR_{i,t}$) using the formula:

$$AR_{i,t} = r_{i,t} - AVG(r_{i,[-60;-11]}) \quad (4)$$

For each autonomous shock we compute the Cumulative Abnormal Returns for the next 1, 2,3,4,5 and 10 days as:

$$CAR_{i,t}^{n} = \sum_{t=1}^{n} AR_{i,t} \quad (5)$$

where $CAR_{i,t}^{n}$ is the Cumulative Abnormal Returns of the index i for the next n days that follow an autonomous shock from a day t.

We calculate the Average Cumulative Abnormal Returns of the index i for the next n days ($ACAR_{i,t}^{n}$) as:

$$ACAR_{i,t}^{n} = \frac{1}{n} \sum_{t=1}^{n} CAR_{i,t} \quad (6)$$

We test, by t-statistics, for each autonomous shock, the significance of Average Cumulative Abnormal Returns. Based on the significance of Cumulative Abnormal Returns we classify the after shock behaviors of returns into three categories:

- overreactions, when a positive shock is followed by significant negative abnormal returns or when a negative shock is followed by significant positive abnormal returns;

- underreactions, when a positive shock is followed by significant positive abnormal returns or when a negative shock is followed by significant negative abnormal returns;

- efficient reactions, when we don't find significant positive or negative abnormal returns after an autonomous shock.

Empirical Results

Table 1 presents the number of the autonomous shocks and the mean reactions associated to them before the global crisis. Excepting BUX Index, for all the indexes the number of negative shocks surpasses the number of positive shocks. In general, the magnitude of shocks was bigger in case of emerging markets in comparison with developed markets.

Table 1 - Shocks before the global crisis

Index	Positive shocks		Negative shocks	
	Number of shocks	Mean reaction	Number of shocks	Mean reaction
Panel A: Developed Markets				
AEX General	17	2.05217 (12.289***)	24	-1.88238 (-13.757***)
BEL-20	17	2.42009 (7.4873***)	19	-2.16294 (-12.811***)
Taiwan Weighted	16	2.70218 (8.672***)	23	-2.84181 (-11.2515)
ATX	17	3.03267 (12.541***)	19	-2.83972 (-10.806***)
Hang Seng	19	3.12696 (6.0983***)	20	-2.73624 (-9.4232***)
Straits	14	2.49452	22	-2.31344

Times		(9.5106***)		(-6.4233***)
S&P TSX Composite	14	2.33958 (9.7172***)	25	-2.07972 (-17.645***)
Swiss Market	20	2.12214 (11.075***)	23	-2.00558 (-9.5999***)
CAC 40	18	2.43167 (9.9193***)	22	-2.18472 (-13.984***)
DAX	14	2.31431 (7.8045***)	24	-2.15107 (-15.147***
FTSE 100	20	2.22067 (10.6548***)	21	-2.09144 (-11.806***)
Standard & Poor's	21	2.10153 (12.8595***)	23	-2.0329 (-12.315***)
Nikkei 225	16	2.7842 (12.5066***)	17	-2.73882 (-8.861***)
All Ordinaries	18	2.05578 (9.49737***)	24	-1.97635 (-12.63***)
Panel B: Emerging Markets				
CROBEX	18	2.63577 (11.128***)	20	-2.27244 (-8.1234***)
PX Index	20	2.95135 (7.1951***)	22	-2.56582 (-10.547***)
BET-C	17	3.05788 (14.0883***)	18	-3.24778 (-10.944***)
Bovespa	17	3.93819 (17.296***)	18	-3.82385 (-12.522***)
Seoul Composite	20	2.97368 (12.035***)	23	-2.56846 (-15.294***)
BSE 30	21	3.65967 (14.517***)	24	-3.36865 (-13.986***
Jakarta Composite	15	3.32742 (6.901***)	21	-2.65346 (-11.725***)
Shanghai Composite	18	4.31391 (7.5918***)	20	-4.31608 (-10.231***)
BUX	20	3.12459 (17.859***)	17	-3.07995 (-15.178***)
MerVal	16	3.34471 (11.849***)	20	-3.27522 (-11.257***)

KLSE Composite	21	1.67528 (8.7898***)	17	-1.65627 (-7.4462***)
Athex Composite	14	3.48499 (6.384***)	19	-2.22187 (-11.5529***)
IPC	19	3.40422 (9.7865***)	21	-2.80758 (-12.235***)
TA 100	17	2.78245 (27.7902***)	21	-3.01851 (-15.426***)

Notes: t-statistic appear in parentheses; ***, **, * mean significant at 0.01, 0.05, 0.1 levels, respectively

During the global crisis there were five indexes for which the number of positive shocks exceeded the number of negative shocks: AEX General, Strait Times, FTSE 100, CROBEX and BUX (Table 2). For two indexes (All Ordinaries and KLSE Composite) the number of positive shocks equaled the number of negative shocks. The magnitude of shocks from emerging markets sharply rose, so the differences between the two markets decreased.

Table 2 - Shocks during the global crisis

Index	Positive shocks		Negative shocks	
	Number of shocks	Mean reaction	Number of shocks	Mean reaction
Panel A: Developed Markets				
AEX General	19	4.57638 (6.44168***)	17	-3.41452 (-7.8484***)
BEL-20	18	3.53162 (8.02556***)	17	-3.5171 (-8.3685***)
Taiwan Weighted	13	3.69238 (7.98***)	20	-3.17485 (-10.601***)
ATX	13	5.11153 (7.39437***)	22	-3.96135 (-9.221***)
Hang Seng	15	4.84467 (5.08725***)	18	-3.76397 (-9.58***)
Straits Times	19	2.77216 (8.03234***)	17	-2.56678 (-8.297***)
S&P TSX Composite	14	2.80282	18	-3.33259

		(6.3582***)		(-6.531***)
Swiss Market	15	3.76474 (5.71569***)	19	-2.76401 (-9.467***)
CAC 40	17	5.27276 (7.12092***)	18	-3.66662 (-11.442***)
DAX	17	5.05139 (6.68843***)	19	-3.58778 (-9.721***)
FTSE 100	18	3.8223 (6.56626***)	16	-3.33236 (-8.1359***)
Standard & Poor's	14	4.45587 (5.25871***)	18	-2.83308 (-8.5015***)
Nikkei 225	9	5.1914 (4.12703***)	15	-3.24236 (-9.476***)
All Ordinaries	17	2.5787 (13.1112***)	17	-2.79949 (-9.058***)
Panel B: Emerging Markets				
CROBEX	17	4.17771 (4.57836***)	15	-2.87459 (-5.7189***)
PX Index	12	5.36937 (5.29504***)	18	-3.69429 (-7.7619***)
BET-C	17	4.87518 (7.73499***)	18	-4.85636 (-8.184***)
Bovespa	12	4.90058 (8.16095***)	13	-4.21323 (-5.2363***)
Seoul Composite	10	4.20161 (7.23304***)	23	-3.23089 (-9.2579***)
BSE 30	17	3.62246 (9.16654***)	15	-3.62707 (-5.8065***)
Jakarta Composite	19	4.28427 (10.8884***)	20	-3.57845 (-7.3368***)
Shanghai Composite	11	4.27312 (6.01831***)	14	-3.93428 (-11.817***)
BUX	17	4.57322 (7.43625***)	15	-4.95275 (-7.0946***)
MerVal	15	5.20943 (7.67364***)	17	-4.73384 (-7.5591***)
KLSE Composite	17	4.81229 (3.12692***)	17	-3.12022 (-2.81849**)

Athex Composite	18	5.8415 (9.63097***)	13	-5.07439 (-13.715***)
IPC	20	3.809 (6.22193***)	23	-2.97406 (-10.358***)
TA 100	16	3.65958 (9.99873***)	17	-3.48262 (-11.291***)

Notes: t-statistic appear in parentheses; ***, **, * mean significant at 0.01, 0.05, 0.1 levels, respectively

The Table 3 presents Cumulative Abnormal Returns following a positive shock before the global crisis. In case of developed markets we find symptoms of underreaction for five indexes (AEX General, BEL 20, CAC 40, DAX and FTSE 100) and of overreaction for a single index (Strait Times) while for the other eight the results suggest efficient reactions to positive shocks. In the case of emerging markets we found a single index, BET-C, which underreacted while the rest of thirteen indexes displayed efficient reactions.

Table 3 - Cumulative Abnormal Returns following a positive shock before the global crisis

Index	AR-1	ACAR-2	ACAR-3	ACAR-4	ACAR-5	ACAR-10
Panel A: Developed Markets						
AEX General	0.114707 (0.355992)	0.813684 (3.19183***)	0.866121 (2.14552**)	1.10067 (2.00975*)	1.39445 (2.70367**)	2.11801 (2.82237**)
BEL-20	-0.0639125 (-0.247467)	-0.266906 (-0.918545)	-0.0782621 (-0.147475)	-0.218877 (-0.33450)	0.031119 (0.050502)	1.31299 (1.83029**)
Taiwan Weighted	-0.368511 (-0.944644)	-0.0888298 (-0.145146)	-0.152167 (-0.19992)	0.138103 (0.186716)	-0.479978 (-0.51762)	0.820431 (0.728657)
ATX	0.0886177 (0.302615)	0.236529 (0.479223)	0.282029 (0.471669)	-0.267187 (-0.39931)	-0.385309 (-0.593203)	0.261992 (0.245861)
Hang Seng	-0.19243 (-0.95012)	0.122511 (0.217543)	0.346729 (0.547647)	0.208741 (0.340178)	-0.400783 (-0.447869)	0.482095 (0.369776)
Straits Times	-0.485278 (-1.58374)	-0.466766 (-1.19502)	-1.01279 (-1.71922)	-1.30414 (-2.2075**)	-1.65715 (-2.14258*)	-2.2445 (-2.00263*)
S&P TSX Composite	0.0925365 (0.36234)	0.263728 (0.732601)	-0.362575 (-1.01422)	-0.0719031 (-0.217629)	0.0304214 (0.056116)	0.27598 (0.280552)
Swiss Market	0.21672	0.193543	0.241581	0.377052	0.404181	0.265982

	(1.27311)	(0.81668)	(0.644021)	(0.952368)	(0.781963)	(0.282781)
CAC 40	0.0403385 (0.168802)	0.410225 (1.55253)	0.787777 (2.198**)	0.786937 (1.57771)	0.672504 (1.32141)	0.548255 (0.630524)
DAX	0.0701547 (0.236512)	0.726007 (2.46875**)	0.986287 (2.93272**)	0.706264 (1.43209)	0.713639 (1.13696)	0.672145 (0.875655)
FTSE 100	-0.187247 (-0.828894)	0.278355 (1.01722)	0.402583 (1.13583)	0.512446 (1.38643)	0.627538 (1.37469)	1.61103 (2.39376**)
Standard & Poor's	-0.028695 (-0.204474)	-0.0978928 (-0.442151)	0.0925944 (0.39472)	0.140717 (0.430213)	0.0208724 (0.063823)	0.465821 (0.962432)
Nikkei 225	-0.186224 (-0.618457)	-0.00222797 (-0.00594062)	-0.1426 (-0.275089)	0.394174 (0.8782)	0.0700756 (0.102274)	1.12316 (1.14556)
All Ordinaries	0.0190831 (0.073551)	0.178995 (0.309183)	0.362421 (0.681572)	0.329139 (0.737622)	-0.13806 (-0.236822)	0.919718 (1.33414)
Panel B: Emerging Markets						
CROBEX	0.386842 (1.24769)	0.707803 (1.5182)	0.390513 (0.7019)	0.484142 (0.883423)	0.550441 (0.7823)	1.63791 (1.54848)
PX Index	-0.192584 (-0.587215)	-0.0379737 (-0.0738153)	-0.111072 (-0.163563)	-0.29746 (-0.38449)	-0.791087 (-0.925566)	0.225126 (0.216412)
BET-C	1.0056 (1.85846*)	1.53713 (2.55656**)	1.47279 (2.42051**)	1.43778 (1.92535*)	1.23546 (1.37775)	1.69012 (1.27861)
Bovespa	0.0281552 (0.0686411)	-0.170566 (-0.318471)	0.473519 (0.702673)	0.260613 (0.274345)	0.890185 (1.22915)	1.26583 (1.03518)
Seoul Composite	0.0869072 (0.526812)	-0.0493406 (-0.133272)	0.470832 (0.985667)	0.567248 (1.12746)	0.180538 (0.28515)	0.88822 (1.13836)
BSE 30	-0.677968 (-1.24495)	-0.311613 (-0.390134)	-0.5473 (-0.525984)	-0.600901 (-0.46663)	-0.932608 (-0.703639)	-0.931325 (-0.584318)
Jakarta Composite	-0.43982 (-0.854083)	-0.247473 (-0.303111)	-0.16405 (-0.157858)	-0.0288363 (-0.025565)	-0.0960418 (-0.076715)	-0.383845 (-0.281888)
Shanghai Composite	-0.372306 (-1.01929)	-0.757393 (-1.33611)	-0.840172 (-1.28025)	0.0135792 (0.0189322)	0.700536 (0.746565)	1.41416 (1.09097)
BUX	0.387934 (1.21328)	-0.00625143 (-0.0123684)	-0.672455 (-1.31413)	-0.137301 (-0.24985)	0.276731 (0.417099)	-0.5969 (-0.485029)
MerVal	-0.264926 (-0.795707)	-0.790011 (-1.48037)	-1.29051 (-1.59259)	-1.109 (-1.1231)	-1.5929 (-1.39166)	-0.940128 (-0.571075)
KLSE Composite	0.167033 (0.687587)	0.021359 (0.0746569)	0.213188 (0.667664)	-0.0909498 (-0.205969)	-0.165852 (-0.393788)	0.0105153 (0.017488)
Athex Composite	-0.274425 (-0.64901)	-0.544662 (-1.01245)	-0.107702 (-0.208268)	0.0515365 (0.0570698)	-0.546884 (-0.464651)	1.11869 (1.04801)

IPC	0.380393 (1.39001)	0.181795 (0.475439)	0.318256 (0.704426)	0.341383 (0.612337)	0.401439 (0.605313)	0.796505 (0.753027)
TA 100	-0.533984 (-1.31398)	-0.199435 (-0.551375)	-0.401714 (-0.716957)	-0.366515 (-0.629612)	-0.636136 (-1.06426)	-0.318206 (-0.28224)

Notes: t-statistic appear in parentheses; ***, **, * mean significant at 0.01, 0.05, 0.1 levels, respectively

The Cumulative Abnormal Returns following a negative shock before the global crisis are presented in Table 4. For the developed markets, the results indicate the underreaction of five indexes (AEX General, BEL 20, Taiwan Weighted, S&P TSX Composite and All Ordinaries), the overreaction of two indexes (Strait Times and Standard & Poor's) and the efficient reaction of the other seven indexes. For the emerging markets we find six indexes which underreacted (Seoul Composite, BSE 30, Jakarta Composite, BUX, MerVal and KLSE Composite) while the other eight reacted efficiently.

Table 4 - Cumulative Abnormal Returns following a negative shock before the global crisis

Index	AR-1	ACAR-2	ACAR-3	ACAR-4	ACAR-5	ACAR-10
Panel A: Developed Markets						
AEX General	-0.092507 (-0.3341)	-0.608447 (-1.95241**)	-0.908998 (-2.02052**)	-1.1202 (-1.70912*)	-0.973952 (-1.43162)	-1.11417 (-1.34535)
BEL-20	-0.22282 (-0.643099)	-0.618821 (-1.87362*)	-0.671099 (-1.23032)	-1.38412 (-1.97196*)	-1.39825 (-2.03495*)	-0.708897 (-0.761104)
Taiwan Weighted	-0.455101 (-1.78865*)	-1.03656 (-2.25471**)	-1.29077 (-2.49771**)	-1.46812 (-2.12612**)	-1.49104 (-1.88491*)	-0.459452 (-0.486017)
ATX	-0.0444762 (-0.0993033)	-0.308844 (-0.521835)	-0.516818 (-0.841597)	-0.761365 (-0.975622)	-0.123937 (-0.151099)	-0.311447 (-0.195673)
Hang Seng	0.111049 (0.262389)	0.370008 (0.718901)	0.120403 (0.241123)	-0.563334 (-0.687367)	0.149871 (0.198799)	-0.843888 (-0.866247)
Straits Times	0.262276 (0.820575)	0.694507 (1.95317*)	0.728657 (1.62452)	0.375555 (0.631658)	0.343384 (0.621082)	-0.495711 (-0.576388)
S&P TSX Composite	-0.387576 (-2.5021**)	-0.661948 (-1.73561*)	-0.913365 (-2.03366**)	-1.29163 (-2.15485**)	-1.24432 (-2.00475*)	-0.763842 (-0.940613)
Swiss Market	0.17489 (0.594553)	0.159936 (0.490259)	0.297365 (0.704111)	0.150922 (0.232331)	0.267044 (0.443131)	0.374883 (0.407572)
CAC 40	-0.321939	-0.240247	-0.494722	-1.03981	-0.632293	-0.801768

	(-1.15713)	(-0.828572)	(-1.20418)	(-1.63719)	(-0.888872)	(-0.884968)
DAX	0.11579 (0.39276)	-0.335761 (-1.03978)	-0.41189 (-0.962399)	-0.871698 (-1.28035)	-0.557872 (-0.752277)	-0.01221 (-0.0120137)
FTSE 100	0.300588 (0.822085)	0.0034359 (0.0107052)	-0.256624 (-0.73634)	-0.192574 (-0.303453)	-0.117106 (-0.196593)	0.134635 (0.149967)
Standard & Poor's	0.039464 (0.276979)	0.51771 (1.78277*)	0.146343 (0.46255)	-0.0140046 (-0.035868)	0.0863516 (0.230936)	-0.0033002 (-0.005013)
Nikkei 225	0.0895489 (0.33201)	0.159299 (0.262899)	0.160555 (0.200207)	-0.464502 (-0.823)	-0.997006 (-1.05511)	-1.72803 (-1.23482)
All Ordinaries	0.00917869 (0.0465767)	-0.415965 (-1.33993)	-0.671152 (-1.97099*)	-0.605974 (-1.02484)	-0.451347 (-0.937637)	-0.661767 (-1.16376)
Panel B: Emerging Markets						
CROBEX	-0.272603 (-0.856915)	0.125164 (0.248833)	-0.494321 (-0.659079)	-0.349785 (-0.391966)	-0.713901 (-0.642524)	-0.648308 (-0.432221)
PX Index	-0.0696347 (-0.182032)	-0.333717 (-0.732584)	-0.735338 (-1.40999)	-0.994488 (-1.21461)	-1.04316 (-1.20784)	-1.12103 (-1.03003)
BET-C	0.0938725 (0.215037)	0.383922 (0.602729)	0.17794 (0.204055)	0.0582945 (0.0573443)	0.149635 (0.148343)	-0.383489 (-0.237331)
Bovespa	0.0159464 (0.0330461)	-0.381418 (-0.502069)	-0.251064 (-0.23034)	-1.09174 (-0.976422)	-1.19794 (-0.890591)	-1.13574 (-0.78945)
Seoul Composite	-0.453433 (-1.34817)	-1.09501 (-2.73463**)	-1.28481 (-1.9778*)	-1.81914 (-2.23706**)	-1.5915 (-1.9903*)	-1.42044 (-1.65157)
BSE 30	-0.952729 (-2.33284**)	-0.266387 (-0.344034)	0.370116 (0.451454)	0.614629 (0.551267)	0.794588 (0.668466)	-0.0350674 (-0.024191)
Jakarta Composite	-0.603784 (-0.997131)	-0.598966 (-0.711841)	-1.42973 (-1.9799*)	-2.40898 (-2.37952**)	-1.99126 (-2.02109*	-2.03232 (-1.8151*)
Shanghai Composite	0.68689 (1.26151)	0.712149 (0.922302)	0.0012021 (0.001202)	-0.042093 (-0.0424052)	-1.39386 (-1.14829)	-0.982557 (-0.836137)
BUX	-0.467983 (-1.28461)	-0.18736 (-0.369365)	-0.416675 (-0.83951)	-0.969035 (-1.19445)	-1.2361 (-1.33095)	-2.63084 (-2.1937**)
MerVal	-0.206336 (-0.64706)	-0.341883 (-0.58993)	-0.935504 (-1.36412)	-2.03098 (-2.31507**)	-2.24703 (-2.208**)	-1.45192 (-1.34091)
KLSE Composite	-0.458348 (-1.41331)	-0.781346 (-1.62716)	-1.34966 (-2.0335*)	-1.68826 (-1.89649*)	-1.19883 (-1.48351)	-1.07071 (-1.27147)
Athex Composite	-0.274444 (-0.844196)	-0.227625 (-0.444783)	-0.618108 (-0.80411)	-1.0084 (-1.03115)	-1.25505 (-1.21613)	-0.879537 (-0.83784)
IPC	-0.0394805 (-0.0970727)	0.426996 (0.669922)	0.432521 (0.546436)	0.44134 (0.564586)	0.529678 (0.556204)	-0.973836 (-0.698786)

TA 100	0.40779 (1.32669)	0.133613 (0.432292)	0.286797 (0.928987)	0.458664 (1.01293)	0.46414 (0.943943)	-0.940687 (-1.04277)

Notes: t-statistic appear in parentheses; ***, **, * mean significant at 0.01, 0.05, 0.1 levels, respectively

Table 5 provides the Cumulative Abnormal Returns following a positive shock during the global crisis. In the case of developed markets, we identify underreaction for three indexes (AEX General, Taiwan Weighted and Swiss Market) and efficient reaction for the rest of eleven indexes. In the case of emerging markets we found three indexes which underreacted (BSE 30, KLSE Composite and IPC), a single index which overreacted (TA 100) while the rest of ten indexes reacted efficiently.

Table 5 - Cumulative Abnormal Returns following a positive shock during the global crisis

Index	AR-1	ACAR-2	ACAR-3	ACAR-4	ACAR-5	ACAR-10
Panel A: Developed Markets						
AEX General	0.453357 (1.83015*)	0.602959 (0.992916)	0.407134 (0.407134)	1.229 (1.03918)	0.709313 (0.786504)	0.65501 (0.436714)
BEL-20	-0.156626 (-0.370685)	0.40494 (0.532069)	0.29377 (0.2387)	0.810742 (0.651069)	0.794233 (0.686947)	0.707728 (0.487392)
Taiwan Weighted	0.916645 (1.80767*)	0.876399 (0.991517)	0.867053 (0.756212)	0.730443 (0.643894)	0.699639 (0.767783)	-0.409928 (-0.291563)
ATX	0.0417734 (0.0375979)	-1.03193 (-0.729116)	-1.71243 (-0.816647)	-2.50911 (-1.10384)	-3.56652 (-1.35527)	-2.62559 (-0.878994)
Hang Seng	0.582725 (1.44814)	1.15589 (1.10437)	1.41962 (1.21715)	1.4351 (0.90341)	1.12234 (0.705974)	-1.53635 (-0.498699)
Straits Times	-0.2172 (-0.510776)	0.887471 (1.37293)	0.88951 (1.15292)	1.033 (1.04883)	0.619863 (0.641883)	0.855388 (0.544642)
S&P TSX Composite	-0.0773137 (-0.224689)	-0.33078 (-0.327762)	-0.41562 (-0.433771)	-0.514641 (-0.410482)	-1.62902 (-0.923332)	-0.697088 (-0.362863)
Swiss Market	1.17578 (2.54741**)	1.89859 (3.03878***)	1.5824 (1.82448**)	2.30514 (2.3737**)	2.27722 (2.8987**)	1.97417 (1.54399)
CAC 40	0.304187 (0.747611)	0.0800832 (0.112839)	-0.571772 (-0.512323)	0.432304 (0.388892)	0.471875 (0.51819)	1.30473 (0.920259)
DAX	0.200161 (0.492922)	0.0583973 (0.102527)	-0.149698 (-0.179868)	0.529013 (0.840779)	0.843149 (0.929303)	1.08171 (0.619151)

FTSE 100	0.257013 (0.641312)	0.673624 (1.21945)	0.659951 (0.865632)	1.24791 (1.45456)	1.12131 (1.34703)	1.62775 (1.58573)
Standard & Poor's	-0.361996 (-0.692557)	-0.342847 (-0.388647)	0.271628 (0.381062)	0.321669 (0.401132)	1.08494 (1.01219)	-0.833869 (-0.459149)
Nikkei 225	1.01721 (0.781866)	-0.0536459 (-0.0341834)	2.00161 (0.943059)	3.01499 (1.18403)	3.25793 (1.70085)	3.36263 (1.02522)
All Ordinaries	0.265875 (0.98084)	0.400394 (1.2115)	0.393083 (0.733421)	0.469566 (0.762152)	-0.237583 (-0.268083)	0.939035 (0.708767)
Panel B: Emerging Markets						
CROBEX	0.133187 (0.234193)	-1.01505 (-1.17054)	-0.955033 (-0.839742)	-1.00748 (-0.955525)	-1.57523 (-1.21378)	-2.74025 (-1.1799)
PX Index	1.87581 (1.52468)	1.78019 (1.52839)	1.55082 (1.03458)	0.846423 (0.361412)	0.767129 (0.367888)	-0.0291987 (-0.009305)
BET-C	0.748804 (0.829)	0.517525 (0.539327)	0.669911 (0.72017)	0.274068 (0.206614)	-0.144449 (-0.0673296)	-0.813432 (-0.244977)
Bovespa	-0.70644 (-1.68563)	-1.29879 (-1.17592)	-1.68621 (-1.18353)	-2.51873 (-1.195)	-3.84736 (-1.49538)	-0.795091 (-0.406225)
Seoul Composite	0.233371 (0.492514)	-0.671924 (-0.501766)	-1.08969 (-0.576398)	-0.940032 (-0.489362)	-1.26802 (-0.869378)	-2.74795 (-0.889735)
BSE 30	0.477691 (2.39462**)	0.959136 (1.34743)	1.65222 (1.47742)	1.13664 (0.74424)	0.805312 (0.608577)	2.1534 (0.947937)
Jakarta Composite	0.535692 (1.1247)	1.1976 (1.24674)	1.06742 (0.892874)	0.797728 (0.643457)	0.784341 (0.681904)	-1.61778 (-0.657143)
Shanghai Composite	0.747248 (0.87374)	0.526374 (0.624187)	0.162333 (0.137196)	1.15693 (0.739232)	1.1343 (0.586957)	-0.661416 (-0.334511)
BUX	0.00447199 (0.00825685)	-0.925129 (-1.62623)	-1.85655 (-1.66075)	-1.68865 (-1.29644)	-1.92565 (-1.41263)	-1.01014 (-0.492003)
MerVal	-1.18378 (-1.31396)	-0.824744 (-0.886392)	-0.154837 (-0.186292)	0.826658 (0.689024)	-0.0663483 (-0.0362379)	-1.27662 (-0.441262)
KLSE Composite	0.189516 (1.12215)	0.71958 (1.78957*)	0.686483 (1.40861)	0.829077 (1.36232)	0.518699 (0.900642)	0.471385 (0.522841)
Athex Composite	0.0898957 (0.176449)	-0.00021627 (-0.0002673)	0.10805 (0.100546)	-0.124833 (-0.074512)	-0.183436 (-0.101071)	-0.0961735 (-0.037415)
IPC	0.761236 (2.21392**)	1.06052 (1.73033*)	1.16342 (1.53429)	1.25788 (1.55397)	1.42847 (1.40899)	1.13683 (0.69833)
TA 100	-1.25881 (-2.80471**)	-0.564739 (-2.17024**)	-1.25131 (-2.09181*)	-0.954035 (-1.19562)	-0.542284 (-0.734457)	-0.236675 (-0.159936)

Notes: t-statistic appear in parentheses; ***, **, * mean significant at 0.01, 0.05, 0.1 levels, respectively

The Cumulative Abnormal Returns following a negative shock during the global crisis are presented in Table 6. For the developed markets we detect four indexes which underreacted (AEX General, Taiwan Weighted, DAX and Nikkei 225), two indexes which overreacted (ATX and Swiss Market) while the rest of eight indexes reacted efficiently. In case of emerging markets the results indicate underreaction for four indexes (CROBEX, Jakarta Composite, Shanghai Composite and BUX) and efficient reactions for the rest of twelve indexes.

Table 6 - Cumulative Abnormal Returns following a negative shock during the global crisis

Index	AR-1	ACAR-2	ACAR-3	ACAR-4	ACAR-5	ACAR-10
Panel A: Developed Markets						
AEX General	-0.92132 (-2.57404***)	-0.618678 (-0.726856)	-0.802699 (-0.677592)	-0.918711 (-0.649468)	-1.00601 (-0.83913)	-0.264608 (-0.159357)
BEL-20	-0.831116 (-1.57946)	-0.037079 (-0.0525646)	0.832818 (1.05374)	0.477509 (0.523022)	-0.406189 (-0.461794)	0.983245 (0.83395)
Taiwan Weighted	-0.284991 (-0.923325)	-0.836482 (-1.8835*)	0.200879 (0.433548)	0.497208 (0.893522)	0.388923 (0.560344)	-0.457093 (-0.424583)
ATX	-0.158794 (-0.286447)	1.35251 (1.74367*)	1.22012 (1.13409)	0.825548 (0.548711)	0.872326 (0.488745)	1.26313 (0.636173)
Hang Seng	-0.888863 (-1.17767)	-0.529537 (-0.659683)	1.10592 (1.33087)	1.68461 (1.17714)	2.25106 (1.95977)	1.62983 (0.951475)
Straits Times	-0.224574 (-0.87932)	-1.0973 (-1.27938)	-0.95689 (-1.02784)	-1.20726 (-1.18035)	-0.58805 (-0.610087)	0.313125 (0.227544)
S&P TSX Composite	0.28646 (0.68029)	0.818773 (0.931022)	0.0179553 (0.0165298)	0.927346 (0.899645)	1.07 (0.807696)	1.39624 (1.00778)
Swiss Market	0.365525 (0.783719)	1.45763 (2.3089**)	1.62395 (2.28293**)	1.38662 (1.62189)	1.09766 (1.97914*)	1.45239 (1.42419)
CAC 40	-0.612208 (-1.32406)	0.365692 (0.608139)	0.979474 (1.30037)	0.705834 (0.718511)	-0.275192 (-0.253739)	1.05871 (0.796469)
DAX	-0.737556 (-1.88866*)	-0.197544 (-0.318782)	-0.104115 (-0.145051)	-0.405186 (-0.494039)	-1.69875 (-1.5176)	0.0919502 (0.0611252)
FTSE 100	-0.662756 (-1.70168)	-0.667582 (-0.930731)	-0.910688 (-0.900504)	-1.40451 (-1.12825)	-1.31723 (-1.32045)	0.354554 (0.296401)
Standard & Poor's	-0.193278	-0.653255	-0.891672	0.401068	-0.870442	-0.967314

	(-0.730443)	(-1.15678)	(-1.35419)	(0.585543)	(-0.995995)	(-0.615489)
Nikkei 225	-0.490905 (-0.887326)	-3.03779 (-1.98583*)	-2.92354 (-1.77701*)	-2.40788 (-1.17185)	-0.226305 (-0.158929)	0.704366 (0.39495)
All Ordinaries	0.242716 (0.668747)	0.270759 (0.528841)	0.695082 (0.89809)	0.384407 (0.535174)	0.144179 (0.244136)	-0.929336 (-1.16602)
Panel B: Emerging Markets						
CROBEX	-0.621855 (-1.34429)	-1.56982 (-1.64132)	-2.83027 (-1.73948*)	-1.68822 (-1.83695*)	-0.953846 (-1.17109)	-2.47617 (-1.7591*)
PX Index	-0.927548 (-1.71648)	-0.618802 (-0.564048)	-0.00509391 (-0.004249)	0.0485695 (0.0456005)	-0.562938 (-0.472325)	-1.59481 (-0.890653)
BET-C	-1.13985 (-1.23871)	-0.918399 (-0.74529)	0.478679 (0.346513)	0.706842 (0.416257)	0.628996 (0.530198)	0.600245 (0.349581)
Bovespa	0.150343 (0.182863)	0.412633 (0.437873)	-0.238353 (-0.170604)	-0.492933 (-0.42565)	-1.54587 (-1.61373)	0.909293 (0.654567)
Seoul Composite	-0.473731 (-1.02806)	-0.404942 (-0.420857)	-0.322067 (-0.318646)	0.0241231 (0.0227658)	0.198768 (0.184761)	0.697313 (0.535951)
BSE 30	-0.0384549 (-0.101204)	-0.210703 (-0.30674)	-0.0711497 (-0.0634873)	0.658076 (0.497325)	1.28703 (0.75749)	1.59915 (0.727576)
Jakarta Composite	-0.443929 (-1.18668)	-1.58673 (-1.84687*)	-0.389149 (-0.362846)	-0.207639 (-0.172257)	0.674991 (0.606758)	0.776321 (0.645471)
Shanghai Composite	-0.160799 (-0.297479)	-0.162348 (-0.246933)	-0.301248 (-0.266112)	-0.444495 (-0.483258)	-0.405755 (-0.489056)	-2.89728 (-1.80378*)
BUX	-1.10564 (-1.44905)	-1.90171 (-1.78444*)	-2.41076 (-1.8054*)	-1.78064 (-1.39366)	-2.16713 (-1.71889)	-2.9049 (-1.99695*)
MerVal	-0.354034 (-0.645415)	0.21522 (0.319261)	0.273948 (0.495408)	-0.590496 (-0.600641)	-1.64773 (-1.1521)	-2.31742 (-1.37789)
KLSE Composite	1.5894 (1.04099)	0.981087 (0.633579)	1.26421 (0.847269)	1.06766 (0.739787)	1.30207 (0.922923)	1.29186 (0.875748)
Athex Composite	-0.75731 (-1.09126)	0.241966 (0.182752)	-0.106041 (-0.0854771)	-0.617728 (-0.406279)	-1.98722 (-1.41825)	-3.1529 (-1.50002)
IPC	-0.510366 (-1.33703)	-0.284788 (-0.396597)	0.0453602 (0.0511436)	-0.241943 (-0.271495)	-0.167598 (-0.186113)	2.04848 (1.64275)
TA 100	-0.455379 (-0.543369)	-0.692399 (-0.966064)	-0.801493 (-0.944157)	-0.745539 (-0.759302)	-0.947463 (-0.869631)	-1.40067 (-0.985699)

Notes: t-statistic appear in parentheses; ***, **, * mean significant at 0.01, 0.05, 0.1 levels, respectively

Conclusions

In this paper we approached the reactions to shocks of the 28 indexes before and during the global crisis. Our investigation revealed different behaviors from the two periods of time between indexes from developed and emerging markets. Before the crisis, the magnitude of shocks from emerging markets was larger in comparison with the developed markets. After the global crisis had began this difference decreased. This evolution could be explained by the different perceptions regarding the two markets. In general, on the emerging markets, investors are aware about the possibility of sharp unexpected changes that could occur. Instead, for transactions from the developed markets, after many years of relative stability, many investors were taken by surprise by the new turbulent period.

The efficient reactions to positive shocks from developed markets were more consistent during the global crisis than before while the overreactions and underreactions became less visible. Most of the positive shocks during the global crisis occurred in the short periods when the financial markets displayed some symptoms of recovery but many investors were cautious about the sustainability of these evolutions. The reactions to negative shocks of the indexes from developed markets experienced some changes to the global crisis in comparison with the precedent period of time. For some indexes the symptoms of underreactions and overreactions disappeared while for other indexes these symptoms just appeared. The negative shocks for developed markets during the global crisis were caused by various factors (difficulties of commercial banks, public debt crisis etc.) and their impact was different from country to country.

In the case of emerging markets, before the global crisis, a single index (BET-C, from the Bucharest Stock Exchange, which experienced a significant ascendant trend) underreacted to positive shocks while the others displayed efficient reactions. During the global crisis, the underreactions and overreactions from emerging markets to the positive shocks became more consistent in detriment of the efficient reactions. These changes could be linked to the nature of a part of positive shocks during the global crisis. In the circumstances of the global crisis many investors could perceive the emerging markets more attractive than the developed markets and their transactions could generate positive shocks. The efficient reactions of indexes from emerging markets to negative shocks became more consistent during the global crisis than before. This evolution could be explained by the various nature of the

factors that caused negative shocks (contagion from developed markets, domestic circumstances etc.)

This investigation could be extended by performing separate analysis for each distinct phase of the global crisis.

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