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Measuring the Return and Volatility Spillovers between Canada, Japan and Emerging Stock Markets

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Abstract

The study aims to investigate the impact of the stock market volatility spillover effect from major developed countries to emerging countries from the period 2014 to 2022 by using the GRACH model. For instance, Canada and Japan are the major contributors to G7 countries and whereas, India, Russia, Brazil, China and Turkey are the emerging countries in Asian and African subcontinents. It has been established that the stock market movement of Canada and Japan has substantially affected the stock markets of major emerging countries. However, Japan has major financial ties with all of the emerging countries except Russia. It is an astonishing fact that the insignificant coefficients of Japan and Canada with Russia indicate that the dynamics of Russian countries are a bit different than the rest of the world. The Russian economy is communist and generally perceived as a closed economy and the said does not have any major trade ties with the rest of the world.

Keywords: Volatility Spillover, Emerging Countries, Developed Countries, GARCH Model

JEL Codes: G15, F36, C58

Introduction

The harsh realm of globalization has made the whole world into a global village whereas, the flow of capital, human and resources is so fluent. Especially, right after the Second World War, the formation of the European Union opened a new horizon of particularly, economic cooperation among the relevant countries perhaps, revival after the massive economic destruction may not be possible without substantial cooperation (Demiralay & Bayraci, 2015). Furthermore, in the last couple of decades particularly, the Western countries have raised their economic

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appetite and consequently, their reliance on the East is mainly enhanced to feed their ever-growing economies. Therefore, the financial bond between developed and developing countries becomes stronger and captivates with each passing day (Ng., 2000). Specifically, developed countries that have industrial indenture may have more rigorous associations with emerging countries in the East. More precisely, Canada and Japan are the major partners in G7 countries, and both have a vast industrial base. To cope with their industrial requirements both the G7 countries have strong reliance on emerging countries to fulfill their industrial input needs either by primary or secondary goods.

Table No. 01: GDP Growth Projections Last 10 Years (Major Emerging Countries)

Brazil	3.1	5.0	0.2	7.4	3.8	1.8	3.5	0.11	2.8	2.4
China	9.6	9.3	9.2	9.5	9.3	6.6	6.5	7.1	5.8	5.4
India	7.2	3.2	8.2	9.3	5.6	5.4	6.5	6.2	7.2	6.5
Russia	5.4	5.2	-7.3	5.5	4.2	3.4	2.3	0.6	2.7	1.8
Turkey	4.1	0.2	-4.4	7.2	7.8	1.1	4.1	1.9	3.6	2.8
GDP Growth Projections Last 10 Years (Major DevelopedCounteries)										
Canada	3.2	1.0	2.8	3.0	3.3	1.9	2.1	2.2	1.1	1.1
Japan	1.0	0.1	5.6	4.7	1.5	1.8	1.2	0.1	0.4	0.4

The results of table no. 01 indicate that developed countries have more stable GDP nominal growth rates whereas developing countries have fragile type of movements in their economic progressions. But it is worth mentioning the fact that all the emerging countries have a bit higher economic growth rate as compared to the developed world. All the emerging countries are selling their industrial and natural output to the developed countries. Mainly, in the last two decades the developed world has parked its massive investments in above-mentioned emerging countries to generate economic ease (Okina et al., 2001).

The ever-surging industrial and economic collaborations between the developing and developed world have also raised the capital markets connectivity of the said countries. As we have seen in Asian financial crises of the late nineties and the subprime mortgage crises of 2007 have affected almost all the countries in the world. Mainly, in the early 1990s when the economy of Japan experienced and economic shock it jolted the rest of the world as well (Okina et al., 2001). Additionally, at the knots of the crunch, initially, the warmth engrossed by the developed world such as the US and European markets. Subsequently, the track of jolt also dribbles down from emerging countries like Japan, Turkey, or Russia (Bosworth and Flaaen, 2009). In each scenario it becomes obvious that the stock markets of different countries will move together as we call co-movements.

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Normally, the perceived effect is known as the spillover effect among the stock markets of relevant countries (Bosworth and Flaaen, 2009).

Table No. 02: Market Capitalization concerning GDP

	Market Cap. % of GDP		**Turnover Ratio % of Mar. Cap**	
Country	**2020**	**2021**	**2020**	**2021**
Canada	135.6	112.8	65.8	69
Japan	70.0	119.8	101.5	114
	Market Cap. % of GDP		**Turnover Ratio % of Mar. Cap**	
Country	**2020**	**2021**	**2020**	**2021**
Brazil	70.0	28.7	98.9	87
China	76.8	74.5	215	490
India	96.4	72.0	67.0	52.0
Russia	63.5	30.6	54.2	30.0
Turkey	42.5	27.1	123.4	195

All the relevant countries have massive stock market capitalizations and even in most cases bigger than their economies originally. So, the volatility spillover effect will emerge in different countries as well. The flow of capital among the countries and the volatility spillover effect among the stock markets have made the said subject worthwhile for investors and capital market players as well (Pricewaterhouse Coopers, 2015). Because a proper understanding of the stock market volatility spillover effect among different countries will help the portfolio managers for risk diversifications (Demiralay and Bayraci, 2015).

Therefore, the current study seems to investigate the volatility spillover effect from the capital markets of major developed countries to major emerging countries by using the most sophisticated statistical methodology GARCH model from the period of 2014 to 2022. Furthermore, to investigate the spillover effect properly the study has used daily observations of data. It is worth mentioning the fact that Japan and Canada are the major partners in G7 countries whereas the said countries are also the major trade partners of major emerging countries as well. Furthermore, the rapid economic escalation of E7 countries has become very important and it is expected that the said countries may become the world leaders in the following few years.

Literature Review

Since the emergence of globalization, the financial markets of different countries started integrating which led to the great interest of research scholars to study the stock market volatility spillover effect with each other (Uludag and Khurshid, 2019; Khurshid and Uludag, 2021). Hamao et al. (1990) measured the stock market volatility spillover between developed and developing countries by using GARCH estimations and concluded that the spillover effect from the US stock market to Japan's capital market. There is also another study that also the same methodology and concluded volatility spillover from the US to Japan by using the GARCH model (Theodossiou & Lee, 1993). Additionally, Bae and Karolyi (1994) also concluded the same and established that abnormalities in the US stock market handsomely provoked the movements in Japan's Markets as well. The same trend has also been observed in other parts of the developed world as well such as in European markets, Booth et al., (1997) concluded that there is a stock market volatility spilloverover effect among the European markets. More precisely, the matter was further investigated from a European perspective by studying the case of the UK, Germany and France and the authors established that each market has a spillover effect on the other (Kanas, 1998; Caloia Cipollini and Muzzioli, 2018).

In the last two decades, several developing countries have broken the shell and entered the arena of emerging countries; resultantly, the developed world has sparked a substantial amount of capital in emerging countries' capital markets. Therefore, the subject of emerging countries' markets also becomes worth studying because these markets are considered as high risks high returns markets. The subject became more crucial right after the Asian financial crises particularly, in the Asia Pacific area Ng (2000) investigated the case of the US and Japan spillover effect on the capital markets of emerging markets and inferred that emerging markets are heavily associated with capital markets of G7 countries the said study also used GARCH estimation technique.

Additionally, Miyakoshi (2003) also studied the stock market volatility spillover between the US, Japan and major Asian stock markets. seven by using the GARCH approach from the study period from 1999-2000 and concluded that US and Japan have more influence on the stock markets of major Asian countries it is also worth mentioning fact that the Japan's capital market has more influence on the major Asian markets as compared to the US effect. Additionally, Sakthivel Bodkhe and Kamaiah (2012) used a bivariate approach with the support of GARCH on weekly observations of Australian, Japanese, India and UK data. The study produced an interesting finding and established that all the countries have bivariate effects on each other (Worthington & Higgs, 2004). Precisely, Li (2007) studied the case of China, the US and Hong Kong for the case of establishing spillover effect from 2000 to 2005 and concluded that there is an effect from the Chinese Stock market US Stock Exchange however, there is a spillover effect from China to Hong Kong Stock Exchange. Furthermore, Lee (2009) inspected the volatility spillover effects between Asian stock markets and showed significant effects inside these stock markets except India. Moreover, Johansson & Ljungwall (2009) explored the spillover effect from China Hong Kong and Taiwan which further affects the

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volatility in China. Different trading blocs also have spillover effects from each other as the US is influencing the BRICKS markets as well (Syriopoulos et al. 2015; Abidin & Zhang, 2011). As Li and Giles (2015) also studied the case of six developing countries (US & Japan) by using data from 1993-2012 the estimations established the spillover effect from developed countries to the developing ones (Irshad, Khurshid, Badshah and Bulut, 2021). Recently, Ahmed Zhao and Habiba (2022) carried out a study to check out the volatility spillovers among the stock markets of China, Japan, Pakistan, Hong Kong, South Korea, and Malaysia by using the daily data from 2010 to 2018. Furthermore, Bossman, Junior and Tiwari (2022) carried out a study to verify the return volatility spillovers among Islamic and Conventional stock exchanges throughout COVID-19 and concluded that the significant volatility spillovers between the Islamic and Conventional stock exchanges. However, same as the case of Balkan stock markets established volatility spillovers from oil to Balkan stock markets (Khurshid and Uludag, 2017; Uludag and Khurshid, 2019; Khurshid and Uludag, 2021).

Literature divulges that numerous studies have been carried out by using different periods and methods to examine volatility spillover effects. However, most of the studies have concluded that spillover effects stock markets. The existing literature sheds light on different regions and economic blocks such as the Asia-Pacific region, Euro Zone, MENA region, ASEAN countries and GCC countries. However, the empirical literature is lacking about the volatility spillover effect from the Canadian and Japanese stock markets to the emerging countries' stock markets. Therefore, the said is being carried out to bridge the gap in the existing body of literature.

Methodology

This study covers the two global stock markets, Canada and Japan, and five emerging stock markets including Brazil, China, India, Russia and Turkey. In this study, the daily data of Canada, Japan, Brazil, China, India, Russia and Turkey have been collected from 2014 to 2022 through the Thomson Reuters database. We have selected benchmark indices including the BOVESPA index of Brazil, the S&P TSX Composite index of Canada, the Shanghai Composite index of China, S & P BSE 100 index of India, the Nikkei 225 of Japan, the RTS index of Russia, and BIST 100 index of Turkey.

Table 03: Stock Indices

Countries	**Stock Index**
Brazil	BOVESPA
China	SSEC
India	BSE 100
Russia	RTS
Turkey	BIST 100
Canada	TSX
Japan	Nikkei 225

The returns were calculated by using the following equation:

$$R_t = (P_t - P_{t-1}) / P_{t-1}$$

$$R_t = (P_t - P_{t-1}) / P_{t-1}$$

(1)

Most of the econometrics models do not capture the issues of financial time series data. To capture the volatility clustering. Engle (1982) views that the ARCH model measures the conditional variance and some critical information which is important in establishing autoregressive ways. He also has the thought of discriminating against conditional and unconditional variances. Bollerslev (1986) developed the GARCH model which was an extension of the ARCH model to overcome the limitations of the ARCH model. In this study, we have applied the ARCH-GARCH model which was proposed by Engle (1982) and Bollerslev (1986) which is used to check the volatility spillover affects which is a function of lagged squared residuals and is as follows:

$$Yt = \alpha_0 + \alpha_1 Y_{t-1} + U_t \quad (2)$$

$$\sigma_{t\,2} = Y_0 + Y_1\, U_{t-1}^2 + \gamma_2\, \sigma_{\,t-1}^2$$

Empirical Findings

The study aims to investigate the impact of the stock market volatility spillover effect from major developed countries to emerging countries from the period 2014 to 2022 by using the GRACH model. Table 04 provides the results of descriptive statistics of Brazilian, Chinese, Indian, Russian, Turkish, Canadian and Japanese stock markets. According to the table, there were a total of 2946 observations where all the means were found positive, especially the emerging stock. The standard deviation of emerging stock markets is high as compared with global markets which indicates that emerging markets are riskier than mature markets. The Russian stock market has the highest standard deviation with a coefficient of 0.028 followed by the Turkish stock market as the second highest volatile stock market with a coefficient of 0.026. The value of kurtosis is high in all

the stock markets. The results of Kurtosis exhibit a positive skew with more than 3 which shows that all the distributions are leptokurtic.

Table No 04: Descriptive Statistics

Variables	Obs	Mean	Std.D.	Min	Max	Skew.	Kurt.
Brazil	2946	.001	.021	-.171	.138	.027	7.788
China	2946	0	.019	-.107	.138	.102	7.733
India	2946	.001	.019	-.113	.174	.164	11.837
Russia	2946	.001	.028	-.326	.343	.318	23.55
Turkey	2946	.001	.026	-.181	.195	.33	10.626
Canada	2946	0	.013	-.156	.11	-.548	17.172
Japan	2946	0	.017	-.119	.125	-.2	8.393

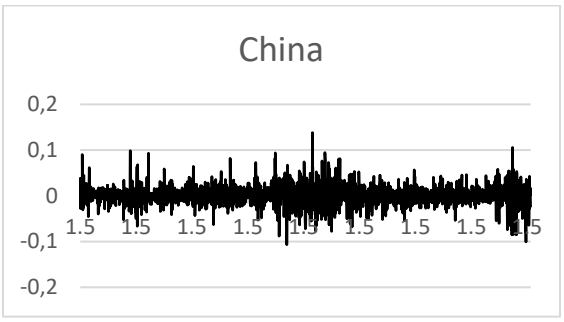
Table 04 reports the unit root test findings with trends and without trends. In this regard, we have applied for ADF and PP tests to check the stationarity of the series. The results exhibit that all the series are stationary, indicating the rejection of the null hypothesis at a 1% significance level. Figure 1 exhibits stock return behaviors for all the stock markets. The Turkish, Indian and Russian stock markets were found highly volatile. The stock markets of Russia and Canada passed through fewer spikes in their return series.

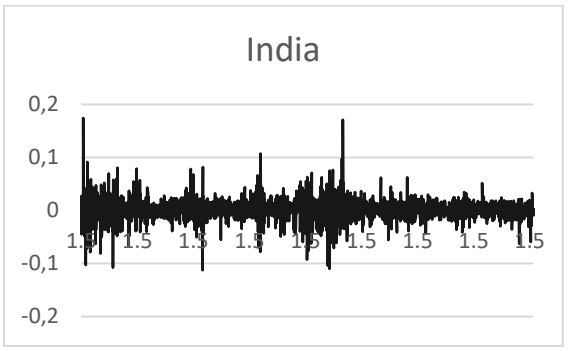
Table 04: Results of ADF and PP Test

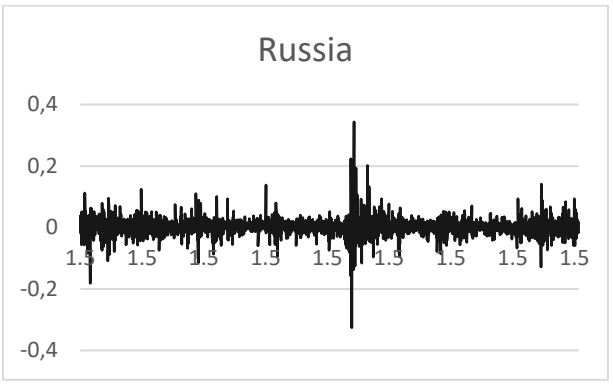
Country	ADF	PP Test	ADF	PP Test
Canada	*-54.104****	-54.212***	*-53.999****	-54.001***
Japan	*-55.254* ***	-55.001***	*-55.155* ***	-53.901 ***
Brazil	-55.217 ***	-55.375 ***	-55.111 ***	-55.098 ***
China	-53.785 ***	-53.796 ***	-53.445 ***	-53.231 ***
India	-50.717 ***	-50.805 ***	-50.321 ***	-50.331 ***
Russia	-51.325 ***	-51.246 ***	-51.100 ***	-51.101 ***
Turkey	-54.296 ***	-54.296 ***	-54.126 ***	-54.098 ***

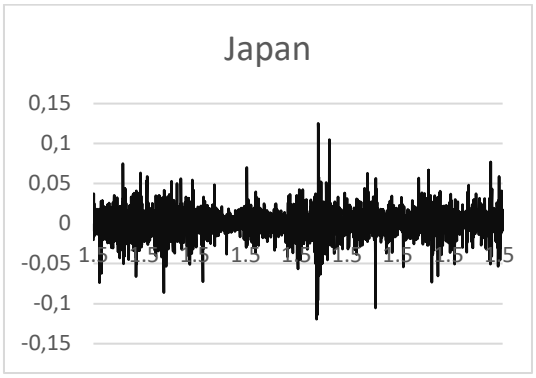
Figure 1

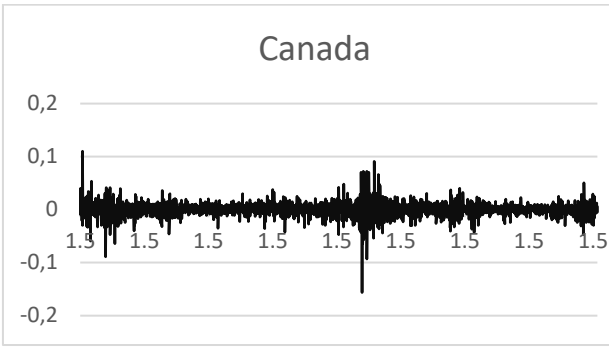

Brazil
0,2
0
-0,2


China
0,2
0,1
0
-0,1
-0,2


India
0,2
0,1
0
-0,1
-0,2


Russia
0,4
0,2
0
-0,2
-0,4


Japan
0,15
0,1
0,05
0
-0,05
-0,1
-0,15


Canada
0,2
0,1
0
-0,1
-0,2

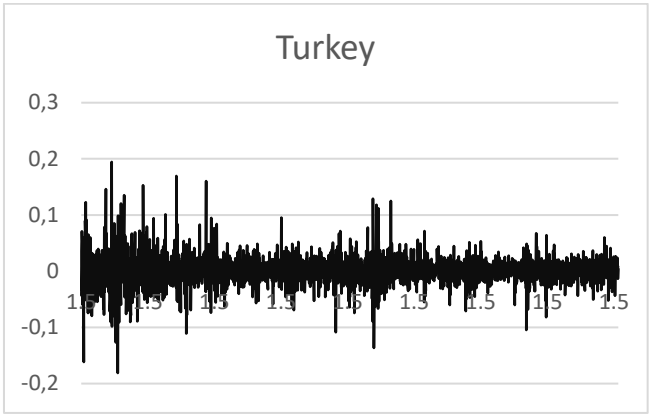

Turkey
0,3
0,2
0,1
0
-0,1
-0,2

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Table 05: Estimates of ARCH-GARCH

VARIABLES	Canada	HET	ARCH	Japan	HET	ARCH
Brazil		-49.59***			-21.22***	
		4.895			6.879	
China		11.48***			-12.71***	
		3.317			4.769	
India		25.20***			-14.87***	
		4.778			4.427	
Russia		-0.276			3.096	
		-3.123			2.534	
Turkey		-20.57***			-15.69***	
		2.928			3.216	
Japan	0.148***					
	0.00956					
L.arch			0.0761***			.0890***
			0.00634			-0.00799
L.garch			0.873***			0.852***
			0.00907			-0.0106
Canada				0.322***		
				-0.0193		
Constant	.000619***	-12.80***		0.000756***	-11.47***	
	0.00017	0.16		-0.00024	0.137	
Observations	2,946	2,946	2,946	2,946	2,946	2,946
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

According to the mean equation of model 1, the previous day's volatility of the Canadian stock market can influence the current-day volatility of the Canadian stock market. More importantly, the p-value of the ARCH term and GARCH term were found significant which means that the previous day's volatility of the Canadian stock market can predict the current day's volatility. It also shows that the internal shock of the Canadian stock exchange severely affects its returns. The coefficients of ARCH-GARCH terms show that the internal shock of the Japanese stock exchange affects its returns by 0.076 and 0.873 respectively. From the perspective of the variance equation, the estimates show that most of the coefficients of Brazil (-49.59), China (11.48), India (25.20) and Turkey (-20.57) were significant except for the stock market of Russia because the coefficient of the

Russian stock market is found insignificant which implies that stock market of Canada does not affect the current returns of the Russian stock market. These findings were found inconsistent with (Caporale, Pittis & Spagnolo, 2006). Moreover, the past stock returns of Brazil and Turkey are influenced negatively.

Turning out to model 2, the mean equation of the Japanese stock market is found significant which implies that the previous day's volatility of the Japanese stock market can influence the current day's volatility of the Japanese stock market. A noteworthy point is that the p-value of the ARCH term and GARCH term were found significant in the Japanese stock exchange which implies that the previous day's volatility of the Japanese stock market predicts the current day's volatility. It also shows that the internal shock of the Japanese stock exchange affects its returns. Focusing on the variance equation of model 2, the results of all the stock markets were found significantly positive except the Russian stock market which was found insignificant. The results mentioned that the Japanese stock market influences the returns of stock markets of Brazil, China, India and Turkey negatively with the coefficients of (-21.22), (-12.70), (-14.87) and (-15.68) respectively.

Conclusion

The study aims to investigate the impact of the stock market volatility spillover effect from major developed countries to emerging countries from the period 2014 to 2022 by using the GRACH model. By using daily observations of stock returns of major indices of respective countries the volatility spillover effect of major G7 countries namely: Japan and Canada to major emerging countries namely, India, Russia, Brazil, China and Turkey have been established. For instance, Canada and Japan are the major contributors to G7 countries and whereas, India, Russia, Brazil, China and Turkey are the emerging countries in Asian and African subcontinents. It has been established that the stock market movement of Canada and Japan has substantially affected the stock markets of major emerging countries. Specifically, east Asian countries where the West parks its major chunk of capital received substantial spillover effects particularly on, India and China. However, Japan has major financial partners with all the emerging countries except Russia. Moreover, the case of Canada is slit different than Japan, the formal country has more inclination with Asian and African countries as well. It is an astonishing fact that the insignificant coefficients of Japan and Canada with Russia indicate that the dynamics of Russian countries are a bit different than the rest of the world. The Russian economy is communist and generally perceived as a closed economy and the said does not have any major trade ties with the rest of the world. Normally, Russia deals with the rest of the world according to its norms by just ignoring the footsteps of capitalist globalization. The establishment of the study will be useful, particularly to capital market players such as investors for risk diversification and administration of effective policy making. The scope of the study can be enhanced by including more countries and by enlarging the sample size.

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