
**MACRO-ECONOMIC DETERMINANTS OF STOCK MARKET
INTERDEPENDENCE BETWEEN CHINA & ISLAMIC EMERGING
ECONOMIES**

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ABSTRACT: *The purpose of this paper is to examine the interdependence between stock markets of Islamic Asian Emerging economies & the Chinese stock market. This study uses monthly time series data and to examine the interdependence. First, co-integration technique is used to measure long run relationship. Second, to measure time varying relationship FEVD technique is used. Finally, a time series pairwise regression employed to examine the impact of macro-economic determinant on time varying relationship measured through FEVD. The findings support that there is interdependence between Islamic Asian Emerging Economies Stock markets and the Chinese stock markets and this interdependence is also time varying, and macro-economic determinants significantly affect this time varying relationships. It is therefore, concluded that there is long run interdependence exist between Islamic Asian Emerging stock markets and the Chinese stock market and macro-economic determinants are significantly affect this relationship. Originality/value: This paper adds to the literature by providing important information regarding the interdependence between Islamic Asian Emerging Stock markets & the Chinese stock market.*

KEYWORDS: *stock market interdependence, co-integration, FEVD, macro-economic determinants, Asian emerging markets, CPEC*

1. Introduction

Stock market interdependence has been a controversial subject over the previous three decades. Stock market Participants profoundly concerned whether stock markets are interdependent or segmented and if yes, at what extent the degree of interdependence is? and what are the forces behind this phenomena? The significance of international diversification gained phenomenal attention after the seminal work of Markowitz in 1960s. Markowitz added that internationally diversified portfolios experience lower risk and higher returns (markowitz 1960). Latest literature is divided into two mainstream thought about the stock market interdependence, First, either stock markets are interdependent or not over the time? and if markets are interdependent, how this interdependence has developed over time. Second, what are the determinants of the stock interdependence from macro-economic perspective?

Early studies examined the first aspect for e.g. (Cheol S. Eun and Sangdal Shim 1989; Cheung and Mak 1992; Longin and Solnik 1995). On the other hand, more recent studies investigate the probable factors following the stock market interdependence for e.g. (Kizys and Pierdzioch 2009; Paramati, Gupta, and Roca 2015; Paramati, Roca, and Gupta 2016; Paramati et al. 2017) , as pointed out by Longin and Solnik (1995) that potential research must concentrate on the primary determinants of cross market correlations. However, the main issue is that plenty of studies are related to the developed and most mature stock markets. These markets had an experience of

dissimilar times of ups and downs with the diverse economic and the Political arrangements. In addition to this, these markets are more regulated, creative and stable as well as compare to undeveloped markets and the emerging markets, which have different characteristics. However, there are a lot of studies in the context of emerging financial markets still it is needed to conduct more research. Past decades reveals that financial markets of emerging economies are the most appealing avenue for the stock market participants because these markets have a potential to be a developed market or in near past it was an in developed market class or alternatively, it has a similar feature as a developed market has but it still needs to meet the benchmark of the developed market. It is therefore, this study endeavors to fill the gap by contributing in the current literature of the equity market interdependence in the perspective of Asian emerging economies. In this study we use Chinese market as a benchmark unlike other studies which selected US as a benchmark market, because China is among the largest economies in the world and especially the position it has gained in the Asian region due to CPEC, and investors and the policy maker of the Asian region views this a game changer project in the Asian region.

The aim of this study is twofold one is to examine interdependence among the Asian emerging economies including China, Turkey, Pakistan, Indonesia, Malaysia and Iran and the second, is to investigate degree of interdependence between these market. Lastly, is to uncover the possible macro-economic determinants of the interdependence among these markets. The rationale behind this investigating is that these markets share particular mutual social, cultural, political & economic physiognomies which have substantial influence on behavior of the market participants. To accomplish the objective of the study first, we employ multivariate co-integration method to ascertain long term relationship (interdependence). Second, to examine the time varying association we employ VAR based forecast error variance decomposition (FEVD). Finally, to detect the influence of macro-economic variables on the security market interdependence this study employs a time series regression model.

The outcomes of multivariate co-integration suggest the long run association between Chinese and other emerging economies stock markets. However, China stock market accounted for around six percent variance in Turkey, Pakistan, Iran, Malaysia and Indonesia. However, on average twenty-three percent variation accounted for China stock market for its own shock or innovation. Finally, overall macroeconomic factors are significant in explaining interdependence between Islamic Asian emerging stock markets and the Chinese stock market. However, these factors have an asymmetric affect across the markets.

The reminder of the text is structured in the following way. Section.2. describes the major existing theories and review the concept of market interdependence. Section.3. briefly overview of the methodology including, statistical model and the technique used for the analysis, sampling technique and the sample size and data sources. Section.4. explains the outcome of empirical testing and it analysis. Section.5.

concludes the study by highlighting the main results obtain from the study and the possible extension of the study.

3. Data and Methodology

3.1 Data

In this paper we obtained monthly closing stock prices of each index from Yahoo finance website from January 2012 to December 2018. Index of the selected countries are as follows, Pakistan (KSE 100), India (BSENSEX), China (SSC composite), Philippine (PSEi), Malaysia (KLSE) and Indonesia (JKSE). Furthermore, the time series model of regression analysis employed to examine the influence of macro-economic variables on the stock markets co-movement. Data is collected from January 2012 to December 2018, using IMF (International) Financial statistics database.

3.2 Methodology

The present study first employs (Johansen 1991, 1995) multivariate cointegration test for long-run connections examination involves the Chinese and five stock markets including (Pakistan, Indonesia, Malaysia, Iran, and Turkey). In the second step, we use the forecast error variance decomposition to examine the degree of the interdependence between stock markets of Islamic Asian emerging economies and China. Lastly, to examine whether the macroeconomic determinants significantly impact the equity market interdependence we use time series regression.

3.3 Multivariate co-integration test

To observe long term static co-movement between stock markets of Islamic Asian emerging economies and China, we use multivariate VAR based co-integration technique developed by (Johansen 1991, 1995). This technique is employed in this study suppose the liner deterministic movement in the specified statistics and there is only one intercept in the equation of co-integration. To examine the long run association among the markets month end stock price data is expressed in the form of natural logarithms. The lag length criteria is based on AIC for the measurement of the co-integration, and it is proved that lag length residuals are random. We apply Johansen co-integration approach using two distinctive likelihood ratio test- one is maximum eigenvalue (λ_{max}) and the other is trace (λ_{trace}), to observe the long run association between the precise factors.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^g \ln(1 - \hat{\lambda}_i) \text{-----}1$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \text{-----}2$$

3.4 Forecast error variance decomposition (FEVD)

In this paper, to examine the degree of the stock market interdependence the Forecast error variance decomposition analysis is conducted by applying vector autoregressive model of equity returns.

We apply forecast error variance decomposition method by applying vector autoregressive model of equity returns to examine the degree of interdependence among the stock markets. This FEVD technique employs the simulations on the

measured VAR model and thus quantifies the particular market response to the innovation in other markets. This technique furnishes a quantifiable criterion for short-term dynamic interdependencies among equity markets. Especially, the FEVD captures the percentage of unanticipated variation in the equity return of one market accounted for by shocks of other markets in the system. Researchers has extensively applied this method to examine the market interdependence (Lin and Cheng 2008; Liu and Shrestha 2008). Nonetheless, the limitation of the customary approach of the FEVD is that the outcome differs as per order of the given variables in the VAR model. Pesaran and Shin (1998) recently proposes generalized FEVD technique to overcome the shortcoming of the traditional FEVD technique.

3.5 Time series regression

To observe the impact of macro-economic on stock market time series regression model is employed. The explained variable is FEVD of the Islamic Asian emerging markets receives an explanation by the Chinese market. The independent variables are macro-economic variables including (differential of bilateral trade, inflation, industrial production, interest rate and the exchange rates). These variables are in monthly frequency and covers a period of seven years and comprises eighty four data points. Previous studies have applied panel regression by pooling observations of all markets-pairs for empirical analysis. However, this study, instead of pooling the data use pair wise time series regression for each China-Islamic Asian markets pair to fully capture the influence of macro-economic variables on the interdependence between these markets. The time series regression model is as follows.

$$FEVD_{it} = C + \beta_1 T_{it} + \beta_2 ER_{it} + \beta_3 ID_{it} + \beta_4 INF_{it} + \beta_5 IRD_{it} + \mu_t \text{ -----(3)}$$

4. Results & Discussion

4.1 Unit root analysis

Prior to measurement of long run co-movement among emerging economies, it is necessary to check stationarity. Results of both tests show that every variable is integrated at first difference.

Table 1. Multivariate cointegration test results

Hypothesized		Trace-	0.05	
No. of CE(s)	Eigen-value	Statistic	Critical- Value	Prob.**
None *	0.425	117.861	95.753	0.000
At -most 1 *	0.363	72.907	69.818	0.027
At- most 2	0.206	36.375	47.856	0.377
At- most 3	0.128	17.641	29.797	0.592
At-most 4	0.076	6.478	15.494	0.639
At most 5	0.0003	0.030	3.841	0.860

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p -

Values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized	Max-Eigen-		0.05	
No. of CE(s)	Eigen-value	Statistic	Critical- Value	Prob.**
None *	0.425	44.954	40.077	0.013
At- most 1 *	0.363	36.532	33.876	0.023
At- most 2	0.206	18.734	27.584	0.435
At- most 3	0.128	11.163	21.131	0.631
At- most 4	0.076	6.447	14.264	0.556
At- most 5	0.000	0.030	3.841	0.860

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Source: Author own Elaboration

Johansen's co integration explains the static interdependence between the stock markets of China and Asian emerging economies including Turkey, Pakistan, Iran, Malaysia and Indonesia. Both tests of co-integration Trace and Max-eigen suggest that there is co-integration relationship at 5 percent level of significance, so we failed to reject the null hypothesis of no co-integration (see. Table.1). Based on the results we can conclude that there is co-integration between stock markets of China and Islamic Asian emerging economies. furthermore, these results are aligned with the earlier studies such as (Kazi 2008; Masih and Masih 1999; Paramati, Gupta, and Roca 2015; Shamsuddin and Kim 2003).

4.3 FEVD Analysis

Analysis of both the ADF and the PP tests suggest that all the equity indices are stationary at the first difference. Consequently, we can use the return series in the VAR framework. The percentage of the FEVD of the Islamic Asian emerging economies has been estimated for every month during 2012 to 2018. This encapsulates the variation in the interdependence between these stock markets. There are several notable findings surfaced in the FEVD analysis. First, no particular market's own innovation entirely accounted for its own variation it implies that no market is completely exogenous. However, it is also observed that there is insubstantial interaction China stock market with other Islamic Asian emerging economies stock market. Having closer investigation of the FEVD analysis of each market it is found that on average, the China stock market accounted for around 6 percent variance in Turkey, Pakistan, Iran, Malaysia and Indonesia. However, on average 23 percent variation accounted for China stock market for its own shock or innovation (see. table.2). It is also found in that before January 2013 the variation explained by China in the all five Islamic Asian emerging economies stock market was trending upward means in 2012 the variation explained were very high, however, afterward, all the markets showing the downward trend. Similarly, it is also observed that variance in Chinese stock market explains by itself also very low in the long run.

Overall empirical evidence of the FEVD analysis reveals that the Islamic Asian Emerging stock markets are vulnerable to the shocks come from the Chinese market, however, the consequences of shocks differ throughout the markets.

Table 2. Percentage of Variance of Among Islamic Asian Emerging Economies Stock Market

China, Turkey, Pakistan, Iran, Malaysia and Indonesia	China- China
6%	23%

Source: Author own Elaboration

4.4 Regression model

We use time series regression to evaluate the impact of macro-economic determinants on the market interdependence. The dependent variable is the percentage of the FEVD of the Islamic Asian emerging economies return explained by the stock market return of China and trade, Industrial production, Inflation, Interest and currency exchange rate are the explanatory variables. Result of the regression reveals that trade linkages is statistically significant influence in explaining the variance particularly in case of Iran and Pakistan with China. On the other hand, in all further cases, the bilateral trade is the statistically insignificant Iran and between China and Pakistan helps in explaining the interdependence between these markets and China. However, there is a striking point which is that only 0.12 percent variation in Pakistan and the Iran markets are explained by the China market. Since many previous literature for e.g. (Mohanty et al. 2011) documents the fact that the government own a large number of Chinese firms or partially registered on the security exchanges. This reason may be the cause of insignificant linkages concerning the bilateral trade and the market interdependence. Further, the industrial production differential has positive significant influence in case of explaining the variation in the relationship between the Iran and Chinese markets. In addition to this the interest rate is only significant in explain the relationship between Chinese and the Malaysian markets. However, Inflation and exchange rate differential are insignificant in all the cases (see table.3). Therefore, it can be concluded that bilateral trade, inflation and the interest rate are significant factors in describing the interdependence between the China and other Islamic Asian emerging economies stock markets. The result are consistent with the conclusion of (Kizys and Pierdzioch 2009) that international equity correlations are unsystematically linked to the co-movement or asymmetric shocks of macro-economic factors.

Table 3. Regression results

Turkey			Indonesia			Malaysia			
Variabl es	Coeff .	t-test	P- value s	Coeff. .	t-test	P- value s	Coeff .	t-test	P- value s

Constant	29.078	21.160	0.000	13.399	26.837	0.000	-14.478	-1.624	0.108
Log of BT	1.748	0.283	0.777	-3.477	-0.692	0.490	1.728	2.799	0.006
Ind.Prod	0.375	2.425	0.018	0.043	0.346	0.730	0.032	1.357	0.179
INF	-0.228	-0.369	0.712	0.257	0.421	0.675	0.001	0.006	0.994
Int. rat	1.571	0.824	0.413	5.171	1.536	0.129	-2.719	-19.626	0.000
Ex.rat	0.176	0.348	0.729	0.001	0.737	0.463	-0.973	-0.769	0.444

	Iran			Pakistan		
Variables	Coeff.	t-test	P-value	Coeff.	t-test	P-value
Constant	4.843	6.538	0.000	194.845	-1.946	0.055
Log of BT	6.390	2.169	0.033	14.455	2.129	0.036
Ind.Prod	0.006	0.342	0.733	0.108	0.765	0.447
INF	-0.091	-0.324	0.747	2.980	1.556	1.916
Int. rat	0.208	0.383	0.702	0.622	0.175	0.861
Ex.rat	0.149	0.623	0.535	-0.617	-0.641	0.524

5. Conclusion

Stock market interdependence has been a crucial issue for last several decades due to the impact it has on the resources flow. It is still an important issue because the interdependence is a time varying process. In addition to this, many studies examined the stock market interdependence and the benchmark market for these studies was US stock market. Conversely, in this study we use Chinese stock market as benchmark stock market for rest of the Islamic Asian emerging economies stock markets because of two reasons. First china is among the largest economies among the world

economies. Second, due to CPEC China has gained much importance especially in the Asian region. Another issue which is highlight in this study is that among a large number of studies there are few which explored the possible macro-economic determinant of stock market integration.

According to the general findings, there is a significant long-run association exist between Chinese and other Asian emerging economies, these results are aligned with the prior studies for e.g. (Kazi 2008; Masih and Masih 1999; Shamsuddin and Kim 2003; Paramati, Gupta, and Roca 2015). FEVD result confirms that this relationship is time varying phenomena. However, the FEVD analysis of each market it is found that on average, the China stock market accounted for around 6 percent variance in Iran, Pakistan, Turkey, Malaysia and Indonesia. However, on average 23 percent variation accounted for China stock market for its own shock or innovation. It is also found in that before January 2013 the variation explained by China in the all five Islamic Asian emerging economies stock market was trending upward means in 2012 the variation explained were very high, however, afterward, all the markets showing the downward trend. Furthermore, the result of regression analysis confirms that macro-economic determinants are significant to change in the degree of interdependence among the stock markets. However, the results suggest that all the macro-economic determinants do not affect the variation in Iran and Pakistan. Likewise, interest rate is only significant in case of Malaysia. Conversely, inflation and exchange rate are insignificant in all the cases. We view this as an Intriguing result because given a large number of macro-economic factors available it is important to find out those variables which are helpful for modeling the change in the equity market interdependence.

In light of these confirmations, the study recommends that the stock markets of Asian emerging economics are interdependent on the Chinese stock market and therefore, the opportunity to invest in Chinese stock market has significantly reduced for the investors Islamic Asian emerging economies looking for opportunities. It is also noticeable for the policy makers of these economies to aware the macro-economic changes as these changes will have implications on their stock market performance.

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