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A STUDY ON CO INTEGRATION BETWEEN SENSEX AND TCS SECURITY IN INDIA

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Introduction

In the present scenario, it is in fact hard to imagine a world without stock markets. Stock markets play a pivotal role in growing industries and commerce of a country that eventually affect the economy. The investors carefully watch the performance of stock markets by observing the composite market index before their investment. The market index provides the historical stock market performance, acts as a yardstick to compare performance of individual portfolios and provides a base for investors in forecasting future trends in the market. It is believed that domestic economic fundamentals play influential role in the performance of stock market.

Importance of stock market in the economic development of a country and its impact on macroeconomic variable cannot be denied. The macroeconomic variables like index namely sensex is important indicator that affect stock price of any company. It is generally perceived that sensex play a seminal role in the overall performance of TCS share price in the stock market. But in the era of globalization and integration of world economies the impact of index economic variable cannot be ignored.

Objectives

1. To study the co integration between BSE Sensex and TCS security in Indian stock market. and
2. To conclude based on the results

Date and Methodology

The study is based on secondary source. The study concentrates on the empirical evaluation of the relationship between Sensex and TCS share price in India. Theoretically, it is proved that when there is an increase in Sensex, the TCS share price becomes dearer and hence, there is a positive relationship between the two variables. The empirical investigation is carried out based on monthly data ranging from February 2002 to October 2015 covering 145 observations. The study has selected BSE Sensex which may have influence on the TCS share price in Indian stock market. The empirical investigation considers BSE (Sensex) closing price as Independent variable i.e. proxy for Indian stock market and TCS share is as dependent variable to study the co integration between them. The closing prices of them are converted into natural log to maintain time consistency. Data are collected from the database of the Yahoo finance and other official websites. E-Views are used to analyze the data.

Descriptive Statistics

It describes then patterns and general trends of a dataset. It enables a reader to quickly understand and interpret the set of data that has been collected. This study uses measures of central tendency (Mean), measures of Variability (standard deviation, range, minimum and maximum), skewness and kurtosis.

Unit Root Test

The foundation of time series analysis is stationarity. A stationary process is a stochastic process whose joint probability distribution does not change when shifted in time or space. If the variable is not stationary, we can obtain a high regression although there is no meaningful relation between variables i.e. spurious regression between totally unrelated variables. Therefore before estimating regression, Augmented Dickey Fuller test (Hamilton, J., 1994) was conducted to check the stationarity of the data.

ADF (Unit root) statistics is used for checking the stationality. If the calculated absolute ADF test statistics is more than the critical values from fuller's table, then the series are stationary i.e. unit root do not exists. The unit root test results obtained through ADF test (with intercept).

ADF test is also employed to check the presence of unit root in the variables. The time series model specification of unit root is given below.

$IMP_t = b_0 + b_1 t + IMP_{t-1} + u_t$…… (1)

$EXR_t = b_0 + b_1 t + EXR_{t-1} + u_t$……..(2)

The above models are non-stationary as root ( ) ≤ 1.

$\Delta IMP = b_0 + b_1 t + \Delta IMP_{t-1} + u_{t-1}$ where ≤ 1 …….. (3)

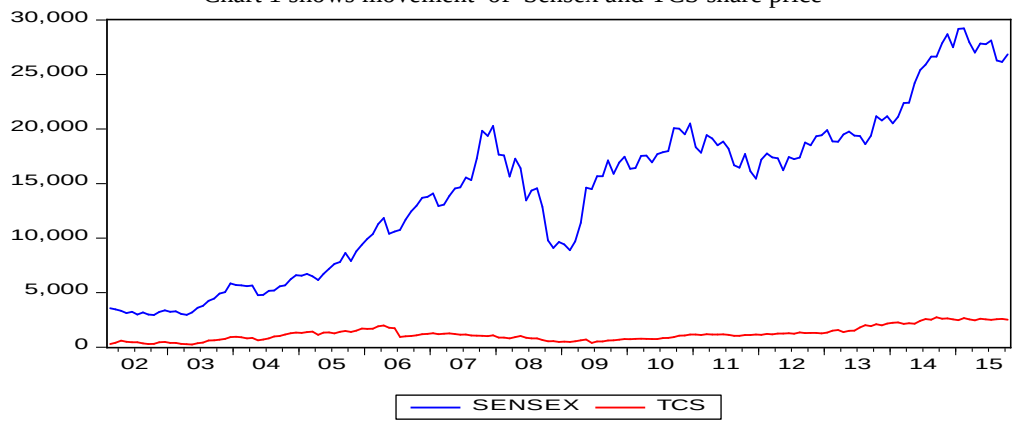
The test for a unit root is conducted on the coefficient of yt-1 in the regression. Where Yt is the variable in period t, T denotes a time trend, is the difference operator, et is pure white noise error term disturbance with mean zero and variance deviation 2, k represents the no. of lags of the differences in the ADF equation and Yt 1 = (Yt-1 – Yt-2).

Co integration

Cointegration test is conducted after ADF test showing stationarity of Sensex and TCS share price. The cointegration test is to be done to check whether there is a long term relationship existing between Sensex and TCS share price through Johansen Co-integration Test. The test results of Johansen cointegration indicates long term relationship between the Sensex and TCS share price by Trace statistic and Max-Eigen Statisitic.

Results and Discussion:

Chart 1 shows movement of Sensex and TCS share price



Interpretation: The graph shows the movement of the Sensex and TCS share price. The Sensex and TCS share price have no similar movement. The graphs show the trends in the volatility of TCS share and sensex. The red line indicates TCS prices and blue line shows Sensex. From a single glance it is clear that the Sensex and TCS share price have no relationship in between.

Table 1- Descriptive Statistics

Descriptive statistics	*Sensex*	*TCS*
Mean	14323.88586	1214.047564
Standard Error	566.4250401	50.0481128
Median	15666.63965	1130.5
Mode	#N/A	444.1
Standard Deviation	7275.861378	642.879649
Sample Variance	52938158.8	413294.2431
Kurtosis	-0.852616308	-0.134475391
Skewness	0.063330957	0.796385266
Range	26270.79907	2496.8
Minimum	2949.320068	241.4
Maximum	29220.11914	2738.2
Sum	2363441.167	200317.848
Count	165	165

The table 1 shows the description statistic of the Sensex and TCS share price for the period of 2002 to 2015. The table gives mean, median, minimum, standard deviation, skewness and kurtosis.

According to the table the mean for sensex is 14323.88586 and TCS is 1214.047564 and the median for the same is 15666.63965 and 1130.5 respectively. For the sensex from 2002 to 2015, the maximum value is 29220.11914 and the minimum value is2949.320068. For the TCS the maximum value during the period is 2738.2 and the minimum value is 241.4. Standard deviation is the variation from the mean. It shows the level of risk in sensex.

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A negative skewness indicates that the tail on the right side is shorter than the left side and the bulk of the values lie to the right of the mean. If the kurtosis exceeds 3, the distribution is leptokurtic relative to the normal. If the kurtosis is less than 3,

the distribution is platykurtic relative to the normal. In the above case, Kurtosis is leptokurtic because it is exceeded the 3. (Kurtosis > 3, Leptokurtic distribution). The probabilities for extreme values are greater than the normal distribution.

Table 2- ADF (Unit Root) test of TCS

Null Hypothesis: D(LNTCS) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=13)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-12.84607	**0**
Test critical values:	1% level		-3.470679	
	5% level		-2.879155	
	10% level		-2.576241	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LNTCS,2)				
Method: Least Squares				
Date: 10/31/15 Time: 08:22				
Sample (adjusted): 2002M04 2015M10				
Included observations: 163 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNTCS(-1))	-0.992068	0.077227	-12.84607	0
C	0.01107	0.010253	1.07972	0.2819
R-squared	0.506167	Mean dependent var		-0.0023
Adjusted R-squared	0.5031	S.D. dependent var		0.184736
S.E. of regression	0.130222	Akaike info. criterion		-1.22696
Sum squared resid	2.730207	Schwarz criterion		-1.189
Log likelihood	101.9969	Hannan-Quinn criter.		-1.21155
F-statistic	165.0214	Durbin-Watson stat		2.041777
Prob(F-statistic)	0			

Table 3 - ADF (Unit Root) test of Sensex:

Null Hypothesis: D(LNSENSEX) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=13)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-11.50476	**0**
Test critical values:	1% level		-3.470679	
	5% level		-2.879155	
	10% level		-2.576241	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LNSENSEX,2)				
Method: Least Squares				
Date: 10/31/15 Time: 08:21				
Sample (adjusted): 2002M04 2015M10				
Included observations: 163 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNSENSEX(-1))	-0.9015	0.078359	-11.50476	**0**
C	0.011347	0.005448	2.082588	0.0389
R-squared	0.451185	Mean dependent var		0.00032
Adjusted R-squared	0.447776	S.D. dependent var		0.092145
S.E. of regression	0.068474	Akaike info criterion		-2.51252
Sum squared resid	0.754887	Schwarz criterion		-2.47456
Log likelihood	206.7705	Hannan-Quinn criter.		-2.49711
F-statistic	132.3594	Durbin-Watson stat		2.006078
Prob(F-statistic)	0			

Test of Unit root

It is clear from tables – 2&3 that all the absolute test statistics values are more than those of critical value. Therefore, the null hypotheses of non-stationary are rejected. It is also clear from the P value that all the P values are 0 which are less than 5 percent. Therefore, the null hypothesis of unit root is rejected in the series. Therefore the alternative hypothesis of stationarity is accepted for all the series namely sensex and TCS at first difference.

Table 4 - Johansen Co integration Test

Johansen Co integration TEST				
Date: 10/31/15 Time: 08:40				
Sample (adjusted): 2002M08 2015M10				
Included observations: 159 after adjustments				
Trend assumption: Linear deterministic trend				
Series: LNSENSEX LNTCS				
Lags interval (in first differences): 1 to 5				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.032451	6.614777	15.49471	**0.6228**
At most 1	0.008577	1.369546	3.841466	**0.2419**
Trace test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.032451	5.245231	14.2646	**0.7106**
At most 1	0.008577	1.369546	3.841466	**0.2419**
Max-eigenvalue test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):				
LNSENSEX	LNTCS			
-2.111668	1.039894			
0.867637	-2.49323			
Unrestricted Adjustment Coefficients (alpha):				
D(LNSENSEX)	0.011346	0.001817		
D(LNTCS)	0.00375	0.01101		
1 Co integrating Equation(s):		Log likelihood	338.5275	
Normalized co integrating coefficients (standard error in parentheses)				
LNSENSEX	LNTCS			
1	-0.49245			
	-0.40756			

Adjustment coefficients (standard error in parentheses)				
D(LNSENSEX)	-0.02396			
	-0.01132			
D(LNTCS)	-0.00792			
	-0.02101			

The table 4 shows the cointegrated or non cointegrated price status of Sensex and TCS share. The test results of Johansen cointegration represents the Sensex and TCS share price are not cointegrated priced over long term. There are two statistic results namely Cointegration Rank Trace statistic and Maximum Eigenvalue statistic Tests. Trace test indicates no cointegration at the 0.05 level since their statistic values are less than those of critical values and their prob. values are 0.7106 and 0.2419 at none and at most 1 respectively. Hence, it accepts null hypothesis of number of co integration is none and at most one. Max-eigenvalue test also indicates no cointegration at the 0.05 level since their statistic values are also less than those of critical values and their prob. Values are 0.7106 and 0.2419 and hence, it denies alternative hypothesis of number of cointegration. Based on the cointegration tests, we conclude there is no long term relationship between the Sensex and TCS share price.

Conclusion

The primary purpose of the study is to examine the cointegration between the Sensex and TCS share price traded in India. The data has been collected from yahoo finance.com for the period Feb. 2002 to Oct. 2015. The results from unit root test (ADF) indicate stationarity at 1st difference. Hence, Johansen's cointegration test is further examined. We conclude that there is no cointegration between the Sensex and TCS share price traded in India. Hence, there is no long term relationship.

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