

# Inter industry financial integration; (an empirical evidence from KSE Pakistan)

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**Abstract**— the study examined the relationship among ten different sectors of KSE. These sectors including Cement, Chemical, Engineering, Textile-Weaving and Automobile Assembler, Insurance, Leasing, Modaraba, Close-ended mutual fund and commercial banks of Pakistan's stock market. Period of the study is from January 2004 to December 2014, data is collected from Business Recorder. Monthly data has been used to examine the relationship among these sectors. Sectoral indices were created to examine the relationship among different sectors in Pakistan. Correlation, Co integration, Vector Error Correction Model (VECM), Granger causality, Impulse Response and Variance Decomposition tests are applied on data to investigate the long and short run relationship among sectors. By Co integration test it is explored these sectors are Co integrating .There is also found short term linkages between sectors by applying Vector Error Correction Model. At 5 % level of confidence unidirectional Granger casualty is also found between automobile and leasing sectors, Commercial banks and Insurance sectors, Commercial banks and Mutual funds, Mutual fund and Cement sectors, Insurance and Chemical sectors. Study help the individual, foreign and institutional investors, decision makers to diversify the portfolio advantages and learn the behavior of stock market.

Key Words: Sectoral Indices, KSE, Granger Casualty. Correlation, Co integration, Vector Error Correction Model (VECM), Impulse Response & Variance Decomposition.

## 1 INTRODUCTION

Financial integration is very important issue in current era and has increased the attention of equity markets throughout the globe. A lot of emphasis has been given to Asian stock markets. There are few number of studies have been performed, investigating the link between sectoral returns and stock market. The shares and assets prices are an important element of the dynamics of economic activity which is treated as an indicator of social mood. An up- growth economy is an economy where equity markets are on uprising trends. The equity market is considered a primary indicator of a country's economic strength and development. Experience shows that investors may 'temporarily' move financial prices away from their long term aggregate price trends. The stock market is affected by many macro and micro variables including behavior of investors and traders. In present era the financial markets have focused the integration because these are closely interacted to each other and lead to an effect on investor's behavior. This causes increase in the interest of researchers towards financial integration. The focus of this study is to examine how closely the major stock exchange sectors' returns are interacting in order to analyze the common trends in long term to investigate the adjusting mechanisms to common equilibrium in the short term. Financial markets are the most globalized institutions and these are used for determining the strength of interactions among major listed companies' stock returns of KSE. This is the fact which supports the investors' behavior and captures the interest of investors in the field of investing activities. Investors are valuable stakeholders of the stock market and show the behavior in investment with the trend of stock returns [5]. When capital is invested in market the aim of investment is to generate a return on the capital invested. The purpose of

investors are to make a profitable return or outperform or beat the equity market. Everyone wants to maximize the utility level. Returns are more volatile and used for analyzing the efficiency of market. When individuals, institutional investors and companies invest in shares of different securities which are registered at stock exchange, the purpose behind this investment is; they require significant return or profit on their investments. Investor's returns and profits are affected by many factors which influence the stock market returns. As compared with the company and institutional investor's the individuals have not enough knowledge in which security they should invest or not, this study will help the companies and institutional investors but its major role is to help individual investors. Investors care about returns volatility because higher volatility of returns have a large impact on portfolio's value. Granger's representation theorem considered that two or more time series are integrated which vary together in the long run and can be seen as an equilibrium relationship, to which an error correction term automatically belongs. Short-run deviations from which long-run relationship results in an automatic adjustment process that causes the variables to return to their long-term equilibrium relationship. So the error correction term contain the information regarding the future movement of one variable based on past prices. Several research studies have been conducting by different researchers towards financial integration through Co-integration analysis investigated the integration of the European money and bank loan markets, by applying the combination of co-integration and structural tests for examining the interactions among different stock prices; short-run and long-run simultaneously[17]. The most globalized institutions to determine the strength of interactions among international companies' stock prices are the financial

markets, which is quite intriguing. In this research the subject matter is to apply Johansen Co-integration Analysis in order to investigate the elimination of stochastic trends by the co-integration vector. The other objective of research is to find the long-run and short-run interactions among sectors returns. The target can be achieved by adopting the framework of co-integration and examine through statistics tools to analyze whether co-integration exists among the ten sectors' prices. Karachi stock market is one of the fairly new stock markets in which investor's attention can be attracted by favorable trading activities. Most of the recent studies have increased the attention to deal with the issue of existence of potential relationships among the stock of different sectors and stock markets. The particular aims of the study in the multivariate co-integrated context is to see the long-run properties of stock returns of equity market. Economic conditions either favorable or not for the

country can be measured by the performance of its equity stock market's trading activities. Equity stock market is a place where stock is to be traded for attraction of potential investors through trading activities and suitable economic conditions. It is clear that economic conditions can influence the stock market activities. Stability must be necessary for the protection of favorable trading activities. Instability leads to the unfavorable conditions like war and terror situations, political instability, high interest rates and high exchange rates; these are all the macroeconomic variables which can influence the trading activities. Information change can affect the change in the stock markets' prices and then respond to the negative and positive news. Investors are the most important key players who are involved in stock market's trading activities and can observe the information which is prevailed in market.

## 2 LITERATURE REVIEW

Conducted a study on KSE-100 with India, China, Hong Kong, Malaysia, Indonesia, Thailand, Japan, Turkey, Brazil and also with U.S.A, U.K, France to check the relationship for causal and dynamic linkages[3]. Monthly stock prices are used in this study from the period of January, 1998 to December, 2008. In this regard 132 monthly stock prices are used for observation. To see the long and short run relationship Correlation, Descriptive statistics, unit root test (ADF and P.P), Co-integration test, VECM (Vector error correction model), Granger causality, Variance decomposition and Impulse response test is used. Results of these tests indicates that KSE-100 is an unpredictable stock market in case of stock returns. These test also indicates long run relationship of KSE-100 with BCI and JCI and short run with SCI. KSE-100 is in granger with stock markets of SET, HSI, KLSE, JCI and SCI, SET, BSE, JSI, BCI, KLSE, ISE are in granger with KSE-100. This study also explain that other markets have no contact on KSE-100 and KSE-100 is mostly changed to its own factors. [9]investigate the causality and Co integration linkage between Japan, United States and South China stock markets. Data of countries are gathered from the time period October 1992 to June 1997. Co integration, Granger Causality and Unit root test are applied to see the integration among equity markets. Presence of Co integration is found between Shanghai and Shenzhen and there is no linkage except these equity markets. Effect of stock prices variation in U.S is more on South China than Japan markets. There is significant linkage is found between Shanghai and Shenzhen. [2]observed the co integration between manufacturing, mining and agriculture sector of Germany. To see the relationship this paper focus on sectoral out put index, individual pairs of real and financial index and sectoral stock index. Data is collected from 1962 to 1994 to test Unit root test, Johansen test for Co integration, Augmented Dickey and Fuller (ADF) and Correlation. Finding of these tests shows that sectoral data is co integrated. Both data with and without adjustment shows link between real and financial sectors. In long run both real

and financial sectors are linked with each other's. Conduct a study on equity markets integration of Sub-Saharan Africa (SSA) which includes Africa, Nigeria, Kenya, Swaziland, Zambia, Tanzania and Mozambique[5]. Some monthly and weekly data is used in this process from 1993 to 2000 and more data is included by adding Malawi, Namibia and Zambia from 1997 to 2000. To investigate the integration in returns of these equity markets ARCH, EGARCH, Descriptive analysis and Correlation tests are used. Finding of these tests suggest that the prices of SSA equity markets are volatility with each other's. Results also show volatility of dominant equity market of South Africa and Nigeria with local equity markets. Documented a study on Intra - sector financial integration; an empirical investigation of telecommunication stock prices[11]. They used Daily closing price of the five major tele communication organization globally (AT & T, NTT) British telecom, France telecom, and Deustde telecom. The data set also contain monthly frequency data of the ten year covering the period of Jan (1999 - 2006). They performed Co - integration rank test and equaling critical value descriptive statistics, unit root test, trace test Max Eigen value model. Although the results revealed that the hypotheses that the strength of interaction is stable among the system's variables. British telecom stock price evidently Granger causes many of the variations of the system , while a complex net of interactions exit indicating among other that a strong , European , unilateral relation exist among the Deutsche telecom's and frame telecom's stock prices.[8] conducted the study on "Co-integration and causal links amongst African stock market". They performed various statistical methods like as co-integration and error correction model. Data is taken from stock markets (Botswana, Egypt, Cote d'Ivoire, Ghana, Kenya, Morocco, Mauritius, Namibia, Nigeria, Swaziland, Tunisia, South Africa, Zambia, and Zimbabwe for the period of 1995 to 2002. They concluded that there is long run stable co-integration relationships exist and error correction model shows significant effects of misalignment in the South African short run stock returns model on the short run model of

Ghana.[1] explored the threshold linkage of inter - sector activity in international equity market. Daily closing stock is used for the period of January of 1996 to December of 2006 for Japan, U.K, France, Canada and U.S. Four in industry specific indexes; energy, technology, utility, healthcare. They performed the VAR models, Mars models to study the relationship at the broad based as well as industry specific levels. Price movement had even a stronger influence than one's own market's lagged data. The industry specific interaction was important dimensions to understand international financial market linkages. The sector specific mars study results revealed the strong linkage when markets were excessively volatile. [9]make a study on the Korea variables to investigate the Co integration relationship. Data including 156 monthly stock prices observation from the time span January 1990 to December 1992. Granger Causality, Co integration and Vector Error Correction Model (VECM) is applied to figure out linkage. Finding of VECM and Co integration suggested that stock prices of Korea are linked with exchange rate, production index, money supply and trade balance. A set of macroeconomic variables are Co integrated with stock prices according to Co integration results.

Investigated casual relation by econometric models and cross spectral methods [13]. He performed the Simple two variables models cross spectral method, causality, three variables model in his study. The result showed that cross spectrum between two variables can be decomposed into two parts, each relating to a single casual arm of a feedback situation. [9]investigated the Inter - counter linkage in Kuala Lumpur stock exchange returns. They used Descriptive statistics, unit root test, and Granger causality test in their study. They took data from financial time's information for the period of 7 July 1995 - 10 August 1999, Yielding 1001 observation (excluding holiday, and he - trading day). They discovered that linkage of inter counter's returns to be stationary and also linkages of inter counter KLSE returns. The evidence of causal linkages among the nine stochastic trends, the predictability of the sector can be enhanced significantly by utilizing information on other sector stock prices.

Examined to seek the dynamic short-term causal relations and the long-term equilibrium relations between the two major financial assets, stock prices of the US and South Africa and the rand/US\$ exchange rate. Monthly stock prices are used in the study and they covered the period, 1986 to 2006. They performed co integration, Granger causality, impulse response functions and forecasting error variance decompositions tests in their study. The results however contradict that suggested by [15] where no long run relationship was observed. The shock of each of the variables was relatively more significant than response to shocks from other variables.

[4],[10],[15] make a study on Hong Kong, Indonesia, Korea, Singapore, Taiwan, Japan, U.S, Malaysia, Philippines and Thailand to see the financial and real integration between global and regional equity markets. For this study data is collected from 1980 to 1998 for Japan, Singapore, Thailand, and U.S. From 1981 to 1998 data is taken for Hong Kong. Data

is gathered from 1990 to 1998 for Malaysia, Indonesia, Philippines and Taiwan. All data is consisted on month end values. For the results of integration Correlation, Variance Decomposition, Covariance and Vector auto regression system (VAR) is used. From results of these tests it is realized that global and regional equity markets are integrated. There is presence of partly and highly integration in this study is founded. [14]conducted a research on eight equity markets including four Southeast Asian and four developed markets. End of the day data is collected from the time period February 1992 to June 1997. To investigate the long and short run relationship among these countries Unit root test, Integration, Granger Causality, Co integration, Vector Error Correction Model and Vector Auto Regression methodology is used. The variation exist among Asian equity markets are mostly explained by regional markets. Results showed that U.S equity market lead short and long run significant effect on Asian equity markets. Richards (1995) make a study on Austria, Australia, Canada, Denmark, France, Germany, Hong Kong, Italy, Japan, Netherland, Norway, Spain, Sweden, Switzerland, U.K and U.S. to investigate Co integration. Data is taken from December 1969 to December 1994. Co integration test and Granger Causality methodology is used to test the linkage among these countries. Finding of test showed a little evidence that stock returns of countries are linked with each other's. Results of Co integration test are significant.

### 3DATA AND METHODOLOGY

Ten different sectors are collected on the basis of availability of data. Sectors are as follows Cement sector, Chemical sector, Engineering sector, Textile-Weaving sector, Automobile assembler sector, Insurance sector, Leasing sector, Moradabad sector, Close end mutual fund sector and Commercial Banks. The data is collected for the Pakistani equity market (KSE - 100) from Business Recorder. Monthly data of all sectors of the companies were collected from the period January 2004 to December 2014. To investigate the Co integration Secondary data is collected. By using market weighted index of sectors are arranged. The data for these sectors are collected from business recorder, Karachi stock exchange and State Bank of Pakistan. Monthly share prices and number of shares are collected for this purpose for ten sectors from KSE 100 index. The sectors are selected on the availability of data. First number of outstanding shares of sectors is collected in next step monthly closing prices of these numbers of shares are collected. After collected number of shares and closing prices, market capitalization is computed by multiplying number of shares and prices. Index for sectors are calculated from market capitalization. Index of log series is taken to make data more absolute, after taking log on index return of these sectors is computed by dividing current value to previous value of log index series. For the accomplishment of the objectives of the study, the researcher used different types of statistical tools because statistical techniques are applied on data to observe the estimation. With the help of Descriptive statistics we investigate Mean, Median, Standard Deviation, Skewness and Kurtosis of every sector. Matrix is applied to see the linkage

between sectors Correlation. Stationary of data is calculated by testing Augmented Dickey Fuller (ADF) test. Variables are linked if there are stationary after differencing at level 1(1). Null hypothesis in ADF unit root methodology says data is non stationary, by comparing with T-statistics null hypothesis may be abandoned or acknowledged. The null hypothesis of unit root which argue that data is non stationary is acknowledged if T-statistics is less than critical value. Data is stationary if T-statistics is greater than critical value then null hypothesis is assumed to be abandoned then time series data is linked at order 1(1). The main objective of calculating the closing returns are to mitigate non stationary from the time series of data. Market returns are to be computed by the following method as follow:

$$R_t = Ln\left(\frac{P_t}{P_{t-1}}\right)$$

Where

R t = Daily stock return at time 't'

	R_AUT	R_BANK	R_CEMNT	R_CHEM	R_ENG	R_INS	R_LE	R_MOD	R_MUTF	R_TEX
Mean	0.001362	0.00010	0.001487	-0.00009	-0.00002	-0.00008	0.000145	0.000827	0.000693	0.003993
Median	0.00001	0.000199	0.001403	0.00000	0.000763	0.00000	-0.00027	-0.0001	0.0001	0.0000
Std. Dev.	0.012108	0.020594	0.013439	0.011705	0.013424	0.020428	0.013714	0.02307	0.02481	0.098407
Skewnes	-0.06759	-1.98234	-0.19247	-2.61375	-0.83083	-1.08656	-0.36639	7.186719	1.903987	6.905586
Minmum	-0.03738	-0.11179	-0.038487	-0.07982	-0.04460	-0.10417	-0.0712	-0.04983	-0.11495	-0.49928
Maxmum	0.036476	0.064547	0.036343	0.034654	0.029737	0.074628	0.054384	0.227357	0.177463	0.997162

Pt = Daily closing stock price at time 't'

P t-1 = Daily closing stock price at time 't-1'

Ln = natural logarithm

As demonstrated in this document, the numbering for sections upper case Arabic numerals, then upper case Arabic numerals, separated by periods. Initial paragraphs after the section title are not indented. Only the initial, introductory paragraph has a drop cap.

### Descriptive statistics:

Results of descriptive statistics shows that average return of Automobile assembler sector is .001362 and Standard deviation is .00001 and Commercial bank's average mean is .00010 and standard deviation is .000199 and Cement sectors' mean is .001487 and standard deviation is .001403 and Chemical sector has -.00009 mean and .00000 is standard deviation and Engineering sectors' has -.00002 mean and .000763 is standard deviation and Insurance sectors' average is -.00008 and standard deviation is .00000, likewise Leasing sectors mean is .000145 and standard deviation is -.00027 and similarly Modarba Co has .000827 mean and -.0001 is the standard deviation for Modarba Co.

Correlation test indicates that there lies a correlation between these sectors. Automobile assembling sectors have strong Correlation 0.864823 with Cement and .456742 Insurance sectors. Automobiles assembling sectors have Correlation with

all sectors but have negative Correlation with Textile sector - 0.09631. Similarly Commercial banks have strong Correlation with Insurance and Chemical .862524 and .86038, Commercial Banks have Correlation with all remaining sectors but negative correlation with Modaraba, Mutual fund and Textile sectors. Likewise Cement sector has strong Correlation with Modaraba but there is negative Correlation with Textile. Cement sector has the strongest Correlation with Automobile sector. Chemical sector has strong Correlation with Insurance sector .89699 but have negative Correlation with Modaraba sector, Mutual fund and Textile sectors -.68839 and -.34345. Engineering sector has strong Correlation with Insurance sector and leasing sectors. Textile sector has strong Correlation with Modarba and Mutual fund sectors.

### Co integration Test:

Trace statistic indicates that these sectors are co integrated with each other in long run relationship. Results of Trace statistics indicate that 04 sectors are co integrated at level .05

critical values. Thus the results of co integration test show that sectors are linked in long run.

Eight Co integrated vectors at the level of 5%.

### Granger Causality Test:

Results of Granger casualty shows that there is unidirectional Granger casualty between insurance and automobile assembling sectors at level .05. Unidirectional Granger casualty found between automobile and leasing sectors, Banks and Insurance, Banks and Mutual fund, Insurance and Cement, Mutual fund and Cement sectors, Textile and Cement sectors, Insurance and Chemical, Chemical and Leasing, Modaraba and Chemical, Mutual fund and Chemical, Insurance and Engineering, Engineering and Leasing, Mutual and Engineering sectors. Granger casualty test suggests that mostly sectors are Granger casualty with each others.

### Vector Error Correction Model:

This study shows a long run relationship and also pays attention to short run relationship between theses 10 sectors by using Vector error correction model (VECM). From the table of Vector error correction model (VECM) it is concluded that there is significant short run linkage.

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#### 4 CONCLUSION

This study was conducted on inter financial linkages between these sectors to investigate long and short run integration. For investigating the short or long run relationship between these sectors different tests are under consideration. Descriptive statistics is applied to see the average return at average risk level. Average return of Automobile assembler sector is .001362 and Standard deviation is .00001 and Commercial bank's average mean is .00010 and standard deviation is .000199 and Cement sectors' mean is .001487 and standard deviation is .001403 and Chemical sector has -.00009 mean and .00000 is standard deviation and Engineering sectors' has -.00002 mean and .000763 is standard deviation and Insurance sectors' average is -.00008 and standard deviation is 0.0000. Automobile assembling sectors have strong Correlation 0.864823 with Cement and .456742 Insurance sectors. Automobiles assembling sectors have Correlation with all sectors but have negative Correlation with Textile sector - 0.09631. Similarly Commercial banks have strong Correlation with Insurance and Chemical .862524 and .86038, Commercial Banks have Correlation with all remaining sectors but negative correlation with Modaraba, Mutual fund and Textile sectors. Likewise Cement sector has strong Correlation with Modaraba but there is negative Correlation with Textile. Cement sector has the strongest Correlation with Automobile sector. Chemical sector has strong Correlation with Insurance sector .89699 but have negative Correlation with Modaraba sector, Mutual fund and Textile sectors -.68839 and -.34345. Engineering sector has strong Correlation with Insurance sector and leasing sectors. Correlation technique is considered a weak form of technique because Correlation test results are not trustable and show no cause and effect relationship.

These sectors are highly significantly correlated with each other's except Textile and Automobile sectors, Banks and Leasing sectors, Banks and Mutual fund, Banks and Textile sectors, Cement and Textile sectors, Engineering and Textile sectors, Insurance and Modaraba, Mutual fund and Textile sectors, Leasing and Modaraba, Mutual fund and Textile sectors. All sectors are stationary at first difference by analyzing critical values for both (PP) and (ADF). All sectors are at integrated at order 1(1). Co integration technique is under consideration to see the relationship between sectors.

Results of co integration indicates sectors are related with each other. By applying Granger causality results suggested that unidirectional Granger causality of insurance and automobile sectors at level .05. According to Granger causality found almost between all sectors. Unidirectional Granger also exists between Automobile and Leasing, insurance and automobile, commercial banks and engineering sectors, mutual fund and cement, insurance at chemicals, textile and insurance sectors and leasing and modaraba sectors. To test the short run relationship between these sectors vector error correction model (VECM) is applied to data. There is short run relationship between these sectors.

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