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FINANCIAL INTEGRATION IN INDIA: AN ANALYSIS OF POST REFORMS PERIOD

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ABSTRACT
Financial integration in India has been examined in this study. Given the importance of financial integration that, it enhances the economic growth, it is essential to examine this issue. In this study monthly data has been used between April 1995 to March 2015 on exchange rate, call rates, money supply (M3), National stock exchange (NSE), Bombay Stock Exchange (BSE) and Foreign Direct Investment (FDI). The study, by using multivariate Johansen co-integration approach, found that there is a robust integration in the variables of interest. However, for reaping the benefits of financial integration, integration in the markets is a necessary but not the sufficient condition, unless market is stable.

KEYWORDS
stock prices, interest rate, money supply, exchange rate, FDI, cointegration.

1. INTRODUCTION
The degree of financial integration around the globe substantially increased in the late 1980s, particularly, between developing and industrial countries. Many countries introduced market oriented reforms along with subsequent deregulation which facilitated vast capital flows especially to the Asian economies (Ho, 2009). Underlying this process, a key factor has been the globalization of the investment which gives incentive to diversify risk, involved in this market and seek higher rates of return. At the same time a series of recent financial crisis like the Mexican peso crisis in December 1994, in July 1997 the collapse of the Thai Bhat actuated the Asian crisis, in August 1998 the Russia crisis and in January 1999 financial crisis in Brazil, intensified the concerns associated with the risk of precipitous reversals which may represent a significant cost in capital flows. In the entire above crisis some sort of misaligned fundamentals like unstable financial markets and flimsy financial system, that gives rise to the risks related with the cross border financial transactions and week regulatory and structural supervisions, played a role (Jain and Bhanumurthy, 2005).

Globalization has had an immense impinge on the economy of India. The financial market of India, (comprises of primary market, FDIs, pension funds, banking and insurance, and asset management segment) remained moribund due to stringent economic controls under Foreign Exchange Regulation Act (FERA). The reforms took place amidst two serious crises, (i.e. Balance of Payments crisis that endangered the credibility of the economy and pushed it to the brink of default and second is the severe threat of insolvency that banking system confronted due to defective accounting policies), in the early 1990s (Varma, 1998). Whereas, deregulation of India's financial market started in 1992 in the wake of liberalisation process, as an integral part of economic and structural reforms of 1991 (Bhoi and Dhal, 1998). The process of reforms since then rolled out in multiple directions. One of the main objectives of these reforms has been to develop several segments of the financial markets into an integrated one, in order to reduce arbitrage opportunities through their inter-linkages and thereby high level of efficiency in the market operations. This implies a surge in the capital flows and equalisation of prices and returns on the trade of financial assets.

At present, in India, the financial market, as it became organised in the earlier 19th century with the securities exchange in Mumbai, Ahmedabad, and Kolkata, is more elevated than many other sectors. There were only eight securities exchanges in the early 1960s whereas; today there are 24 regional securities exchanges in India. The market encountered many new companies traversing across different industry segments and the business also started to expand. The major part of the India's financial system is regulated and supervised by the Reserve Bank of India (RBI). Whereas mutual funds, capital market and other capital market intermediaries of India are regulated by Securities and Exchange Board of India (SEBI), which came into prominence after the turbulence experienced by the capital markets of India in April 1988. The integrated financial systems, via formal agreements, have numerous advantages. Most important one is that it provides better access, especially to small and medium-sized firms facing credit constraints, to broader financial and capital markets. Further integration leads to risks minimisation with enhanced portfolio diversification and thereby enhanced economic growth (Ho, 2009). However, the effective integration of this market depends upon certain characteristics; buyers and sellers of the financial product should be in large number, market forces (i.e. demand and supply) should determine the price of the product, free flow of resources from one to another segment of the markets, in order to wipe out the arbitrage opportunity, and the rates prevailing in the various segments of the market should move in tandem (Bhoi and Dhal, 1998).

This has been extensively discerned in the literature also that the impact of financial integration is mixed. Empirical evidences, from some studies, show that the economies which are financially more integrated have done better than that of financially less integrated one. Obstfled (1994) demonstrated that risk-sharing is alleviated by the financial integration which further leads to significant welfare gains. Various dimensions of the linkages among financial integration and the growth were examined by Edison and Warnock (2003) and of the view that integrated financial system leads to growth benefits. Ho (2009) is of the view that the process of financial integration benefitted developing countries the most. According to Ananchotikul, Piao, and Zoli (2015), financial integration, by improving allocation of savings and investment, ensures high productivity and living standards. On the other hand, according to Boyd and smith (1992), Arteta ***et al.,*** (2001) and Kraay (1998), financial integration retards growth. However, Kose *et al.,* (2003) and Rogoff *et al.,* (2003) examined the effects of financial integration on developing countries and found that there is no robust causal relationship between growth and financial integration while, sometimes, lead to consumption volatility. The present study attempts to know the market integration in India by looking in an empirical perspective on this issue.

2. DATA METHODOLOGY
Monthly data of variables like exchange rate, call rate, money supply (M3), NSE (indices), BSE (indices) and FDI, from April 1995 to March 2015, culled out from the handbook of statistic on Indian economy, Reserve Bank of India. All the data has been transformed into natural logarithm to fulfil the linearity assumption of classical least square methods.

2.1 TECHNIQUES AND TOOLS
The technical details of the methods that are involved in assessing the financial markets integration in this study are as under.

2.1.1 UNIT ROOT
Johansen's cointegration approach implicitly assume that the variable should be integrated on order one i.e., I(1). To fulfil this standard assumption of the Johansen's cointegration techniques, Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981) is applied to comprehend the statistical properties of the time series using the model (1).

$$\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + \sum_{j=i}^{q} \beta_j \Delta Y_{t-j} + \varepsilon_t \dots (1)$$

Where, Δ is the difference parameters (i.e., $\Delta Y_1 = Y_t - Y_{t-1}, Y_{t-1} = Y_{t-1} - Y_{t-2}$ and $Y_n = Y_{n-1} - Y_{n-2}$) and so on. $Y_t = Y_t - Y_{t-1}$ and β_0 is the constant or drift, t is the time or trend variable while q is the number of lags length, on the basis of Akaike Information Criterion (AIC), and ε_t is a pure white noise error term.

2.1.2 PHILLIPS AND PERRON TEST

The asymptotic distribution of the Phillips and Perron test (PP) is same as the ADF test statistic, but Phillips and Perron developed a nonparametric statistical method without adding lagged difference to correct the serial correlation in the error terms (Phillips and Perron, 1988).

2.1.3 JOHANSEN COINTEGRATION

The Johansen cointegration is more prevalent and widely used technique. Its popularity arises because it allows one to determine the number of cointegrated equations in the case of multivariate system (Shahnoushi, et.al, 2009). Johansen (1988) started from the Vector Auto-Regression (VAR) of order (p) model and its solution and reparameterization leads to equation (2).

$$\Delta Y_t = \mu + \Pi_{t-p} Y_{t-1} + \sum_{i=1}^{m-1} \Gamma_i \Delta Y_{t-i} + \beta \mu_t + \varepsilon_t \dots (2)$$

Where Y is a p-dimensional process and Π and the Γi's are p x p parameter matrices of the long and short run dynamics, μ_t contains deterministic terms such as a constant, a linear trend and seasonal dummies and ε_t is a p-dimensional vector of white noise components. The numbers of the cointegrating vectors depend upon the rank of the coefficients matrices Π. If the rank (Π) = n, i.e. the matrix Π has full rank, indicate that the vector process Y_t is stationary. But if the rank (Π) = 0, i.e., the matrix Π is the null matrix, then there is no cointegration among the system and If the 0 < rank (Π) = r < n then there are n x r cointgrating vectors.

The heart of the Johansen procedure is simply to decompose Π into two matrices α and β both of which are n x r such that Π=αβ'. Whereas α is known as the adjustment parameters in the vector error correction model and the β is the cointegrating vectors (Engle and Granger, 1987). In order to determine the number of cointegration equations in the multivariate system Johansen proposed two likelihood ratio tests namely; The trace test and the maximum eigenvalue test given by following equations (3 and 4):

$$J_{trace} = -T \sum_{i=r+1}^{N} \ln(1 - \hat{\lambda}_i) \dots (3)$$

$$\lambda_{max} = -T ln(1 - \hat{\lambda}_{r+1}) \dots (4)$$

Here, T is the sample size and λ is the estimated value for the i^{th} ordered eigenvalue.

3. RESULTS AND DISCUSSION

Descriptive statistics of the variables of interest measured by the coefficients of variation show that except exchange rate all other variables are volatile [insert Table 1 here].

3.1 UNIT ROOT RESULTS

Time series modelling felicitous necessitates the one to conscious about the behaviour of the underlying series. The appropriation of the time series modelling is contingent on the statistical properties of the data. Among the various techniques, Augmented Dickey-Fuller and Phillips-Perron tests were conducted (because of their wider applicability in the literature) to understand the behaviour of the data. The result of the Augmented Dickey-Fuller and Phillips-Perron test explicates that all the variables are stationary at the first differences [i.e., I(1)] except call rate in Phillips-Perron test [insert Table 2 here].

3.2 JOHANSEN COINTEGRATION RESULTS

Johansen cointegration technique includes the various model specifications that depend upon the inclusion/exclusion of intercept and trend component in the model. In this study, firstly lag length is selected on the basis of Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ) [insert Table 3 here]. Then linear unrestricted intercept with no trend is selected that represents the inclusion of intercept in the cointegrating space and exclusion of the trend [insert Table 4 here]. The result of trace and max-Eigen statistics further confirmed that the variables used in this study has two cointegrating vectors [insert Table 5 and 6 here].

The coefficients of the entire study as per priory expectation and are representing the macroeconomic relation.

3.3 LONG RUN COINTEGRATION RESULTS

The two normalized equations (5 and 6), explaining the impact of money supply, BSE, NSE and FDI on exchange rate and call rate, represent the real picture of macroeconomics. The sign of all the coefficients, except the variable which is normalized, are need to be reversed while normalizing the cointegrating coefficients.

$$ER = 0.88 + 3.71(M3) + 0.05(NSE) - 0.02(BSE) - 0.25(FDI) \dots \dots (5)$$

$$CR = 6.66 - 5.39(M3) - 0.63(NSE) - 1.42(BSE) + 15.98(FDI) \dots \dots (6)$$

The result of long run cointegration equations shows that money supply is positively related to the exchange rate and negatively related to the interest rate. Which implies that as the money supply increases interest rate declines and result in capital outflows following this exchange rate also depreciates (increases). Further the study found a direct relation between NSE and exchange rate. While BSE and FDI are found negatively related to the exchange rate which means that an increase in the stock prices and FDI decreases the exchange rate (appreciates). However, both NSE and BSE had a very little impact on exchange rate. For the interest rate model, barring FDI, all the variables are negatively related with the interest rate which elucidates that the financial system of India is highly contingent on the interest rate or in other words, interest rate is the driver of the Indian financial system. The result has the conformity with the macroeconomics relation [insert Table 7 here].

3.4 VECTOR ERROR CORRECTION MODEL RESULTS

The two cointegrating equations of the error correction model are statistically significant and the prominent diagnostic statistics (R-squared, Adjusted R-squared, F-statistic, Durbin-Watson statistics and Jarque Bera test statistic) satisfied the estimates of the model. Both the coefficients of the error correction term satisfy the conditions, that their sign should be negative, and are statistically significant at the 5% level. Their significance and the negative sign further confirmed the results of cointegration and values of the coefficients explain the speed of adjustment between the cointegrated vectors. The coefficient of the exchange rate shows the 1% disequilibrium which explain that one month need to restore the equilibrium, as the data used in the analysis is monthly in nature. Similarly, 18 months need to restore the complete equilibrium in the interest rate cointegrated vectors and it explains that exchange rate has a very high speed of adjustment than the interest rate [insert Table 8 here].

3.5 SHORT RUN RESULTS OF THE VECTOR ERROR CORRECTION MODEL

The result of vector error correction (short run coefficients) shows that only few variables responded as short run is immediate period. In the exchange rate model, Interest rate, money supply and NSE are statistically significant at the level of 5% and 10% while BSE and FDI are not significant. Similarly, in the interest rate model, only exchange rate and BSE are statistically significant at the 5% level. For money supply and NSE, only BSE responded and is statistically significant and for FDI as dependant variable, again only BSE highly responded in the short run [insert Table 9 here].

4. CONCLUSION

The present study examined the financial integration, by taking various variables like exchange rate, call rate, money supply (M3), NSE, BSE and FDI, in India for the period April 1995 to March 2015. All the variables become stationary after the first difference at the 5% level of significance. As all the variables had the same order of integration, therefore Johansen co-integration was applied to find the long-run relationship. The variables found to be cointegrated which explicates that the financial markets are highly contingent on the exchange rate and interest rate. But to reap the positive benefits of integration, integration of financial markets should be more strengthened. However, efforts should be made for the greater stability of the economy to minimise the risks involved in these markets.

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TABLES

TABLE 1: DESCRIPTIVE STATISTICS OF THE VARIABLES

Statistics	ER	CR	M3	NSE	BSE	FDI
Mean	45.91640	11.28689	35618.93	3109.603	4587.676	1157.388
SD	7.073644	8.950107	29595.50	2201.199	3010.247	1266.373
CV	15.40548	79.29648	83.08924	70.78714	65.61595	109.4165
Maximum	63.75214	80.00000	107303.5	8750.435	10795.30	6177.070
Minimum	31.37890	3.110000	5248.640	835.1875	1281.380	58.00000

Note: *ER is exchange rate, CR is call rate, M3 is money supply, SD is standard deviation and CV is the coefficient of variation.*

TABLE 2: UNIT ROOT TEST RESULTS

	Phillips-Perron Test			Augmented Dickey Fuller Test		
Variables	t-Statistics	Critical Value at 5%	P-Value	t-Statistic	Critical Value at 5%	P-Value
In ER	-1.378684	-2.873390	0.5925	-1.536507	-2.873440	0.5135
Δ*In* ER	-11.21987	-2.873440	**0.0000***	-11.30269	-2.873440	**0.0000***
In CR	-2.347043	-1.942153	**0.0186***	-0.578584	-1.942176	0.4659
Δ*In* CR	-101.9870	-1.942159	**0.0001***	-13.15277	-1.942176	**0.0000***
In M3	-1.563632	-2.873390	0.4996	-1.516123	-2.873390	0.5239
Δ*In* M3	-13.34191	-2.873440	**0.0000***	-13.35963	-2.873440	**0.0000***
In NSE	-0.251852	-2.873390	0.9284	-0.384531	-2.873440	0.9083
Δ*In* NSE	-12.26635	-2.873440	**0.0000***	-12.27418	-2.873440	**0.0000***
In BSE	-1.121527	-2.873390	0.7077	-1.077685	-2.873390	0.7249
Δ*In* BSE	-13.30473	-2.873440	**0.0000***	-13.30473	-2.873440	**0.0000***
In FDI	-0.364305	-2.873390	0.9117	-0.499260	-2.873440	0.8877
Δ*In* FDI	-12.44380	-2.873440	**0.0000***	-12.43569	-2.873440	**0.0000***

Note: *variables with prefix 'Δ'* indicates *first difference and '*' indicate significant at 5% level of significance*

TABLE 3: LAG LENGTH SELECTION CRITERION RESULTS

Lag	Log-L	LR	FPE	AIC	SC	HQ
0	1985.453	NA	1.68e-15	-16.99101	-16.90215	-16.95518
1	3726.482	3377.447	7.41e-22	**-31.6264***	**-31.00438***	**-31.3756***
2	3776.418	94.29983	**6.58e-22***	-31.74608	-30.59080	-31.28022
3	3806.732	55.68300	6.92e-22	-31.69727	-30.00878	-31.01639
4	3836.449	53.05693	7.32e-22	-31.64334	-29.42164	-30.74745
5	3851.011	25.25033	8.84e-22	-31.45933	-28.70442	-30.34843
6	3882.096	**52.29656***	9.29e-22	-31.41713	-28.12902	-30.09122
7	3901.021	30.86461	1.09e-21	-31.27056	-27.44924	-29.72964
8	3923.673	35.77734	1.23e-21	-31.15599	-26.80146	-29.40005

Note: *LR is sequential modified Lag Range test statistic, FPE is Final Prediction Error, AIC is Akaike Information Criterion, SC is Schwarz Information Criterion and HQ is Hannan-Quinn Information Criterion.*

TABLE 4: SUMMARY OF THE COINTEGRATION MODEL

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace Statistics	2	2	2	2	2
Max-Eigen Statistics	2	2	2	2	2

TABLE 5: TRACE STATISTIC TEST RESULTS

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value	Prob.**
None *	0.366279	188.5185	95.75366	0.0000
At most 1 *	0.176189	79.49955	69.81889	0.0069
At most 2	0.071164	33.17788	47.85613	0.5470
At most 3	0.042846	15.53423	29.79707	0.7445
At most 4	0.018912	5.068088	15.49471	0.8015
At most 5	0.002110	0.504711	3.841466	0.4774

***Note:** '*' indicates rejection of the Null hypothesis at the 5% level and '**' indicates MacKinnon-Haug-Michelis (1999) p-values.*

TABLE 6: MAX-EIGEN STATISTIC TEST RESULTS

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value	Prob.**
None *	0.366279	109.0189	40.07757	0.0000
At most 1 *	0.176189	46.32168	33.87687	0.0010
At most 2	0.071164	17.64365	27.58434	0.5250
At most 3	0.042846	10.46614	21.13162	0.7000
At most 4	0.018912	4.563377	14.26460	0.7956
At most 5	0.002110	0.504711	3.841466	0.4774

***Note:** '*' indicates rejection of the Null hypothesis at the 5% level and '**' indicates MacKinnon-Haug-Michelis (1999) p-values.*

TABLE 7: LONG RESULTS OF THE COINTEGRATION

Cointegrating Equations:	Cointgration Eq1	Cointgration Eq2
$ER_{(-1)}$	1.000000	0.000000
$CR_{(-1)}$	0.000000	1.000000
$M3_{(-1)}$	-3.714584 (0.01552) [-239.365]	5.390507 (2.48976) [2.16507]
$NSE_{(-1)}$	-0.057581 (0.02066) [-2.78738]	0.634384 (3.31431) [0.19141]
$BSE_{(-1)}$	0.022610 (0.00336) [6.71993]	1.420924 (0.53981) [2.63226]
$FDI_{(-1)}$	0.259054 (0.17523) [1.47838]	-15.98627 (28.1135) [-0.56863]
Constant	0.889594	6.665460

***Note:** figures in the parenthesis are the standard error and figures in brackets are the test statistics and (-1) indicates lag one.*

TABLE 8: ERROR CORRECTION TERM OF THE VECTOR ERROR CORRECTION MODEL

Equations	Coefficient	t-Statistic	Prob.
Cointgration Eq1	-0.015013	-3.316930	0.0011*
Cointgration Eq2	-0.189080	-3.507070	0.0005*
Cointgration Eq1		**Cointgration Eq2**	
R-Squared	0.573420	R-squared	0.350294
Adjusted R-Squared	0.558582	Adjusted R-squared	0.327696
F-Statistic	38.64650	F-statistic	15.50080
Prob(F-Statistic)	0.0000*	Prob(F-statistic)	0.0000*
Durbin-Watson Stat	2.009451	Durbin-Watson stat	2.067362
Jaeque-Bera Test Statistic	79.42517	Jaeque-Bera test statistic	423.8912
Prob(Jaeque-Bera Test Statistic)	0.00000*	Prob (Jaeque-Bera test statistic)	0.00000*

***Note:** '*' indicates significant at 5% level of significance.*

TABLE 9: SHORT RUN RESULTS OF THE VECTOR ERROR CORRECTION MODEL

Dependent Variables → **Independent Variables↓**	**ER**	**CR**	**M3**	**NSE**	**BSE**	**FDI**
ER		**8.318492** **[2.96469]** **(0.0033)***	-0.033311 [-0.94229] (0.3470)	0.349434 [0.89713] (0.3706)	0.780297 [1.38650] (0.1669)	0.040573 [0.78310] (0.4344)
CR	**-0.003311** **[-1.90438]** **(0.0581)****		-0.000971 (-1.21249) [0.2266]	-0.000797 [-0.09025] (0.9282)	0.009912 [0.77724] (0.4378)	-0.000212 [-0.18033] (0.8571)
M3	**1.417379** **[0.426972]** **(0.0010)***	-1.608513 [-0.1030] (0.9180)		-3.044382 [-1.40469] (0.1615)	**-8.134314** **[-2.5975]** **(0.0100)***	-0.386774 [-1.34163] (0.1810)
NSE	**0.256510** **[1.687453]** **(0.0929)****	5.488199 [0.98737] (0.3245)	0.080840 [1.15437] (0.2495)		0.704693 [0.63208] (0.5280)	0.021100 [0.20558] (0.8373)
BSE	-0.020883 [-1.54570] (0.1236)	**1.444227** **[2.92347]** **(0.0038)***	**-0.016077** **[-2.58301]** **(0.0104)***	**0.178819** **[2.60755]** **(0.0097)***		**0.023940** **[2.62442]** **(0.0093)***
FDI	-1.679873 [-1.48841] (0.1380)	-49.0001 [-1.1873] (0.2363)	-0.464043 [-0.89248] (0.3731)	-2.914709 [-0.50877] (0.6114)	-4.08723 [-0.4937] (0.6219)	
Constant	**0.001995** **[2.445906]** **(0.0152)***	-0.02939 [-0.9855] (0.3254)	0.000534 [1.42234] (0.1563)	**0.009542** **[2.30496]** **(0.0221)***	0.008646 [1.44552] (0.1497)	**0.001224** **[2.22347]** **(0.0272)***

Note$_1$: *'*' indicates significant at 5% level of significance and '**' indicates significance at 10% level of significance*
Note$_2$: *figures in parenthesis are p-value and in brackets are t-statistics.*

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