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Do investors consider composite leading indicators? Time series evidence from emerging countries

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Abstract. *The nexus between macroeconomic indicators and stock market has been worthy of examination in emerging markets in the recent years. This paper therefore aims to investigate the long run and causal relationship between Composite Leading Indicators (CLI) and share prices in the thirteen emerging markets. Findings obtained from the analyses do not provide consistent results across all emerging markets. Empirical evidences of this study indicate that component structure of CLI and financial development level of questioned countries appears to play important role in determining the effectiveness of CLI in investors' decisions.*

Keywords: share prices; composite leading indicators; emerging markets.

JEL Classification: E44, F37.
REL Classification: 10F.

1. Introduction

Policymakers and researchers need to have an indicator that anticipates the fluctuations in economic activity earlier especially soon after crisis experiments in recent years. OECD has developed a system of "Composite Leading Indicators" to provide early signals of peaks and troughs between expansions and slowdowns of economic activity cooperatively with relevant country.

Anticipation of financial sector clearly contributes to development of real sector. From this viewpoint, proving the nexus between macroeconomic indicators and share prices also makes major contribution to this anticipation. Thus, it is very crucial to find out whether there exists any relationship between leading indicators and share prices both for financial and real sectors.

One would argue that the relationship between economic indicators and share prices could exist via the development of capital markets. Since investors trade through financial intermediaries, especially banks in emerging stock markets, for example, the development level of banking sector is positively correlated with the development level of stock markets (Demirguc-Kunt, Levine, 1996, Yartey, 2007).

The papers that examine the relationship between macroeconomic variables and stock markets contain different macroeconomic determinants. However, established models normally involve multicollinearity problem. In this sense, this paper aims to find out long run and causal relationships between macroeconomic indicators and share prices in emerging markets by utilizing CLI. The countries classified as emerging markets changes somewhat from year to year but typically MSCI determines 21 countries as emerging[(1)]. In our analysis, we use 13 of them, namely Brazil, Chile, China, Czech Republic, Hungary, India, Indonesia, Korea, Mexico, Poland, Russia, South Africa and Turkey because of lack of data.

Present literature includes a large number of studies on the relationship between macroeconomic variables and stock markets. Nonetheless, empirically little is known about the impacts of composite leading indicators to share prices. Besides, despite of a relatively lots of papers on developed countries, to our knowledge, there is no other study which explores this issue in the case of emerging markets. Hence, this paper aims to fulfill this gap and contributes to empirical literature.

Since the long run and causal relationships between macroeconomic indicators and stock markets in emerging countries mostly differ from one to another, it is very difficult to discuss the theoretical relation between CLI and stock market. Another goal of this paper is therefore to provide a linkage between question variables on country or continental basis.

This study is composed of six sections. Following the introductory part, related literature was analyzed in the second part, model and data of the study were put forth in the third part, methodology and findings were interpreted in fourth, policy implications were made in the fifth part and finally a general review was presented.

2. Literature review

The relationship between stock prices and macroeconomic variables such as exchange rate, interest rate, industrial output, inflation, slope of the yield curve and money supply is well documented for the United States and other developed markets (Abdallah, Murinde 1997, Bredina, Gavin, O'Reilly, 2005, Chaudhuri, Smiles 2004, Chen et al. 1986, Cheung, Lilian, 1998, Darrat, Dickens, 1999, Fama, 1981, 1990, Flannery, Protopapadakis, 2002, Fama, French, 1989, Hamao, 1988, Humpe, Macmillan, 2009, Nasseh, Strauss, 2000, Thornton, 1993, Kim, 2003, Rahman, Khan, 2009, Ratanapakorn, Sharma, 2007, Wang, Lim, 2010). There exist relatively little papers including a few of emerging markets but these papers are lack of consensus. Hence it is still ambiguous that what this relationship looks like in emerging markets.

Because there exist no other study exploring the CLI-stock markets nexus, literature part is composed of the relation between macroeconomic indicators and stock markets in order to reveal empirical links. Muradoglu, Metin and Argac (2001) examined the long-run relationship between stock returns and overnight interest rate, money supply and foreign exchange rate during the period from 1988 to 1995 in Turkey. They found no cointegration relationship between stock prices and any of monetary variables or groups of variables of concern.

Samitas and Kenourgios (2007) investigated whether current and future domestic and international macroeconomic variables can explain long and short run stock returns in four "new" European countries (Poland, Czech Republic, Slovakia and Hungary) and "Old" Western European countries (UK, France, Italy and Germany). They tested the relationships between share prices, industrial production in the US, domestic industrial production, interest rates in the US and domestic interest rates using cointegration theory. They found that interest rates had a significant relationship with all countries stock prices, while domestic industrial production was found to have a significant effect only on share prices of European developing countries.

Gay (2008) investigated the time-series relationship between stock market index prices and the macroeconomic variables of exchange rate and oil price for Brazil, Russia, India, and China (BRIC) using the Box-Jenkins ARIMA model. He found

that no significant relationship between exchange rate and oil price on the stock market index prices in all of BRIC countries and no significant relationship found between present and past stock market returns.

Kandir (2008) investigated the role of seven macroeconomic factors in explaining Turkish stock returns in the period from July 1997 to June 2005. Macroeconomic variables used in his study are growth rate of industrial production index, change in consumer price index, growth rate of narrowly defined money supply, change in exchange rate, interest rate, growth rate of international crude oil price and return on the MSCI World Equity Index and the analysis is based on stock portfolios rather than single stocks. He found that exchange rate, interest rate and world market return seem to affect all of the portfolio returns, while inflation rate is significant for only three of the twelve portfolios.

Liu and Shrestha (2008) investigated the relationship between the Chinese stock market indices and a set of macroeconomic variables, such as money supply, industrial production, inflation, exchange rate and interest rates. They discovered the evidence of cointegration relationships between stock prices and macroeconomic variables and they also found that macroeconomic situation is positively influenced by long-run stock-market performance.

Alam and Uddin (2009) examined the impacts of interest rates on stock exchange. Their findings showed empirical relationship exists between stock market index and interest rates for fifteen developed and emerging countries: Australia, Bangladesh, Canada, Chile, Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, the Philippine, South Africa, Spain, and Venezuela. They found that changes of interest rates have significant negative relationship with changes of stock prices.

Kumar (2011) examined the causal relationship between stock prices and macroeconomic variables in India for the period from 1st April 2006 to 31st March 2010 using techniques of unit–root tests, cointegration and the Granger causality. He found that there is no co integration between Nifty index and all other variables except Wholesale price index (WPI) as per Johansen cointegration test. Furthermore, causal relationship between such macro economic variables and Nifty index is also not established.

Auzairy, Ahmad and Ho (2011) investigated the effects of macroeconomic factors: exchange rates, interest rates, oil prices and market liquidity, on stock market performances in Malaysia, Thailand and Indonesia. They found that macroeconomic variables have significant impact on the performances of liberalizing countries' stock markets in some of these events.

Hsing (2011) examined the relationship between Hungary's stock market index and relevant macroeconomic variables. He found that Hungary's stock market index has a positive relationship with real GDP, the ratio of the government debt to GDP, the nominal effective exchange rate and the German stock market index, a negative relationship with the real interest rate, the expected inflation rate and the government bond yield in the euro area, and a quadratic relationship with real M2 money supply.

3. Model and data

In this paper, the relationship between composite leading indicators and share prices is investigated for thirteen emerging markets. For this purpose, co-integration and causality methodologies are employed in order to find out questioned relationship. Basic econometric specification of each country is as follows:

$$sp_t = \alpha_0 + \alpha_1 \times CLI_t + \varepsilon_t \quad (1)$$

In established model, left-hand-side variable is share prices. The variable is in logarithmic form and denoted by sp. On the other hand, right-hand-side variable is composite leading indicators consisting of macroeconomic indicators of relevant countries. This variable is also in logarithmic form and denoted by CLI. Data used in this paper gathered from OECD Database. As base year index, 2005 share prices are counted as 100. The data are monthly and sample period is 2000:1-2011:10[(2)].

4. Methods and findings

As the first step, we need to determine optimum lag length by considering information criteria. With respect to Schwarz Information Criteria (SIC), lag lengths are chosen as 3 for Mexico and 4 for the rest of the countries.

In time series analyses, testing the stability of series before the identification of the relationship between variables is very important prior to the empirical procedure as well as the panel data analyses. Augmented Dickey-Fuller (ADF) (1981) and Phillips-Peron (PP) (1988) tests are commonly used for stationary in empirical applications. Table 2 reports unit root test results for questioned variables using ADF and PP tests considering only intercept and intercept+trend. ADF and PP tests confirm that all data series are integrated of I(1) except for Indonesia, Korea, Mexico and Turkey.

Long run relationship between non-stationary two series can be analyzed by employing co-integration test. Co-integration between the common components can be investigated by using standard time series tests such as the Although Engle and Granger (1987) is more favored in co-integration analyses with two variables, it is

better to employ Johansen's (1988) reduced rank approach, possible supported with a model that corrects for small sample bias as this technique resolves most of the other matters attached with Engle-Granger technique. Hereby, Johansen (1988) method is used in the paper in order to examine long run running.

Table 3 shows the co-integration results[3] for the countries where I(1) is detected. It is seen from the table that while no evidence of co-integration is found in the cases of Chile, Hungary, and India; co-integration is detected in the cases of Brazil, China, Czech Republic, Poland, Russia and South Africa.

The common causality type in time-series analyses in order to investigate causal running is standard Granger causality. Because the causality between the variables has to be investigated by employing error correction model in this procedure in the cases where co-integration is detected, it demands more documented examinations. Toda and Yamamoto (1995) procedure, however, minimizes the risk associated with possibly wrongly identifying the orders of integration of the series and the presence of co-integration relationship. This paper therefore employs Toda-Yamamoto approach since it does not require whether the series are in the same order or co-integrated.

Table 4 contains Toda-Yamamoto causality results. According to table, while there exists bi-directional causality running in the cases of Brazil, Chile, China, Korea and Turkey; uni-directional causal running from CLI to share prices is detected in the cases of Czech Republic, Hungary, India, Indonesia, Mexico, Russia and South Africa. Additionally, no causal running is found for Poland.

5. Policy implications

Since emerging markets have higher average returns rather than developed markets, attentions have turned to these markets recently. Moreover, the fact that emerging countries have gained ground to become future's central countries increases demand for emerging markets, as well.

As CLI provide early signals of turning points between expansions and slowdowns for an economy, they should be regarded as important factor by investors and policymakers. In this context, three major implications have been appeared in this study. First, while investors in some emerging economies consider CLI in their long term decisions, some of them do not. This may result from the component structure in CLI of a country. If the combination of the components shows incoherent changes over time in a country, investors or shareholders in this country are expected not to consider CLI in long term decisions. This makes sense that the elasticity of emerging stock markets to the changing structure of macroeconomic indicators in CLI is relatively more volatile

in non-cointegrated countries. However, it does not seem as strict evidence and can be considered in investors' long term decisions if the changes in the structure of CLI components become consistent over time.

Second, investors in emerging countries except Poland should take CLI into account in short run decisions. Because the CLI react in the same direction with share prices, it is possible to expect that CLI are positively correlated with share prices in emerging markets. While an upturn movement in CLI is anticipated to have an expansionary effect, an adverse movement is anticipated to have a contractionary effect on emerging stock markets.

Finally, in several countries such as Brazil, Chile, China, Korea and Turkey, there also exist a causal running from share prices to CLI in addition to the adverse running. Since CLI summarize information on early signals contained in a number of key economic indicators, policymakers in these emerging markets should consider share prices in computing CLI. The reason makes these countries different may be about that development of a well-functioning stock market requires a well-functioning banking sector. Thereby, it could be inferred that these countries have more advanced banking structure than the others and the bi-directional running could be explained via the development level of banking sector which is not directly aimed in the paper. In that sense, examining this issue by following researchers will be useful for the literature.

6. Conclusions

This study investigates the link between composite leading indicators and share prices in emerging markets. We employ cointegration and causality methodologies based on monthly data ranging from January 2000 to December 2011. The empirical results indicate no cointegration relationship between leading indicators and share prices in Chile, Hungary, India, Indonesia, Korea, Mexico and Turkey; while there is cointegration for Brazil, China, Czech Republic, Poland, Russia and South Africa. On the other hand, causality results indicate that macroeconomic fluctuations cause changes in share prices for all emerging countries except for Poland as expected. Nonetheless, in the case of five markets - Brazil, Chile, China, Korea and Turkey, changes in share prices also led to macroeconomic fluctuations. This classification proves that share prices should be considered in computing CLI for the countries whose banking sector is relatively more advanced. As a consequence, two points can be highlighted as emerging market feature: considering leading indicators as a long term determinant by investors or shareholders depends on economic stability of relevant country and share prices are very responsive to macroeconomic fluctuations in the short run.

Notes

(1) See Table 1 to see this classification detailed.
(2) Due to lack of data, sample period is started from 2000 which is oldest available for all countries and variables.
(3) In multivariate co-integration analysis, five different models are available, which are based upon various specifications of intercept and trend term. We run the model with 'unrestricted intercept and no trend' following estimations including intercept and trend.

References

Abdalla, I., Murinde, V. (1997). "Exchange Rate and Stock Price Interactions in Emerging Financial Markets: Evidence on India, Korea, Pakistan and the Philippines", *Applied Financial Economics*, No. **7**, pp. 25-35

Alam, M., Uddin, G.S. (2009). "Relationship Between Interest Rate and Stock Price: Empirical Evidence from Developed and Developing Countries, *International Journal of Business and Management*, No. 4, pp. 43-51

Auzairy, N.A., Ahmad, R., Ho, Catherine S. (2011). "Stock Market Deregulation, Macroeconomic Variables and Stock Market Performances", *International Journal of Trade, Economics and Finance 2*, No. 6, pp. 495-500

Chaudhuri, K., Smiles, S. (2004). "Stock Market and Aggregate Economic Activity: Evidence from Australia", *Applied Financial Economics,* 14, pp. 121-29

Chen, Nai-Fu, Rolland, R., Ross, S.A. (1986). "Economic Forces and the Stock Market, *Journal of Business,* 59, pp. 383-403

Cheung, Y. Wong, Ng, Lilian K. (1998). "International Evidence on the Stock Exchange and Aggregate Economic Activity, *Journal of Empirical Finance,* 5, No. 3, pp. 281-96

Darrat, A.F., Dickens, R.N. (1999). "On the Inter-Relationship Among Real Monetary and Financial Indicators*, Applied Financial Economics,* 9, No. 3, pp. 289-93

Demirguc-Kunt, A., Ross, L. (1996). "Stock Market Development and Financial Intermediaries: Stylized Facts", *The World Bank Economic Review,* 10, No. 2, pp. 232-91

Dickey, D., Fuller, W.A. (1981). "Likelihood Ratio Statistics for Autoregressive Time Series With a Unit Root", *Econometrica,* 49, No. 4, pp. 1057-72

Enders, W. (2004). *Applied Econometrics Time Series*, New York: John Willey and Sons Engle

Engle, R.F., Granger, C.W.J. (1987). "Cointegration and Error Correction: Representation, Estimation and Testing", *Econometrica,* 55, pp. 251-76

Fama, E.F. (1981). "Stock Returns, Real Activity, Inflation and Money", *American Economic Review,* 71, pp. 545-65

Fama, E.F. (1990). "Stock Returns, Expected Returns, and Real Activity", *Journal of Finance*, 45, pp. 1089-1108

Fama, E.F., French, K.R. (1989), "Business Conditions and Expected Returns on Stocks and Bonds", *Journal of Financial Economics,* 25, pp. 23-49

Flannery, M.J., Protopapadakis, A.A. (2002). "Macroeconomic Factors Do Influence Aggregate Stock Returns", *Review of Financial Studies,* 15, pp. 751-82

Gay, R.D. (2008). "Effect Of Macroeconomic Variables On Stock Market Returns For Four Emerging Economies: Brazil, Russia, India, and China", *International Business & Economics Research, 7,* No. 3, pp. 1-8

Gujarati, D.N. (2004). *Basic Econometrics*, The McGraw-Hill Company, Fourth Edition

Hamao, Y. (1988). "An Empirical Examination Of the Arbitrage Pricing Theory: Using Japanese data", *Japan and the World Economy, 1*, pp. 45-61

Hsing, Yu (2011). "Macroeconomic Determinants Of The Stock Market Index And Policy Implications: The Case Of A Central European Country", *Eurasian Journal of Business and Economics,* 4, No. 7, pp. 1-11

Humpe, A., Macmillan, P. (2009). "Can Macroeconomic Variables Explain Long-Term Stock Market Movements? A Comparison Of The US And Japan", *Applied Financial Economics,* 19, pp. 111-19

Johansen, S. (1988). "Statistical Analysis Of Cointegration Vectors", *Journal of Economic Dynamics and Control,* 12, No. 2-3, pp. 231-54

Kandir, S.Y. (2008). "Macroeconomic Variables, Firm Characteristics and Stock Returns: Evidence From Turkey", *International Research Journal of Finance and Economics,* 16, pp. 35-45

Kim, Ki-Ho (2003). "Dollar Exchange Rate and Stock Price: Evidence From Multivariate Cointegration And Error Correction Model", *Review of Financial Economics,* 12, pp. 301-13

Kumar, A. (2011). "An Empirical Analysis Of Causal Relationship Between Stock Market and Macroeconomic Variables in India", *International Journal of Computer Science& Management Studies,* 11, No. 1, pp. 8-14

Liu Ming-Hua, Shrestha, K.M. (2008). "Analysis Of The Long-Term Relationship Between Macroeconomic Variables and The Chinese Stock Market Using Heteroscedastic Cointegration", *Managerial Finance,* 34, No. 11, pp. 744-755

MSCI Emerging Market Indices, http://www.msci.com/products/indices/country_and_regional/em/.

Muradoglu, G., Kivilcim, M., Argaç, R. (2001). "Is There a Long-Run Relationship Between Stock Returns and Monetary Variables: Evidence from an Emerging Market", *Applied Financial Economics,* 11, pp. 641-649

Nasseh, A., Strauss, J. (2000). "Stock Prices and Domestic and International Macroeconomic Activity: A Cointegration Approach", *Quarterly Review of Economics and Finance,* 40, pp. 229-245

OECD Database Statistics, http:/stats.oecd.org.

Phillips, P.C.B., Peron, P. (1988). "Testing For A Unit Root In Time Series Regression", *Biometrika,* 75, No. 2, pp. 336-246

Rahman, M., Khan, M.M. (2009). "The Euro and Convergence Among Stock Markets Of Germany, France And Italy", *Global Economy Journal,* 9, pp. 1-13

Ratanapakorn, O., Sharma, S.C. (2007). "Dynamic Analysis Between The US Stock Returns And The Macroeconomic Variables", *Applied Financial Economics,* 17, pp. 337-369

Samitas, A., Kenourgios, D. (2007). "Macroeconomic Factors Influence On "New" European Countries Stock Returns: The Case Of Four Transition Economies", *International Journal of Financial Services Management,* 2, pp. 34-49

Toda, H.Y., Yamamoto, T.T. (1995). "Statistical Inference In Vector Autoregressions With Possibly Integrated Processes", *Journal of Econometrics,* 66, No. 1-2, pp. 225-250

Thornton, J. (1993). "Money, Output and Stock Prices In The UK", *Applied Financial Economics,* 3, No. 4, pp. 335-38

Wang, G., Lim, Christine (2010). "Effects Of Macroeconomic Factors On Share Prices", *Journal of International Finance and Economics,* 10, pp. 113-123

Yartey, C.A. (2007). Well Developed Financial Intermediary Sector Promotes Stock Market Development: Evidence from Africa," *Journal of Emerging Market Finance, 6,* pp. 269-289

APPENDIX

Table 1. *Emerging markets-country coverage*

Americas	Europe, Middle East & Africa	Asia
Brazil	Czech Republic	China
Chile	Egypt	India
Columbia	Hungary	Indonesia
Mexico	Morocco	Korea
Peru	Poland	Malaysia
	Russia	Philippines
	South Africa	Taiwan
	Turkey	Thailand

Source: MSCI Emerging Market Indices.
http://www.msci.com/products/indices/country_and_regional/em/.

Table 2. *Unit root test results*

H_0: series have unit root					
Countries	ADF		PP		Decision
	τ_τ	τ_μ	τ_τ	τ_μ	
Brazil					
sp	-0,780[0,82]	-2,426[0,36]	-0,739[0,83]	-2,149[0,51]	H_0: Accept
CLI	-4,330[0,00]***	-4,319[0,00]***	-2,571[0,11]	-2,701[0,23]	H_0: Accept
Δsp	-8,622[0,00]***	-8,593[0,00]***	-8,671[0,00]***	-8,643[0,00]***	H_0: Reject
ΔCLI	-3,387[0,01]**	-3,376[0,05]*	-3,373[0,01]**	-3,371[0,05]*	H_0: Reject
Chile					
sp	-0,276[0,92]	-2,903[0,16]	-0,280[0,92]	-2,929[0,15]	H_0: Accept
CLI	-2,576[0,12]	-2,820[0,19]	-2,573[0,11]	-2,693[0,27]	H_0: Accept
Δsp	-9,463[0,00]***	-9,441[0,00]***	-9,546[0,00]***	-9,527[0,00]***	H_0: Reject
ΔCLI	-4,695[0,00]***	-4,585[0,00]***	-3,145[0,02]**	-3,146[0,09]*	H_0: Reject
China					
sp	-1,639[0,45]	-1,938[0,62]	-1,842[0,35]	-2,066[0,55]	H_0: Accept
CLI	-3,444[0,01]**	-3,375[0,05]*	-2,576[0,11]	-2,685[0,24]	H_0: Accept
Δsp	-7,351[0,00]***	-7,324[0,00]***	-7,647[0,00]***	-7,623[0,00]***	H_0: Reject
ΔCLI	-4,290[0,00]***	-4,286[0,00]***	-3,406[0,01]**	-3,402[0,05]*	H_0: Reject
Czech Rep.					
sp	-1,083[0,72]	-1,076[0,92]	-1,326[0,61]	-1,111[0,92]	H_0: Accept
CLI	-4,026[0,00]***	-4,008[0,01]**	-2,341[0,16]	-2,356[0,40]	H_0: Accept
Δsp	-9,452[0,00]***	-9,433[0,00]***	-9,674[0,00]***	-9,660[0,00]***	H_0: Reject
ΔCLI	-3,031[0,03]**	-3,147[0,09]*	-3,536[0,00]***	-3,526[0,04]**	H_0: Reject
Hungary					
sp	-1,138[0,69]	-1,648[0,76]	-1,227[0,66]	-1,609[0,78]	H_0: Accept
CLI	-2,577[0,11]	-2,847[0,18]	-2,569[0,10]	-2,596[0,28]	H_0: Accept
Δsp	-8,781[0,00]***	-8,751[0,00]***	-8,930[0,00]***	-8,902[0,00]***	H_0: Reject
ΔCLI	-4,339[0,00]***	-4,352[0,00]***	-3,291[0,01]**	-3,278[0,07]*	H_0: Reject
India					
sp	-0,838[0,80]	-2,680[0,24]	-0,533[0,88]	-2,552[0,30]	H_0: Accept
CLI	-2,515[0,11]	-2,414[0,37]	-2,576[0,11]	-2,631[0,26]	H_0: Accept
Δsp	-5,077[0,00]***	-5,049[0,00]***	-8,461[0,00]***	-8,465[0,00]***	H_0: Reject
ΔCLI	-3,635[0,00]***	-3,609[0,05]*	-2,752[0,06]*	-3,146[0,09]*	H_0: Reject
Indonesia					
sp	-0,380[0,90]	-3,144[0,11]	-0,104[0,94]	-3,144[0,11]	H_0: Accept
CLI	-4,260[0,00]***	-4,258[0,00]***	-2,832[0,05]*	-3,146[0,09]*	H_0: Reject
Δsp	-7,598[0,00]***	-7,596[0,00]***	-7,518[0,00]***	-7,519[0,00]***	H_0: Reject
ΔCLI	-5,990[0,00]***	-5,960[0,00]***	-3,288[0,01]**	-3,305[0,06]*	H_0: Reject
Korea					

H_0: series have unit root					
Countries	ADF		PP		Decision
	τ_τ	τ_μ	τ_τ	τ_μ	
sp	-0,961[0,76]	-3,144[0,12]	-0,822[0,80]	-3,141[0,12]	H_0: Accept
CLI	-4,579[0,00]***	-4,560[0,00]***	-3,359[0,01] **	-3,349[0,06] *	H_0: Reject
Δsp	-8,368[0,00]***	-8,359[0,00]***	-8,419[0,00] ***	-8,359[0,00] ***	H_0: Reject
ΔCLI	-4,366[0,00] ***	-4,301[0,00]**	-3,237[0,01]**	-3,191[0,09]*	H_0: Reject
Mexico					
sp	-0,393[0,90]	-2,178[0,49]	-0,461[0,89]	-2,067[0,55]	H_0: Accept
CLI	-3,421[0,01] **	-3,399[0,05] *	-2,888[0,04] **	-3,146[0,09] *	H_0: Reject
Δsp	-9,743[0,00]***	-9,715[0,00]***	-9,816[0,00] ***	-9,788[0,00] ***	H_0: Reject
ΔCLI	-5,285[0,00] ***	-5,288[0,00]**	-3,548[0,00]**	-3,579[0,03]**	H_0: Reject
Poland					
sp	-0,927[0,77]	-1,837[0,68]	-1,088[0,71]	-1,775[0,71]	H_0: Accept
CLI	-3,936[0,00]***	-3,992[0,01] **	-1,902[0,33]	-1,979[0,60]	H_0: Accept
Δsp	-8,631[0,00]***	-8,598[0,00]***	-8,893[0,00] ***	-8,861[0,00] ***	H_0: Reject
ΔCLI	-2,579[0,08] *	-3,149[0,09]*	-2,578[0,08]*	-3,149[0,09]*	H_0: Reject
Russia					
sp	-1,426[0,56]	-1,891[0,65]	-1,321[0,61]	-1,693[0,74]	H_0: Accept
CLI	-3,697[0,00]***	-3,667[0,02] **	-3,552[0,011]	-2,477[0,33]	H_0: Accept
Δsp	-8,089[0,00]***	-8,098[0,00]***	-8,110[0,00]***	-8,121[0,00]***	H_0: Reject
ΔCLI	-3,857[0,00]***	-3,882[0,01]**	-3,236[0,02]**	-3,250[0,07]*	H_0: Reject
South Africa					
sp	-0,903[0,78]	-1,958[0,61]	-0,738[0,83]	-1,935[0,63]	H_0: Accept
CLI	-2,578[0,12]	-2,938[0,15]	-2,058[0,26]	-2,035[0,57]	H_0: Accept
Δsp	-8,478[0,00]***	-8,447[0,00]***	-8,492[0,00] ***	-8,461[0,00] ***	H_0: Reject
ΔCLI	-3,212[0,02] **	-3,200[0,08]*	-2,750[0,06]*	-3,149[0,09]*	H_0: Reject
Turkey					
sp	-0,712[0,83]	-2,486[0,33]	-0,586[0,86]	-2,659[0,25]	H_0: Accept
CLI	-4,004[0,00]***	-4,052[0,00]***	-2,930[0,04] **	-3,146[0,08] *	H_0: Reject
Δsp	-10,32[0,00]***	-10,29[0,00]***	-10,34[0,00] ***	--10,31[0,00] ***	H_0: Reject
ΔCLI	-4,544[0,00] ***	-4,549[0,00]***	-3,702[0,00]***	-3,744[0,02]**	H_0: Reject

Note: Probability values of t-statistics are in brackets.
***, ** and * denote significant at %1, %5 and %10 respectively.
Δ signifies the first difference of the questioned variable.
To accept null hypothesis, it is enough to be statistically insignificant for one test.

Table 3. *Johansen co-integration results*

H_0: series are not co-integrated									
	Trace test results				Maximum eigenvalue test results				
Coun-tries	Hypothesized No of CE(s)	Eigen-value	Trace Stats	0,05 Critical Value	Hypothesized No of CE(s)	Eigen-value	Max-Eigen Stats	0,05 Critical Value	Decision
Brazil	None (r=0)	0,121693	18,02121	15,49471[0,02]*	None (r=0)	0,121693	17,77695	14,26460[0,01]**	H_0: Reject
	At Most 1 (r=≤1)	0,001781	0,244259	3,841466[0,62]	At Most 1 (r=≤1)	0,001781	0,244259	3,841466[0,62]	
Chile	None (r=0)	0,062990	8,940436	15,49471[0,37]	None (r=0)	0,062990	8,913474	14,26460[0,29]	H_0: Accept
	At Most 1 (r=≤1)	0,000197	0,026962	3,841466[0,86]	At Most 1 (r=≤1)	0,000197	0,026962	3,841466[0,86]	
China	None (r=0)	0,136170	23,42117	15,49471[0,00]**	None (r=0)	0,136170	20,05395	14,26460[0,00]***	H_0: Reject
	At Most 1 (r=≤1)	0,024279	3,367224	3,841466[0,06]*	At Most 1 (r=≤1)	0,024279	3,367224	3,841466[0,06]*	
Czech Republic	None (r=0)	0,112441	18,46192	15,49471[0,01]*	None (r=0)	0,112441	16,34142	14,26460[0,02]**	H_0: Reject
	At Most 1 (r=≤1)	0,015359	2,120506	3,841466[0,14]	At Most 1 (r=≤1)	0,015359	2,120506	3,841466[0,14]	

H_0: series are not co-integrated									
	Trace test results				Maximum eigenvalue test results				
Coun-tries	Hypothesized No of CE(s)	Eigen-value	Trace Stats	0,05 Critical Value	Hypothesized No of CE(s)	Eigen-value	Max-Eigen Stats	0,05 Critical Value	Decision
Hungary	None (r=0)	0,069234	11,69171	15,49471[0,17]	None (r=0)	0,069234	9,829343	14,26460[0,22]	H_0: Accept
	At Most 1 (r=≤1)	0,013502	1,862371	3,841466[0,17]	At Most 1 (r=≤1)	0,013502	1,862371	3,841466[0,17]	
India	None (r=0)	0,052508	7,517173	15,49471[0,51]	None (r=0)	0,052508	7,389385	14,26460[0,44]	H_0: Accept
	At Most 1 (r=≤1)	0,000932	0,127788	3,841466[0,72]	At Most 1 (r=≤1)	0,000932	0,127788	3,841466[0,72]	
Poland	None (r=0)	0,118392	19,32756	15,49471[0,15]	None (r=0)	0,118392	17,26303	14,26460[0,01]**	H_0: Reject
	At Most 1 (r=≤1)	0,014957	2,064531	3,841466[0,15]	At Most 1 (r=≤1)	0,014957	2,064531	3,841466[0,15]	
Russia	None (r=0)	0,069200	12,89061	15,49471[0,11]	None (r=0)	0,069200	9,824361	14,26460[0,22]	H_0: Reject
	At Most 1 (r=≤1)	0,022133	3,066251	3,841466[0,07]*	At Most 1 (r=≤1)	0,022133	3,066251	3,841466[0,07]*	
South Africa	None (r=0)	0,126254	20,19820	15,49471[0,00]***	None (r=0)	0,126254	18,49030	14,26460[0,01]**	H_0: Reject
	At Most 1 (r=≤1)	0,012389	1,707894	3,841466[0,19]	At Most 1 (r=≤1)	0,012389	1,707894	3,841466[0,19]	

Note: Probability values of t-statistics are in brackets. ***, ** and * denote significant at %1, %5 and %10 respectively.

Table 4. *Toda Yamamoto causality results*

Countries	Null hypothesis	MWald Stat.	Desicion
BRA	H_0: CLI does not Granger cause sp	6,940[0.00]***	H_0: Reject
	H_0: sp does not Granger cause CLI	2,008[0.08]*	H_0: Reject
CHILE	H_0: CLI does not Granger cause sp	4,770[0.00]***	H_0: Reject
	H_0: sp does not Granger cause CLI	2,457[0.03]**	H_0: Reject
CHINA	H_0: CLI does not Granger cause sp	3,458[0.00]***	H_0: Reject
	H_0: sp does not Granger cause CLI	2,907[0.01]**	H_0: Reject
C.REP	H_0: CLI does not Granger cause sp	2,987[0.01]**	H_0: Reject
	H_0: sp does not Granger cause CLI	1.234[0.29]	H_0: Accept
HUN	H_0: CLI does not Granger cause sp	4,293[0.00]***	H_0: Reject
	H_0: sp does not Granger cause CLI	1,282[0.27]	H_0: Accept
INDIA	H_0: CLI does not Granger cause sp	2,803[0.01]**	H_0: Reject
	H_0: sp does not Granger cause CLI	1,219[0.30]	H_0: Accept
INDON	H_0: CLI does not Granger cause sp	6,840[0.00]***	H_0: Reject
	H_0: sp does not Granger cause CLI	0,971[0.42]	H_0: Accept
KOREA	H_0: CLI does not Granger cause sp	8,824[0.00]***	H_0: Reject
	H_0: sp does not Granger cause CLI	4,369[0.00]***	H_0: Reject
MEX	H_0: CLI does not Granger cause sp	5,046[0.00]***	H_0: Reject
	H_0: sp does not Granger cause CLI	0,569[0.61]	H_0: Accept
POL	H_0: CLI does not Granger cause sp	1,612[0.16]	H_0: Accept
	H_0: sp does not Granger cause CLI	1,098[0.36]	H_0: Accept
RUS	H_0: CLI does not Granger cause sp	7,238[0.00]***	H_0: Reject
	H_0: sp does not Granger cause CLI	0,296[0.91]	H_0: Accept
S.AFR	H_0: CLI does not Granger cause sp	12,31[0.00]***	H_0: Reject
	H_0: sp does not Granger cause CLI	0,906[0.47]	H_0: Accept
TUR	H_0: CLI does not Granger cause sp	6,353[0.00]***	H_0: Reject
	H_0: sp does not Granger cause CLI	6,983[0.00]***	H_0: Reject

Note: Probability values of t-statistics are in brackets.
***, ** and * denote significant at %1, %5 and %10 respectively.