

Integration of Pakistani Financial Markets: An Empirical Investigation

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Resumen

El objetivo de este estudio es investigar la integración de los mercados de valores, mercado de divisas y el mercado de dinero en el contexto de Pakistán. La integración intra-país de estos mercados financieros en el corto y largo plazo se estiman utilizando datos mensuales que cubren el período mayo 1994 a octubre de 2012. Para lograr los objetivos utilizamos análisis de cointegración y Vector Método de corrección de errores (VECM). Los resultados empíricos de ambas, las técnicas de cointegración es decir, el de Engle-Granger y Johansen y Juselius (JJ), demuestran que los mercados financieros paquistaníes están cointegradas en el largo plazo. Los resultados de VECM muestra que en el corto plazo, tipo de cambio y tasa de interés no afectan precios de las acciones y de manera similar precios de las acciones y de tipos de interés no afectan a los tipos de cambio. Sin embargo, el tipo de cambio afecta significativamente la tasa de interés en el corto plazo. Las conclusiones basadas en las funciones de impulso-respuesta y la descomposición de varianza demuestran que la mayoría de las variaciones en cada variable de mercado se explica por su propio horario. Por lo tanto, los mercados financieros paquistaníes ofrecen menos oportunidades de diversificación dentro de los países de la cartera financiera.

Mercados financieros, Capital, Beneficios.

Abstract

The objective of this study is to investigate the integration of stock market, foreign exchange market and money market in the context of Pakistan. The intra-country integration of these financial markets in the short and long-run are estimated using monthly data covering the period May 1994 to October 2012. To accomplish the objectives we use cointegration analysis and Vector Error Correction Method (VECM). The empirical results from both the techniques of cointegration i.e. the Engle-Granger and Johansen and Juselius (J-J), demonstrate that the Pakistani financial markets are cointegrated in the long-run. Results from VECM shows that in the short run, exchange rate and interest rate do not affect stock prices and similarly stock prices and interest rate do not affect exchange rate. However, exchange rate significantly affects interest rate in the short run. The findings based on impulse response functions and variance decomposition demonstrates that most of the variations in each market variable can be explained by its own lag. Thus, the Pakistani financial markets offer less opportunities of intra-country diversification of financial portfolio.

Financial markets, Capital, Benefits.

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Introduction

One of the most important decisions for investors is portfolio allocation. Important thing in this decision is to know how different financial markets are integrated. If, for instance, stock and money markets are not highly integrated, it is possible to lower the portfolio risk by diversification. One of the key interests of an investor is to minimize the risks of an investment portfolio and maximize the expected returns. Generally, portfolio diversification is attained by employing two major strategies: investing in various categories of assets thought to have no or negative correlations or investing in identical categories of assets in various markets through global diversification. The admittance towards capital markets has raised the prospects of portfolio diversification for the investors and also provides them with more potential opportunities to obtain a higher risk-adjusted rate of return, (Obstfeld 1994). In economies where the financial system is integrated, it may happen that instability and distress in any one country's financial market may cause for running away of the capital to other countries' financial markets; this process of capital flight from one country to another country disturb the company's asset value which in turn decreases the organization's creditworthiness.

An open and well-integrated financial market helps to maximize the benefits of an increasing globalized economy. A well integrated financial market with rest of the nations in the world can help country to level its consumption pattern and to enhance their productivity by attracting large number of investors. Developing and emerging nations can attain high level economies of scale, growth and better improved living standard for people.

Integration of financial markets has significantly increased during the period of 1980s and 1990s. A wave of recent reform and internationalization in emerging markets has enhanced linkage within various sectors of national and international markets. Some of the key factors behind this change are increased globalization of investment in order to get higher rates of return and diversification of risk internationally. Pakistan also implemented policies similar to various other emerging economies of financial sector reforms and liberalization in the early 1990s. Transformation and reforms have a positive effect on the economy, which improved credit rating by appreciation of the currency. As a result of these reforms and deregulation of many sectors of the economy, the movements of important financial market indicators such as exchange rates, stock prices and interest rates became a reflection of market forces.

Two main results of implementing financial sector reforms in Pakistan are opening of three stock markets and implementing of flexible exchange rate system in Pakistan. As a result of various stock markets opening in Pakistan, portfolio investment inflows increased quickly. On one hand, such portfolio investment assists investors for increasing investable finances and at the other hand, such portfolio investment have created feral dangles in the stock market. Such as, in 1995 Karachi Stock Exchange (KSE)-100 Index reached 2600 but in 1998 turned down quickly to just 878 and KSE-100 Index crossed 10 thousand marks in early 2005 and again turned down to around 7 thousand by May 2005.

Despite the importance of this topic, limited number of studies, with regards to Pakistan, is available. For instance, dynamic linkage among foreign exchange, stock and money markets, in case of Pakistan studied by Khalid & Rajaguru (2006).

They employed three empirical testing techniques to investigate the linkage among three financial markets. The observed indication of Johansen and Juselius cointegration process advocates that there is no long run relationship between stock, money and foreign exchange markets in Pakistan. The results of Granger causality technique support a causal relation from the foreign exchange market to the stock market and from the stock market to the money market, consequently signifying a relationship between the three financial markets. The results of variance decomposition and impulse response analysis are consistent with the Granger causality technique's results. In order to investigate the linkage between the stock market and foreign exchange market, Qayyum and Kemal (2006) employed the Engle and Granger two-step process and volatility spillover is measured through the Bivariate EGARCH technique. The observed indication from Engle Granger two-step process advocates that there is no long run relationship between the stock market and foreign exchange market. The observed indication of volatility spillover using a Bivariate EGARCH technique reveals that the behavior of both stock market and foreign exchange market are interrelated. The returns of one market are influenced by the volatility of the other market. Especially, stock market returns are very sensitive to the volatility and returns of the forex market. In contrast, forex market returns are mean reverting, and forex market returns are influenced by stock market return's volatility. There is a strong relationship between the volatility of forex and stock markets returns.

They concluded that the volatility spillover takes place from the stock market to the foreign exchange market but not vice-versa. Although a limited number of studies investigated integration of financial markets in Pakistan.

Empirical results of these two studies did not provide integrated relationship between Pakistani financial markets. The findings are sometimes doubtful for various financial markets. Specifically, observed indication of the co-movement of the money market is skeptical with other financial markets. Normally, we found that these studies use commonly the cointegration technique in a bivariate framework analysis. With these identifiable gaps in these studies our main objective is to investigate the interrelationship among the money market, stock market, and foreign exchange market in Pakistan within the multivariate framework of Johansen and Juselius. Our study also has an important consideration that it covers the period in which Pakistan faced various internal and external syndromes that affected the economic situation of the country.

The primary objective of the study is to investigate whether the financial markets are integrated in Pakistan. To analyze this, co-movement has been estimated among the Pakistani stock prices, exchange rate, and interest rate for the period May 1994 to October 2012. The specific objectives of the study are: To estimate the short run and long run relationship among exchange rate, stock prices and interest rate in Pakistan and moreover to estimate the response of one variable to shock in the other two variables.

Literature Review

Numerous causes can be given in the favor of attention given by decision makers and economists on financial integration.

Firstly, it is obvious that the macroeconomic guiding principle mix based significantly on the openness of the economic system (Fleming, 1962; Mundell, 1963).

Secondly, the higher is the capital mobility, the higher will be the portfolio moves, and the exchange rate will be more volatile, it thus become very difficult for a country to set interest rates independently without taking into account the rest of the world's interest rates.

Lastly, the extent of financial openness is an experimental issue which desires to be determined if decision makers are to be familiar with the constitution of their economies and execute course of actions that will be helpful in attaining their objectives.

One proposition of financial integration is that the market forces settle on the price of the good or the asset in a well-organized and unbiased way. The level of financial integration would point out whether there are competence returns in the liberalization procedure. Financial integration furthermore provokes amendments in the fundamental economic constitution as well as guiding principle for both commerce and households. These amendments can however frequently formulate financial integration perplexing and complicated, thus it become difficult for a firm to decide especially its behavior in transition, which become more complicated when liberalization of the capital account is being considered. Liberalization of the capital account has been deferred in the majority of the countries for the reason that global financial integration will motivate capital inflows, persuade appreciation in the real exchange rate, and in this manner lessen global competitiveness (Dornbusch and Park, 1994).

An additional guiding principle that takes place through the examination of financial markets is the growing significance of overseas interest rates in the structure of domestic interest rates and overseas control of the domestic financial system in general. This sequentially can modify the harmonization of financial cycles among countries.

Financial instrument's prices carry out a significant task in the financial system as they influence marginal evaluations and course of actions thus include future prospects. Since financial security prices across the countries congregate various shocks that were formerly distinctive should turn out to be general and the impulses they produce should be frequent to the domestic and overseas financial system. The financial system can counter to the identical impulses but the growing instrument of the impulses would revolutionize with internationalization. Financial market integration, consequently, may involve the larger integration of real economies (Brouwer, 1999).

The level of global financial market integration to the highest degree has an effect on the behavior of exchange rate and interest rate across the countries, which sequentially has critical implication for the extent to which the local financial powers can put into practice autonomous monetary policies (Agenor, 2001). There is minute disagreement on the suggestion that the higher integrated the global markets for foreign exchange, goods and capital is; the narrower is the extent of chase autonomous local financial policies. For instance, if goods and capital shift around to eradicate the discrepancy between interest rates and stock prices across countries then the local financial system will have no power in their interest. Thus real exchange rates compared to those of other countries will restrict the effect of their stabilization policies. Hence, it is compulsory to take complete account of the probable consequences of global market integration.

It is imperative to decide whether there has been strong financial market integration.

It has to be borne in mind that the alike hi-tech novelties that have cemented the method for overseas financial dealings have furthermore augmented the international dispersion of information in real time. For that reason, it might be the situation that the central motivating power at the back of the clear boost in financial market relationships is the globalization of the news that have an effect on the prices of financial assets instead of an elevated level of integration of financial markets.

Financial market integration at both domestic and worldwide might be examine with reference to equalization of profits on identical financial instruments or it may be observed as identical financial securities moving together. Anderson et al. (2005) discover that financial market integration channel has a strong relationship between various financial securities prices (particularly high-turnover bond and equity prices) in financial markets of the developed and developing countries. Feldstein and Horioka (1980) and Feldstein (1983) (also see Haque 1990) theory states that if funds have perfect mobility, it may smash the connection among national investment and savings, depending on the situation that the country can have a loan of adequate finances from abroad in order to cover up decline in its savings. They concluded that portfolio inclination and the factors related to institutional stringencies restrain the transfer of funds at international levels and any increase in local saving are revealed principally in supplementing local investment. Further they also suggested that in a market which is financially integrated at global level, short term transfer of funds plays a crucial role to eliminate interest rate differentials in a short span of time.

Later, Taylor (1994) censured this verdict and presented their arguments in support of capital mobility at international levels. Qayyum et al. (2005) made use of similar techniques as discussed in previous studies, tried to explore the integration of the markets of five Asian economies, Pakistan, India, Bangladesh, Sri Lanka, and Nepal, and reported that capital markets of countries under the analysis were not integrated at global levels. Lane et al. (2006) revealed the evidence of gross capital stream as an indicator of the speed of integration in financial markets. Their focus was on to measure the integration of financial markets within the context of share of a country in the holding of external assets and liabilities at international levels. They specifically considered the case of India and China and found the evidence in support of asymmetric composition of gross assets and liabilities. The researcher investigated the fact that portfolio investment is a comparatively most important element for financial markets of India whereas FDI was considered the most important element for China. Moosa et al. (1997) scrutinized the level of integration among financial and commodity markets of seven countries- Hong Kong, Korea, Malaysia, Philippines, Singapore, Taiwan and Japan - around the world. They found strong evidence in support of high degree of cointegration between financial and goods markets by applying uncovered interest rate parity and ex-ante purchasing power parity for the period of 1980-1994. Gerard et al (2003) studied six stock indices of developed and developing markets, developed markets include, the US, Japan and Hong Kong while Thailand, Malaysia and Korea were taken in the sample of developing markets. They used inter-temporal capital asset pricing model (ICAPM) for monthly profits of stock markets in terms of dollar and provide some evidence of market segmentation for the period of 1985-1998.

Data and Econometric Methodology

Data

To estimate inter linkages, we use monthly stock prices, exchange rate and interest rate over the period May 1994 to October 2012; a total of 222 observations. The data on stock price index (i.e. KSE-100 index) is obtained from the official website of Karachi Stock Exchange. The data on exchange rate that is Rupees per US dollar and interest rate that is 6-Month T-Bill rate is obtained from the statistical bulletin of State Bank of Pakistan.

KSE-100 Index consists of 100 companies chosen based on sector representation and highest market capitalization, which holds more than 80% of the whole market capitalization of the companies listed on the Karachi Stock Exchange. The Karachi Stock Exchange (KSE) indices are particularly imperative to investigate for the reason that they are broadly used for determining sector performance in Pakistan and financial market agents make use of these indices greater than any others to pursue movements of stock prices.

Econometric Methodology

First of all we have analyzed the stationarity properties of the selected variables, for which we have used Augmented Dickey-Fuller unit root test on both level and first difference. To estimate long-run relationship between variables, Johansen and Juselius cointegration test is used in which Trace test and Maximum Eigen-value test are used to find out number of co-integrating vectors. Furthermore, Vector Error-Correction Model is used to estimate the short run relationship among stock prices, exchange rate and interest rate in Pakistan.

Empirical Results & Discussion

Preliminary Statistics

Table 1 reports the preliminary statistics of the monthly stock prices, exchange rate, and interest rate series. These statistics include mean, median, maximum, minimum, standard deviation, skewness, kurtosis, and Jarque-Bera statistics.

	LER	LSP	IR
Mean	3.9915	8.1378	9.9555
Median	4.0712	7.732896	10.94000
Maximum	4.454386	9.624163	17.42000
Minimum	3.420673	6.735424	1.210000
Std. Dev.	0.284970	0.904187	3.995497
Skewness		0.22441	-0.554652
		-0.436428	
Kurtosis	2.570312	1.439257	2.688391
Jarque-Bera	7.966447*22.19780*		10.9532*

Table 1 Preliminary Statistics of Variables

As we can see from the above preliminary statistics, the data is not normally distributed. Furthermore, all three variables illustrate skewness. Stock price series with a standard deviation of 0.904187 shows a positive skewness, which means that data is skewed in the right direction. Interest rate series with a standard deviation of 3.995497 shows a negative skewness, which means that data is skewed in the left direction. Exchange rate series with a standard deviation of 0.284970 shows a negative skewness, which means that data is skewed in the left direction. Kurtosis values of all series also prove that the data is not normally distributed for the reason that values of excess kurtosis are not zero.

The Jarque-Bera statistic is applied to test the null hypothesis that the data is from a normal distribution.

This null hypothesis refers to a combined hypothesis of both the skewness and excess kurtosis that is to say skewness=excess kurtosis=0. As skewness and excess kurtosis for stock prices, exchange rate and interest rate volatility are far from zero; Jarque-Bera statistics for stock prices, exchange rate, and the interest rate are respectively 22.19780, 7.966447, and 10.9532 which evidently illustrates the non-normality of distribution.

Correlation Analysis

Correlation matrix gives an idea of linear association among the variables. For a preliminary analysis of integration among financial markets, we initiate through investigation of correlation coefficients between stock prices, exchange rate, and interest rate. Results in Table 2 show that the correlation between indicators of different financial markets is statistically significant, which is an indicator of financial integration among these markets.

	LSP	LER	IR
LSP	1		
LER	0.636**	1	
IR	-0.095	-0.147*	1

Table 2 Correlation Coefficients of the Tested Variables

As we can see from the above table, exchange rate has a positive and significant relationship with stock prices while negative and significant relationship with interest rate. The interest rate has a negative but statistically insignificant relationship with stock prices.

Correlation analysis, however, is not appropriate technique as it captures only linear association and gives spurious picture when variables under consideration follow Random Walk. We therefore estimated the integration using more sophisticated cointegration techniques namely the Engle and Granger and Johansen and Juselius.

Econometric Estimation and Empirical Results

In this portion, we execute econometric tests to find out whether or not the three financial markets are interconnected.

Unit Root Test

We start our analysis by testing for the presence of unit root among the financial markets using Augmented Dickey-Fuller (ADF) test. The ADF test results in table 3 illustrate that all these series are non-stationary at conventional levels of significance. However, the null hypothesis of non-stationary is rejected at the 1% level of significance when the variables are differentiated once. From Table 3, ADF test demonstrate that all series are integrated of order one, I (1) point out ADF test consistence.

Difference

Model	LER	LSP	IR
Level	-1.2964	-0.2501	-0.7902
First Difference	-9.2756	-13.6386	-11.6009
Decision	I(1)	I(1)	I(1)

Table 3 ADF Unit Root Test at Level and First

These results necessitate the use of cointegration techniques to test for the market integration among the variables in the long run and for short run dynamics the variables can be modeled as Vector Error Correction Model.

Co integration Analysis Engle-Granger Test

The long run relationship among the stock prices, exchange rate, and the interest rate is examined by employing Engle and Granger two-step method. In the first step the stock prices are regressed on the foreign exchange rate and interest rate and the results are presented below (t-statistics are in parentheses).

$$\text{LSP}_t = 21.45 + 0.032 T - 4.13 \text{LER}_t - 0.006 \text{IR}_t$$

(45.12) (48.80) (-30.84) (-1.63)

R-squared= 0.96, F-statistic=1431.82, ADF= -5.16 (-2.28) (1)

Outcomes of the above equation (1) demonstrate that both intercept and trend are significantly different from zero. The effect of exchange rate on stock prices is negative and statistically significant at 1% level. The effect of interest rate is negative but significant only at 10% level. However, our main focus here is not on the first step results; rather we go for second step as the prime objective here is to test market integration in which direction of causality is not important.

Moreover if the residuals from this equation are found non-stationary then results of 1 are spurious.

As a second step we tested the existence of cointegrating relationship among the three variables by employing the ADF unit root test on the residual series obtained from the equation (1). The results are presented in table 4, which show that, there is no unit root in the residual series. This entails that the three variables under consideration are cointegrated.

Variables	ADF test statistic	Lags	5% Critical Value	Decision
Residuals of equation 4.1	-5.16	1	-1.94	I(0)

Table 4 Engle and Granger Cointegration Test

Johansen and Juselius Test

Subsequently, we investigate cointegration among the three financial markets using the framework of Johansen and Juselius. We discover that there is at most one cointegrating vector among the three variables. The results presented in Table 5 based on both the Trace test and the Maximum Eigenvalue test, support long-run relationships between the three variables, which is an indication of market integration.

Null Hypothesis H_0	Trace Test		Maximum Eigen Value	
	Alternative	Statistics[Prob]**	Alternative	Statistics[Prob]**
$r=0$	$r=1$	49.23 [0.010]*	$r>=1$	27.90 [0.026]*
$r<=1$	$r=2$	21.33 [0.166]	$r>=2$	13.99 [0.255]
$r<=2$	$r=3$	7.33 [0.311]	$r>=3$	7.33 [0.311]

Table 5 Johansen and Juselius Cointegration Test

Vector Error Correction Model

Results in Table 6 show, ECM_{t-1} is significant indicating log-run equilibrium relationship among three variables. If there is an error in the equilibrium in the short run then 16% of the errors are corrected by stock prices series, 1% by exchange rate, and almost 51% by interest rate, in one period. Results also show that there is inertia in the stock prices, exchange rate, and interest rate. Moreover, it is found that, in the short run, exchange rate and interest rate do not affect stock prices and similarly stock prices and interest rate do not affect exchange rate. However, exchange rate significantly affects interest rate in the short run.

	(ΔLSP)	(ΔLER)	(ΔIR)
$(LSP_t - 20.29 - 0.03T + 3.81LER_t + 0.005IR_t)_{t-1}$	-0.156 (-4.23)	-0.010(-1.86)	0.509(2.01)
Intercept	0.009 (1.36)	0.003(2.91)	0.003(2.91)
ΔLSP_{t-1}	0.181 (2.52)	-0.008(-0.73)	-0.418(-0.85)
ΔLER_{t-1}	-0.329 (-0.69)	0.394(5.66)	12.348(3.76)
ΔIR_{t-1}	-0.011 (-1.02)	0.001(0.55)	-0.034(-0.72)
R-squared	0.13	0.18	0.12
F-statistics	6.90	10.12	6.61

Table 6 Results of Vector Error Correction Model

Impulse Response Functions

The impulse response functions are presented in Figure. Impulse response function is an analysis which exhibits the dynamics of the variables representing the response of each variable to a particular shock. Summarizing it, the impulse response function traces the effect of one-standard-deviation shock in a variable on current and future values of the endogenous variables in the system.

The detailed results in table form are given in Table in the appendix.

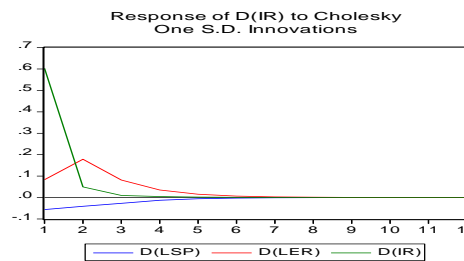
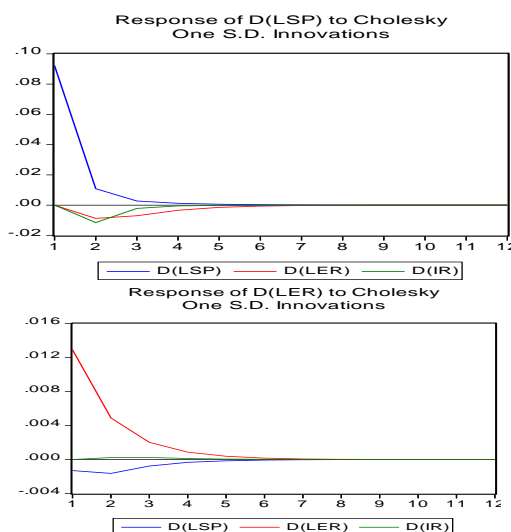


Figure 1 Impulse Response to One S.D. Innovations

It is shown in the figure that stock prices respond negatively to shocks in interest rate and exchange rate. The effect starts after one period of the shock and die out to zero in third period. The effect of exchange rate is however more long lasting. The effect of stock prices on exchange rate is also negative; it starts immediately and becomes insignificant after third period. The exchange rate series does not respond to shocks in interest rate. Interest rate responds negatively to changes in stock prices and positively to exchange rate; the effect becomes insignificant in the fourth period.

Variance Decomposition

The Variance Decomposition demonstrates the percentage of forecast error variance for each variable that is attributable to its own innovation/shocks and to innovations in the other endogenous variables. Forecast error variance decomposition, presents complementary information on the dynamic behavior of the variables in the system. It is possible to decompose the forecast error variance into the contributions by each of the different shocks. The results in table 4.7 indicate that almost 97% of the variation in stock prices is caused by its own lags, even after 12 months and remaining 3% is evenly distributed between exchange rate and interest rate. Same magnitude of inertia is found in exchange rate series and stock prices contribute more variation in exchange rate than the interest rate do.

Interest rate explains 87% variation in itself, 11% variation in interest rate is explained by exchange rate, and remaining 2% variation in interest rate is explained by Stock prices.

(a) Variance Decomposition of D(LSP):

Period	S.E.	D(LSP)	D(LER)	D(IR)
1	0.092183	100.0000	0.000000	0.000000
2	0.093947	97.61009	0.876876	1.513038
3	0.094275	97.01846	1.424085	1.557459
4	0.094345	96.89167	1.549959	1.558370
5	0.094358	96.86717	1.574431	1.558403
6	0.094361	96.86247	1.579117	1.558410
7	0.094361	96.86157	1.580017	1.558412
8	0.094361	96.86140	1.580190	1.558412
9	0.094361	96.86136	1.580223	1.558412
10	0.094361	96.86136	1.580230	1.558412
11	0.094361	96.86136	1.580231	1.558412
12	0.094361	96.86136	1.580231	1.558412

(b) Variance Decomposition of D(LER):

Period	S.E.	D(LSP)	D(LER)	D(IR)
1	0.012976	1.003093	98.99691	0.000000
2	0.013966	2.240139	97.73334	0.026518
3	0.014133	2.479758	97.46417	0.056077
4	0.014165	2.523608	97.41302	0.063372
5	0.014171	2.531888	97.40331	0.064800
6	0.014172	2.533475	97.40145	0.065073
7	0.014172	2.533780	97.40109	0.065126
8	0.014172	2.533839	97.40103	0.065136
9	0.014172	2.533850	97.40101	0.065138
10	0.014172	2.533853	97.40101	0.065138
11	0.014172	2.533853	97.40101	0.065138
12	0.014172	2.533853	97.40101	0.065138

(c) Variance Decomposition of D(IR):

Period	S.E.	D(LSP)	D(LER)	D(IR)
1	0.611628	0.843859	1.857372	97.29877
2	0.640396	1.176285	9.471497	89.35222
3	0.646218	1.334425	10.89471	87.77087
4	0.647310	1.370148	11.14993	87.47993
5	0.647517	1.377104	11.19802	87.42487
6	0.647557	1.378437	11.20725	87.41432
7	0.647565	1.378693	11.20902	87.41229
8	0.647566	1.378742	11.20936	87.41189
9	0.647567	1.378752	11.20943	87.41182
10	0.647567	1.378754	11.20944	87.41180
11	0.647567	1.378754	11.20944	87.41180
12	0.647567	1.378754	11.20944	87.41180

Cholesky Ordering: D(LSP) D(LER) D(IR)

Table 7 Variance Decomposition

Conclusion and Recommendations

This study investigates the integration of Pakistani stock, foreign exchange, and money markets over the period May 1994 to October 2012. Both Engle and Granger, and Johansen and Juselius cointegration techniques are used to estimate long run relationship while short run dynamics are modeled in Vector Error Correction Model. The empirical results from both Engle and Granger and Johansen and Juselius cointegration analysis demonstrate that the three financial markets of Pakistan are cointegrated for the time under consideration.

The empirical results from Error Correction Model indicate log-run equilibrium relationship among three variables. If there is an error in the equilibrium in the short run then 16% of the errors are corrected by stock prices series, 1% by exchange rate, and almost 51% by interest rate, in one period. Results also show that there is inertia in the stock prices, exchange rate, and interest rate. Moreover, it is found that, in the short run, exchange rate and interest rate do not affect stock prices and similarly stock prices and interest rate do not affect exchange rate. However, exchange rate significantly affects interest rate in the short run. Empirical findings from impulse response functions show that stock prices respond negatively to shocks in interest rate and exchange rate. The effect starts after one period of the shock and die out to zero in third period. The effect of exchange rate is however more long lasting. The effect of stock prices on exchange rate is also negative; it starts immediately and becomes insignificant after third period. The exchange rate series does not respond to shocks in interest rate. Interest rate responds negatively to changes in stock prices and positively to exchange rate; the effect becomes insignificant in the fourth period.

The variance decomposition results indicate that almost 97% of the variation in stock prices is caused by its own lags, even after 12 months and remaining 3% is evenly distributed among exchange rate and interest rate. Same magnitude of inertia is found in exchange rate series and stock prices contribute more variation in exchange rate than the interest rate do. Interest rate explains 87% variation in itself and 11% variation in interest rate is explained by exchange rate. Stock prices do not contribute in the variation of interest rate. Thus, the Pakistani financial markets offer lower diversification possibilities for intra-country diversification.

The empirical findings based on impulse response functions and forecast error variance decomposition analysis shows that variation in each market is mostly explained by its own lag.

Policy Implications: This is a significant outcome and could have imperative policy implications. Such as, policy makers, whilst making a decision on internal policy should be vigilant of the implications of their decision. On the backside, policy makers could take a priori measure in one of the markets (e.g. exchange rate) if an external shock is forthcoming and expected to hit a market (e.g. stock prices).

Future Directions: This study highlighted some key issues for future research taking into consideration the Pakistani financial market integration. One can test the integration of Pakistani financial markets with that of its trading partners and neighboring countries. One can also work further on this study using other techniques like Principle-Component Analysis and ARDL methodology.

A clear extension to our study would be to use a non-linear model like GARCH to capture spillover from one market to others.

One can also investigate for structural breaks in this relationship dividing the whole sample period in various sub-periods.

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