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Short and Long Run Relationship Analysis of Indian Stocks Cross Listed in U.S

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Abstract This study investigates the short run and long run relationship of dually listed Indian shares traded in US market using daily closing data for the financial crisis period from Sep 2007 to Feb 2009.Thedynamic interrelations between portfolio of three American depository receipts (ADRs) and their underlying stocks (UNDs) is examined by applying Cointegration test, Granger causality testand Vector Error Correction Model. The results confirm a long-run cointegrating relationship among the prices of Indian ADRs and their underlying shares, the Indian and the United States (US) market indices. The short-term dynamics of the ADR portfolio are influenced by the deviation from the long-run equilibrium and the lagged changes of all.

Keywords: *cross listing, short run relationship, long run relationship, VECM, ADR, NYSE, NIFTY*

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1. Introduction

Due to the influx of globalization and deregulation of the financial setting in the past decade, there has been a magnification in cross-border listings by firms [16]. Cross-listings are becoming an important financing strategy for companies and stock exchanges alike.

Cross listing of shares is when a firm lists its equity shares on one or more foreign stock exchange in addition to its domestic exchange. Cross-listing on a foreign market lowers costs of capital through enhanced liquidity, lower transaction costs, enhanced order-execution quality, the enhanced ability of foreign investors to diversify portfolios [5] and afford access to extensive range of investors.

Indian Stocks are listed in foreign exchanges likes NYSE, NASDAQ, as American Depository Receipt (ADR) Global Depository Receipt (GDR), ADRs are the most common vehicle through which Indian companies cross-list shares in the U.S.

In India the stock market is enduring considerable revolution with liberalization measures, and the exploration of the nature of integration with other developed and emerging markets would not only give an idea of the potential gains to be obtained out of portfolio diversification from Indian market, but may also afford some indication of the vulnerability of the country's stock market in case of a regional financial crisis and subsequent reversal of capital flows from the region. The globalization of financial systems and the hastening of information transmission have augmented the risk of financial crises, as a crisis in one country can spread to other countries and bring about worldwide crises. However, in recent times, with the mounting activities of foreign portfolio investors who track international indices and incessantly move funds between markets, as well as further linkages with foreign markets through the route of ADR/GDR issues and other channels, correlation between Indian and global stock markets has improved extensively necessitating a comprehensive exhaustive study.

If the markets are informationally efficient, and the prices of underlying shares truly affect the prices of ADRs, a shock from the underlying shares should be reflected in the prices of ADRs by the same calendar day.

The focus of the study is to examine the dynamic interrelations between the portfolio of three Indian shares and its ADR dually listed in US using Cointegration test, and VECM model. The Johansen Cointegration is used to test for possible long-run cointegrating relationship between pricing factors, namely, the price of Indian ADRs and the underlying shares, the India and US market indices. The vector error correction model is used to estimate the short-run dynamics of the pricing factors for all firms. In addition, the effect and persistence of a shock in one pricing factor to itself as well as to the other factors in the system are also analysed. Results from the analysis provide not only an indication of the direction of information transmission but also an assessment on the degree of influence by individual variables on both the Indian shares and their ADRs.

2. Literature Review

The review is done under two dimensions, viz., studies related to international cross listing and on research applying econometric analysis. There has been an extensive research literature related to the issues of cross listing, where recent work by many is used as the reference to detailed review of this growing sphere of literature.

The long-run and short-run performance of 192 Australian cross-listed firms relative to their rivals was examined [16]. The findings revealed that in short run, the mean cumulative abnormal returns are statistically significant for the cross-listed firms during the long-run analysis, rival firms carried out negative abnormal returns. Further analysis revealed liquidity gains are mostly not a factor for cross listed firms' abnormal returns.

Corporate investment to stock price is higher for firms cross-listed in the U.S. than for firms non cross-listed with 633 firms from 39 countries was analyzed for the period 1989-2006 **[7]**. The hypothesis suggested that a cross-listing had a positive impact on the investment-to-price sensitivity which in turn assists managers to acquire more informative feedback from the stock market.

The price discovery using trivariate model for 7 Canadian firms cross-border listed in the Toronto Stock Exchange Market (TSX) and the New York Stock Exchange Market (NYSE) was investigated [11] and also analyzed the information role of each country to the efficient foreign exchange rate shock and to the individual firm's fundamental value change. The results of the study revealed that 5 out of 7 firms found adjustment to the fundamental component of firm's value from home (TSX) market. In the remaining of 2 firms the price discovery takes place equally in both home and foreign (NYSE) markets. To the efficient exchange rate shock, price discovery takes place equally in both markets for 5 out of 7 firms and occurs more in the home market for the rest of 2 firms.

The short-term and long-term relationships between BSE 500, BSE 200 and BSE 100 Index of Bombay Stock Exchange and crude price by using various econometric techniques was examined [2]. The study was for the period 02.04.2001 and 31.03.2011. The empirical results showed there was a co-integrated long-term relationship between three index and crude price and Granger causality test also revealed that there was one way causality relationship from all index of the stock market to crude price, but crude price was not the causal.

The influence of government sectoral expenditure on economic growth in Malawi from 1980 to 2007 was scrutinized [15] using econometric tools like cointegration analysis, error correction model to assess the growth effects of government expenditures in agriculture, education, health, defence, social protection and transport and communication. The results of long run results showed a significant positive effect on economic growth of expenditure on agriculture and defence, while short run results showed no significant relationship between government sectoral expenditure and economic growth.

A Vector Error Correction (VEC) model technique was used to analyze the long and short run relationship of monetary and fiscal policies on economic growth in Nigeria [14]. The Findings revealed that monetary policy obtained larger effect on the economic growth but the impact of fiscal policy was lower especially during the drop in inflation rate.

The remainder of the paper is structured as follows. Section 3 outlines the data used in the study and the methodology Section 4 reports the empirical results. Finally, Section 5 presents the conclusions of the study.

3. Methodology

3.1. Data Set

Table 1. Details of ADR employed in the study

COMPANY	SYMBOL	EXCHANGE	ADR: DOMESTIC SHARE	INDUSTRY
TATA MOTORS	TTM	NYSE	1:2	Industrial
MTNL	MTNL	NYSE	1:2	Fixed Line Telecom.
Dr. REDDY'S LABORATORIES	RDY	NYSE	1:1	Pharma. & Biotech.

Source: (www.adrbnymellon.com)

This study includes the Daily closing prices of the three dually listed Indian shares, and the Indian and the US indices.Table 1 lists the ADRs employed for this study and provides the names of the respective industries along with the listed stock exchange. The ADRs and their underlying stocks are constructed based on their mean prices as portfolio. The prices of the Indian ADRs (P_A) and their underlying shares (P_I), and the total market indices for India (NSE) (P_{IM}) and the US (NYSE)(P_{AM}) are selected samples for the financial crises period Sep 2007 to Feb 2009.The data were collected from www.adrbny.com and www.nseindia.com.E views 6.0 package is used for arranging the data and implementation of econometric analyses.

3.2. Techniques

Initially, natural logarithms of data have been taken before passing to the analysis process. Then, stationarity analysis has been performed for data pertaining to the variables used in the study. The most widely used test among parametric tests is Augmented Dickey-Fuller (ADF-1979) that considers possible structural fracture and trend in the time series. A long term relationship between time series has been searched by applying co-integration test developed by Johansen and Juselius (1990). Both granger causality and vector error correction model are carried out to establish the short run and long-run dynamics.

First step is to test whether each of the ADRs, their underlying prices are stationary. The Augmented Dickey Fuller (ADF) tests are used to test for unit roots in the time series. The basic Dickey–Fuller (DF) test [4] is to examine whether <1 in the equation (3.1),

$$\gamma_t = \mu + \rho\gamma_{t-1} + \varepsilon_t, \varepsilon_t \sim N\left(0, \sigma^2{}_{\varepsilon}\right) \qquad (3.1)$$

which, after subtracting y_{t-1} from both sides, can be written as:

$$\Delta\gamma_t = \mu + \left(\rho - 1\right) y_{t-1} + \varepsilon_t = \mu + \theta\gamma_{t-1} + \varepsilon_t \qquad (3.2)$$

The null hypothesis is that there is a unit root in y_t, or $H_0 : \theta = 0$, against the alternative $H_1 : \theta < 0$, or there is no unit root in y_t. The Dickey–Fuller procedure gives a set of critical values developed to deal with the non-standard distribution issue, which are derived through simulation. A sufficient number of lagged differences are included so that the residual series is approximately white noise. If, as expected, each variable is integrated of order one, I (1), then the next step would be to test for Co integration.

Let $Y_t = (Y_{1t}\ldots,Y_{kt})'$ denote an k x1 vector of I(1) time series. Y_t is co integrated if there exists k x1 vector $\beta = (\beta_1 \ldots \beta_k)'$ such that

$$Z_t = \beta' Y_t = \beta_1 Y_{1t} + \ldots + \beta_k Y_{kt} \sim I(0) \qquad (3.3)$$

The non-stationary time series in Y_t are co integrated if there is a linear combination of them that is stationary. If some elements of β are equal to zero then only the subset of the time series in Y_t with non-zero coefficients is co integrated.

There may be different vectors β such that $Z_t = \beta' Y_t$ is stationary. In general, there can be $0 < r < k$ linearly independent co integrating vectors. All cointegrating vectors form *a co integrating matrix* B [12].

A vector error correction (VEC) has cointegration relations built into the specification so that it restricts the long-run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegration term is known as the *error correction* term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

If a bivariate I(1) vector $Y_t = \left(Y_{1t}, Y_{2t}\right)'$ is cointegrated with cointegrating vector $\beta = (1, -\beta_{2,})'$ then there exists an error correction model (ECM) of the form

$$\Delta Y_{1t} = \delta_1 + \phi_1 (Y_{1,t-1} - \beta_1 Y_{2,t-1}) + \sum_{j=1} \alpha^j{}_{11} \Delta Y_{1,t-j} + \sum_{j=1} \alpha^j{}_{12} \Delta Y_{2,t-j} + \epsilon_{1t} \qquad (3.4)$$

$$\Delta Y_{2t} = \delta_2 + \phi_2 (Y_{1,t-1} - \beta_2 Y_{2,t-1}) + \sum_{j=1} \alpha^j{}_{21} \Delta Y_{1,t-j} + \sum_{j=1} \alpha^j{}_{22} \Delta Y_{2,t-j} + \epsilon_{2t} \qquad (3.5)$$

that describes the long term relations of Y_{1t} and Y_{2t}. If both time series are I (1) but are cointegrated (have a long term stationary relationship), there is a force that brings the error term back towards zero. If the cointegrating parameter $\beta_{1,}$ or β_2 is known, the model can be estimated by the OLS method.

The Granger causality test is employed to determine whether one return series is useful in forecasting another. Based on the definition of Granger causality, a time series X is said to Granger-cause Y if it can be shown that those X values provide statistically significant information about future values of Y.

4. Empirical Results

4.1. Descriptive Statistics

Table 2 report the descriptive statistics of two Indian ADRs viz., TCL, MTNL listed at NYSE and their underlying, US and home market indices. The sample period is from 2001 to 2012.

Table 2. Descriptive Statistics (2001-2012)

Variables/ Statistics	P_A	P_I	P_{IM}	P_{AM}
Mean	6.262521	14.14429	8.364690	7.684356
Median	6.695318	14.56499	8.419839	7.756314
Maximum	7.213964	15.04956	8.746374	7.958269
Minimum	4.507048	12.57019	7.833679	7.182443
Std. Dev.	0.850351	0.791391	0.261169	0.211507
Skewness	-0.769973	-0.867911	-0.579069	-0.862508
Kurtosis	2.007236	2.168122	2.059670	2.291354
JarqueBera	6.262521	14.14429	8.364690	7.684356
Probability	0.0000	0.000	0.000	0.000

Note: *All prices are in natural logarithms. *Significant @1% level*
Skewness is a measure of asymmetry of the distribution of the series around its mean.
Kurtosis measures the peakedness or flatness of the distribution of the series.
Jarque-Bera is a test statistic for testing whether the series is normally distributed.

The descriptive statistics from Table 2 of all the variables under study reveals that the variables are not normally distributed which is evident from the significant values of Jarque- Bera Test. It is observed that the mean returns are positive for all variables. The variables are skewed left and leptokurtic.

4.2. VAR Lag Order Selection Criteria

Table 3 indicates the selected lag from LR test statistic, Final prediction error, Akaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion by (*). These are the lags with the smallest value of the criterion.

Table 3 present the evidence based on the VAR Lag Order Selection Criteria, the SC criterion & HQ suggests the use of 2 lag and 3 lag while the LR,FPE and AIC criteria suggest that 5 lags should be accommodated in the VAR. But the subsequent analysis was estimated based on VAR with 2 lags according to Schwarz Information (SIC) criterion which is most commonly used criterion.

Table 3. VAR lag order selection criteria – TCL (2001-2012)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	728.1783	NA	5.39e-08	-5.384226	-5.330773	-5.362759
1	2209.100	2906.791	1.00e-12	-16.27584	-16.00858	-16.16851
2	2284.989	146.6996	6.43e-13	-16.72111	-16.24003*	-16.52791
3	2315.914	58.85992	5.76e-13	-16.83207	-16.13718	-16.55300*
4	2333.718	33.35783	5.68e-13	-16.84549	-15.93679	-16.48055
5	2349.924	29.88272*	5.68e-13*	-16.84702*	-15.72451	-16.39622
6	2359.657	17.65702	5.95e-13	-16.80043	-15.46410	-16.26376
7	2372.650	23.18320	6.09e-13	-16.77806	-15.22793	-16.15553
8	2386.501	24.30451	6.20e-13	-16.76209	-14.99814	-16.05369

Note:* indicates lag order selected by the criterion

4.3. Unit Root Test

Table 4.1-4.2 reports the result of the standard unit root tests (ADF) on the integration properties of the NYSE, NIFTY, TTM, RDY and MTNL Close prices.

The choice of lag length was assigned according to the Schwarz Information criterion (SIC).

Table 4.1. Augmented Dickey Fuller (ADF) Unit Root Test

DVariables	Deterministic	Levels		Inference
		t-statistic	Probability	
P_A	Intercept	0.207363	0.9728	Unit Root
P_I	Intercept	0.384193	0.9821	Unit Root
P_{IM}	Intercept	-0.196986	0.9359	Unit Root
P_{AM}	Intercept	-0.403867	0.9055	Unit Root

Note: Critical values at 1% level:-3.449504, 5% level:--2.869876, 10% level:--2.571280

Table 4.1 indicatesin the level form, the unit root tests are rejected for all the variables. In Table 4.2, the ADF test takes care of possible serial correlation in the error terms by adding the lagged difference terms of the regressand. The ADF test statistic is more negative than the critical value and hence the null hypothesis of unit roots in the first differences i.e. the returns of the variables is rejected at 1% level and confirms the stationarity of the returns. However, the test rejects the null of non-stationarity for all the variables when they are used in their first difference. This shows that all the series are stationary in the first difference, and integrated of order *I* (1) which justifies the need for cointegration test.

Table 4.2. Augmented Dickey Fuller (ADF) Unit Root Test

DV ariables	Deterministic	Levels		Inference
		t-statistic	Probability	
P_A	Intercept	-20.65795*	0.0000	No Unit Root
P_I	Intercept	-16.90432*	0.0000	No Unit Root
P_{IM}	Intercept	-17.72052*	0.0000	No Unit Root
P_{AM}	Intercept	-20.92533*	0.0000	No Unit Root

Note: Critical values at 1% level:-3.449504, 5% level:--2.869876, 10% level:--2.571280
*Significant at 1% Level.

4.4. Cointegration Rank Test

The Johansen Co integration Rank summary for the two ADRs under study is presented in Table 5.

Table 5. Johansen Co integration Rank Summary

Data Trend	None	None	Linear	Linear	Quadratic
No. of CEs	No intercept No Trend	Intercept NoTrend	Intercept NoTrend	Intercept Trend	Intercept Trend
Trace	1	1	1	1	1
Max-Eig	1	1	1	1	1

The cointegration results across the five types of model and the type of test (the 'trace' or 'max' statistics) suggest that the series are cointegrated - in other words, all specifications suggest that there are at least one cointegrating vectors. The lag number to be taken into account in application of cointegration test for each comparison was calculated according to Schwarz (SIC), information criterion as 2 (two) and was included into the model.

Table 6. Johansen Cointegration Test Results

Hypothesized no. of co-integrating equationsH(r)	Trace test		MaxEigen value test	
	Trace statistic	Critical Value (p<0.05)**	Max-Eigen statistic	Critical Value (p<0.05)**
r = 0*	55.16581	47.85613	35.67511	27.58434
r ≤ 1	19.49070	29.79707	11.95348	21.13162
r ≤ 2	7.537218	15.49471	7.356900	14.26460
r ≤ 3	0.180317	3.841466	0.180317	3.841466

Note: *denotes rejection of the hypothesis at the 0.05 level**MacKinnon-Haug-Michelis (1998) p-values

4.5. Johansen Cointegration Test

Results of Johansen cointegration test applied for the purpose of finding whether there is a long term relationship between the variables within the scope of the analysis, are shown in Table 6.

According to the results of Table 6, the Trace test indicates 1cointegratingeqn(s) at the 0.05 level and Max-eigenvalue test also indicates 1cointegratingeqn(s) at the 0.05 level. Thus it is proven that a long run relationship exist between the variables taken for the study.

4.6. Vector Error Correction Model

The existence of cointegration between variables suggests a long term relationship among the variables under consideration. Using VECM the speed of adjustment in the short run among the variables is analyzed. Table 7 present the short-run components of the estimated Vector Error Correction Model (VECM), with the restrictions implied by the CEs imposed.

The C_1 values (Table 7) reflect the log-run price of instancy embedded in the cointegrating vectors. C_2 coefficients reflect the long run risk premiums for the various series. The VECM model is based on 2 lags. There are 1cointegrating vectors.

According to Table 7, the coefficients in the VECM give the estimated long-run relationship among the variables shows how deviations from that long-run relationship affect the changes in the variable in the next period. The error correction coefficient for $P_A$is about 0.04, with a negative sign and statistically significant. This means that the P_A deviation in period (t-1) and its long run equilibrium value is corrected by as much as 4 percent. Since the value of the Error correction coefficients is low, it can be inferred that the speed of deviation adjustment is not swift. Examination of the R^2, suggests that the variables P_A, P_I accounts for 36% and 12% of the short-run variation.

The variables that have significant influence on the Indian ADR portfolio prices are lags of its own and on the

US market. The lagged returns on the Indian market and its underlying portfolio have trivial significant short-run effect on ADR portfolio prices over the sample period.

The error correction model not only validates the long run equilibrium, but also reflects the impact of short term variables fluctuations.

Table 7. Estimated Vector Error Correction Model Results

CointegratingEq:	**CointEq1**			
$P_A(-1)$	1.000000			
$P_I(-1)$	-1.05103 (0.10870)[-9.66904]			
$P_{IM}(-1)$	-0.70057 (0.25079)[-2.79349]			
$P_{AM}(-1)$	0.750963 (0.30945)[2.42679]			
C_1	8.693592			
	DP_A	DP_I	DP_{IM}	DP_{AM}
$ECM_{(t-1)}$	-0.04549 (0.03339) [-1.36215]	0.138156 (0.03091) [4.46957]	0.074452 (0.01498) [4.97044]	-0.00764 (0.01326) [-0.57604]
$D(P_A(-1))$	-0.36988 (0.08416) [-4.39525]	-0.0689 (0.07790) [-0.88448]	0.001671 (0.03775) [0.04427]	0.027228 (0.03341) [0.81494]
$D(P_A(-2))$	-0.11841 (0.07237) [-1.63627]	-0.09705 (0.06699) [-1.44872]	-0.0676 (0.03246) [-2.08238]	-1.82E-05 (0.02873) [-0.00063]
$D(P_I(-1))$	0.428155 (0.09549) [4.48381]	0.123095 (0.08839) [1.39260]	-0.00697 (0.04283) [-0.16278]	0.006845 (0.03791) [0.18056]
$D(P_I(-2))$	0.279562 (0.09901) [2.82344]	0.234791 (0.09166) [2.56168]	0.098801 (0.04442) [2.22448]	0.013558 (0.03931) [0.34489]
$D(P_{IM}(-1))$	0.791634 (0.18099) [4.37387]	0.397565 (0.16754) [2.37296]	0.184441 (0.08119) [2.27177]	0.363140 (0.07186) [5.05363]
$D(P_{IM}(-2))$	-0.11294 (0.18584) [-0.60771]	-0.39094 (0.17203) [-2.27253]	-0.18842 (0.08336) [-2.26018]	0.023372 (0.07378) [0.31677]
$D(P_{AM}(-1))$	-0.04666 (0.20365) [-0.22910]	0.007982 (0.18851) [0.04234]	-0.03891 (0.09135) [-0.42594]	-0.31193 (0.08085) [-3.85796]
$D(P_{AM}(-2))$	0.013613 (0.19540) [0.06967]	-0.06281 (0.18088) [-0.34726]	0.140069 (0.08765) [1.59800]	-0.18078 (0.07758) [-2.33028]
C_2	-0.00472 (0.00310) [-1.52197]	-0.00527 (0.00287) [-1.83637]	-0.00124 (0.00139) [-0.88874]	-0.00158 (0.00123) [-1.28147]
R-squared	0.364934	0.116399	0.119084	0.195212
Adj. R-squared	0.346673	0.090992	0.093754	0.172072
Sum sq. resids	0.943148	0.808162	0.189779	0.148663
S.E. equation	0.054893	0.050813	0.024624	0.021794
F-statistic	19.98467	4.581385	4.701326	8.435838
Log likelihood	484.2266	509.1719	743.1697	782.6042
Akaike AIC	-2.93639	-3.09085	-4.53975	-4.78393
Schwarz SC	-2.81943	-2.97389	-4.4228	-4.66697

Note: Figures in ( ) are std errors and [ ] are t-values associated with the respective parameters.

4.7. Granger Causality Test

One of the ways to determine short run causality among variables is to employ Granger Causality Test Table 8 presents the result of pair wise causality.

Table 8. Granger Causality Test

Direction	Lag 2	
	F-statistic	Probability
$P_I P_A$ →	67.0842	3.E-25
$P_{IM} P_A$ →	56.9673	5.E-22

Conferring to Table 8 the pair wise Granger causality test reveals that Indian stocks (P_I)and Index (P_{IM}) granger cause ADR(P_A).

Figure 1 represents the residuals of VECM for India-US stock and Index close during the financial crisis period (2007-2009). The abscissa axis represents the time period (Unit: Daily), ordinate axis represents the range in the values of VECM residuals expressed in percentage.

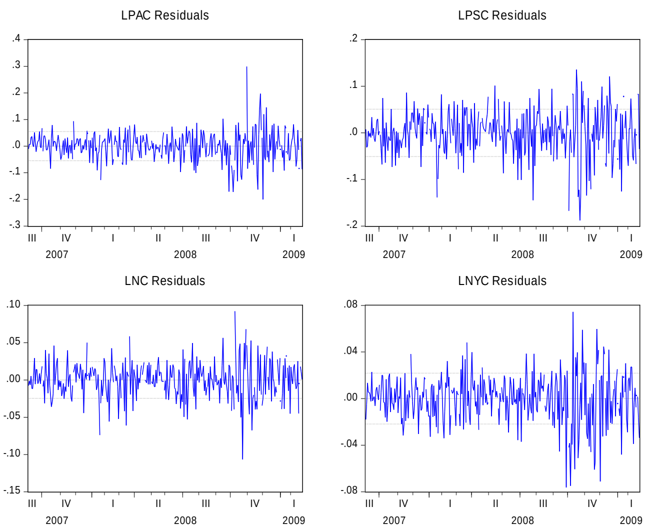

Figure 1. Residuals of VECM

5. Conclusion

Using Vector Error Correction Model the long run and short run dynamic interrelationship was investigated on the ADRs of Indian stock price movements. The empirical analysis of indicates that the long run co-integrating relationship exists among ADR, NYSE and domestic stock and index with Johansen co-integration test. The error correction model not only validates the long run equilibrium but also describes the short-run adjustments to equilibrium. Examination of R^2 values show a robust relationship among the prices of Indian ADRs and their underlying shares, the Indian and the United States (US) market indices. The error correction coefficients of ADR closing prices are statistically significant with a negative sign. The short-term dynamics of the ADR portfolio are influenced by the deviation from the long-run equilibrium and the lagged changes of all. Further, the results of Granger causality test confirms that ADR close prices are influenced by the domestic stock close price as well as the domestic index returns. The results confirm a long-run cointegrating relationship among the prices of Indian ADRs and their underlying shares, the Indian and the United States (US) market indices. The short-term dynamics of the ADR portfolio are influenced by the deviation from the long-run equilibrium and the lagged changes of all.

References

[1] Baruch, S., Andrew Karolyi, G., & Lemmon, M. L. (2007). Multimarket trading and liquidity: theory and evidence. *The Journal of Finance*, 62(5), 2169-2200.

[2] Bhunia, A. (2012). Association between Crude Price and Stock Indices: Empirical Evidence from Bombay Stock Exchange. *Journal of Economics and Sustainable Development*, 3(3), 25-34.

[3] Bonham, C., Gangnes, B., & Zhou, T. (2009). Modeling tourism: A fully identified VECM approach. *International Journal of Forecasting*, 25(3), 531-549

[4] Dickey, D., Fuller, W. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74 (366), pp. 427-431.

[5] Errunza, V. R., & Miller, D. P. (2000). Market segmentation and the cost of the capital in international equity markets. *Journal of Financial and Quantitative analysis*, *35*(04), 577-600.

[6] Eun, C. S. and S. Sabherwal (2003). "Cross-Border Listing and Price Discovery: Evidence from US-Listed Canadian Stocks," *Journal of Finance* 58, 549-575.

[7] Foucault, T., & Frésard, L. (2012). Cross-Listing, Investment Sensitivity to Stock Price, and the Learning Hypothesis. *Review of Financial Studies*, *25*(11), 3305-3350.

[8] Gagnon, L., & Andrew Karolyi, G. (2010). Multi-market trading and arbitrage. *Journal of Financial Economics*, 97(1), 53-80.

[9] Hansda, S. K., & Ray, P. (2003). Stock market integration and dually listed stocks: Indian ADR and Domestic Stock Prices. *Economic and Political Weekly*, 741-754.

[10] Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. *Oxford Bulletin of Economics and statistics*, *52*(2), 169-210.

[11] Kim, L. C. H. (2010). Cross-Border Listing and Price Discovery: Canadian Blue Chips Traded in TSX and NYSE. Available at SSRN 1550230.

[12] MacKinnon, J. G. (1996). Numerical distribution functions for unit root and cointegration tests. *Journal of Applied Econometrics*, 11 (6), pp. 601-618.

[13] MacKinnon, J. G., Haug, A. A., & Michelis, L. (1998). Numerical distribution functions of likelihood ratio tests for cointegration.

[14] Musa, Y., & Asare, B. K. (2013). Long and Short Run Relationship Analysis of Monetary and Fiscal Policy on Economic Growth in Nigeria: A VEC Model Approach.

[15] Musaba, E. C., Chilonda, P., & Matchaya, G. (2013). Impact of Government Sectoral Expenditure on Economic Growth in Malawi, 1980-2007. *Journal of Economics and Sustainable Development*, *4*(2), 71-78.

[16] Ng, Y. H., Yong, H. H. A., & Faff, R. (2012). The long-and short-run financial impacts of cross listing on Australian firms. *Australian Journal of Management*.

[17] Patnaik, I., & Vasudevan, D. (1999). Interest Rate Determination: An Error Correction Model. National Council of Applied Economic Research.

[18] Wang, S. S., Meng Rui, O., & Firth, M. (2002). Return and volatility behavior of dually-traded stocks: the case of Hong Kong. *Journal ofchgtdychgtdyui4 International Money and Finance*, 21(2), 265-293.

[19] Hirsh, H., Coen, M.H., Mozer, M.C., Hasha, R. and Flanagan, J.L, "Room service,AI-style," *IEEE intelligent systems*, 14 (2). 8-19. Jul.2002.

[20] T. Eckes, *The Developmental Social Psychology of Gender*, LawrenceErlbaum, 2000. [E-book] Available: netLibrary e-book.