Journal of Applied Finance & Banking, vol. 7, no. 5, 2017, 75-101
ISSN: 1792-6580 (print version), 1792-6599 (online)
Scienpress Ltd, 2017

Analysis of the Effects of the US Stock Market Returns and Exchange Rate Changes on Emerging Market Economies' Stock Market Volatilities

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Abstract

In this paper, the effects of the US stock market returns, exchange rate changes and volatilities on stock market volatilities in 10 emerging market economies between 2000-2013 (also two sub-periods covering the time between 2000-2007, and between 2008-2013) have been analysed with separate 30 VAR models. According to the analysis, the fact that the US stock market returns cause stock market volatilities is revealed to be the most prominent result in the whole period. In the 2000-2013 period and the 2008-2013 interval, covering the term following the Global Financial Crisis of 2008, there was a remarkable increase in causality.

JEL classification numbers: G15, F37, F31, C58
Keywords: Stock market volatilities, exchange rates, financial markets, Granger Causality/Block Exogeneity Wald Test, variance decomposition analysis

1 Introduction

Given the historical development of human kind, agriculture had long been the main means of livelihood since the first permanent settlement. With industrialisation, increasingly populated cities were founded, and countries where production had drastically increased started to seek new markets where they could sell their products and services, and subsequently reduce production costs. As a result of this pursuit, many empires, notably Spain, Portugal, the Netherlands and United Kingdom (UK) were established. These countries not only expanded their borders, but also increased their trade volume.

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Article Info: *Received :* June 4, 2017. *Revised :* July 2, 2017.
Published online : September 1, 2017

Among these countries, UK had long kept its place as the strongest empire in this historical process. According to Roberts (2008) economic factors, in addition to political reasons, contributed crucially to this situation, and financial markets which were formed under this economic power played an important role from the 16th to the early 20th century.

All European countries, even triumphant ones such as UK and France, suffered huge losses after World War I. Even if industrial revolution had been revealed, the world order depended to a large extent on labour-intensive manufacturing and such a huge global casualty posed an important problem in terms of production. War loans, along with post-war expenditures caused unease all over Europe. Furthermore, states such as France and UK were dragged into an inflationary environment, since countries such as Germany and Turkey which had been defeated had difficulty in paying war indemnities.

During this era, thanks to its geographical location the USA was able to resist the effects of the war, provided many countries with loans, reinforced its financial market and developed its industry. Thus the USA became the most powerful economy in global markets until the Great Depression of 1929.

After the Great Depression, countries whose economies led global markets started to rearm, and once again war conditions were met. The USA ended World War II as the strongest country and has retained its power up until the present.

In more recent times, developments in information and communication technologies, foundation of global economic structures such as EU, and the rise of Asian countries, notably Japan, South Korea and China have contributed largely to an articulated world economy. This articulation has crossed the boundaries of advanced economies, and emerging market economies have also become a crucial part of the system. As a consequence, global markets, which were founded by advanced economies, have been reshaped in a modern fashion as emerging market economies became integrated into the system. Academicians such as Hamao et al. (1990), Nasseh and Strauss (2000), Chaudhuri and Smiles (2004), and Kurihara (2006) analyse this development and conclude in their papers that both positive and negative developments in global markets can be observed in many countries. Lee (2013) conducts his work on stock market volatilities and studies its global and regional spillover effects. In the study, Lee demonstrates how market volatilities in developed countries affect other integrated countries, citing Taiwan, Japan and the USA as examples. The results of the work form the basis for analysing how the strongest link in the system, the USA, affects other countries.

As they made necessary adjustments to be integrated into the system, emerging market economies experienced economic and financial crises during 1990's and early 2000's; hence, their economies had fragile structures. Along with domestic dynamics, the overall situation of global markets had significantly contributed to the crises.

In the period between 2001 and 2003, central banks of developed countries reduced interest rates taking different factors such as the decrease in share market prices and revitalisation of real sector into consideration. Thus, the US housing market investments experienced a fast rise, and some global investors turned towards relatively risky, but lucrative markets, notably after 2003 because of high liquidity. Taylor (2009) argues that this situation had brought about a global-scale excess, and that it had not been reinforced by sufficient financial adjustments and regulations.

The liquidity excess lasted until the Global Financial Crisis of 2008 and the process affected the macroeconomic parameters of many advanced and emerging market economies in global markets positively. According to Aiginger (2011), this process stepped up the integration of many emerging market economies which aimed at stable economic growth.

The crisis which occurred in late 2007 in the US mortgage market turned into a global financial crisis in 2008, and influenced global financial markets along with many advanced and emerging market economies which were integrated into the system. The crisis had negative effects on a large number of macroeconomic parameters, most remarkably stock markets.

Considering the fact that the crisis affected so many economies so fast, many academicians compared the crisis to the Great Depression of 1929 in their studies. However, by late 2010 countries entered an overall recovery period due to the implementation of strict macroeconomic policies.

The rise in the number of system-integrated economies also led to the idea that the developments in the US economy, which ranked as the strongest economy during the Global Financial Crisis of 2008 would affect more countries. The main target of this research is to reveal how exchange rate changes, their volatilities, and the US stock market returns affect stock market volatilities which are one of the principal parameters in ten emerging market economies which are integrated into global markets.

The second part of the study touches upon an overview of the basic literature related to stock market returns and their volatilities, exchange rates and their volatilities. In the third part, an empirical research is provided to demonstrate the effects of exchange rate changes, their volatilities and the US stock market returns in terms of stock market volatility in several important emerging market economies forming global markets.

2 Related Literature

Mandelbrot (1963) focuses on volatility clustering and suggests that high positive returns tend to be followed by high negative returns, and that low positive returns tend to be followed by low negative returns. Following Mandelbrot's research, many academic studies modelling stock market volatilities, have been published as these volatilities are one of the most important parameters related to the capital markets. Academicians, notably Black (1976), Christie (1982), Nelson (1990) and Schwert (1990) have presented such volatility models.

On the basis of volatility models which demonstrate symmetric effects, Bekaert and Wu (2000) include the effects of capital market volatilities and interest rates in terms of stock market volatilities in their evaluation. Awartani and Corradi (2005) forecast S&P 500 index volatility employing the GARCH model and asymmetric GARCH models.

While Franck and Young (1972) identify no relationship between different exchange rates and share prices, Aggarwal (1981) suggests a strong positive relationship between the US stock market and the US dollar rates. Employing similar methods, Muhammad and Rasheed (2002) analyse four Asian countries, Nieh and Lee (2001) analyse G-7 countries, Morales (2009) analyses seven different countries (4 transition economies and 3 advanced economies), and they note no long-term relationship between these variables. Ajayi et al. (1998) and Stavarek (2004) study the relationship between exchange rates and stock market returns in fifteen different countries and eight EU economies respectively (four advanced and four emerging market economies), and suggest stronger causality in advanced economies.

Fama and French (1989), Ferson and Harvey (1991), Black et al. (1997) analyse the relationship between stock market returns and macroeconomic variables such as inflation and interest rates. Chen et al. (1986) argue that macroeconomic variables play an important

role in shaping stock market prices in finance theory.

Sims (1980) ignores the distinction between exogenous and endogenous variables and presents the vector autoregression (VAR) model. Lee (1992) analyses the relationship between macroeconomic variables such as stock market returns, interest rates and inflation. The study referred to constitutes an important example of the application of the model.

Bloom (2009) examines the volatility created by unexpected investment shocks. The study has an important place in measuring the potential of external factors in causing and affecting volatilities.

Caldara et al. (2012) analyse volatility risk on the basis of asset pricing models. French et al. (1987) study the relationship between stock market returns and volatilities. Furthermore, researchers present the relationship employing linear models between market returns and standard deviations, and demonstrate a negative relationship between stock market returns and unexpected volatilities.

Schwert (1990) analyses the relationship between stock market volatilities and real and nominal macroeconomic variables. With reference to the research of Schwert (1990), Beltratti and Morana (2006) study stock market volatilities and macroeconomic variable volatilities using macroeconomic variables and S&P 500 Index between 1970 and 2001. Zhao (2009) examines the relationship between exchange rates and the stock market in the Chinese economy, taking related variable volatilities into consideration, and notes no relationship between the variables. Bansal et al. (2014) analyse the relationship between macroeconomic variables. In the study, researchers set VAR models and include volatilities. Ewing et al. (2003), applying impulse response functions, argue that stock market returns react to macroeconomic shocks.

Hamao et al. (1990) analyse the volatility effect and the relationship between three stock markets which play active roles in global markets: New York (USA), London (UK) and Tokyo (Japan). The results suggest that the price volatilities in the New York stock market affect the stock markets in London and Tokyo (spillover effect), and that the price volatilities in the London stock market affect the Tokyo stock exchange. The analysis has an important place in demonstrating how certain fluctuations in capital markets in developed countries interact and affect one another. Chaudhuri and Smiles (2004), and Kurihara (2006) published similar papers on Australia and Japan respectively. While Chaudhuri and Smiles (2004) suggest that the Australian stock market is affected by the fluctuations in the US and the New Zealand stock markets, the latter argues that the Tokyo stock exchange is affected by the fluctuations in the US stock market and exchange rates. Schwert (2011) suggests that the stock market volatilities in the USA, UK and Japan increase and react in a similar manner during wars and crises between 1800 and 2010. Srinivasan and Kalaivani (2013) examine the relationship between nine Asian economies, along with the influence of the US and the British stock markets on these countries. The results point to the interaction between stock markets along with the influence of the USA and UK. Lee (2013) studies the spillover effect of the US stock market volatilities on Asian markets, and concludes that the US stock market affects stock market volatilities in Taiwan. Kayral and Karacaer (2017) examine causalities between US stock market and G7 countries' markets. In this research, they find that US stock market returns affects G7 economies' stock exchange volatilities. The results and findings are of high importance, since they suggest that the strongest link, the USA, can influence other economies, and that stock markets and stock market volatilities in the countries which are integrated into global markets, interact and influence each other during the term analysed.

3 Empirical Research

The purpose of the research is to present the effects of exchange rate changes, their volatilities, and the returns of the US stock market which is deemed the strongest economy in global markets, on stock market volatilities in ten emerging market economies.

3.1 Variables

The Global Financial Crisis of 2008, which originated in the USA in 2008, influenced numerous advanced and emerging market economies which are integrated into global markets. Data pertaining to 10 emerging market economies (except USA) which preserve their global importance before and after the crisis were included in the study. The economies which are included in the study are listed in Table 1.

Table 1: List of Economies

Argentina	Brazil	China	India	Israel
Malaysia	Poland	Russia	S.Africa	Turkey

global markets due to their fast paced development, along with Turkey, Poland, Israel, South Africa and Malaysia which are integrated into the system and which attract foreign investors due to high economic growth.

Table 2: List of Stock Markets

Argentina - MERVAL	Israel - TELAVIV	Russia - MICEX
Brazil - BOVESPA	Malaysia - KUALA LUMPUR	S.Africa - JOHANNESBURG
China - SHANGHAI	Poland - WARSAW	Turkey - BORSA ISTANBUL
India - BOMBAY		

The stock market (as shown in Table 2) volatilities of stock market returns pertaining to the economies listed in Table 1 are referred to as dependent variables in the models. Exchange rate (to the US dollars) changes, their volatilities and the influence of the stock market returns of the USA (which is deemed the strongest economy amongst global markets) on these variables are analysed using dynamic models.

From this point of view, we pool together relevant monthly data pertaining to these variables from the 2000-2013 period. In order to compare the pre-crisis era to the post-crisis, the period is divided into two sub-periods covering the terms between 2000-2007, and between 2008 - 2013. All stock market and exchange rate data have been retrieved from the Data Stream database, and the websites of relevant stock markets and central banks.

3.2 Methodology

Before presenting the results concerning the models which are used within the scope of the analysis, an outline of the methodology is provided. Sims (1980) suggests that the systems of simultaneous equations are useful in analysing the relationship between macroeconomic variables, and that the endogenous and exogenous variables should not be addressed separately. Based on this explanation, Sims (1980) presents the VAR model. The VAR

models demonstrate the level and the strength of the relationship between the lagged values of two variables depending on the significance of coefficients. Additionally, the causalities between variables can be detected when Granger Causality/Block Exogeneity Wald Tests are applied based on VAR models. Moreover, the extent to which the changes in endogenous variables are associated with the variables in question or different variables can be detected through variance decomposition analysis. Furthermore, the impulse response functions which are applied based on these models reflect the effects of a standard deviation shock in a random error term on current and future values of an endogenous variable. The impulse response functions are applied in evaluating the dynamic interaction between the variables in VAR models.

Within the scope of this study, a number of VAR models are set in order to analyse the variables which affect the stock market volatilities ($SRV_{country}$) in aforementioned countries, in line with our purpose. In the models, effects of other dependent variables deriving from the US stock market returns (SR_{USA}), exchange rate changes ($ER_{country}$), and their volatilities ($ERV_{country}$) on stock market volatilities are evaluated for both the whole term of the analysis and the two sub-periods, making use of Granger Causality/Block Exogeneity Wald Tests, variance decomposition analyses and impulse response functions.

3.3 Results

Within the context of this study, the results of the empirical study which demonstrates the effects of other variables on stock market volatilities are presented in this section. The relationship between the variables in question are analysed before establishing separate models for each country. During a preliminary analysis, the stock market volatilities in the USA and other countries are revealed to have high correlation. Similarly, Hamao (1990), Schwert (2011) and Lee (2013) reach the same correlation in their studies. Thus, this variable is excluded from the models. All volatilities are obtained from conditional variance of returns in stock exchange (or changes in exchange rates) with GARCH (1,1) model.

As shown in Table 3, the correlation coefficient between the variables which are included in the analysis are higher than -0.5 and lower than 0.5. In this case, there cannot be any multicollinearity between parameters. Descriptive statistics related to the variables included in the analysis are presented in Table 4 (in Appendix).

Before evaluating the effects of exchange rate changes, their volatilities and the US stock market returns on stock market volatilities for each country with VAR models, stationarity of variables are assessed applying ADF and Phillips-Perron Tests, and consequently level I (0) variables are determined to be stationarity. Results are presented in Table 5 (in Appendix).

After the variables are assed as stationarity, VAR models are applied to the stock market volatilities in the economies which are included in the analysis, for all the terms studied. For each model, a suitable lag is designated in line with the Akaike Information Criterion (AIC).

We only focus on the equation that is shown below (in first equation) for each country and period in VAR models because of our research's purpose:

$$SRV_{Country,t} = c_1 + \sum_{i=1}^{p} \alpha_{1,1}^{i} SRV_{Country,t-i} + \sum_{j=1}^{p} \alpha_{1,2}^{j} ER_{Country,t-j} + \sum_{k=1}^{p} \alpha_{1,3}^{k} ERV_{Country,t-k} + \sum_{l=1}^{p} \alpha_{1,4}^{l} SR_{USA,t-l} \quad (1)$$

$SRV_{country}$ is the stock market volatility of country in aforementioned countries; SR_{USA} is the US stock market returns; $ER_{country}$ is the exchange rate changes; $ERV_{country}$ is exchange rate volatility of country; and p is the number of lags in VAR models.
Granger Causality/Block Exogeneity Wald Tests are applied based on VAR models for the analysis periods and the countries.
Granger Causality/Block Exogeneity Wald Test is shown below in second equation:

$$(T-3p-1)(\log\left|\sum re\right|-\log\left|\sum un\right|) \quad \chi^2(2p) \tag{2}$$

Wald Test shows a chi-square distrubition. T is the number of observations; $\sum un$ is variance/covariance matrices of the unrestricted VAR system; $\sum re$ is variance/covariance matrices of the restricted system when the lag of a variable is excluded from the VAR system; and p is the number of lags of the variable that is excluded from the VAR system. (Enders, 2003).
Test results in question are as presented in Table 6. Causalities are analysed using Wald test statistics, and the results suggest that the US stock market returns causes stock market volatilities in all emerging market economies in the 2000-2013 period. During the 2000-2007 period, the US stock market returns do not cause stock market volatilities in five emerging market economies (China, S. Africa, India, Israel and Russia). During the 2008-2013 period, the analysis suggests no causality effect only in the Argentinean stock market volatilities. Bianconi (2013) argues that the shocks in the USA affect Russia (except during the 2000-2007 period in our research) and Brazil; Srinivasan and Kalaivani (2013) and Lee (2013) point to the US influence in Asian countries which are included in their analyses. Our findings for the 2008-2013 period are fully compatible with aforementioned approaches and conclusions. According to the results, the effects of the US stock market which is the strongest link in the system, on foreign stock markets are observed to have risen after 2003 as integration rates into global markets started to increase.

Table 6: Granger Causality/Block Exogeneity Wald Test Results

SRV_{County}	**Period**	**Model**	**ER_{County}**	**ERV_{County}**	**SR_{USA}**	**lag**
Argentina	2000-2013	Model 1	30.830***	20.311***	51.065***	6
	2000-2007	Model 2	25.639***	16.260**	28.595***	8
	2008-2013	Model 3	60.309***	77.900***	9.862	7
Brazil	2000-2013	Model 4	21.240***	21.780***	60.683***	2
	2000-2007	Model 5	8.695	3.899	59.996***	6
	2008-2013	Model 6	15.441***	23.974***	17.384***	2
China	2000-2013	Model 7	11.811***	7.273**	8.455**	2
	2000-2007	Model 8	14.668***	6.228**	0.978	2
	2008-2013	Model 9	1.404	3.179	5.944*	2
India	2000-2013	Model 10	2.454	0.606	8.614**	2
	2000-2007	Model 11	1.705	0.158	0.662	1
	2008-2013	Model 12	2.018	8.260**	7.611**	2
Israel	2000-2013	Model 13	0.232	0.944	3.849**	1
	2000-2007	Model 14	0.026	0.923	0.281	1
	2008-2013	Model 15	0.641	16.597***	18.661***	2
Malaysia	2000-2013	Model 16	3.765	3.949	26.443***	5
	2000-2007	Model 17	1.834	2.589	18.011**	8

	2008-2013	Model 18	0.175	5.815**	12.305***	1
Poland	2000-2013	Model 19	7.745***	0.839	46.831***	1
	2000-2007	Model 20	0.603	6.734**	28.024***	2
	2008-2013	Model 21	10.588**	4.795	10.721**	4
Russia	2000-2013	Model 22	1.086	4.761	14.774***	3
	2000-2007	Model 23	1.020	0.157	0.728	1
	2008-2013	Model 24	0.040	3.386	9.108**	3
S.Africa	2000-2013	Model 25	2.327	0.042	18.892***	2
	2000-2007	Model 26	0.013	0.859	1.768	1
	2008-2013	Model 27	0.231	3.183*	6.429**	1
Turkey	2000-2013	Model 28	12.207**	10.122**	44.659***	4
	2000-2007	Model 29	6.300	4.198	22.643***	4
	2008-2013	Model 30	9.893***	1.244	14.485***	1

*** ➔ statistical significance at the 1% level. ** ➔ statistical significance at the 5% level. *➔ statistical significance at the 10% level.

Notes: Table 6 presents Granger Causality/Block Exogeneity Wald Test Results. Returns and changes are calculated with $return = \ln(\frac{P_t}{P_{t-1}})$ and $changes = \ln(\frac{exchangerate_t}{exchangerate_{t-1}})$ formulas and volatilities are obtained with GARCH (1,1) models. Lags are determinated in line with the Akaike Information Criterion (AIC). Wald Test shows a chi-square distrubition. These results are obtained from vector autoregressive models. We only focus on the equation that is shown below for each country and period in VAR models because of our research's purpose:

$$SRV_{Country,t} = c_1 + \sum_{i=1}^{p} \alpha_{1,1}^{i} SRV_{Country,t-i} + \sum_{j=1}^{p} \alpha_{1,2}^{j} ER_{Country,t-j} + \sum_{k=1}^{p} \alpha_{1,3}^{k} ERV_{Country,t-k} + \sum_{l=1}^{p} \alpha_{1,4}^{l} SR_{USA,t-l}$$

$SRV_{Country}$ ➔ Stock Market Volatility of Country, $ER_{Country}$ ➔ Exchange Rate Changes of Country,
$ERV_{Country}$ ➔ Exchange Rate Volatility of Country, SR_{USA} ➔ US Stock Return

Our results suggest that exchange rate changes cause stock market volatilities in 5 countries during the 2000-2013 period, and in 4 countries during the 2008-2013 period. In the 2000-2007 period, the causality is at its lowest ebb and shows similarities with the effects of the US stock market returns. Numbers of the economies where exchange rate volatilities cause stock market volatilities are 4, 3 and 6 respectively according to the periods analysed. The results are remarkable for monitoring the relationship between variable volatilities especially after the Global Financial Crisis of 2008.

The models which are set for the analysis are also evaluated in terms of variance decomposition. Theoretically, the lagged values of market volatilities are expected to explain error variances to a larger extent, in the short-term rather than the long-term. The results obtained support this approach.

Results related to the explanation rates of the variables for the error variance of stock market volatilities according to emerging market economies and to analysis periods are presented in Table 7. In Table 8, summary information in terms of economies based on the results which are shown in the previous table is presented. Stock market volatility changes are explained to a larger extent through related variable (in and of itself) at the end of month 3 compared to the end of month 6, and at the end of month 6 compared to the end of month 12.

The variables which have strong influence on explaining stock market volatilities have a

stronger potential in showing significant statistical relations with the variable. Within the scope of the analysis, the results we obtained support this finding. Generally, the stock market volatility of the variable accounts for the error variance to a greater degree if any variable is set to cause stock market volatilities.

During the term of the analysis and the sub-periods analysed, the US market returns have significant influence on stock market volatilities in economies (the causality direction is from the US market returns to stock market volatilities). Consequently, the US stock market return becomes the most striking explanatory variable rating at 10-14 percent, except for the variable itself. However, these results are not similar for economies in the 2008-2013 sub-period during which the crisis had intense impacts on financial markets. For the sub-period, exchange rates, in comparison with the US stock market returns, are observed to have a stronger explanatory effect on the error variance of stock market volatilities.

Table 7: Variance Decomposition Analysis Results

SRV_{County}	**Model**	**Period**	**Month**	**SRV_{County}**	**ER_{County}**	**ERV_{County}**	**SR_{USA}**
Argentina	Model 1	2000	3	63.327	12.576	0.957	23.139
		2013	6	45.891	28.282	4.629	21.198
			12	43.355	28.964	5.797	21.883
	Model 2	2000	3	65.821	15.007	0.927	18.245
		2007	6	58.101	25.388	2.137	14.374
			12	53.328	15.433	5.976	25.263
	Model 3	2008	3	88.069	5.203	0.239	6.489
		2013	6	72.423	5.649	14.059	7.870
			12	58.745	10.370	19.550	11.334
Brazil	Model 4	2000	3	47.154	30.182	1.119	21.546
		2013	6	41.446	28.677	5.192	24.684
			12	39.120	25.173	9.674	26.033
	Model 5	2000	3	45.039	12.924	3.356	38.682
		2007	6	36.391	18.063	8.629	36.917
			12	34.988	16.593	8.973	39.445
	Model 6	2008	3	42.413	42.092	2.767	12.728
		2013	6	46.094	29.762	11.449	12.694
			12	46.352	27.348	12.228	14.072
China	Model 7	2000	3	90.803	2.404	2.370	4.423
		2013	6	80.239	11.671	3.178	4.913
			12	67.197	24.835	3.672	4.297
	Model 8	2000	3	86.749	6.579	6.100	0.572
		2007	6	74.028	15.266	10.398	0.307
			12	66.474	19.718	13.659	0.149
	Model 9	2008	3	91.115	0.351	0.549	7.984
		2013	6	86.280	3.295	0.402	10.022
			12	79.765	8.585	0.777	10.873
India	Model 10	2000 2013	3	92.539	4.234	0.069	3.159
			6	87.826	8.266	0.143	3.765
			12	86.422	9.468	0.169	3.941
	Model 11	2000 2007	3	97.377	1.990	0.000	0.633
			6	96.346	2.687	0.008	0.958
			12	96.352	2.503	0.089	1.055
	Model 12	2008 2013	3	79.789	15.156	1.763	3.293
			6	62.898	30.539	3.529	3.034
			12	54.865	37.206	4.970	2.959
Israel	Model 13	2000 2013	3	97.472	0.103	0.100	2.326
			6	97.204	0.115	0.342	2.339
			12	96.933	0.136	0.579	2.353

	Model 14	2000 2007	3	98.833	0.216	0.685	0.267
			6	98.119	0.231	1.385	0.265
			12	97.709	0.251	1.777	0.264
	Model 15	2008 2013	3	68.511	1.710	7.950	21.830
			6	68.033	1.748	8.471	21.749
			12	67.403	1.789	8.825	21.983
Malaysia	Model 16	2000 2013	3	84.700	2.134	0.408	12.758
			6	75.144	3.734	0.530	20.592
			12	73.318	2.702	1.223	22.758
	Model 17	2000 2007	3	86.353	1.023	0.014	12.610
			6	65.512	2.226	1.226	31.037
			12	64.505	2.397	1.536	31.562
	Model 18	2008 2013	3	79.024	9.162	0.163	11.651
			6	65.349	20.758	1.285	12.608
			12	51.439	34.596	3.551	10.415
Poland	Model 19	2000 2013	3	65.178	18.061	0.011	16.750
			6	58.314	22.831	0.041	18.815
			12	57.551	23.303	0.099	19.047
	Model 20	2000 2007	3	75.222	0.841	1.751	22.186
			6	73.890	0.753	2.405	22.952
			12	71.485	0.831	5.524	22.160
	Model 21	2008 2013	3	52.727	30.351	0.662	16.260
			6	44.039	30.064	2.142	23.755
			12	38.192	27.912	2.189	31.708
Russia	Model 22	2000	3	92.970	0.454	0.267	6.309
		2013	6	89.808	0.712	0.611	8.869
			12	88.731	0.855	0.738	9.675
	Model 23	2000	3	98.035	1.308	0.032	0.624
		2007	6	96.975	2.097	0.092	0.835
			12	96.667	2.261	0.176	0.896
	Model 24	2008	3	93.542	0.612	0.144	5.702
		2013	6	93.388	0.736	0.357	5.519
			12	93.796	0.626	0.300	5.277
S. Africa	Model 25	2000 2013	3	81.060	7.849	0.023	11.068
			6	76.963	7.885	0.552	14.600
			12	73.790	7.436	2.897	15.877
	Model 26	2000 2007	3	97.721	0.005	0.562	1.712
			6	95.986	0.040	1.825	2.149
			12	94.762	0.095	2.877	2.265
	Model 27	2008 2013	3	82.334	7.762	4.398	5.506
			6	71.534	7.003	15.754	5.710
			12	62.158	7.489	25.806	4.547
Turkey	Model 28	2000 2013	3	59.422	18.048	2.220	20.310
			6	58.280	16.175	2.958	22.586
			12	53.213	18.725	7.904	20.158
	Model 29	2000 2007	3	68.740	7.415	5.311	18.534
			6	71.822	5.088	9.147	13.943
			12	72.304	7.988	9.906	9.801
	Model 30	2008 2013	3	57.633	32.867	0.148	9.353
			6	49.601	37.676	0.100	12.623
			12	44.284	41.019	0.850	13.847

Notes: Table 7 contains explanation rate of the error variance of stock market volatilities from all variables (including itself) for whole periods.

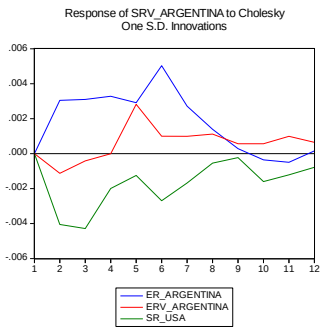
Table 8: Variance Decomposition Analysis Spreadsheet

Period	Month	SRV_{Mean}	ER_{Mean}	ERV_{Mean}	$SR_{USA\text{-}Mean}$
2000-2013	**3**	77.462	9.604	0.754	12.179
	6	71.112	12.835	1.818	14.236
	12	67.963	14.160	3.275	14.602
2000-2007	**3**	81.989	4.731	2.080	11.406
	6	76.717	7.184	3.725	12.374
	12	74.857	6.807	5.049	13.286
2008-2013	**3**	73.516	14.527	1.878	10.080
	6	65.964	16.723	5.755	11.558
	12	59.700	19.694	7.905	12.701

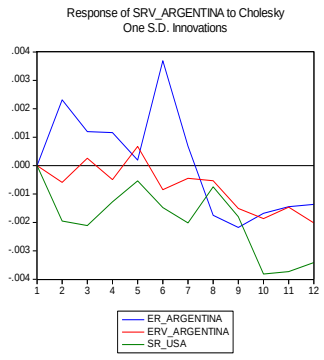
Notes: Table 8 contains mean of the explanation rate of the error variance of stock market volatilities from all variables (including itself) for whole periods. $SRV_{Mean} = \sum_{i=1}^{10} SRV_i / 10$, SRV is the explanation rate of the error variance of stock market volatilities from itself; i is the country name. $ER_{Mean} = \sum_{i=1}^{10} ER_i / 10$, ER is the explanation rate of the error variance of stock market volatilities based on exchange rate changes; i is the country name. $ERV_{Mean} = \sum_{i=1}^{10} ERV_i / 10$, ER is the explanation rate of the error variance of stock market volatilities based on exchange rate volatilities; i is the country name.

As already stated, the liquidity excess which was observed from 2003 until the Financial Crisis of 2008 accelerated the integration of emerging market economies into global markets. As a result, a greater number of economies have become vulnerable to the parameters of global markets, the explanation rate of the stock market error variance by the variables included in the study for economies are 40.30 per cent (sum of ER_{Mean}, ERV_{Mean} and $SR_{USA\text{-}Mean}$) in the 2008-2013 sub-period by the end of 12 months. Abovementioned rate for the analysis term is 32.04 per cent respectively. In the 2000-2007 sub-period, during which markets experienced liquidity excess, the rates for economies are merely 25.14 per cent. The results obtained corroborate our approximation that the integration of emerging market economies into global markets has accelerated lately.

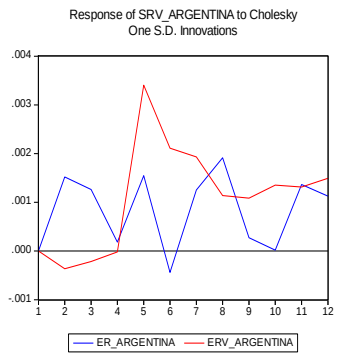
Within the scope of our analysis, effects of variable shocks (positive shocks in our study), which cause stock market volatilities and show significant Wald test levels, are evaluated using impulse response analysis. Thus, extensive dynamic interaction between variables is observed. The reactions of stock market volatilities to variable shocks are evaluated within the framework of the diagrams set for each model. (No diagram is put together for the models in which stock market volatilities affect no variable.)



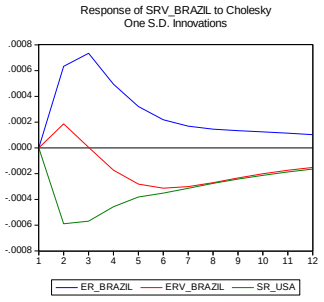
Model 1



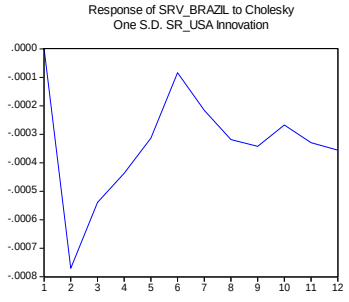
Model 2



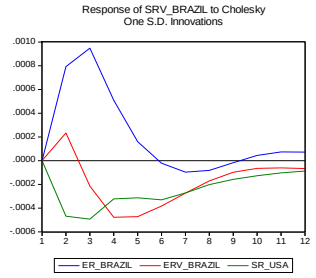
Model 3



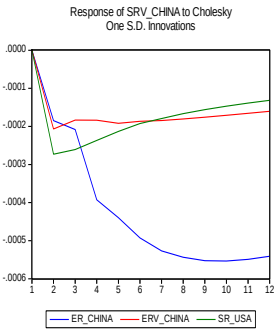
Model 4



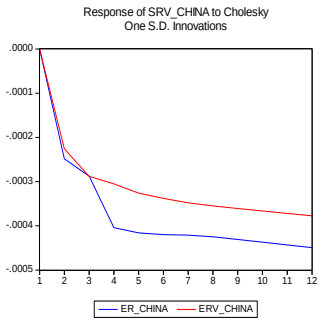
Model 5



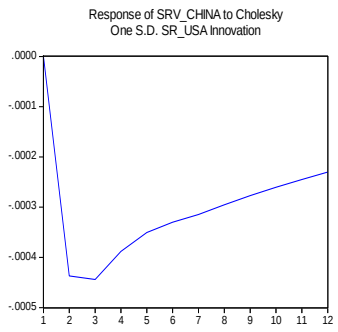
Model 6



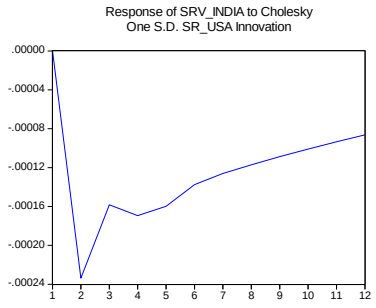
Model 7



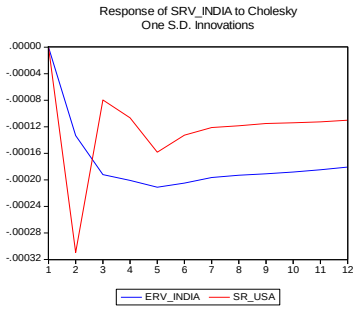
Model 8



Model 9

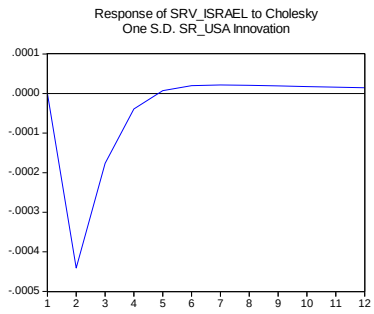


Model 10

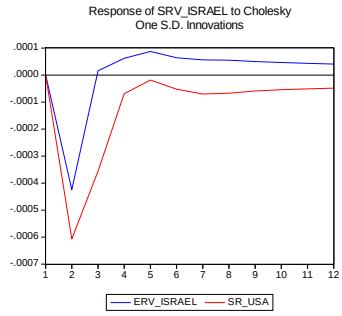


Model 12

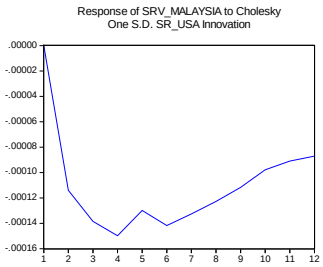
Figure 1: Impulse Response Analysis Diagrams (continued)



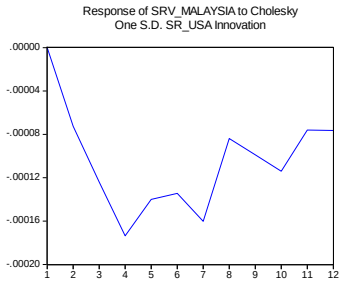
Model 13



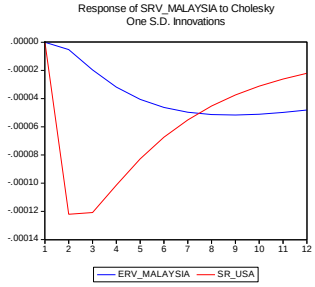
Model 15



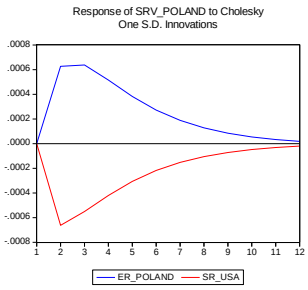
Model 16



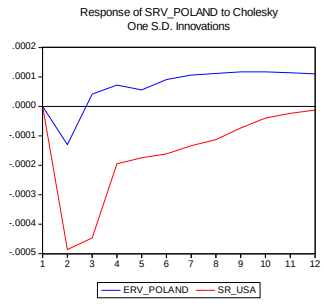
Model 17



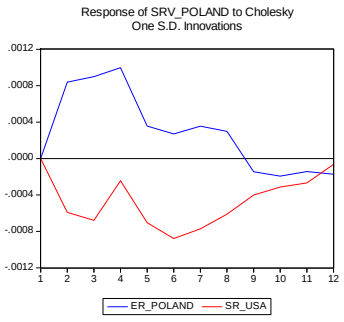
Model 18



Model 19



Model 20



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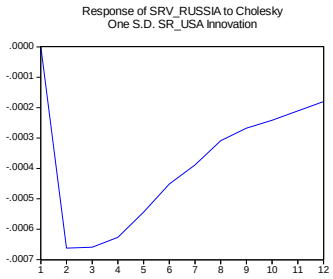
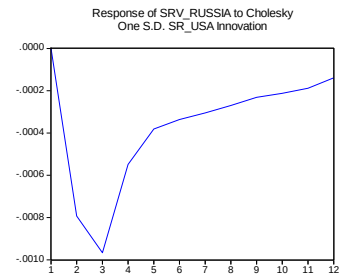
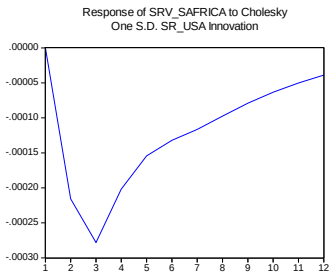


Model 22

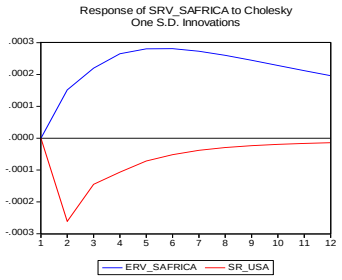


Model 24

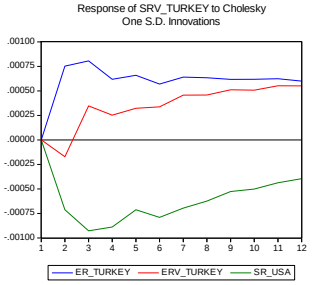
Figure 1: Impulse Response Analysis Diagrams (continued)



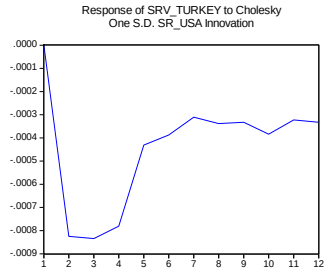
Model 25



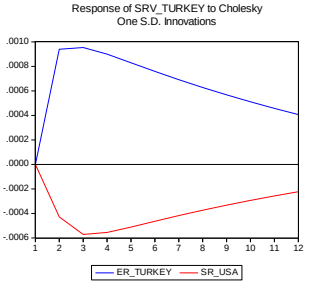
Model 27



Model 28



Model 29



Model 30

Figure 1: Impulse Response Analysis Diagrams

The stock market volatilities in all countries which are included in the study react negatively to the US stock market return shocks. These reactions tend to increase during the term covering the 2nd and 3rd months. As of month 3, reactions in several countries decrease diverging from the equilibrium point while they decrease approaching the equilibrium state in other countries. How stock market volatilities react to exchange rate change and exchange rate volatility shocks varies from country to country and according to the term in question.

4 Conclusion

In this paper, we realised an empirical study which demonstrate the effects of exchange rate changes, their volatilities and the US stock market returns on stock market volatilities, which are one of the principal parameters, in 10 emerging market economies which are integrated into global markets for 2000-2013, 2000-2007 and 2008-2013 periods. The effects in question are evaluated setting VAR models for each period and country (30 models in total). Within this scope, Granger Causality/Block Exogeneity Wald Test Statistics are applied; variance decomposition analyses are carried out in order to find the extent to which the changes in stock market volatilities result from themselves or from other variables during 12 month periods; and the impulse response functions which demonstrate the effects of variable shocks showing significant Wald test levels on stock market volatilities are evaluated based on the VAR models.

The Wald Test statistics suggest that the US stock market returns cause stock market volatilities in 10 countries during the 2000-2013 period. While 5 countries are affected in the 2000-2007 sub-period, the US stock market returns affect 9 countries in the 2008-2013 sub-period. These results and findings are compatible with the conclusions of other

academicians such as Bianconi (2013), Srinivasan and Kalaivani (2013) whose studies point the US effect on stock market volatilities in Asian countries, BRIC countries such as Brazil and Russia.

Within the framework of our analyses, it is concluded that the exchange rate changes and exchange rate volatilities cause stock market volatilities in five and four countries in the 2000-2013 period. When sub-periods are scrutinised, it is revealed that abovementioned variable volatilities have causal effect in two and three countries in the 2000-2007 period, and four and six countries in the 2008-2013 period respectively. These results are remarkable, as they point the importance of closely monitoring these variable volatilities and the relationship between them after the Financial Crisis of 2008.

When the variance decomposition analyses are evaluated, it is concluded that the US stock market return is the variable which explains the error variance in terms of stock market volatilities to the greatest extent in economies in the 2000-2013 and 2000-2007 periods, besides the volatilities themselves. However, in the 2008-2013 sub-period exchange rate changes are revealed to explain stock market volatilities to a larger extent compared to the US stock market returns.

In the 2008-2013 sub-period, other variables than the error variance itself, explain 40.30 per cent of the error variance of stock market volatilities at the end of 12 months economies. These percentages are the highest rates observed during whole terms. These conclusions support our argument that the USA, which is the most important country in global markets, would be affected by the developments from 2008 on, depending on the fact that the integration of emerging market economies, which aim at benefitting the liquidity excess, into global markets had accelerated from 2002 until the crisis.

According to the impulse response functions, stock market volatilities in the countries analysed react negatively to the positive shocks in the US stock market returns. This result suggests that the negative shocks in the US stock market returns would cause high stock market volatilities in other countries. The result is thought to be of high importance in terms of evaluating the cause of high volatilities occurring during the period when the effects of the Global Financial Crisis of 2008 were intense. The reactions of stock market volatilities to exchange rate and volatility shocks are revealed to vary country to country and according to the term analysed.

The empirical research lays emphasis on the importance of closely monitoring the stock prices, the factors shaping returns depending on these prices, economic developments in the USA, along with the reactions of the US stock market and the US dollars for the countries which aim at strong economic growth performance in the global markets.

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APPENDIX

Table 3: Correlations

2000 - 2013 Period					**2000 - 2007 Period**					**2008 - 2013 Period**				
Model 1 Variables	$SRV_{Argentina}$	$ER_{Argentina}$	$ERV_{Argentina}$	SR_{USA}	**Model 2 Variables**	$SRV_{Argentina}$	$ER_{Argentina}$	$ERV_{Argentina}$	SR_{USA}	**Model 3 Variables**	$SRV_{Argentina}$	$ER_{Argentina}$	$ERV_{Argentina}$	SR_{USA}
$SRV_{Argentina}$	1.000	0.379	0.367	-0.232	$SRV_{Argentina}$	1.000	0.493	0.448	-0.280	$SRV_{Argentina}$	1.000	0.362	0.432	-0.193
$ER_{Argentina}$		1.000	0.477	-0.079	$ER_{Argentina}$		1.000	0.492	-0.109	$ER_{Argentina}$		1.000	0.275	-0.060
$ERV_{Argentina}$			1.000	-0.055	$ERV_{Argentina}$			1.000	-0.080	$ERV_{Argentina}$			1.000	-0.144
SR_{USA}				1.000	SR_{USA}				1.000	SR_{USA}				1.000
Model 4 Variables	SRV_{Brazil}	ER_{Brazil}	ERV_{Brazil}	SR_{USA}	**Model 5 Variables**	SRV_{Brazil}	ER_{Brazil}	ERV_{Brazil}	SR_{USA}	**Model 6 Variables**	SRV_{Brazil}	ER_{Brazil}	ERV_{Brazil}	SR_{USA}
SRV_{Brazil}	1.000	0.313	0.493	-0.155	SRV_{Brazil}	1.000	0.340	0.476	-0.037	SRV_{Brazil}	1.000	0.290	0.499	-0.271
ER_{Brazil}		1.000	0.220	-0.426	ER_{Brazil}		1.000	0.065	-0.348	ER_{Brazil}		1.000	0.327	-0.410
ERV_{Brazil}			1.000	-0.208	ERV_{Brazil}			1.000	-0.070	ERV_{Brazil}			1.000	-0.288
SR_{USA}				1.000	SR_{USA}				1.000	SR_{USA}				1.000
Model 7 Variables	SRV_{China}	ER_{China}	ERV_{China}	SR_{USA}	**Model 8 Variables**	SRV_{China}	ER_{China}	ERV_{China}	SR_{USA}	**Model 9 Variables**	SRV_{China}	ER_{China}	ERV_{China}	SR_{USA}
SRV_{China}	1.000	-0.273	0.280	-0.125	SRV_{China}	1.000	-0.440	0.323	0.022	SRV_{China}	1.000	-0.069	0.204	-0.236
ER_{China}		1.000	-0.466	0.024	ER_{China}		1.000	-0.295	-0.031	ER_{China}		1.000	-0.400	0.075
ERV_{China}			1.000	-0.029	ERV_{China}			1.000	0.079	ERV_{China}			1.000	-0.144
SR_{USA}				1.000	SR_{USA}				1.000	SR_{USA}				1.000
Model 10 Variables	SRV_{India}	ER_{India}	ERV_{India}	SR_{USA}	**Model 11 Variables**	SRV_{India}	ER_{India}	ERV_{India}	SR_{USA}	**Model 12 Variables**	SRV_{India}	ER_{India}	ERV_{India}	SR_{USA}
SRV_{India}	1.000	0.057	-0.365	-0.093	SRV_{India}	1.000	0.319	-0.378	0.001	SRV_{India}	1.000	-0.069	-0.476	-0.179
ER_{India}		1.000	0.175	-0.301	ER_{India}		1.000	-0.230	-0.183	ER_{India}		1.000	0.111	-0.385
ERV_{India}			1.000	0.087	ERV_{India}			1.000	0.057	ERV_{India}			1.000	0.162
SR_{USA}				1.000	SR_{USA}				1.000	SR_{USA}				1.000

Table 3: Correlations (continued)

2000 - 2013 Period					**2000 - 2007 Period**					**2008 - 2013 Period**				
Model 13 Variables	SRV_{Israel}	ER_{Israel}	ERV_{Israel}	SR_{USA}	**Model 14 Variables**	SRV_{Israel}	ER_{Israel}	ERV_{Israel}	SR_{USA}	**Model 15 Variables**	SRV_{Israel}	ER_{Israel}	ERV_{Israel}	SR_{USA}
SRV_{Israel}	1.000	0.021	0.008	-0.082	SRV_{Israel}	1.000	-0.142	-0.071	0.031	SRV_{Israel}	1.000	0.348	0.345	-0.378
ER_{Israel}		1.000	0.069	-0.473	ER_{Israel}		1.000	-0.125	-0.383	ER_{Israel}		1.000	0.165	-0.434
ERV_{Israel}			1.000	-0.096	ERV_{Israel}			1.000	-0.065	ERV_{Israel}			1.000	-0.164
SR_{USA}				1.000	SR_{USA}				1.000	SR_{USA}				1.000
Model 16 Variables	$SRV_{Malaysia}$	$ER_{Malaysia}$	$ERV_{Malaysia}$	SR_{USA}	**Model 17 Variables**	$SRV_{Malaysia}$	$ER_{Malaysia}$	$ERV_{Malaysia}$	SR_{USA}	**Model 18 Variables**	$SRV_{Malaysia}$	$ER_{Malaysia}$	$ERV_{Malaysia}$	SR_{USA}
$SRV_{Malaysia}$	1.000	0.095	-0.444	-0.192	$SRV_{Malaysia}$	1.000	0.212	-0.491	-0.133	$SRV_{Malaysia}$	1.000	0.103	-0.480	-0.283
$ER_{Malaysia}$		1.000	0.043	-0.393	$ER_{Malaysia}$		1.000	-0.306	-0.158	$ER_{Malaysia}$		1.000	0.063	-0.408
$ERV_{Malaysia}$			1.000	0.073	$ERV_{Malaysia}$			1.000	0.024	$ERV_{Malaysia}$			1.000	0.194
SR_{USA}				1.000	SR_{USA}				1.000	SR_{USA}				1.000
Model 19 Variables	SRV_{Poland}	ER_{Poland}	ERV_{Poland}	SR_{USA}	**Model 20 Variables**	SRV_{Poland}	ER_{Poland}	ERV_{Poland}	SR_{USA}	**Model 21 Variables**	SRV_{Poland}	ER_{Poland}	ERV_{Poland}	SR_{USA}
SRV_{Poland}	1.000	0.209	0.429	-0.128	SRV_{Poland}	1.000	0.162	0.066	-0.077	SRV_{Poland}	1.000	0.213	0.405	-0.164
ER_{Poland}		1.000	0.062	-0.468	ER_{Poland}		1.000	0.041	-0.182	ER_{Poland}		1.000	-0.018	-0.461
ERV_{Poland}			1.000	0.096	ERV_{Poland}			1.000	0.030	ERV_{Poland}			1.000	0.130
SR_{USA}				1.000	SR_{USA}				1.000	SR_{USA}				1.000
Model 22 Variables	SRV_{Russia}	ER_{Russia}	ERV_{Russia}	SR_{USA}	**Model 23 Variables**	SRV_{Russia}	ER_{Russia}	ERV_{Russia}	SR_{USA}	**Model 24 Variables**	SRV_{Russia}	ER_{Russia}	ERV_{Russia}	SR_{USA}
SRV_{Russia}	1.000	0.242	0.198	-0.203	SRV_{Russia}	1.000	0.170	0.104	-0.113	SRV_{Russia}	1.000	0.297	0.357	-0.268
ER_{Russia}		1.000	-0.012	-0.392	ER_{Russia}		1.000	-0.221	-0.179	ER_{Russia}		1.000	-0.102	-0.406
ERV_{Russia}			1.000	0.134	ERV_{Russia}			1.000	0.093	ERV_{Russia}			1.000	0.190
SR_{USA}				1.000	SR_{USA}				1.000	SR_{USA}				1.000

Table 3: Correlations (continued)

2000 - 2013 Period					**2000 - 2007 Period**					**2008 - 2013 Period**				
Model 25 Variables	$SRV_{S.Africa}$	$ER_{S.Africa}$	$ERV_{S.Africa}$	SR_{USA}	**Model 26 Variables**	$SRV_{S.Africa}$	$ER_{S.Africa}$	$ERV_{S.Africa}$	SR_{USA}	**Model 27 Variables**	$SRV_{S.Africa}$	$ER_{S.Africa}$	$ERV_{S.Africa}$	SR_{USA}
$SRV_{S.Africa}$	1.000	-0.021	0.270	-0.170	$SRV_{S.Africa}$	1.000	-0.040	-0.206	0.063	$SRV_{S.Africa}$	1.000	-0.011	0.308	-0.276
$ER_{S.Africa}$		1.000	-0.243	-0.386	$ER_{S.Africa}$		1.000	-0.210	-0.123	$ER_{S.Africa}$		1.000	0.253	-0.441
$ERV_{S.Africa}$			1.000	0.023	$ERV_{S.Africa}$			1.000	-0.013	$ERV_{S.Africa}$			1.000	-0.461
SR_{USA}				1.000	SR_{USA}				1.000	SR_{USA}				1.000
Model 28 Variables	SRV_{Turkey}	ER_{Turkey}	ERV_{Turkey}	SR_{USA}	**Model 29 Variables**	SRV_{Turkey}	ER_{Turkey}	ERV_{Turkey}	SR_{USA}	**Model 30 Variables**	SRV_{Turkey}	ER_{Turkey}	ERV_{Turkey}	SR_{USA}
SRV_{Turkey}	1.000	0.191	0.454	-0.138	SRV_{Turkey}	1.000	0.279	0.491	-0.131	SRV_{Turkey}	1.000	-0.028	-0.256	-0.177
ER_{Turkey}		1.000	0.187	-0.421	ER_{Turkey}		1.000	0.241	-0.441	ER_{Turkey}		1.000	0.101	-0.463
ERV_{Turkey}			1.000	-0.087	ERV_{Turkey}			1.000	-0.209	ERV_{Turkey}			1.000	0.072
SR_{USA}				1.000	SR_{USA}				1.000	SR_{USA}				1.000

$SRV_{Country}$ ➔ Stock Market Volatility of Country, $ER_{Country}$ ➔ Exchange Rate Changes of Country, $ERV_{Country}$ ➔ Exchange Rate Volatility of Country, SR_{USA} ➔ US Stock Returns

Table 4: Descriptive Statistics

Variable		**Period**			**Variable**		**Period**			**Variable**		**Period**		
		2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013
$SRV_{Argentina}$	Mean	0.014	0.014	0.014	$ER_{Argentina}$	Mean	0.011	0.012	0.010	$ERV_{Argentina}$	Mean	0.002	0.004	0.000
	Median	0.009	0.009	0.009		Median	0.003	0.000	0.009		Median	0.002	0.003	0.000
	Maximum	0.124	0.084	0.124		Maximum	0.461	0.461	0.053		Maximum	0.042	0.042	0.002
	Minimum	0.004	0.004	0.005		Minimum	-0.071	-0.071	-0.035		Minimum	0.001	0.002	0.000
	Std. Dev.	0.015	0.013	0.016		Std. Dev.	0.049	0.064	0.012		Std. Dev.	0.004	0.005	0.000
	Skewness	4.148	2.754	4.994		Skewness	6.229	4.841	0.649		Skewness	8.818	6.396	2.544
	Kurtosis	26.030	11.928	32.147		Kurtosis	51.114	30.316	7.157		Kurtosis	87.311	46.681	9.154
	JB	4144.643	430.978	2847.956		JB	17084.860	3289.588	56.898		JB	51316.940	8113.957	191.300

Table 4 (Continued)

Variable		**Period**			**Variable**		**Period**			**Variable**		**Period**		
		2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013
SRV_{Brazil}	Mean	0.005	0.005	0.005	ER_{Brazil}	Mean	0.002	0.000	0.004	ERV_{Brazil}	Mean	0.001	0.001	0.001
	Median	0.005	0.005	0.004		Median	-0.005	-0.005	-0.004		Median	0.001	0.001	0.001
	Maximum	0.019	0.014	0.019		Maximum	0.188	0.130	0.188		Maximum	0.012	0.006	0.012
	Minimum	0.002	0.002	0.003		Minimum	-0.100	-0.100	-0.068		Minimum	0.001	0.001	0.001
	Std. Dev.	0.002	0.002	0.002		Std. Dev.	0.039	0.038	0.040		Std. Dev.	0.001	0.001	0.002
	Skewness	2.106	1.048	3.480		Skewness	1.022	0.437	1.700		Skewness	4.893	3.057	4.194
	Kurtosis	9.830	3.928	18.149		Kurtosis	6.030	3.740	8.343		Kurtosis	34.672	15.165	233.596
	JB	445.323	20.566	833.835		JB	92.391	5.132	120.344		JB	7600.348	725.971	1454.635
SRV_{China}	Mean	0.006	0.005	0.008	ER_{China}	Mean	-0.002	-0.001	-0.003	ERV_{China}	Mean	0.000	0.000	0.000
	Median	0.004	0.004	0.006		Median	0.000	0.000	-0.002		Median	0.000	0.000	0.000
	Maximum	0.020	0.014	0.020		Maximum	0.006	0.006	0.003		Maximum	0.000	0.000	0.000
	Minimum	0.003	0.003	0.003		Minimum	-0.016	-0.016	-0.016		Minimum	0.000	0.000	0.000
	Std. Dev.	0.004	0.002	0.005		Std. Dev.	0.003	0.003	0.004		Std. Dev.	0.000	0.000	0.000
	Skewness	1.519	2.166	0.739		Skewness	-1.845	-2.315	-1.388		Skewness	2.931	3.521	2.456
	Kurtosis	4.206	6.540	2.186		Kurtosis	6.987	10.760	4.721		Kurtosis	13.076	16.733	10.575
	JB	73.890	122.613	8.543		JB	204.154	319.819	32.016		JB	939.759	932.948	244.500

Table 4 (Continued)

Variable		**Period**			**Variable**		**Period**			**Variable**		**Period**		
		2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013
SRV_{India}	Mean	0.006	0.006	0.006	ER_{India}	Mean	0.002	-0.001	0.006	ERV_{India}	Mean	0.000	0.000	0.001
	Median	0.005	0.005	0.005		Median	0.000	-0.001	0.003		Median	0.000	0.000	0.001
	Maximum	0.017	0.017	0.017		Maximum	0.066	0.030	0.066		Maximum	0.001	0.001	0.001
	Minimum	0.003	0.004	0.003		Minimum	-0.044	-0.044	-0.043		Minimum	0.000	0.000	0.000
	Std. Dev.	0.003	0.003	0.003		Std. Dev.	0.018	0.011	0.025		Std. Dev.	0.000	0.000	0.000
	Skewness	1.540	1.812	1.274		Skewness	0.765	-0.799	0.428		Skewness	0.498	1.896	-0.500
	Kurtosis	4.650	5.599	3.739		Kurtosis	5.025	5.988	2.877		Kurtosis	1.740	5.884	2.307
	JB	84.463	77.876	21.125		JB	44.583	44.981	2.242		JB	17.841	88.882	4.440
SRV_{Israel}	Mean	0.004	0.004	0.003	ER_{Israel}	Mean	-0.001	-0.001	-0.001	ERV_{Israel}	Mean	0.001	0.000	0.001
	Median	0.003	0.003	0.003		Median	-0.001	-0.001	-0.001		Median	0.000	0.000	0.001
	Maximum	0.034	0.034	0.010		Maximum	0.074	0.046	0.074		Maximum	0.002	0.001	0.002
	Minimum	0.002	0.002	0.002		Minimum	-0.063	-0.046	-0.063		Minimum	0.000	0.000	0.000
	Std. Dev.	0.003	0.004	0.002		Std. Dev.	0.025	0.019	0.030		Std. Dev.	0.000	0.000	0.000
	Skewness	6.326	5.543	2.654		Skewness	0.266	0.268	0.272		Skewness	1.873	0.823	1.172
	Kurtosis	55.677	39.911	10.428		Kurtosis	3.383	2.979	2.822		Kurtosis	7.009	2.478	4.063
	JB	20300.120	5817.304	250.023		JB	2.973	1.124	0.982		JB	208.277	11.668	19.873

Table 4 (Continued)

Variable		Period			Variable		Period			Variable		Period		
		2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013
$SRV_{Malaysia}$	Mean	0.002	0.002	0.002	$ER_{Malaysia}$	Mean	-0.001	-0.001	0.000	$ERV_{Malaysia}$	Mean	0.000	0.000	0.001
	Median	0.002	0.002	0.001		Median	0.000	0.000	-0.001		Median	0.000	0.000	0.001
	Maximum	0.005	0.005	0.005		Maximum	0.068	0.015	0.068		Maximum	0.001	0.000	0.001
	Minimum	0.001	0.001	0.001		Minimum	-0.043	-0.025	-0.043		Minimum	0.000	0.000	0.000
	Std. Dev.	0.001	0.001	0.001		Std. Dev.	0.015	0.006	0.022		Std. Dev.	0.000	0.000	0.000
	Skewness	1.136	0.674	2.113		Skewness	0.633	-1.496	0.439		Skewness	0.459	2.190	-0.304
	Kurtosis	3.476	2.344	8.121		Kurtosis	6.642	7.579	3.424		Kurtosis	1.572	6.783	1.885
	JB	37.298	8.796	132.235		JB	102.805	117.172	2.850		JB	19.929	131.183	4.833
SRV_{Poland}	Mean	0.004	0.004	0.004798	ER_{Poland}	Mean	-0.002	-0.005	0.003	ERV_{Poland}	Mean	0.001	0.001	0.001
	Median	0.004	0.004	0.003732		Median	-0.006	-0.007	-0.002		Median	0.001	0.001	0.001
	Maximum	0.020	0.008	0.020450		Maximum	0.138	0.060	0.138		Maximum	0.003	0.001	0.003
	Minimum	0.002	0.002	0.001840		Minimum	-0.070	-0.059	-0.070		Minimum	0.001	0.001	0.001
	Std. Dev.	0.002	0.001	0.003174		Std. Dev.	0.035	0.027	0.043		Std. Dev.	0.001	0.000	0.001
	Skewness	2.916	0.737	2.488		Skewness	1.030	0.118	1.040		Skewness	1.977	0.342	1.023
	Kurtosis	16.602	2.770	10.834		Kurtosis	5.389	2.484	4.427		Kurtosis	6.975	2.753	3.539
	JB	1514.876	8.720	258.408		JB	68.811	1.262	19.091		JB	217.428	2.073	13.424

Table 4 (Continued)

Variable		Period			Variable		Period			Variable		Period		
		2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013
SRV_{Russia}	Mean	0.008	0.008	0.007	ER_{Russia}	Mean	0.001	-0.002	0.004	ERV_{Russia}	Mean	0.001	0.000	0.001
	Median	0.006	0.006	0.005		Median	0.000	0.001	-0.002		Median	0.000	0.000	0.001
	Maximum	0.034	0.026	0.034		Maximum	0.138	0.019	0.138		Maximum	0.006	0.000	0.006
	Minimum	0.003	0.003	0.003		Minimum	-0.054	-0.025	-0.054		Minimum	0.000	0.000	0.000
	Std. Dev.	0.005	0.004	0.006		Std. Dev.	0.023	0.009	0.032		Std. Dev.	0.001	0.000	0.001
	Skewness	2.212	1.853	2.359		Skewness	2.175	-0.448	1.422		Skewness	3.434	0.208	2.437
	Kurtosis	8.998	6.538	9.131		Kurtosis	13.373	2.564	6.560		Kurtosis	16.593	1.766	8.852
	JB	384.158	102.848	179.513		JB	875.199	3.891	62.279		JB	1604.287	6.645	173.975
$SRV_{S.Africa}$	Mean	0.002	0.002	0.002	$ER_{S.Africa}$	Mean	0.003	0.001	0.006	$ERV_{S.Africa}$	Mean	0.002	0.002	0.002
	Median	0.001	0.002	0.001		Median	-0.001	-0.004	0.003		Median	0.002	0.002	0.002
	Maximum	0.011	0.004	0.011		Maximum	0.174	0.154	0.174		Maximum	0.004	0.008	0.006
	Minimum	0.001	0.001	0.001		Minimum	-0.115	-0.085	-0.115		Minimum	0.001	0.001	0.000
	Std. Dev.	0.001	0.001	0.002		Std. Dev.	0.050	0.048	0.052		Std. Dev.	0.001	0.001	0.001
	Skewness	4.274	0.998	3.731		Skewness	0.573	0.515	0.613		Skewness	0.341	1.068	1.316
	Kurtosis	28.734	3.542	18.534		Kurtosis	3.561	3.103	3.934		Kurtosis	3.775	4.718	4.026
	JB	5085.749	16.740	890.913		JB	11.248	4.202	7.126		JB	7.378	29.439	23.931

Table 4 (Continued)

Variable		Period			Variable		Period			Variable		Period		
		2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013			2000-2013	2000-2007	2008-2013
SRV_{Turkey}	Mean	0.011	0.013	0.010	ER_{Turkey}	Mean	0.008	0.008	0.008	ERV_{Turkey}	Mean	0.002	0.002	0.001
	Median	0.009	0.010	0.008		Median	0.000	0.000	0.005		Median	0.001	0.001	0.001
	Maximum	0.030	0.030	0.022		Maximum	0.302	0.302	0.238		Maximum	0.007	0.007	0.005
	Minimum	0.004	0.004	0.005		Minimum	-0.102	-0.102	-0.066		Minimum	0.000	0.001	0.000
	Std. Dev.	0.006	0.007	0.004		Std. Dev.	0.050	0.055	0.043		Std. Dev.	0.001	0.001	0.001
	Skewness	1.039	0.580	1.639		Skewness	1.910	1.837	1.992		Skewness	1.395	1.230	1.645
	Kurtosis	3.176	2.219	5.264		Kurtosis	11.656	10.780	12.198		Kurtosis	4.287	3.707	5.004
	JB	30.075	7.656	47.609		JB	619.196	289.968	301.396		JB	65.315	25.670	44.518

Table 5: Stationarity Test Results (ADF – PP)

Variable	Period	ADF	P-P	Variable	Period	ADF	P-P	Variable	Period	ADF	P-P
$SRV_{Argentina}$	2000-2013	-5.554***	-5.588***	$ER_{Argentina}$	2000-2013	-6.264***	-6.356***	$ERV_{Argentina}$	2000-2013	-7.038***	-7.038***
	2000-2007	-3.060**	-2.871*		2000-2007	-4.782***	-4.743***		2000-2007	-5.191***	-5.193***
	2008-2013	-4.340***	-4.340***		2008-2013	-2.984**	-2.974**		2008-2013	-4.025***	-3.874***
SRV_{Brazil}	2000-2013	-4.050***	-3.992***	ER_{Brazil}	2000-2013	-8.379***	-8.39***	ERV_{Brazil}	2000-2013	-5.793***	-5.303***
	2000-2007	-2.705*	-2.627*		2000-2007	-7.136***	-6.666***		2000-2007	-4.297***	-4.223***
	2008-2013	-2.996**	-2.996**		2008-2013	-5.056***	-5.088***		2008-2013	-3.355**	-3.524**

Table 5 (Continued)

Variable	Period	ADF	P-P	Variable	Period	ADF	P-P	Variable	Period	ADF	P-P
SRV_{China}	2000-2013	-5.699***	-5.888***	ER_{China}	2000-2013	-3.622**	-7.779***	ERV_{China}	2000-2013	-6.719***	-6.755***
	2000-2007	-2.757*	-2.602*		2000-2007	-3.224**	-5.808***		2000-2007	-4.858***	-4.872***
	2008-2013	-10.843***	-12.123***		2008-2013	-5.332***	-5.280***		2008-2013	-4.285***	-4.088***
SRV_{India}	2000-2013	-3.335**	-3.238**	ER_{India}	2000-2013	-9.160***	-9.088***	ERV_{India}	2000-2013	-11.987***	-11.958
	2000-2007	-3.404**	-4.238***		2000-2007	-6.766***	-6.321***		2000-2007	-4.346***	-3.555***
	2008-2013	-2.412*	-2.439*		2008-2013	-6.200***	-6.103***		2008-2013	-7.827***	-7.809***
SRV_{Israel}	2000-2013	-9.139***	-9.017***	ER_{Israel}	2000-2013	-12.752***	-12.740***	ERV_{Israel}	2000-2013	-2.587*	-2.601*
	2000-2007	-6.966***	-6.828***		2000-2007	-8.159***	-8.206***		2000-2007	-2.658*	-2.684*
	2008-2013	-5.921***	-5.937***		2008-2013	-9.098***	-9.091***		2008-2013	-9.341***	-9.377***
$SRV_{Malaysia}$	2000-2013	-2.933**	-2.919**	$ER_{Malaysia}$	2000-2013	-12.550***	-12.583***	$ERV_{Malaysia}$	2000-2013	-7.753***	-7.589***
	2000-2007	-3.584***	-3.431**		2000-2007	-7.479***	-8.188***		2000-2007	-6.674***	-6.958***
	2008-2013	-7.449***	-7.411***		2008-2013	-8.369***	-8.443***		2008-2013	-6.775***	-7.003***
SRV_{Poland}	2000-2013	-4.686***	-4.736***	ER_{Poland}	2000-2013	-8.855***	-8.782***	ERV_{Poland}	2000-2013	-3.052**	-2.962**
	2000-2007	-3.583***	-3.442**		2000-2007	-8.242***	-7.534***		2000-2007	-2.671*	-2.601*
	2008-2013	-3.718***	-2.814*		2008-2013	-5.405***	-5.468***		2008-2013	-8.053***	-8.053***
SRV_{Russia}	2000-2013	-3.314**	-3.505**	ER_{Russia}	2000-2013	-8.406***	-7.519***	ERV_{Russia}	2000-2013	-3.175**	-3.101**
	2000-2007	-3.247**	-3.065**		2000-2007	-6.803***	-6.489***		2000-2007	-2.629*	-2.617*
	2008-2013	-5.591***	-6.228***		2008-2013	-5.685***	-4.999***		2008-2013	-9.242***	-9.205***
$SRV_{S.Africa}$	2000-2013	-4.889***	-4.925***	$ER_{S.Africa}$	2000-2013	-12.718***	-12.768***	$ERV_{S.Africa}$	2000-2013	-3.422**	-3.424**
	2000-2007	-3.829***	-3.804***		2000-2007	-9.415***	-9.408***		2000-2007	-3.305**	-3.241**
	2008-2013	-3.324**	-3.086**		2008-2013	-8.640***	-8.655***		2008-2013	-8.824***	-8.838***

Table 5 (Continued)

Variable	Period	ADF	P-P	Variable	Period	ADF	P-P	Variable	Period	ADF	P-P
SRV_{Turkey}	2000-2013	-3.144**	-3.036**	ER_{Turkey}	2000-2013	-10.657***	-10.601***	ERV_{Turkey}	2000-2013	-3.324**	-3.115**
	2000-2007	-3.680***	-4.074***		2000-2007	-7.980***	-7.489***		2000-2007	-5.397***	-5.921***
	2008-2013	-7.812***	-7.809***		2008-2013	-7.838***	-7.896***		2008-2013	-6.910***	-6.955***
SR_{USA}	2000-2013	-11.243***	-11.331***								
	2000-2007	-9.701***	-9.702***								
	2008-2013	-6.598***	-6.545***								

*** ➔ statistical significance at the 1% level. ** ➔ statistical significance at the 5% level. *➔ statistical significance at the 10% level.
Notes: We applied ARCH-LM Test for stock returns and exchange rate changes to check heteroskedasticity. Variables are found appropriate to apply GARCH models to obtain volatilities. $SRV_{Country}$ ➔ Stock Market Volatility of Country, $ER_{Country}$ ➔ Exchange Rate Changes of Country, $ERV_{Country}$ ➔ Exchange Rate Volatility of Country, SR_{USA}➔ US Stock Return