Governance and Regulatory Determinants of Financial Markets Resilience - Cross Country Evidence

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Abstract

The study seeks to identify factors that made some countries more susceptible than others to the impact of the global financial crisis (GFC), and factors that made some more resilient and better able to recover from its adverse impact. Results suggest that different sets of variables best explain the experience of the stock markets in the period following the onset of GFC, than during the recovery period. Developed countries experienced a sharper decline in their stock markets and higher relative volatility following the GFC compared to the emerging markets but also experienced a flatter recovery in the level and volatility of the stock markets. The extent of stock trading and a greater reliance on the international capital inflows prior to the on-set of GFC is associated with subsequent sharper fall and higher volatility in the markets.

I. Introduction

The global financial crisis of 2007-09 (GFC) has impacted countries across the globe, though its impact has been varied in severity as well as in duration; some economies have been affected more than others, and some have rebounded quicker than others. Stock markets in Ireland, Belgium, Croatia, and Greece, for example, dropped by over 50% following the onset of GFC, while stock indices of Indonesia, Brazil, Chile, India lost less than 5%. Likewise, the market volatility in some countries greatly increased compared to others (e.g., Iceland, USA) over the first two years of the GFC period. Figure 1 depicts varied experience of various countries as to the markets indices and relative volatility during the first two year of GFC (crash period), and the subsequent recovery period, 2009-2011. Statistics are provided in Table 1, showing the GFC's impact on different markets and the subsequent recovery.

The present study's objective is to empirically identify economic, financial and regulatory determinants which may explain the experience of a cross-section of countries as to (i) the initial impact of GFC, (ii) recovering from the external shock of the GFC. We start by hypothesizing a number of economic and financial characteristics of the economies that may influence the vulnerability of a country to external shocks, and the characteristics that may help it to recover from such shocks. These factors are suggested by previous related studies, and include variables reflecting the structure of the economy and financial markets. We also include a set of governance indicators which may help a country in absorbing the adverse impact from external shocks and recovering from it.

A particular factor in exacerbating the financial crisis is attributed to the fact that in many countries the regulatory and governance structure lagged behind the innovations and increasing complexity in the financial products. As the powerful forces of globalization and information technology revolution reshaped the financial markets, the legal and regulatory capacity failed to evolve alongside. Financial services firms on the other hand also indulged in *regulatory avoidance* to circumvent regulation. The recent episode of financial crisis seems to be similar to the interplay of market innovation and regulatory response suggested by Kane (1988). The cycle

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of *avoidance-reregulation-avoidance* is triggered by changes in the market and technological environment. Markets adapt to such changes in the form of innovation, avoidance and circumvention of regulation. The resulting conflict calls for new regulations, which are, however, followed by another round of avoidance. Kane describes it in Hegelian terms as "a delayed reaction to interacting dialectical processes." The conflicting elements play out as *thesis* and *antithesis*, and evolve into a new policy *synthesis*. However, the new synthesized policy mix generates its own contradictions in the dialectical process. This on-going process of conflict resolution is a particular source of volatility in the financial markets. Kane (1988) considers financial instability as a cost of inefficient financial regulation. Therefore, we want to focus on the quality of governance and regulatory framework which could affect the vulnerability and resilience of a country to external shocks.

The next section discusses the concepts of vulnerability, resilience and the related literature. It is followed by section III describing the data and the empirical methodology. Section IV describes the set of determinants of resilience and vulnerability included in the empirical models. Results are discussed in section V. The last section concludes the paper.

II. Economic Vulnerability and Resilience

The concept of *economic vulnerability* was first explored by Briguglio (1995). A number of empirical studies (for example, Briguglio, 2003; Crowards, 2000; and Atkins et al., 2000) showed that small states, particularly the island states, tend to be economically more vulnerable than other countries. This tendency has been attributed to a high degree of economic openness and export concentration. These structural characteristics lead to a higher exposure to exogenous shocks, which could magnify the economic fluctuations and the risks in economic growth. Cordina (2004a and 2004b) shows that higher variability in economic growth rate can also adversely affect the economic growth itself.

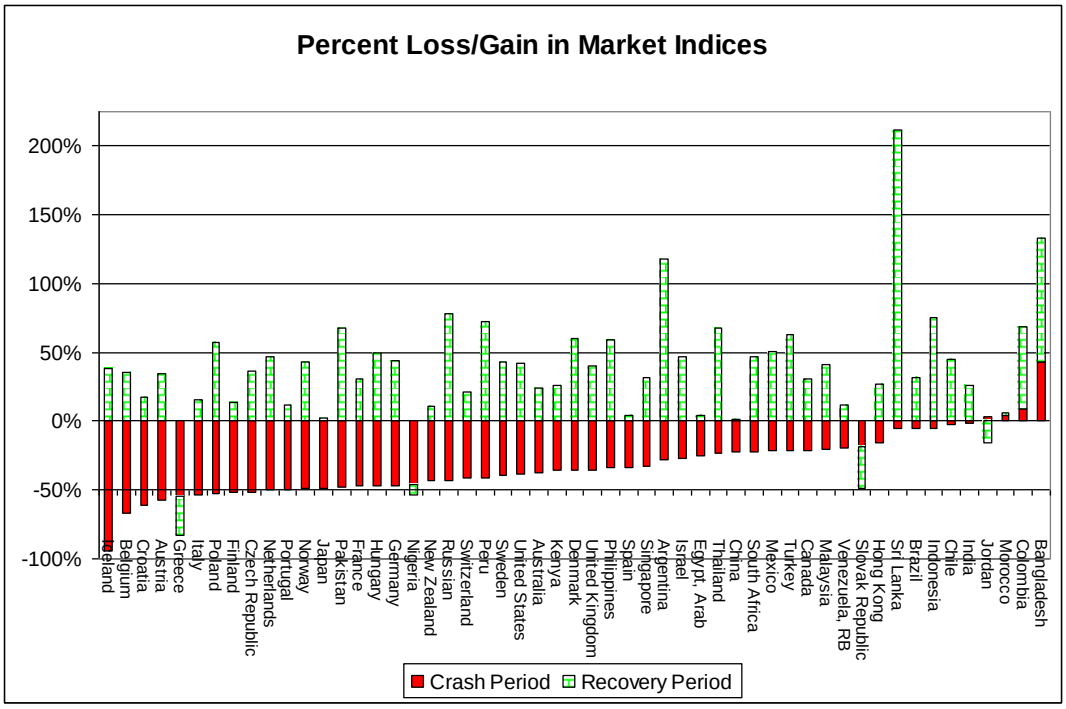
The term '*resilience*' is generally understood to mean the ability to recover quickly from the effect of an adverse incident.[1] Briguglio (2003) observed that some small states are able to generate relatively higher GDP per capita despite their higher vulnerability to external economic shocks. He termed this phenomenon as the "*Singapore Paradox*". Singapore although being highly exposed to external shocks, has yet managed to sustain relatively higher rates of economic growth and higher GDP per capita. He explains this paradox in terms of the ability of Singapore to build its *economic resilience* by structuring the economy so that it may offset the disadvantages associated with its economic vulnerability. Briguglio (2003; 2004) refers to the economic vulnerability as reflecting an economy's inherent features which are permanent or quasi-permanent. On the other hand, economic resilience is *nurtured* and associated with "man-made measures, which enable a country to withstand or bounce back from the negative effects of external shocks." As Briguglio et al. (2009) note, the term has been used in the economics literature in at least three senses relating to the ability to (a) recover quickly from a shock,

[1] Merriam-Webster defines resilience as 1) the capability of a strained body to recover its size and shape after deformation caused especially by compressive stress, 2) an ability to recover from or adjust easily to misfortune or change; origin, Latin *resilire*, to jump back, recoil.

"*shock-counteraction*"; (b) withstand the effect of a shock, "*shock-absorption*"; and (c) avoid the adverse impact of shocks, the *shock avoidance* as the obverse of economic vulnerability.

Figure 1: Impact of the Global Financial Crisis

A: % Change in Market Indices



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B: Relative Change in Market Volatility

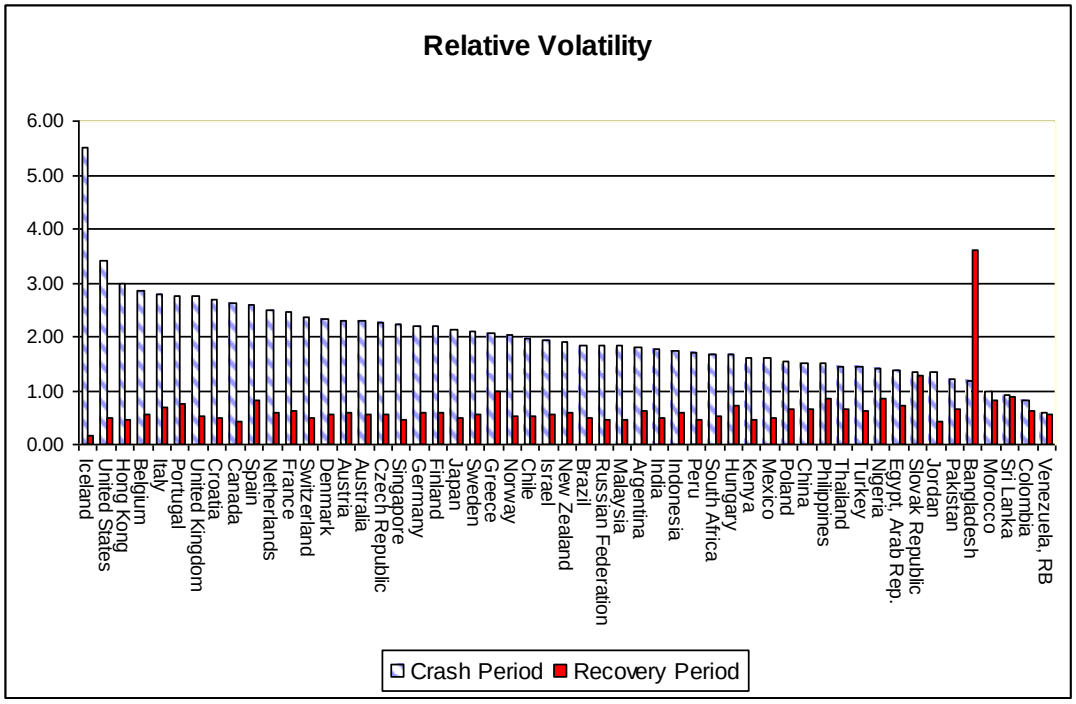

Table 1: Data Sample and Summary Statistics

A: Emerging Markets		Change in Market Index		Relative Volatility		B: Developed Markets		Change in Market Index		Relative Volatility	
		Crash Period	Recovery Period	Crash Period	Recovery Period			Crash Period	Recovery Period	Crash Period	Recovery Period
1	Argentina	-28%	118%	1.81	0.62	1	Australia	-37%	24%	2.29	0.55
2	Bangladesh	43%	90%	1.17	3.62	2	Austria	-57%	35%	2.31	0.59
3	Brazil	-5%	32%	1.85	0.48	3	Belgium	-67%	35%	2.85	0.55
4	Chile	-2%	45%	1.97	0.53	4	Canada	-21%	31%	2.61	0.43
5	China	-23%	1%	1.51	0.65	5	Croatia	-61%	18%	2.68	0.48
6	Colombia	9%	59%	0.81	0.62	6	Czech Republic	-52%	36%	2.26	0.55
7	Egypt,	-25%	4%	1.38	0.72	7	Denmark	-36%	60%	2.33	0.55
8	India	-1%	26%	1.76	0.48	8	Finland	-52%	14%	2.19	0.60
9	Indonesia	-5%	76%	1.72	0.59	9	France	-47%	31%	2.45	0.63
10	Jordan	3%	-15%	1.33	0.42	10	Germany	-47%	44%	2.20	0.59
11	Kenya	-36%	26%	1.61	0.46	11	Greece	-54%	-28%	2.06	0.98
12	Malaysia	-21%	41%	1.82	0.46	12	Hong Kong	-16%	27%	2.98	0.46
13	Mexico	-22%	50%	1.61	0.48	13	Hungary	-47%	50%	1.67	0.73
14	Morocco	4%	3%	0.99	0.81	14	Iceland	-94%	39%	5.50	0.17
15	Nigeria	-46%	-7%	1.40	0.85	15	Israel	-28%	46%	1.92	0.57
16	Pakistan	-48%	68%	1.22	0.64	16	Italy	-54%	15%	2.80	0.70
17	Peru	-42%	73%	1.71	0.47	17	Japan	-49%	3%	2.12	0.49
18	Philippines	-33%	59%	1.51	0.84	18	Netherlands	-50%	47%	2.48	0.60
19	Russian Fed	-43%	78%	1.84	0.47	19	New Zealand	-43%	11%	1.91	0.60
20	South Africa	-22%	46%	1.68	0.52	20	Norway	-49%	43%	2.02	0.51
21	Sri Lanka	-5%	212%	0.92	0.88	21	Poland	-53%	57%	1.53	0.66
22	Thailand	-23%	68%	1.45	0.66	22	Portugal	-50%	12%	2.76	0.75
23	Turkey	-22%	63%	1.44	0.62	23	Singapore	-33%	31%	2.22	0.46
24	Venezuela, RB	-19%	12%	0.59	0.54	24	Slovak Republic	-19%	-30%	1.33	1.29
						25	Spain	-33%	4%	2.59	0.82
						26	Sweden	-40%	43%	2.10	0.54
						27	Switzerland	-42%	21%	2.36	0.50
						28	United Kingdom	-36%	41%	2.75	0.53
						29	United States	-39%	43%	3.42	0.49
Average:		-17.2%	51.2%	1.46	0.73	*Average:*		-45.0%	27.7%	2.44	0.60
Std Deviation		20.9%	47.9%	0.36	0.63	*Std Deviation*		15.5%	21.8%	0.74	0.19
Minimum		-48.0%	-15.5%	0.59	0.42	*Minimum*		-94.0%	-30.2%	1.33	0.17
Maximum		42.9%	211.8%	1.97	3.62	*Maximum*		-15.6%	60.4%	5.50	1.29

Full Sample Summary Statistics

Average:	-32.4%	38.3%	2.00	0.66
Std Deviation	22.7%	37.6%	0.77	0.45
Minimum	-94.0%	-30.2%	0.59	0.17
Maximum	42.9%	211.8%	5.50	3.62

Source: Authors' calculations based on market data from the Data Stream International.

In his conceptual framework, Briguglio (2004) identifies four possible cases into which countries may be classified according to their vulnerability and resilience characteristics. He terms these as "*best-case*", "*worst-case*", "*self-made*", and "*prodigal son*".

- "Self-made" countries have a high degree of inherent economic vulnerability, but have adopted offsetting policies to build their economic resilience, thereby reducing the overall exposure to external shocks.
- Countries termed as "prodigal son" are characterized by a relatively low degree of inherent economic vulnerability, but have adopted policies that increase their exposure to exogenous shocks.
- The "best-case" scenario countries are not inherently highly vulnerable and adopt resilience-building policies as well.
- The "worst-case" is of the countries that are not only highly vulnerable and but also adopt policies that exacerbate the negative effects of their vulnerability

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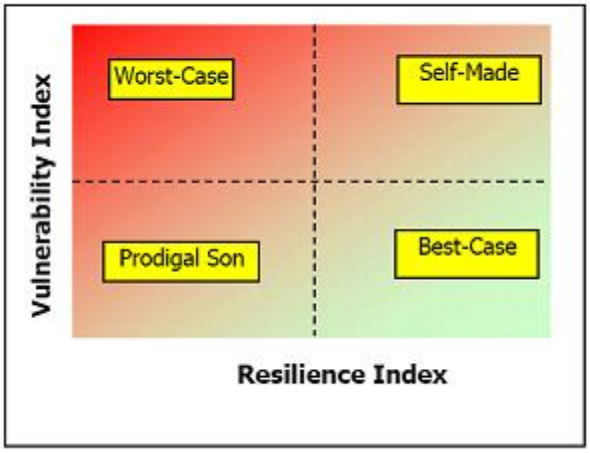
Figure 2



These four cases are illustrated in Figure 2, where the inherent economic vulnerability and nurtured resilience are measured on the vertical and horizontal axes, respectively. Briguglio et al. (2009) go on further to construct vulnerability and resilience indices for eighty seven countries, which we use in this study. The composition of these indices is explained in the next section.

III. Data and Methodology

Considering the time-line of the progression of the GFC, we mark the onset of the down turn in the stock markets as the first of July, 2007, and the beginning of the recovery as of July 1, 2009, when the recession was officially declared to have ended in the USA. We go back about two years to establish a base case. Therefore, our study spans a time period from July 1, 2005 to

March 4, 2011, subdivided into the following three sub-periods:

July 1, 2005 to June 30, 2007 – the *Base Period*, 520 trading days.

July 1, 2007 to June 30, 2009 – the *Crash Period*, 521 trading days.

July 1, 2009 to March 4, 2011 – the *Recovery Period*, 437 trading days.

The impact of the GFC is the dependent variable measured in its two dimensions. The first is the impact on the level of stock prices, measured as a percentage drop in the market indices from the beginning of the crash period to its end. And likewise, we measure the gain in the markets indices over the recovery period. The second dimension is the relative market volatility during one period relative to its observed level in the previous period. Thus relative volatility in the crash period is the ratio $\boldsymbol{\sigma_{i,\ \text{crash period}}}$ / $\boldsymbol{\sigma_{i,\ \text{base period}}}$, and $\boldsymbol{\sigma_{i,\ \text{recovery period}}}$ / $\boldsymbol{\sigma_{i,\ \text{crash period}}}$

for the recovery period where σ_i is the raw standard deviation of the first log differences of the ith stock market index. Market data was obtained from the DataStream International.

A list of the countries included in the sample in placed as Table 1, along with the observed changes in the market indices and relative volatility over the crash and recovery periods. Summary statistics are also placed at the bottom of the list. There are 24 emerging and 29 developed markets in the sample. The developed markets experienced an average decline of 45% compared to a 32% decline for the emerging markets over the crash period. Similarly, the developed markets' volatility was 2.44 times in the crash period relative to the base period, while the corresponding relative volatility of the emerging markets was 1.46 times. However, over the recovery period, the emerging markets' gains were higher (51%) compared to the developing markets' gains (28%).

Percent losses/gains and the relative volatility of individual market's returns over the crash and recovery periods are then further used in the cross-country regression on various measures of economic, financial market characteristics and governance indicators. We start with a broad set of theoretically feasible determinants (fifteen variables) and employ step-wise linear regression to narrow down to the most parsimonious models. Forward/backward selection criteria were used with a cut-off statistical significance level of 20%.

IV. Feasible Set of Determinants

A. Economic Vulnerability and Resilience Indices

As mentioned before Briguglio, Cordina, Farrugia, and Vella (2009), henceforth called the BCFV, developed the concept of economic vulnerability and resilience and constructed indices to represent the two constructs.

1. The BCFV *economic vulnerability index* is "based on the premise that a country's proneness to exogenous shocks stems from a number of inherent economic features, including high degrees of economic openness, export concentration and dependence on strategic imports." Economic openness is measured as the ratio of international trade to the GDP. Export concentration is measured by the UNCTAD index on merchandise trade. Dependence on strategic imports is measured as the ratio of the imports of energy, food or industrial supplies to GDP.

2. BCFV *economic resilience index* is based on the following variables:

- Macroeconomic stability constructed on the basis of three variables namely: (i) the fiscal deficit to GDP ratio, (ii) the sum of the unemployment and inflation rates, and (iii) the external debt to GDP ratio.
- Microeconomic market efficiency based on the indicators reflecting (i) the size of government, and (ii) the freedom to trade internationally.
- Good governance as indicated by the Economic Freedom of the World Index has a component which reflects legal structure and security of property rights. The Index is based on the following indicators: (i) judicial independence, (ii) impartiality of courts, (iii) the protection

of intellectual property rights, (iv) military interference in the rule of law; and (v) political system and the integrity of the legal system.

- Social development index utilizes the education and health indicators used to construct the Human Development Index of the UNDP.

B. Economic and Financial Market Indicators

We include the following indicators characterizing the economy and financial markets as theoretically feasible determinants of the vulnerability and resilience of the stock markets to the global financial crisis. These indicators, except for the last one, were extracted from the World Bank's online databank of World Development Indicators (WDI) and Global Development Finance (GDF).[1]

1. Financing via international capital markets (gross inflows, % of GDP), "INT-FINANCING". Accessing capital through international capital markets may render a country vulnerable to sudden stoppage of capital inflows. But it could also be a factor in reviving the capital markets through inbound international capital flows.

2. Market capitalization of listed companies (% of GDP), "MARKET-CAP." Market capitalization reflects not only the size of the markets, but also the maturity and depth of the markets. It may also indicate the extent to which complex financial products are available.

3. Stocks traded, total value (% of GDP), "STOCK-TRADING." The relative volume of stocks traded would indicate the role of the stock market in the economy.

4. Stocks traded, turnover ratio (%), "TURN-OVER." The ratio of total volume to the market capitalization indicates an active and liquid market, and a capacity to absorb adverse shocks. However, excessive turnover might also indicate a speculative market.

5. GDP (constant 2000 US$). A larger economy is likely to have greater capacity to absorb shocks in one sector of the economy. We use the natural log of the GDP as an explanatory variable, LnGDP.

6. Natural log of GDP per capita (constant 2000 US$) is used as "LnPerCAPITA. It would indicate the degree of economic development, and also be a proxy for concomitant developed institutional capacity for making and executing appropriate policies for absorbing and taking offsetting measures.

7. Systematic Risk (BetaWRLD). Each market's systematic risk factor is measured over the base period with respect to the Morgan Stanley Capital International World Index using the single factor model: $R_{i,t} = \alpha_i + \beta_i R_{W,t} + \varepsilon_{i,t}$, where R_i and R_w are respectively the first log differences of market index for country i and MSCI-World index, using daily observations. The

[1] http://databank.worldbank.org/ddp/home.do

β_i should indicate the sensitivity of the country i's stock market to the overall world index representing a global market place.

C. Governance Indicators

In order to capture the governance environment in different countries we use aggregate governance indicators for the year 2007 developed at the World Bank. A detailed discussion can be found in Kaufmann, Kraay, and Mastruzzi (2004). The six indicators are as follows:
1. *Voice and Accountability*, the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and free media.

2. *Political Stability and Absence of Violence*, the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including political violence and terrorism.

3. *Government Effectiveness*, the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

4. *Regulatory Quality*, the ability of the government to formulate and implement sound policies and regulations which permit and promote private sector development.

5. *Rule of Law*, the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence.

6. *Control of Corruption*, the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

We hypothesize that the increase in the cross-country market volatility in the wake of the GFC is negatively related to the effectiveness of regulation and the quality of governance environment. Effective governance mechanism and financial regulations in a country are likely to lessen the initial impact of the GFC. Effective governance environment should also help in managing an effective response in terms of monetary and fiscal policies, leading to a quicker economic recovery and subsiding of the market volatility.

V. Results and Discussion

The results of the empirical estimation are reported in Table 2; Panels A and B report results for the crash period and the recovery period respectively. Each panel is sub-divided into two sections for the two regression models; in section (i) decline/increase in the market indices is the dependent variable, in section (ii) relative increase/decline in the volatility is the dependent variables. Discussion of the results follows.

A. Crash Period Results (Table 2 - Panel A)

In section (i) the dependent variable is the percent change in the markets indices over the period, the step-wise regression results in the selection of five explanatory variables, TURNOVER, CONTROL-OF-CORRUPTION, POLITICAL-STABILILTY, LnGDP and LnPerCAPITA. All of these are significant at 5% or better level, except for POLITICAL-STABILILTY with a *p-value* of 8.8%. Its coefficient also has an unexpected negative sign, implying that countries with higher scores on this indicator suffered relatively greater decline in their markets. The negative sign could be driven by the indicator's positive correlation with the level of development. This observation is supported by the significant and negative coefficient of the LnPerCapita variable. It reflects the fact that the Global Financial Crisis of 2007-09 originated in the sub-prime real estate sector in the US and had an immediate impact on the most developed economies. As to the size of the economy, however, the positive sign of the LnGDP indicates that for smaller economies the negative economic impact has been larger than for the developed economies. Positive coefficient of the CONTROL-OF-CORRUPTION indicator is as expected since better governance should be associated with a lower decline in the stock markets. The coefficient on the TURNOVER variable is negative, meaning that markets with higher turnovers experienced a greater drop in their markets indices. The market turnover could be reflecting an element of speculation preceding the GFC, which was followed by a bubble burst triggered by the down-turn in the sub-prime real estate market.

In the second section of Panel A, results are presented for the regression model when the dependent variable is the relative market volatility. The selected model consists of four independent variables, RESILIENCE, STOCK TRADED, CONTROL-OF-CORRUPTION and ACCOUNTABILTY. The coefficient of CONTROL-OF-CORRUPTION has the expected sign, but is not significant at the conventional levels. However, ACCOUNTABILTY and the RESILIENCE indices are significant but of unexpected positive signs, implying that countries scoring higher on these indicators experienced a relatively higher levels of volatility. The positive sign on the STOCK TRADED indicates that more active, and probably speculative markets, also experienced relatively higher levels of volatility following the financial shocks.

B. The Recovery Period Results (Table 2 – Panel B)

Section (i) of Panel B of Table 2 reports results for the model where percent change in the markets over the recovery period is the dependent variable. Five variables are included in the final set, RESILIENCE, VULNERABILITY, POLITICAL-STABILITY, BETA-WRLD, and LnGDP, which are all statistically significant at 5% or better level. RESILIENCE and BETAWRLD are of the expected sign, indicating that countries scoring high on these indicators experienced a sharper recovery in their stock markets. The VULNERABILITY index has a negative sign as expected. However, POLITICAL-STABILITY has an unexpected negative sign. LnGDP's negative sign indicates that markets in larger economies gained relatively less than the markets in the smaller economies.

TABLE 2: RESULTS OF STEPWISE REGRESSIONS

PENAL A: CRASH PERIOD

Section (i)	**DEPENDENT VARIABLE: % CHANGE IN INDICES**		
Regression F(5,47)	7.3698	Adj. R Squared	0.3798
Significance Level of F	0.0000	Durbin-Watson	1.8716
Variable	Coefficient	T-Statistics	Significance
1. Constant	-0.8242	-1.5631	0.1247
2. TURNOVER	-0.1673	-3.0550	0.0037
3. CONTROL_OF_CORRUPTION	0.1356	2.3442	0.0233
4. POLITICAL_STABILITY	-0.0905	-1.7410	0.0882
5. LNGDP	0.0640	2.7777	0.0078
6. LNPCAPITA	-0.1261	-2.6542	0.0108

Section (ii)	**DEPENDENT VARIABLE: RELATIVE VOLATILITY**		
Regression F(4,48)	14.4266	Adj. R Squared	0.5081
Significance Level of F	0.0000	Durbin-Watson	1.9390
Variable	Coefficient	T-Statistics	Significance
1. Constant	0.8263	2.6511	0.0108
2. RESILIENCE	1.7892	2.3810	0.0213
3. STOCKS TRADED	0.3498	2.6253	0.0116
4. CONTROL_OF_CORRUPTION	-0.2573	-1.3149	0.1948
5. VOICE_AND_ACCOUNTABILITY		0.3526	2.4350
0.0187			

PANEL B: RECOVERY PERIOD

Section (i)	**DEPENDENT VARIABLE % CHANGE IN INDICES**		
Regression F(5,47)	4.8382	Adj. R Squared	0.2696
Significance Level of F	0.0012	Durbin-Watson	2.3158
Variable	Coefficient	T-Statistics	Significance
1. Constant	3.6132	2.9988	0.0043
2. RESILIENCE	1.1932	2.9124	0.0055
3. VULNERABILITY	-0.7913	-2.5997	0.0124
4. POLITICAL_STABILITY	-0.3485	-3.9675	0.0002
5. BETAWRLD	0.2560	2.1730	0.0349
6. LNGDP	-0.1437	-3.0246	0.0040

Section (ii)	**DEPENDENT VARIABLE RELATIVE VOLATILITY**		
Regression F(2,50)	6.1512	Adj. R Squared	0.1654
Significance Level of F	0.0041	Durbin-Watson	1.9036
Variable	Coefficient	T-Statistics	Significance
1. Constant	2.1593	4.9795	0.0000
2. INT-FINANACING	-6.5621	-2.1683	0.0349
3. LNPCAPITA	-0.1597	-3.4568	0.0011

In Panel B, section (ii) reports results for regressions where the dependent variable is the relative market volatility. Two variables are selected by the step-wise procedure, INT-FINACING and LnPerCAPITA, both with negative coefficients. The international financing variable captures the extent to which countries were financing via international capital markets (as a % of GDP). It reflects the ability of the countries to attract international capital and, hence, it is expected to lead to calmer markets with lower volatility. The LnPerCAPITA's negative coefficient implies that more developed economies experienced relatively greater decreases in the market volatility.

EXHIBIT 1: SUMMARY OF SIGNIFICANCE AND SIGNS OF COEFFICIENTS

#	Determinant	Crash Period				Recovery Period			
		%Δ Index		Relative Volatility		%Δ Index		Relative Volatility	
		Signifi-cance	Coeff Sign	Signifi-cance	Coeff Sign	Signifi-cance	Coeff Sign	Signifi-cance	Coeff Sign
1	Vulnerability Index					**	-		
2	Resilience Index			**	+ ?	***	+		
3	International Financing							**	-
4	Market capitalization								
5	Stocks Traded			**	+				
6	Turnover Ratio	***	-						
7	ln(GDP)	***	+			***	-		
8	ln(per capita GDP)	**	-					***	-
9	BetaWRLD					**	+		
10	Accountability			**	+ ?				
11	Political Stability	*	- ?			***	- ?		
12	Govt. Effectiveness								
13	Regulatory quality								
14	Rule of law								
15	Control of corruption	**	+	~	-				

Exhibit 1 provides a summary of the statistical significance and signs of the feasible determinants tested in this empirical exercise. It shows that the vulnerability index is significant in explaining change in volatility in the recovery period. The resilience index is significant but of unexpected sign in explaining change in volatility in the crash period. However, it is significant and of the expected sign in the market recovery. The indicators of market characteristics, economy size and economic development do a better job in both periods. Among the governance indicators "Political Stability" and "Accountability" yield unexpected signs; the "Control of Corruption" variable, however, is significant and of the expected sign.

The country differences in the level of development proxied by the per capita income seem to be explaining the variations in the impact on stock market indexes and the volatility in the crash period as well as in the market gains and subsiding of volatility in the recovery period. The shifting signs of the different governance indicators and the Resilience index point out to the problem of multi-collinearity in the explanatory variables, since the governance indexes are

highly correlated within the group and with the LnPerCapita variable. The Resilience index is also highly correlated with the lnPerCapita.

It is evident from the step-wise regression procedure that four different sets of determinants are needed to explain the drop in the market indices and increase in volatility in the crash period and gains in the indices and decline in volatility in the recovery period. It seems logical that one set of circumstances determined the impact of the GFC, and a different set influenced the economic recovery from the shock.

In order to see if one set of explanatory variables can explain the GFC impact in both the crash and the recovery period we employ all the variables identified by the step-wise regression procedure in a series of OLS models as follows. First, we replace the LnPerCapita variable with a dummy variable which takes a value of zero for the emerging markets and of one for the developed markets. Second, in order to reduce the number of explanatory variables and to mitigate the multi-collinearity problem we extract the first principal component (GOVERNANCE-PC) from the six governance indicators; it explains 90% of the variance proportion. Third, we start with a basic model with six independent variables, and then expand the model by including GOVERNANCE-PC, RESILIENCE AND VULNAERABILITY variables, thus forming four models as shown Exhibit 2. We run the four comparative models for both the crash period and the recovery period for the two dependent variables: %change in the market index and relative volatility. The results are presented in Tables 3 and 4.

EXHIBIT 2: COMPARATIVE MODELS

Independent Variable	*Model 1*	*Model 2*	*Model 3*	*Model 4*
TURNOVER	✓	✓	✓	✓
LNGDP	✓	✓	✓	✓
DEVELOPED MKT (Dummy)	✓	✓	✓	✓
STOCKS TRADED	✓	✓	✓	✓
BETAWRLD	✓	✓	✓	✓
INT-FINANACING	✓	✓	✓	✓
GOVERNANCE-PC		✓		✓
RESILIENCE			✓	✓
VULNERABILITY			✓	✓

In Table 3 results for the crash period regressions for the four models are presented. In Panel A the dependent variable is the percent change in the market indices. Out of the four models, model #1, the most parsimonious, should be selected on the basis of the Akaike Information Criteria and the Bayes-Schwartz Criteria. Inclusion of Governance variable or the Resilience and Vulnerability indexes in the extended models does not improve the explanatory power; coefficients on these variables are insignificant as well. The most important factors appear to be the dummy variable for the developed markets, and the "Stocks Traded" variable. Panel B of Table 3 shows the results when the dependent variable is the relative volatility over the crash period. Here too the most parsimonious model #1 appears to be the best explanatory set of variables, which does not include Governance, Resilience or Vulnerability indices.

In Table 4 we present results for the recovery period; panel A and B show results for the four models when the dependent variable is the change in the indices and the relative volatility. Notably none of the model is statistically significant as a whole as indicated by the F-statistics. There is some indication that the larger and developed economies, as indicated by the negative signs of the coefficients of LnGDP and the dummy for developed market in Model 3, experienced weaker recoveries in their market indices. However, as far the relative volatility in the recovery period is concerned none of the variable seems to have much explanatory power

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VI. Conclusions

The study aimed at empirically identifying economic, financial and regulatory determinants which may explain the experience of different countries as to the initial impact of the GFC, and their recovery in terms of changes in market indices and market volatility.
Results of the step-wise regressions used to identify the determinant suggests that a different set of variables best explains the experience of different markets in each of the four cases: (i) decline in the market indices in the crash period (ii) increase in the market volatility in the crash period (iii) gain in the market indices in the recovery period and (iv) subsiding of volatility in the recovery period. This finding reflects the fact that the global financial crisis arose due to unique combination of institutional and economic factors and also impacted the economies across the globe through distinct channels and linkages. In the recovery period countries adopted various different measures to deal with the adverse impact of the GFC.

The results suggest that the developed countries (as indicated by the per capital income or a dummy variable) experienced a sharper decline in their stock markets and higher relative volatility following the onset of the GFC compared to the emerging markets. The developed markets also experienced a flatter recovery in the stock markets. It seems that the emerging markets fared better on the down-side as well as the up-side over the course of the GFC. There is also some evidence that the extent of stock trading prior to the on-set of GFC is associated with sharper fall in the markets. The extent of reliance on the international capital inflows seems to also lead to steeper drops in the market indices resulting from the GFC.

In examining comparative models with and without the resilience, vulnerability indices constructed by Briguglio at el (BCFV, 2009) and the governance indicators developed at the World Bank, it appears that these do not provide additional explanatory power beyond the level of economic development and the degree of speculation prior to the crash. The results of the study underscore the need to develop reliable predictors of the financial vulnerability and resilience to external shocks. The need for such indicators cannot be overemphasized in the age of a globally integrated financial and economic systems for assessing and managing systemic risk to financial systems arising through external shocks.

TABLE 3: RESULTS OF OLS - CRASH PERIOD

PANEL A: DEPENDENT VARIABLE: PERCENT CHANGE IN INDICES

Independent	*Model 1 1*				*Model 2 2*				*Model 3*				*Model 4*			
Variable	**Coef.**	**t-Stat.**		**Prob.**	**Coef.**	**t-Stat.**		**Prob.**	**Coef.**	**t-Stat.**		**Prob.**	**Coef.**	**t-Stat.**		**Prob.**
Constant	-0.9711	-1.7452	*	0.0876	-0.9850	-1.7712	*	0.0833	-0.7738	-1.0873		0.2828	-1.0153	-1.4012		0.1683
TURNOVER	-0.1282	-2.1601	**	0.0360	-0.1177	-1.9555	*	0.0568	-0.1291	-1.9523	*	0.0573	-0.1462	-2.1974	**	0.0334
LNGDP	0.0365	1.6028		0.1158	0.0401	1.7418	*	0.0884	0.0297	1.0744		0.2885	0.0480	1.5836		0.1206
DEVELOPED MKT	-0.3611	-4.9202	***	0.0000	-0.4565	-3.8946	***	0.0003	-0.3623	-3.6163	***	0.0008	-0.4559	-3.8177	***	0.0004
STOCKS TRADED	0.0492	1.0893		0.2817	0.0260	0.5161		0.6083	0.0529	0.9931		0.3261	0.0405	0.7569		0.4533
BETAWRLD	-0.0033	-0.0515		0.9592	-0.0225	-0.3350		0.7392	-0.0110	-0.1624		0.8717	-0.0399	-0.5675		0.5734
INT-FINANACING	-3.0341	-1.8599	*	0.0693	-3.2844	-1.9938	*	0.0523	-3.0222	-1.8002	*	0.0787	-3.2112	-1.9274	*	0.0605
GOVERNANCE-PC					0.0253	1.0430		0.3025					0.0511	1.4047		0.1673
RESILIENCE									0.0152	0.0741		0.9413	-0.2972	-0.9878		0.3288
VULNERABILITY									-0.0768	-0.4609		0.6472	-0.0088	-0.0515		0.9592
Regression Statistics																
Adjusted R-squared	0.4071				0.4083	max			0.3832				0.3965			
Durbin-Watson	2.3787				2.2993				2.3973				2.2784			
Akaike Info Criterion	-0.5257	min			-0.5118				-0.4550				-0.4622			
Schwarz criterion	-0.2655	min			-0.2144				-0.1205				-0.0904			
F-statistic	6.9519	max	***	0.0000	6.1256		***	0.0000	5.0379		***	0.0002	4.7964		***	0.0002

PANEL B: DEPENDENT VARIABLE: RELATIVE VOLATILITY

Independent	*Model 1 1*				*Model 2 2*				*Model 3*				*Model 4*			
Variable	**Coef.**	**t-Stat.**		**Prob.**	**Coef.**	**t-Stat.**		**Prob.**	**Coef.**	**t-Stat.**		**Prob.**	**Coef.**	**t-Stat.**		**Prob.**
Constant	1.9480	1.0765		0.2873	1.9056	1.0523		0.2983	2.7720	1.2296		0.2254	2.9383	1.2529		0.2170
TURNOVER	-0.0960	-0.4972		0.6214	-0.0636	-0.3247		0.7469	0.0293	0.1400		0.8893	0.0411	0.1908		0.8496
LNGDP	-0.0287	-0.3872		0.7004	-0.0177	-0.2366		0.8140	-0.0690	-0.7866		0.4357	-0.0815	-0.8313		0.4104
DEVELOPED MKT	0.9317	3.9036	***	0.0003	0.6398	1.6764		0.1006	0.6056	1.9080	*	0.0629	0.6700	1.7335	*	0.0902
STOCKS TRADED	0.4093	2.7855	***	0.0077	0.3382	2.0629	**	0.0449	0.2986	1.7685	*	0.0839	0.3071	1.7754	*	0.0829
BETAWRLD	-0.0311	-0.1482		0.8828	-0.0898	-0.4107		0.6832	-0.0685	-0.3176		0.7523	-0.0486	-0.2134		0.8320
INT-FINANACING	6.3175	1.1909		0.2398	5.5516	1.0349		0.3062	5.2856	0.9938		0.3258	5.4156	1.0044		0.3208
GOVERNANCE-PC					0.0773	0.9800		0.3323					-0.0352	-0.2986		0.7667
RESILIENCE									1.0309	1.5884		0.1193	1.2458	1.2795		0.2076
VULNERABILITY									-0.2711	-0.5137		0.6100	-0.3179	-0.5719		0.5704
Regression Statistics																
Adjusted R-squared	0.4514				0.4510				0.4583	max			0.4469			
Durbin-Watson	2.0663				1.9832				1.9283				1.9364			
Akaike Info Criterion	1.8328	min			1.8494				1.8511				1.8868			
Schwarz criterion	2.0930	min			2.1468				2.1857				2.2586			
F-statistic	8.1323	max	***	0.0000	7.1018		***	0.0000	6.5001		***	0.0000	5.6681		***	0.0000

TABLE 4: RESULTS OF OLS - RECOVERY PERIOD

PANEL A: DEPENDENT VARIABLE: PERCENT CHANGE IN INDICES

Independent	*Model 1*			*Model 2*			*Model 3*			*Model 4*		
Variable	**Coef.**	**t-Stat.**	**Prob.**	**Coef.**	**t-Stat.**	**Prob.**	**Coef.**	**t-Stat.**	**Prob.**	**Coef.**	**t-Stat.**	**Prob.**
Constant	1.6369	1.4102	0.1652	1.6237	1.3866	0.1724	2.9973	2.1056 **	0.0410	3.3988	2.3285 **	0.0247
TURNOVER	0.0652	0.5268	0.6009	0.0753	0.5940	0.5555	0.1317	0.9958	0.3248	0.1601	1.1947	0.2387
LNGDP	-0.0500	-1.0518	0.2984	-0.0466	-0.9612	0.3416	-0.1033	-1.8657 *	0.0688	-0.1337	-2.1891 **	0.0341
DEVELOPED MKT	-0.2506	-1.6366	0.1085	-0.3411	-1.3818	0.1738	-0.4394	-2.1928 **	0.0337	-0.2838	-1.1799	0.2445
STOCKS TRADED	-0.0530	-0.5618	0.5770	-0.0750	-0.7076	0.4829	-0.0984	-0.9230	0.3610	-0.0777	-0.7213	0.4747
BETAWRLD	0.2268	1.6828 *	0.0992	0.2086	1.4761	0.1469	0.1707	1.2544	0.2163	0.2187	1.5430	0.1302
INT-FINANACING	-0.2563	-0.0753	0.9403	-0.4938	-0.1424	0.8874	-0.7828	-0.2331	0.8167	-0.4688	-0.1397	0.8895
GOVERNANCE-PC				0.0240	0.4700	0.6406				-0.0850	-1.1591	0.2528
RESILIENCE							0.6489	1.5835	0.1205	1.1681	1.9275 *	0.0605
VULNERABILITY							-0.5014	-1.5046	0.1396	-0.6143	-1.7758 *	0.0828
Regression Statistics												
Adjusted R-squared	0.0553			0.0390			0.0962			0.1032	max	
Durbin-Watson	2.3614			2.3547			2.4110			2.4201		
Akaike info criterion	0.9447			0.9776			0.9314	min		0.9384		
Schwarz criterion	1.2050	Min		1.2750			1.2660			1.3102		
F-statistic	1.5072		0.1971	1.3016		0.2716	1.6922	max	0.1273	1.6652		0.1275

PANEL B: DEPENDENT VARIABLE: RELATIVE VOLATILITY

Independent	*Model 1*			*Model 2*			*Model 3*			Model 4		
Variable	**Coef.**	**t-Stat.**	**Prob.**	**Coef.**	**t-Stat.**	**Prob.**	**Coef.**	**t-Stat.**	**Prob.**	**Coef.**	**t-Stat.**	**Prob.**
Constant	0.3299	0.2352	0.8151	0.3760	0.2708	0.7878	0.7173	0.4120	0.6823	0.9163	0.5067	0.6150
TURNOVER	0.0278	0.1858	0.8535	-0.0075	-0.0497	0.9606	-0.0806	-0.4980	0.6210	-0.0665	-0.4004	0.6908
LNGDP	0.0264	0.4609	0.6470	0.0145	0.2529	0.8015	0.0232	0.3428	0.7334	0.0082	0.1082	0.9144
DEVELOPED MKT	-0.1252	-0.6768	0.5019	0.1928	0.6586	0.5135	0.1379	0.5627	0.5765	0.2150	0.7215	0.4745
STOCKS TRADED	-0.1594	-1.4002	0.1681	-0.0820	-0.6520	0.5177	-0.0478	-0.3669	0.7155	-0.0376	-0.2816	0.7796
BETAWRLD	-0.1815	-1.1149	0.2707	-0.1177	-0.7021	0.4862	-0.1925	-1.1564	0.2538	-0.1687	-0.9605	0.3422
INT-FINANACING	-4.2746	-1.0399	0.3038	-3.4401	-0.8364	0.4074	-3.3573	-0.8174	0.4181	-3.2017	-0.7700	0.4455
GOVERNANCE-PC				-0.0842	-1.3924	0.1706				-0.0421	-0.4636	0.6453
RESILIENCE							-0.7700	-1.5363	0.1316	-0.5127	-0.6828	0.4984
VULNERABILITY							-0.1916	-0.4701	0.6406	-0.2475	-0.5776	0.5666
Regression Statistics												
Adjusted R-squared	0.0276			0.0470	max		0.0464			0.0291		
Durbin-Watson	1.9952			1.9821			1.9530			1.9519		
Akaike info criterion	1.3227			1.3183	min		1.3342			1.3670		
Schwarz criterion	1.5830	Min		1.6157			1.6688			1.7387		
F-statistic	1.2460		0.3010	1.3667	max	0.2427	1.3163		0.2607	1.1730		0.3361

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