MACRO-ECONOMIC DETERMINANT AND INTERDEPENDENCE OF THE STOCK MARKETS: EVIDENCE FROM EMERGING ECONOMIES

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ABSTRACT

The purpose of the study is threefold. First, is to examine the long-term interdependence between China and the ten emerging economies, including Pakistan, Malaysia, Philippine, Indonesia, India, Hungary, Mexico, Russia, South Africa and Brazil using Johansen co-integration. Second, is to measure the time-varying interdependence between China and the other emerging economies using DDC GARCH model. Third, is to examine the impact of macroeconomic determinants on stock markets conditional correlations using panel regression. Monthly data from 2010 to 2016 is used. Results indicate that there is long-term interdependence between China and the other ten emerging economies. Furthermore, the results of DDC GARCH model support that China has a higher positive significant correlation with Pakistan, India, China, Indonesia, Malaysia, Philippine, Hungary, Mexico, Russia and South Africa. Finally, the results of the panel regression show that macroeconomic determinants have no significant effect on the equity market correlations between China and its companion emerging economies. It this, therefore, we can conclude that there is long run interdependence between the Chinese and the other emerging economies. Furthermore, this interdependence is also dynamic over the time. However, there is no significant impact of the macroeconomic determinants on the stock market interdependence between Chinese and the ten emerging economies.

KEYWORDS

Co-integration, DCC GARCH, Macro-economic determinants, Panel regression.

1. INTRODUCTION

Over the last few decades, government agencies and the key policymakers of both developing and the developed nations have attempted a few measures to abolish the hindrances among the nations to ensure the free stream of resources. This has significantly contributed to the interdependence of the economies and the effect of this association on their equity markets linkages. However, there are predominantly two distinct features in the realm of stock market interdependence. First, to what extent stock markets move together over the period. Second, what are the possible factors behind such a process? Earlier studies paid attention to the first aspect of the stock market interdependence for e.g.[1]–[4]. On the one hand, the more contemporary studies investigated the developed and the developing stock markets of USA, European, ASEAN and Asian markets. On the other hand, most of the previous studies examined the stock market interdependence in terms of correlation. Whereas, it is commonly believed that correlation has several deficiencies including the existence and the instability of lags. Therefore, even if the low correlation exists among the stock markets, this can be deceptive if it is time-varying [5]–[9].

Moreover, recently financial researchers have mainly devoted their attention to the [10]emerging economies stock markets for e.g. [6], [11], [12]. In view of that fact, emerging markets have distinctive characteristics from of the developed markets in terms of economic conditions, political structure, higher volatility, high interdependence, mean returns, currency, and the low correlation with the developed stock markets [13]–[15]. However, in these studies interdependence has been measured between emerging and the developed economies stock markets.

On the one hand, some previous studies found a strong linkage between macroeconomic factors and the equity market, while some other found that these linkages are rather not robust [16], [17]. On the other hand, [18] investigated what are the factors behind the stock market interdependence of emerging economies. [19]–[21] studies the cross-market linkages between Australia and its trading partners and found trade ties result in equity market interdependence.

But to our best knowledge, there is no major contribution regarding stock market interdependence in emerging economies after the Pretorius because financial crises divert the attention of the researchers. So, in this study it is endeavor first, to fill up the gap and identify what macroeconomic factors are behind the stock market interdependence in emerging economies context, as emerging economies grow in number since last twenty years and secondly, there is dearth of empirical investigation on stock market interdependence that takes the viewpoint of emerging economies, the use of emerging economies perspective provides an opportunity to address this particular gap.

This paper is also different from the other papers in the sense that in this paper the major driver of equity market belongs inside the emerging economy which is Chinese stock market rather than any developed world like in other studies for e.g. US equity markets are considered to be the benchmark equity market as the significance of China is the second largest and shares the major world output among the top ten economies. Moreover, presently China share has grown to 15.1%, while the share of Japan and the USA has fallen down to 31.1%% by 2017 [22].

The aim of this paper is threefold. First, is to observe the interdependence among the emerging economies stock markets, second, measure the time varying relationship among the stock markets of emerging economies. Finally, is to detect the possible macroeconomic determinants behind the interdependence among these markets. The subject of stock market interdependence has immense, theoretical, policy and practical significance. The foremost benefit of the interdependent market is that cost of and access to foreign investment lower and easier, respectively. To achieve the objective of the study first, we employ the Johansen multivariate co-integration test to ascertain long term association (interdependence). Second, to examine the time-varying association we employ DCC GARCH model. Finally, to detect the influence of macroeconomic variables on the security market interdependence this study employs a panel regression model.

2. LITERATURE REVIEW

Stock market interdependence has been tested employing several techniques but the empirical shreds of evidence are mixed. Studies focus on the co-integration techniques includes: [23] was among the first to implement the co-integration technique for the analysis of the interdependence among the United Kingdom and Japan, Germany and USA after the abolition of the currency restrictions in the United Kingdom. It was found that UK equity market was correlated with all except the USA market.

Researchers commonly belief that global diversification benefits can only be reaped if the correlation between the equity markets is low. However, the correlation between the equity markets is not stable over the time. It is, therefore, crucial to understand the instability of the correlation over the time. Initially, [24] researched the instability of the correlation and the covariance and found that correlation is stable over a fifteen year period during 1967-82. The results from past studies are mixed because most of the previous literature examined the market interdependence under the liner frame.

However, the liner co-integration technique unable to present whether the equity markets have become more integrated or whether the process of integration is gradual. According to [13] market interdependence is time-varying. To address this issue several studies consider the non-linear framework. [8] Uses the complex network analysis and the corresponding correlation measure to examine the underlying dynamic interdependence of the equity markets. [6] examined the twenty-two emerging equity markets situated in Europe, Asia, America, and the Africa/Middle East with the US market by applied a different approach as most of the researchers used, which is wavelet theory for empirical testing and It was found that the integrated intensity of the stock markets is time varying. [25] Tested the dynamic conditional correlation between the Chines and the international stock markets. It is substantiated through the results that correlations across the markets are time-varying. It is also identified that dynamic correlation is compactly linked with the geographic location. [26] Also confirmed that dynamic conditional correlation between S&P 500 and S&PGSCI energy sub-index is time- varying. It is therefore, we can infer that interdependence between the equity markets is dynamic and it is a gradual process.

So based on the literature the DDC GARCH methodological approach has succeeded in capturing is the dynamic conditional correlation. It permits the researchers to comprehend the change in the conditional correlation and the volatilities which is the more precise representation of the fact.

Literature gives an exposition of the theoretical understanding of why the co-movement between the stock markets exist. on the one hand, variables those are perceived to be the main driver of the interdependence of the stock market in the developed economies are bilateral trade, exchange rate volatility, Size differential, market volatility, size differential, real interest rate differential, term structure differential, industrial composition and return on world market index.

Alternatively, the variables that influence the stock market interdependence are still mainly undiscovered in case of emerging equity markets. In general changes in these variables over the time also affects the stock market interdependence. According to the early studies, foreign trade promotes business cycle harmonization through the countries and consequently impacts the degree of their market interdependence for example [27]–[30] ascertained that trade is a significant variable in describing the correlation between the stock markets. similarly, Pretorius (2002) if interdependence between two economies due to bilateral trade, consequently, one can anticipate that there stock market and the economy will move

in the similar route. Based on these theoretical and empirical pieces of evidence it is concluded that trade is a significant factor in describing the interdependence.

Numerous past studies use exchange rates volatility and the inflation differential to observe their impact on stock market interdependence [18]. The outcomes from these limited studies indicate that the exchange rate has a significant effect on the equity market interdependence [31]–[33]. Similarly, [34] also confirm the previous findings and documented negative effect of exchange rates on stock market interdependence.

Based on the above critical review of the literature it can be argued that market interdependence is a conflicting issue. This implies that it is a time-varying phenomenon even among the similar markets and furthermore, it also varies among countries development level for e.g. developed, developing, underdeveloped and emerging.in addition to this, bilateral trade relationships, industrial production, inflation, exchange rate are possible factors in describing the stock market interdependence.

In the process of the review of the literature, we find the gap in three areas first, there is a number of studies conducted in the most mature and the developed world and mostly the benchmark economy have been US stock market. Secondly, most of the studies use correlation or the co-integration to measure the stock market interdependence. Lastly, there is no comprehensive study after the [18] which re-examine the interdependence of the stock markets in terms of economic interdependence among the emerging economies stock market using the DDC GARCH model to also consider time-varying behavior.

3. DATA AND METHODOLOGY

On the one hand, we Johansen co-integration to examine long run static interdependence. On the other hand we applied DCC GARCH model to assess the long run time-varying interdependence. Following are the representative index of each country. KSE 100 index (Pakistan), S&P BSE SENSEX (India), SSE Composite (China), JSKE (Indonesia), FTSE Bursa Malaysia KLCI (Malaysia), PSEi (Philippine), BVSP (Brazil), BUX (Hungary), MMX (Mexico), MICEX (Russia) and FTSE/JSE (South Africa).

Further, to study the impact of macroeconomic determinant on stock market interdependence we run a Panel regression model. For this purpose we collected data of differential of bilateral trade, inflation (CPI), interest rate and exchange rates (local currency) from IMF Financial statistics database. Only bilateral trade data is transformed into natural logarithm form and the other factors are used in their initial form.

In this study, we apply the well- known multivariate GARCH model, namely the DDC GARCH model. The key benefit of the DDC GARCH model as compared to other time-varying models, for instance, Flexible Least Square and Kalman filters are that it permits the researcher to understand the shifts in conditional correlations and volatilities which is the more correct picture of the reality. Lastly, the panel regression techniques is an effective and efficient in terms of measuring the cause

and effect of industrial production, bilateral trade, exchange rate, inflation and interest rate on time-varying conditional correlations of stock market returns.

4. EMPIRICAL RESULTS
4.1. Multivariate co-integration test

After unit root testing as a prerequisite condition for co-integration testing, we examine the long-term co-movement between China and the other emerging economies by employing the multivariate VAR based co-integration technique developed by [35], [36]. Results of the multivariate co-integration are discussed below.

Table 1. Multivariate co-integration.

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.620	406.469	285.143	0.000
At most 1 *	0.543	323.234	239.235	0.000
At most 2 *	0.516	255.852	197.371	0.000
At most 3 *	0.468	193.523	159.530	0.000
At most 4 *	0.435	139.285	125.615	0.005
At most 5	0.270	90.238	95.754	0.113
At most 6	0.245	63.132	69.819	0.152
At most 7	0.198	38.960	47.856	0.262
At most 8	0.123	19.959	29.797	0.426
At most 9	0.089	8.6380	15.494	0.310
At most 10	0.007	0.609	3.841	0.435
Trace test indicates 5 co-integrating eqn(s) at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.620	83.235	70.535	0.002
At most 1 *	0.543	67.382	64.505	0.026
At most 2 *	0.516	62.329	58.434	0.020
At most 3 *	0.468	54.238	52.363	0.032
At most 4 *	0.435	49.047	46.231	0.024
At most 5	0.270	27.106	40.078	0.626
At most 6	0.245	24.171	33.877	0.443
At most 7	0.198	19.001	27.584	0.415
At most 8	0.123	11.321	21.132	0.615
At most 9	0.089	8.029	14.265	0.376
At most 10	0.007	0.609	3.841	0.435
Max-eigenvalue test indicates 5 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

Grounded on these outcomes, the null hypothesis of no co-integration between these markets can be rejected (see. Table. 2). These outcomes are similar to [4], [21], [37], [38]. It is, therefore, on the basis of results we reject the null hypothesis as stated below:

Ho: There is no long-run relationship between emerging and Chinese stock markets.

Table 2. Time-varying conditional correlations Between China and each country.

Country	Index	Correlation coefficient	P-value
Pakistan	KSE	0.845	0.000
Malaysia	KLCI	0.813	0.000
Philippine	PSEi	0.834	0.000
Indonesia	JKSE	0.834	0.000
India	BSENSEX	0.860	0.000
Hungary	BUX	0.947	0.000
Mexico	MMX	0.915	0.000
Russia	MICEX	0.957	0.000
South Africa	JSE	0.986	0.000
Brazil	BVSP	-0.708	0.000

Table 2 testifies the conditional correlations between China and the rest of emerging economies in MSCI index. The calculated correlations in the above table support that China has the higher positive significant correlation with Pakistan, India, China, Indonesia, Malaysia, Philippine, Hungary, Mexico, Russia and South Africa. However, Brazil is an exception with higher negative significant correlation with China stock market. On the basis of the empirical analysis of the time-varying behavior of stock markets, we can reject the below mentioned null hypothesis.

H_0: There is no dynamic relationship between china and the other emerging economies.

4.2. Impact of macro-economic determinants on stock market correlations using Panel regression model

To analyze the influence of the macroeconomic determinants on the stock market correlations between the China and the emerging economies we apply the panel regression model.

Table 3. Result of Random Effect Model.

Dependent Variable: Correlation				
Method: Panel EGLS (Cross-section random effects)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.633	8.500	0.545	0.585
D(Trade)	8.899	5.788	0.015	0.987
D(Exchange rate)	-9.811	9.988	-0.098	0.922
D(Industrial Production)	2.499	1.277	0.196	0.845
D(INFLATION)	-2.688	2.699	-0.999	0.318
D(Interest rate)	-0.001	0.000	-1.753	0.080

The result of random effect model presents that there is no single macroeconomic determinant among bilateral trade, inflation differential, interest rate differential, industrial production differential and exchange rate differential, which report the significance. The results show that macroeconomic determinants have no significant effect on the stock market correlations between China and its companion emerging economies. It is, therefore, we cannot reject the null hypothesis as stated below:

Ho: There is no significant impact of macroeconomic determinants on stock market correlations between China and emerging economies.

It is therefore, we can conclude macroeconomic determinants have insignificant impact on the stock market correlations between China and the emerging economies stock markets. However, the results of this study are dissimilar to those of [39], [40] who document that macroeconomic linkages among the countries can drive their stock market interdependence.

5. CONCLUSION

In this paper, first, we investigate the interdependence from the perspective of China and its companion emerging economies stock markets including Chinese, Pakistan, Malaysia, Indonesia, Philippine, Brazil, Mexico, Hungary, Russia, South Africa, and India, through the application of multivariate Johansen co-integration technique. Second, we determine the degree of the interdependence between these markets, through the application of DDC GARCH model. Third, we examine what macroeconomic determinants are significant in establishing the interdependence between China and its companion emerging economies, this study has empirically analyzed the dynamic association between the equity markets and the macroeconomic determinants using panel regression analysis.

Results indicate that Chinese stock market are co-integrated with stock market of the other emerging markets. Centered on these outcomes, the null hypothesis of no co-integration between these markets can be rejected. These outcomes are consistent with the earlier studies like (Masih and Masih, 1999; Shamsuddin and Kim, 2003; Kazi, 2008; Paramati, Gupta and Roca, 2015). In addition to this, The results of DDC GARCH model support that China has a higher positive significant correlation with Pakistan, India, China, Indonesia, Malaysia, Philippine, Hungary, Mexico, Russia and South Africa. However, Brazil is an exception with higher negative significant correlation with the Chinese stock market.

It also confirms that the relationship between China and the other emerging economies has been increasing over the time except for Brazil. Finally, the results of the panel regression show that macroeconomic determinants have no significant effect on the equity market correlations between China and its companion emerging economies. It this, therefore, we can conclude that there is long run interdependence between the Chinese and the other emerging economies.

Furthermore, this interdependence is also dynamic over the time. However, there is no significant impact of the macroeconomic determinants on the stock market interdependence between Chinese and the other emerging economies. The outcomes of this study will significantly contribute to the current literature, from the perspective of both the investors and the policymakers.

6. ACKNOWLEDGEMENTS

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