

IMPACT OF EURO-ASIAN MARKETS ON INDIAN CAPITAL MARKET

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Abstract *Indian capital market is one of the outperforming financial markets in the global index have been attracting attention of investors world wide. The market has grown over 6% during the year 2018-19 with a market capitalization of INR 151 lakh crores facilitated in raising funds through debt and equity by 5.3% amounting to 9 lakh crores. This also contributed in the growth of returns from Indian markets and attraction of European and Asian investors. Liberalization of economic policies of trade and free flow of capital resulted in integration of global economies. Euro-Asian markets are globally recognized for the economic development of the region. This paper finds impact of Euro-Asian markets on Indian capital market using multiple regression analysis. The study finds global indices of Shanghai Composite do not have an impact on Indian stock market. However, the markets of Hangseng (HSI), EuroNext 100 and Taiwan (TSE Taiwan 50) have a positive impact on Indian capital market (Sensex). Any fluctuations of increase or decrease in these markets have simultaneous effect on Indian indices.*

Keywords: *Integration, Euro-Asian Markets, Impact, Capital Market*

INTRODUCTION

Globalization and liberalization of trade and free flow of capital amongst different economies resulted in integration of global economies. Capital market is one of the important components facilitating in channelizing scarce financial resources into a profitable investments. Stock markets around the world facilitates in capital formation through financial instruments to different classes of investors. Euro Asian markets are globally recognized for the economic development of the region. The important Euro-Asian markets are UK (FTSE 100), Germany (DAX) and France (CAC 40), Australia (ASX All Ordinaries), Shanghai (Shanghai Composite), Japan (Nikkei 225), Hong Kong (Hangseng), India (Sensex) and Taiwan (TSEC Taiwan 40).

Asia is the largest economy with around 60% population of the world, accounting for 35% of EU's exports i.e., EUR 618 billion and 45% of EU's imports i.e., €774 billion growing global interdependence. Europe and Asia, considered as the engines of a more cooperative approach to world politics, global stability and regional economic prosperity (European Commission, 2018). Accordingly, significant momentum of capital flows is observed amongst Asian and European markets in the recent past. India, being one of the biggest democracies and developing nations in the Asian continent has attracted investments from across the globe, which

also flourished the investments in the stock markets. This has resulted in significant change in the movement of stock markets (Srivastava, 2016). India being a part of Asian region, Euro-Asian investments has been increasing Indian businesses. It is one of the leading markets in terms of volume of trade in the global capital market. Indian economy has undergone revolutionary changes and has become a part of worldwide integrated system after the liberalization reforms. Bombay Stock Exchange is one of the oldest stock exchanges set up in the year 1875 and its indices; SENSEX is one of the popular indices in the global capital market. With the growing significance of capital markets in the international financial system Euro-Asian markets are influencing in capital and industrial output of emerging economies. In this regard, India being one of the important emerging economies in the world market, it is imperative to understand impact of Euro-Asian markets on Indian capital market. This paper, therefore, made an attempt to understand the impact of Euro-Asian markets on Indian capital market.

This paper is presented in the following sections - Section 2 reviews existing literatures on impact of global stock markets on Indian and global capital markets, Section 3 describes methodology adopted for the study, Section 4 contains data analysis and interpretation and Section 5 presents findings and conclusions.

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REVIEW OF LITERATURE

This study reviewed scholastic literature in the areas of Euro Asian markets, cross sectional diversification and its impact on Indian capital market.

Global capital markets reacts with global cues and any change in the global scenario i.e., macroeconomic or country specific issues shall affect various markets (Mukherjee, 2007). This study compared the trends, similarities and patterns in the activities and movements of the Indian stock market in comparison to its international counterparts. Kanas (1998) investigated the co-integration between US and European stock markets namely US (Dow Jones Industrial Average), Germany (FAZ General), the UK (FT All Share), France (CAC General), Switzerland (Swiss Bank Corporation All Share), Italy (Milan Banca Commerciale), and the Netherlands (CBS General) using Johnsen, multivariate trace statistic and Bierens nonparametric approach. The results revealed that there is no existence of long run relationship between the US and European markets. Tripathi and Sethi, (2010) studied the integration of the Indian stock market with the stock markets of Japan, The United Kingdom, The United States and China from January 1998 to 31 October 2008 using Johansen and Engle-Granger co-integration tests. It was found that Indian stock market was integrated with the US stock market, however, not integrated with Japan, UK and China. Jayashree (2014) made a comparative analysis of the Indian Stock Market (BSE SENSEX) with five international indices such as Shanghai (China), ASX (Australia), Hang Seng (Hong Kong), FSE DAX (Germany) and DJIA (USA). The study found that Indian stock exchanges are influenced by other international stock exchanges. Singh (2015) examined the inter-linkages and causal relationships between the stock exchanges using Granger-causality and Co-integration test. The study found that there was unidirectional short-term causal influence from Indian stock markets to the Japanese and Hong Kong stock market. Long-term relationships did not exist between the Indian, Japanese and Hong Kong market over the study period. Srikanth and Aparna (2012) studied the degree of stock market integration using correlation t tests and found that integration between Indian and International financial markets exists. It was revealed that sensex had a strong association with NYSE, Hang Seng and SSE Composite Index; however, there was poor integration of BSE sensex with NASDAQ, Nikkei225 and S&P500. Singh (2016) analyzed the relationship between NIFTY returns and major Asian stock markets, Nikkei, KOSPI, and Hangseng, Taiwan weighted index returns using Johansen's co-integration test, VECM and Granger causality test. The results of VECM indicated returns of NIFTY index respond significantly to the stock exchanges of Asia. Co-integration test revealed stable

long run equilibrium, i.e., NIFTY index returns co integrated with stock exchanges of Asia. Wong et al. (2004) studied the co movement between United States, United Kingdom, Japan, Malaysia, Thailand, Korea, Taiwan, Singapore and Hong Kong stock indices. It was found that there was no existence of long run equilibrium relationship between Malaysia, Thailand and Korea and the developed markets of the United States, the United Kingdom and Japan. However, Singapore and Taiwan markets co integrated with Japan, whereas, Hongkong co integrated with US and UK markets. Samadder and Bhunia (2018) examined stock market integration between global stock markets of Australia, Canada, France, Germany, UK and USA with Indian stock market. The study used Johansen co-integration test, VECM and granger causality tests and the results revealed that USA stock market are associated with Indian stock market in the long run, whereas, France, Germany are associated in the short run. Kanakarajamma et al. (2014) examined the co movement relationship between markets of US, China, India and found that Indian stock market was not co-integrated with China and US stock markets. It also found that Indian stock influenced the china stock market; however, China stock market did not influence the Indian stock market. Sharkasi et al. (2005) studied the price interdependence between Irish, UK, Portuguese, US, Brazilian, Japanese and Hong Kong, based on the wavelet analysis. The study used the indices ISEQ Overall, FTSE All Share, PSI20, S&P500, Bovespa, Nikkei 225 and Hang Seng. The results revealed significant effects from the UK and Portuguese markets on the US and Brazilian markets. While, US and Brazilian markets influence the Asian markets, Japan and Hong Kong impact the European market.

The above scholastic evidences found the long run, short run relationship and co-integration between global markets with Indian and other Asian markets by employing Johnson co-integration, VECM and granger causality tests; however there is limited research in understanding the impact of Euro-Asian capital market of Hong Kong, Taiwan, Netherland. This study, therefore, analyzed the impact of Euro-Asian markets on Indian capital markets with an intention to add a new thought to the existing domain of knowledge with the objective to understand the impact of Euro-Asian markets on Indian bench mark index.

METHODOLOGY

The study employing empirical research method used secondary data from published sources and selected Hangseng index (HSI), Euronext 100 index (N100), Shangai Composite (SSEC) index and TSEC Taiwan 50 (TSE 50) index as independent variables and Sensex (Indian stock market) as dependant variable. Sensex being one of the

important indices in Indian capital market has been selected to review the impact. The study used the monthly closing prices of the indices from April 2008 to March 2018. E-views software has been used for statistical analysis. The influence of independent variables on Sensex as a dependant variable is examined through multiple regression analysis.

The study tested the stationary by converting variables into log values as the variables were not stationary under differentiation method. The same has been carried out using Augmented Dickey - Fuller test; accordingly, log variables are converted into stationary at the first difference. The study also employed Breusch – Godfrey serial Correlation LM test, Heteroskedasticity - Breusch- Pagan – Godfrey test and Normality test using Jarque – Bera Probability method.

Augmented Dickey - Fuller Test: Stationarity Test

The stationarity of data has been verified through ADF with the following regression equation:

$$\Delta y_t = a + \alpha y_{t-1} + \sum_{i=1}^k b_i \Delta y_{t-i} + \varepsilon_t \quad (1)$$

$$\Delta y_t = a + \beta t + \alpha y_{t-1} + \sum_{i=1}^k b_i \Delta y_{t-i} + \varepsilon_t \quad (2)$$

The test for unit root in y_t where Δy_{t-i} is the lagged difference to accommodate serial correlation in the errors ε_t , k is the appropriate lag length.

The null and alternate hypotheses are as under:

$$H_0 : \alpha = 0.$$

$$H_1 : \alpha < 0.$$

The series shall be non-stationary, if there is a presence of unit root due to not rejecting the null hypothesis. In case of equation (1), the series shall be mean stationery process, if the null hypothesis is rejected whereas; for equation (2) the series shall be trend stationery process. The series is called differenced stationery process if ΔY_t is stationary. Y_t is called as integrated of first order I(1) if ΔY_t is stationary and Y_t is not.

Multiple Regression Analysis

The relationship between a dependent and two or more independent variables are evaluated using multiple regression analysis. Multiple regression estimates the β 's in the equation.

$$y_j = \beta_0 + \beta_1 x_{1j} + \beta_2 x_{2j} + \dots + \beta_p x_{pj} + \varepsilon_j \quad (3)$$

Here, X variables indicate independent variables and Y is the dependant variable. The subscript j represents the observation. The β 's are the unknown regression coefficients. Their

estimates are represented by b 's. Each β represents the original unknown (population) parameter, while b is an estimate of this β . The ε_j is the error (residual) of observation j .

The sample multiple regression equation is

$$\hat{y}_j = b_0 + b_1 x_{1j} + b_2 x_{2j} + b_p x_{pj} \quad (4)$$

If $p = 1$, the model is called simple linear regression. The intercept, b_0 , is the point at which the regression plane intersects the Y axis. The b_i is the slopes of the regression plane in the direction of x_i . These coefficients are called the partial-regression coefficients. Each partial regression coefficient represents the net effect the i variable has on the dependent variable, holding the remaining X's in the equation constant.

Serial Correlation LM Test

The study used Breusch- Godfrey Serial Correlation LM Test for verifying if the residuals are serially correlated. This test is used when there are errors in the regression model. Residuals are used from the regression model and a test statistic is derived. The null hypothesis of this test is that there is no serial correlation in the residuals up to the specified order. Test statistic is computed by an auxiliary regression as follows. The estimated regression;

$$y_t = X_t \beta + \varepsilon_t \quad (5)$$

Where, ε indicates errors.

In Breusch- Godfrey Serial Correlation LM Test is the observed R squared statistic. LM statistic is computed as the number of observations. This LM statistic is computed as the number of observations, times the (uncentered) R^2 from the test regression. In certain conditions the LM test statistic is asymptotically distributed as $\chi^2(p)$.

Heteroskedasticity Test

The study used Breusch - Pagan - Godfrey test to understand the nature of deviations of the concerned return series. If the variance is time dependant and changes from one period to another then it is known as Heteroscedastic. The Breusch - Pagan - Godfrey test as a lagrange multiplier test of null hypothesis of no heteroscedasticity against heteroscedasticity of the form:

$$\tilde{A}_{t=\tilde{K}^2}^2 h(z_t', \alpha) \quad (6)$$

Where, z_t indicates as a vector independent variable. Generally this vector contains regressors from the original least square regression which is not necessary. It is tested by completing an auxiliary regression of the squared residual of the original equation on $(1, z_t')$.

Normality Test

The study used Normality test to verify if the data is well modeled by normal distribution and also to compute how likely it is for a random variable underlying the data set to be normally distributed. If the residuals are normally distributed then histogram is a bell shaped and the Jarque Bera statistic is not significant.

Jarque Bera Test: The residuals are tested for normality using the statistical tool of Jarque Bera test. It is a test of statistics used to analyze normality of residuals. The test statistic measures the difference of the skewness and kurtosis of the series with those from the normal distribution. The statistic is computed as:

$$\text{Jarque Bera} = \frac{N}{6} \left(S^2 + \frac{(K-3)^2}{4} \right) \quad (7)$$

CUSUM Test

The CUSUM test has been used to understand the stability of regression model developed under the study. CUSUM test is a cumulative sum plotted at 5% critical line. If the cumulative sum moves outside the area between two critical lines then instability of the test is noticed.

DATA ANALYSIS AND INTERPRETATION

The study focusing on its objective evaluated impact of Euro Asian capital markets on Indian stock market. The study considered indices of Euro Asian markets of HongKong-Hangseng, Netherlands-EuroNext 100, China-SSEC composite and Taiwan-TSEC 40 as independent variables to evaluate their impact on Indian indices of Bombay stock exchange- Sensex as a dependent variable. The study converted the variables into stationary using Augmented Dickey - Fuller test. The results of stationary are shown in Table 1.

Table 1: Test of Stationarity

Sl. No.	Variable (log)	At the Level		At First Difference	
		T - statistic	P - value	T - statistic	P - value
1.	Hangseng (HSI)	-1.583689	0.4878	-9.736168	0.0000
2.	Euronext 100 (ENxt100)	-2.608434	0.0941	-9.696531	0.0000
3.	Shangai Composite (SSEC)	-2.802982	0.0609	-9.007464	0.0000
4.	TSEC Taiwan 50 (TSE50)	-0.563110	0.8734	-9.561911	0.0000
5.	Sensex	-1.684178	0.4367	-10.56148	0.0000

Table 1 show the results of ADF test. At the level p value for (HSI) is 0.4878 which is more than 0.05 further, at first difference the p-value was 0.00, indicating stationarity. In case of EuroNext 100 the p value at the level was 0.0941 indicating non stationarity and at the first difference, p value became stationary. The p value of SSEC at the level is not stationary as the p value is more than 0.05 (0.0609). TSE50 at the first difference is stationary with p value of 0.0000. The Sensex has p value more than 0.05 (0.4367) indicating null hypothesis has a unit root, however, the same variable at the first difference converted into stationary with p value of 0.0000.

Table 2: Regression Output

Dependent Variable: DSENSEX				
Method: Least Squares				
Sample (adjusted): 2008M05 2018M03				
Included Observations: 119 After Adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.033754	1.631589	-0.020688	0.9835
DHNSNG	0.072843	0.019345	3.765458	0.0003

DENXT	0.095822	0.044255	2.165237	0.0325
DSHNGI-COMP	-0.110209	0.061539	-1.790877	0.0760
DTAIWAN	0.749070	0.247488	3.026692	0.0031
R-squared	0.591995	Mean dependent var		0.663271
Adjusted R-squared	0.577679	S.D. dependent var		27.20159
S.E. of regression	17.67729	Akaike info criterion		8.623547
Sum squared resid	35623.48	Schwarz criterion		8.740317
Log likelihood	-508.1011	Hannan-Quinn criter.		8.670964
F-statistic	41.35206	Durbin-Watson stat		2.179015
Prob(F-statistic)	0.000000			

Model Fit – Table 2 shows the R square value as 0.591 indicating 59.1% variability in dependent variable, sensex expressed by the independent variables i.e., Euro-Asian indices of Hong Kong, Netherlands, China and Taiwan. The rest 40.9% variations in sensex are explained by residuals or other variables in addition to the Euro-Asian indices used in the study.

Individual Significance of Variables – T-statistic is used to evaluate the influence of Euro Asia indices on Sensex. From table 2, t-statistic of HSI is 3.765458, N100 is 2.165237, SSEC is -1.790877 and TSE50 is 3.026692. The significance of independent variables is evaluated on p-value. Accordingly, the indices of Hong Kong, Netherlands and Taiwan are 0.0003, 0.0325, and 0.0031 respectively are significant with p-values less than 0.05 at 95% confidence intervals. However, the SSEC is not significant with p-value of 0.0760 being more than 0.05. In total, three out of four independent variables i.e., HSI, ENxt 100 and TSE50 are significant in the model satisfying statistical criteria of influencing majority of independent variables on dependent variable.

Joint Significance of Independent Variables: In addition to the above, the regression model should also have a combined significance of independent variables on dependent variable. The table 2 also indicates F-statistics value to understand joint significance of Euro-Asian indices on sensex. Accordingly, the F-statistics (41.35206) with a corresponding p-value is less than 5% showing the significance of independent variables explaining the variability in dependent variable, Sensex. The study, therefore, based on computed statistics found that selected Euro-Asian indices jointly express the variability on sensex.

Serial or Auto Correlation LM Test

The presence of autocorrelation in the variables has been verified using Breusch- Godfrey Serial Correlation LM Test and the results are depicted in Table 3.

Null Hypothesis (H0) – Residuals are not serially/auto correlated

Alternate Hypothesis (H1) - Residuals are serially/auto correlated

Table 3: Breusch- Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test			
F-statistic	2.087403	Prob. F(2,112)	0.1288
Obs*R-squared	4.276331	Prob. Chi-Square(2)	0.1179

The observed R-square and corresponding P- value as shown in table 3 is more than 0.05 (0.1179). Hence, the study cannot reject null hypothesis, and accepts that residuals are not serially/auto correlated and it is desirable for a good regression model.

Test of Heteroskedasticity

The study used Breusch-Pagan-Godfrey test to check Heteroskedasticity of the regression model. The hypothesis developed is as under -

Null Hypothesis (H0) - Variance of residuals are not heteroskedastic.

Alternate Hypothesis (H1) - Variance of residuals are homoskedastic.

Table 4: Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.379694	Prob. F(4,114)	0.8228
Obs*R-squared	1.564545	Prob. Chi-Square(4)	0.8151
Scaled explained SS	2.995129	Prob. Chi-Square(4)	0.5586

Table 4 shows outcome of Breusch-Pagan-Godfrey test. Accordingly, the P-Value (81.51%) of observed R square is more than 5%. The study based on P value cannot reject null hypothesis and concludes that, variance of residuals are not heteroscedastic. This outcome is desirable.

Test of Normality

The study reviewed the normality of the variables using Jarque Bera test. Accordingly, the hypothesis framed are-

Null Hypothesis (Ho): Residuals are normally distributed.

Alternate Hypothesis (H1): Residuals are not normally distributed.

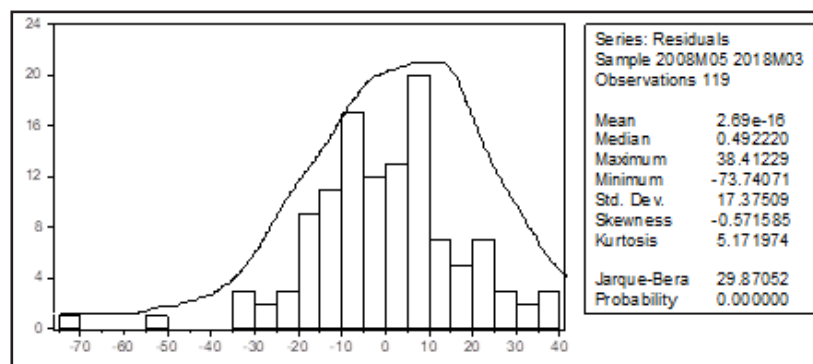


Fig. 1: Results of Normality Test

The study used Jarque Bera test of Normality and finds test value as 29.87052 with corresponding p value as 0.000000 (Fig. 1). Here, the p value is less than 0.05, the study therefore, rejects null hypothesis and accepts that population residual (u) are not normally distributed, however the bar chart of the statistical outcome fulfils the requirement of bell shaped curve. Hence, it is normally distributed.

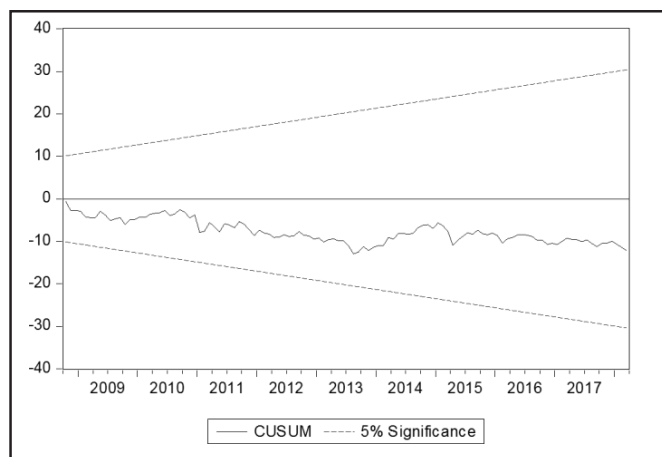


Fig. 2: Results of CUSUM Test

The study used CUSUM test to check the stability of the regression model. The results of the test indicate that the variables are stable and the developed model is significant as curved line lies within the level of significance as shown in the Fig. 2. Hence, the regression model developed is acceptable.

Table 5: Summary of Regression Model

Sl. No	Criteria	Statistical Value	Remarks
1.	Model fit	Observed R square - 0.591995 (59.19%)	Desirable
2.	Individual significance of variables	T statistics- 3 out of 4 variables are significant	Desirable
3.	Joint Significance of independent variables	F statistic- with p-value less than 0.05 showing influence of all independent on dependent variables	Desirable
4.	Test of Serial Correlation	Breusch- Godfrey Serial Correlation LM Test - Observed R square with p P- value is more than 0.05.	Desirable
5.	Test of Heteroscedasticity	Breusch-Pagan-Godfrey test results with the p value of 81.51%, Homoscedastic.	Desirable
6.	Test of Normality	Jarque- Bera test with p-value - 0.000000, residuals with bell shaped curve	Acceptable

Table 5 depicts the output of the regression model used in the study. The observed R square is 59.19% i.e., is nearer to 60%, hence, the developed regression model is best fit. Individual significance of independent variables 3 out of 4 are significant, showing that majority of variables are significant, therefore, it is desirable. The test also shows the combined significance of independent variables such as Hangseng, EuroNext 100, Shanghai and Taiwan significantly influences on sensx with the value of f- statistic in the study. Hence it is desirable to accept the model. Breusch- Godfrey Serial Correlation LM Test shows that residuals are not auto-correlated, and Breusch-Pagan-Godfrey test results shows the residuals are homoskedastic. In total, amongst the six criteria of the good regression model developed in the study satisfying all six criteria. The model developed is statistically significant and explaining the impact of Euro Asian markets on Indian stock market index, sensx.

The regression model contributes to the development of following equation-

$$SENSEX = -0.0337539703335 + 0.0728429022207 * HSI + 0.0958224678211 * N100 - 0.110209498308 * SSEC + 0.749069979594 * TSE50$$

Sensex being a dependent variable is influenced with selected independent variables as identified in the study. The variations in Taiwan index are directly influencing change in sensx. As per the above regression model, one unit increase in Taiwan index showing the variation to the extent of 74.90% increase in sensx.

India is one of the largest exporters to Taiwan and the bilateral relationship between India and Taiwan has improved. Trade relations between the two countries have also improved from USD 1.2 billion in 2000 to USD 6 billion in 2016. 90 Taiwanese companies are working in different sectors of the Indian economy. Also, an agreement was signed between two countries during December 2017 for cooperation in areas of engineering, product manufacturing, and research and development. Hence, it is likely that Taiwan has a great influence on Indian capital markets. India is Hong Kong's 7th largest trading partner. The bilateral trade relations among Hong Kong and India are strong. In the first half of 2018, the total trade value between Hong Kong and India amounted to USD 14.4 billion during the beginning of the year 2018. The inflow from Hong Kong has also significantly increased from USD 134 million (2016-2017) to USD 1,044 million (2017-18). Netherland is the third largest country in terms of FDI inflows to India during the year 2017-2018 with an inflow USD 2677 million. However, the FDI inflow has reduced as compared to the previous year 2016-2017 with USD 3234 million (Reserve Bank of India, 2018). India's economic growth, large market and pool of knowledge workers have

created a good impression and interest to Netherlands. The bilateral economic and commercial relations between the countries have also been strong since 2015. Hence, the variation in Taiwan, Hong Kong and Netherland stock markets leads to a positive influence on Indian capital market. However, the study did not find the influence of China market on Indian capital market.

FINDINGS AND CONCLUSIONS

India being an emerging economy attracting capital inflows from global investors. The market is successful in raising capital through bonds and equities attracted foreign institutional investors to buy mammoth amount of Indian shares to the extent of 8.4 billion. Indian equity bench mark index touched peak and it has become the world's second-largest in the markets valued more than USD 1 trillion. The capital inflow from Euro-Asian markets to Indian market have increased considerably over a period of time. It is, therefore, important to understand impact of Euro-Asian markets indices of Hong Kong (Hangseng), EuroNext 100, Shanghai Composite and Taiwan (TSE Taiwan 50) to understand their impact on Indian stock market. This paper finds positive impact of Hangseng (HSI), EuroNext 100 and Taiwan (TSE Taiwan 50) on Indian benchmark index. The investors tracking on Euro-Asian markets have an edge in understanding the fluctuations of Indian market. This paper strongly proposes to follow the momentum of change in indices of Hong Kong, Euronext and Taiwan to take advantage of movement in Indian bench mark index.

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ANNEXURES

STATIONARITY TEST

Sensex

(a) At the Level

Null Hypothesis: SENSEX has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-1.684178	0.4367
Test critical values:	1% level		-3.486064	
	5% level		-2.885863	
	10% level		-2.579818	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(SENSEX)				
Method: Least Squares				
Sample (adjusted): 2008M05 2018M03				
Included observations: 119 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SENSEX(-1)	-0.056136	0.033331	-1.684178	0.0948
C	21.95878	12.88428	1.704307	0.0910
R-squared	0.023669	Mean dependent var		0.663271
Adjusted R-squared	0.015325	S.D. dependent var		27.20159
S.E. of regression	26.99236	Akaike info criterion		9.445649
Sum squared resid	85244.73	Schwarz criterion		9.492357
Log likelihood	-560.0161	Hannan-Quinn criter		9.464615
F-statistic	2.836455	Durbin-Watson stat		1.860699
Prob(F-statistic)	0.094813			

(b) At the First Difference

Null Hypothesis: D(SENSEX) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-10.56148	0.0000
Test critical values:	1% level		-3.486551	
	5% level		-2.886074	
	10% level		-2.579931	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(SENSEX,2)				

Method: Least Squares				
Sample (adjusted): 2008M06 2018M03				
Included observations: 118 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
(-1))	-0.972809	0.092109	-10.56148	0.0000
C	0.987632	2.501274	0.394852	0.6937
R-squared	0.490210	Mean dependent var		0.183200
Adjusted R-squared	0.485816	S.D. dependent var		37.87401
S.E. of regression	27.15819	Akaike info criterion		9.458038
Sum squared resid	D(SENSEX 85557.78	Schwarz criterion		9.504999
Log likelihood	-556.0242	Hannan-Quinn criter.		9.477105
F-statistic	111.5449	Durbin-Watson stat		1.997050
Prob(F-statistic)	0.000000			

HANSENG

(a) At the Level

Null Hypothesis: HNSNG has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-1.583689	0.4878
Test critical values:	1% level		-3.486064	
	5% level		-2.885863	
	10% level		-2.579818	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(HNSNG)				
Method: Least Squares				
Sample (adjusted): 2008M05 2018M03				
Included observations: 119 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	162.0373	100.6133	1.610495	0.1100
R-squared	0.020987	Mean dependent var		4.449456
Adjusted R-squared	0.012619	S.D. dependent var		163.3662
S.E. of regression	162.3321	Akaike info criterion		13.03383
Sum squared resid	3083152.	Schwarz criterion		13.08054
Log likelihood	-773.5129	Hannan-Quinn criter.		13.05280
F-statistic	2.508072	Durbin-Watson stat		1.722405
Prob(F-statistic)	0.115964			

(b) At the First Difference

Null Hypothesis: D(HNSNG) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=12)				

			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-9.736168	0.0000
Test critical values:	1% level		-3.486551	
	5% level		-2.886074	
	10% level		-2.579931	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(HNSNG,2)				
Method: Least Squares				
Sample (adjusted): 2008M06 2018M03				
Included observations: 118 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HNSNG(-1))	-0.896984	0.092129	-9.736168	0.0000
C	5.301071	15.02847	0.352735	0.7249
R-squared	0.449697	Mean dependent var		0.454747
Adjusted R-squared	0.444953	S.D. dependent var		219.0043
S.E. of regression	163.1614	Akaike info criterion		13.04416
Sum squared resid	3088112.	Schwarz criterion		13.09112
Log likelihood	-767.6055	Hannan-Quinn criter.		13.06323
F-statistic	94.79297	Durbin-Watson stat		2.005939
Prob(F-statistic)	0.000000			

EURONEXT

(a) At the Level

Null Hypothesis: ENXT has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.608434	0.0941
Test critical values:	1% level		-3.486064	
	5% level		-2.885863	
	10% level		-2.579818	
*MacKinnon (1996) one-sided p-values.				

Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(ENXT)				
Method: Least Squares				
Sample (adjusted): 2008M05 2018M03				
Included observations: 119 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ENXT(-1)	-0.088662	0.033990	-2.608434	0.0103
C	85.42417	33.61876	2.540967	0.0124
R-squared	0.054957	Mean dependent var		-1.194845
Adjusted R-squared	0.046880	S.D. dependent var		58.59227
S.E. of regression	57.20239	Akaike info criterion		10.94773

Sum squared resid	382837.2	Schwarz criterion	10.99444
Log likelihood	-649.3901	Hannan-Quinn criter.	10.96670
F-statistic	6.803925	Durbin-Watson stat	1.735200
Prob(F-statistic)	0.010282		

(b) At the First Difference

Null Hypothesis: D(ENXT) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-9.696531	0.0000
Test critical values:	1% level		-3.486551	
	5% level		-2.886074	
	10% level		-2.579931	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(ENXT, 2)				
Method: Least Squares				
Sample (adjusted): 2008M06 2018M03				
Included observations: 118 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ENXT(-1))	-0.895402	0.092343	-9.696531	0.0000
C	-1.071459	5.411347	-0.198002	0.8434
R-squared	0.447679	Mean dependent var		-0.047275
Adjusted R-squared	0.442917	S.D. dependent var		78.74153
S.E. of regression	58.77108	Akaike info criterion		11.00198
Sum squared resid	400668.6	Schwarz criterion		11.04894
Log likelihood	-647.1169	Hannan-Quinn criter.		11.02105
F-statistic	94.02271	Durbin-Watson stat		1.938436
Prob(F-statistic)	0.000000			

SHANGAI

(a) At the level

Null Hypothesis: SHNGICOMP has a unit root				
Exogenous: Constant				
Lag Length: 1 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.802982	0.0609
Test critical values:	1% level		-3.486551	
	5% level		-2.886074	
	10% level		-2.579931	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				

Dependent Variable: D(SHNGICOMP)				
Method: Least Squares				
Sample (adjusted): 2008M06 2018M03				
Included observations: 118 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SHNGICOMP(-1)	-0.105964	0.037804	-2.802982	0.0059
D(SHNGICOMP(-1))	0.232351	0.090348	2.571739	0.0114
C	44.64749	16.19893	2.756199	0.0068
R-squared	0.094606	Mean dependent var		0.085255
Adjusted R-squared	0.078860	S.D. dependent var		35.59047
S.E. of regression	34.15833	Akaike info criterion		9.924985
Sum squared resid	134181.0	Schwarz criterion		9.995426
Log likelihood	-582.5741	Hannan-Quinn criter.		9.953586
F-statistic	6.008231	Durbin-Watson stat		1.975590
Prob(F-statistic)	0.003297			

(b) At the First Difference

Null Hypothesis: D(SHNGICOMP) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-9.007464	0.0000
Test critical values:		1% level	-3.486551	
		5% level	-2.886074	
		10% level	-2.579931	
*MacKinnon (1996) one-sided p-values.				

Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(SHNGICOMP,2)				
Method: Least Squares				
Sample (adjusted): 2008M06 2018M03				
Included observations: 118 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SHNGICOMP(-1))	-0.819659	0.090998	-9.007464	0.0000
C	0.105883	3.236147	0.032719	0.9740
R-squared	0.411569	Mean dependent var		0.199638
Adjusted R-squared	0.406496	S.D. dependent var		45.63051
S.E. of regression	35.15338	Akaike info criterion		9.974122
Sum squared resid	143348.2	Schwarz criterion		10.02108
Log likelihood	-586.4732	Hannan-Quinn criter.		9.993190
F-statistic	81.13440	Durbin-Watson stat		1.960039
Prob(F-statistic)	0.000000			

TAIWAN

(a) At the Level

Null Hypothesis: TAIWAN has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-0.563110	0.8734
Test critical values:	1% level		-3.486064	
	5% level		-2.885863	
	10% level		-2.579818	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(TAIWAN)				
Method: Least Squares				
Sample (adjusted): 2008M05 2018M03				
Included observations: 119 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
TAIWAN(-1)	-0.014090	0.025022	-0.563110	0.5744
C	3.328907	4.901957	0.679098	0.4984
R-squared	0.002703	Mean dependent var		0.621408
Adjusted R-squared	-0.005821	S.D. dependent var		10.38301
S.E. of regression	10.41319	Akaike info criterion		7.540687
Sum squared resid	12686.83	Schwarz criterion		7.587395
Log likelihood	-446.6709	Hannan-Quinn criter.		7.559654
F-statistic	0.317093	Durbin-Watson stat		1.737639
Prob(F-statistic)	0.574437			

(b) At the First Difference

Null Hypothesis: D(TAIWAN) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=12)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-9.561911	0.0000
Test critical values:	1% level		-3.486551	
	5% level		-2.886074	
	10% level		-2.579931	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(TAIWAN,2)				
Method: Least Squares				
Sample (adjusted): 2008M06 2018M03				
Included observations: 118 after adjustments				

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TAIWAN(-1))	-0.880385	0.092072	-9.561911	0.0000
C	0.600785	0.957314	0.627573	0.5315
R-squared	0.440776	Mean dependent var		0.073325
Adjusted R-squared	0.435955	S.D. dependent var		13.82345
S.E. of regression	10.38182	Akaike info criterion		7.534793
Sum squared resid	12502.72	Schwarz criterion		7.581753
Log likelihood	-442.5528	Hannan-Quinn criter.		7.553860
F-statistic	91.43015	Durbin-Watson stat		1.998805
Prob(F-statistic)	0.000000			

REGRESSION

Dependent Variable: DSENSEX				
Method: Least Squares				
Sample (adjusted): 2008M05 2018M03				
Included observations: 119 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.033754	1.631589	-0.020688	0.9835
DHNSNG	0.072843	0.019345	3.765458	0.0003
DENXT	0.095822	0.044255	2.165237	0.0325
DSHNGICOMP	-0.110209	0.061539	-1.790877	0.0760
DTAIWAN	0.749070	0.247488	3.026692	0.0031
R-squared	0.591995	Mean dependent var		0.663271
Adjusted R-squared	0.577679	S.D. dependent var		27.20159
S.E. of regression	17.67729	Akaike info criterion		8.623547
Sum squared resid	35623.48	Schwarz criterion		8.740317
Log likelihood	-508.1011	Hannan-Quinn criter.		8.670964
F-statistic	41.35206	Durbin-Watson stat		2.179015
Prob(F-statistic)	0.000000			

RESIDUAL TEST

Breusch-Godfrey Serial Correlation LM Test

F-statistic	2.087403	Prob. F(2,112)	0.1288
Obs*R-squared	4.276331	Prob. Chi-Square(2)	0.1179
Test Equation:			
Dependent Variable: RESID			
Method: Least Squares			
Sample: 2008M05 2018M03			
Included observations: 119			
Presample missing value lagged residuals set to zero.			
Variable	Coefficient	Std. Error	t-Statistic
C	0.039395	1.616628	0.024369
DHNSNG	-0.002104	0.019252	-0.109269
DENXT	-0.006058	0.043950	-0.137831
			0.8906

DSHNGICOMP	0.001256	0.061447	0.020447	0.9837
DTAIWAN	0.020917	0.246816	0.084748	0.9326
RESID(-1)	-0.120821	0.094570	-1.277585	0.2040
RESID(-2)	-0.163413	0.095915	-1.703722	0.0912
R-squared	0.035936	Mean dependent var		2.69E-16
Adjusted R-squared	-0.015711	S.D. dependent var		17.37509
S.E. of regression	17.51105	Akaike info criterion		8.620564
Sum squared resid	34343.33	Schwarz criterion		8.784042
Log likelihood	-505.9235	Hannan-Quinn criter.		8.686947
F-statistic	0.695801	Durbin-Watson stat		1.972649
Prob(F-statistic)	0.653491			

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.379694	Prob. F(4,114)	0.8228
Obs*R-squared	1.564545	Prob. Chi-Square(4)	0.8151
Scaled explained SS	2.995129	Prob. Chi-Square(4)	0.5586

Test Equation:

Dependent Variable: RESID²

Method: Least Squares

Sample: 2008M05 2018M03

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	300.3937	57.27992	5.244310	0.0000
DHNSNG	0.256045	0.679143	0.377012	0.7069
DENXT	0.390728	1.553651	0.251490	0.8019
DSHNGICOMP	1.001456	2.160453	0.463540	0.6439
DTAIWAN	-2.429720	8.688520	-0.279647	0.7803
R-squared	0.013147	Mean dependent var		299.3570
Adjusted R-squared	-0.021479	S.D. dependent var		614.0343
S.E. of regression	620.5937	Akaike info criterion		15.74034
Sum squared resid	43905563	Schwarz criterion		15.85711
Log likelihood	-931.5502	Hannan-Quinn criter.		15.78776
F-statistic	0.379694	Durbin-Watson stat		2.030585
Prob(F-statistic)	0.822753			