"Macroeconomic Factors and Pakistani Equity Market"

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Abstract

This paper analyzes long-term equilibrium relationships between a group of macroeconomic variables and the Karachi Stock Exchange Index. The macroeconomic variables are represented by the industrial production index, the consumer price index, M1, and the value of an investment earning the money market rate. We employ a vector error correction model to explore such relationships during 1973:1 to 2004:4. We found that these five variables are cointegrated and two long-term equilibrium relationships exist among these variables. Our results indicated a "causal" relationship between the stock market and the economy. Analysis of our results indicates that industrial production is the largest positive determinant of Pakistani stock prices, while inflation is the largest negative determinant of stock prices in Pakistan. We found that while macroeconomic variables Granger-caused stock price movements, the reverse causality was observed in case of industrial production and stock prices. Furthermore, we found that statistically significant lag lengths between fluctuations in the stock market and changes in the real economy are relatively short.

Macroeconomic Factors and Pakistani Equity Market

1. INTRODUCTION

The growing importance of stock markets around the world has recently opened a new avenue of research into the relationship between stock market development and economic growth. It is one of the most enduring debates in economics that whether financial development causes economic growth or whether it is a consequence of increased economic activity. Schumpeter (1912) argued that technological innovation is the force underlying long-run economic growth, and that the cause of innovation is the financial sector's ability to extend credit to the "entrepreneur". Joan Robinson, on the other hand, maintained that economic growth creates a demand for various types of financial services to which the financial system responds, so that "where enterprise leads finance follows" (1952, p. 86). Empirical investigations of the link between financial development in general and stock markets in particular and growth have been relatively limited. Goldsmith (1969) reports a significant association between the level of financial development, defined as financial intermediary assets divided by GDP, and economic growth. He recognized, however, that in his framework there was "no possibility of establishing with confidence the direction of the causal mechanisms (p. 48)." A number of subsequent studies have adopted used the growth regression framework in which the average growth rate in per capita output across countries is regressed on a set of variables controlling for initial conditions and country characteristics as well as measures of financial market development [see King and Levine (1993a); Atje and Jovanovic (1993); Levine and Zervos (1996); Harris (1997) and Levine and Zervos (1998) among others].

A more difficult question arises with respect to whether the forward-looking nature of stock prices could be driving apparent causality between stock markets and growth. Current stock market prices should represent the present discounted value of future profits. In an efficient equity market, future growth rates will, therefore, be reflected in initial prices.

2. PAKISTAN'S EQUITY MARKET

Since its independence in 1947, a multitude of problems have stood in Pakistan's way of realising its true economic potential. Included in the social and political problems are recurring fights among various religious sects, an ever-increasing population and archaic bureaucratic procedures.

Economic problems have included counter-productive tax rates, debilitating customs duties that stymied foreign investments, and the Pakistani government's strategic approach that kept the economy as well as the stock market closed to foreigners.

Although Pakistan continues to struggle with socio-political problems, it has recently made tremendous strides in the economic front via reforms that were introduced in the early part of 1991. The most significant of the reforms was perhaps the opening of the economy to foreign investment on very liberal terms and allowing, for the first time in independent Pakistan's history, direct and indirect investments by foreign nationals and institutional investors in Pakistan's equity markets. These reforms have produced positive results. Pakistan's industrial exports and foreign investment today are growing at the country's fastest rate ever. The country's foreign exchange reserves skyrocketed to $12327.9 million in 2003-04 from $2279.2 million in 1998-99. Similarly, several Pakistani stocks are now traded on international markets. Also, foreign brokerage houses are now being allowed through joint ventures with Pakistani investment bankers to participate in primary as well as secondary markets in Pakistan. Given the newfound interest in the Pakistani stock markets, an intriguing question is how these markets have performed over the years. To answer this question we examine the return generating process of the Karachi Stock Exchange (KSE). The KSE is the largest and most active stock exchange in Pakistan, accounting for between 65 percent and 70 percent of the value of the country's total stock transactions. It has been declared as the "Best Performing Stock Market of the World for the year 2002". On October 01, 2004, 663 companies were listed with the market capitalization of Rs 1,495.12 billion (US$ 25.23 billion) having listed capital of Rs 390.41 billion (US$ 6.59 billion). The KSE 100 Index touched at 5245.82 on October 01, 2004. KSE has been well into the 3rd year of being one of the Best Performing Markets of the world as declared by the international magazine "Business Week". Similarly the US newspaper, USA Today, termed Karachi Stock Exchange as one of the best performing bourses in the world.

Time series data over a reasonably long period are available on the KSE. The KSE is also well established emerging equity markets and thus, provides a showcase for other emerging markets in the world. The empirical evidence regarding the direction of causality between stock prices and macro variables is not conclusive. Nishat and Saghir (1991) and Hussain and Mahmood (2001) examined causality between stock prices and macro variables in Pakistan. Nishat and Saghir (1991) observed a unidirectional causality from stock prices to consumption expenditures whereas Hussain and Mahmood (2001) observed a unidirectional causality from macro variables to stock prices. Mookerjee (1988) and Ahmed (199) reported a unidirectional causality from stock prices to investment spending for India and Bangladesh respectively.

The objective of this paper is to analyze the long-term relationship between the KSE and certain relevant macroeconomic factors. It employs a vector error correction model (VECM) [Johansen (1991)] in a system of five equations to investigate the presence of cointegration (and, by implication, long-term equilibrium relations) among these factors.

This pape's contributions are as follows. First, by embracing a study period that extends beyond 1990, the study by Nishat and Saghir (1991) does not cover the period of 1990s, the post reforms period. Moreover this paper employs different set of macroeconomic variables as compared with Hussain and Mahmood (2001) to find the causal relationship between macroeconomic activity and stock prices. The current paper provides interpretations of multiple cointegrating relationships in a system of equations [unlike the single cointegrating vector models of Baillie and Bollerslev (1989); Hafer and Jansen (1991); Diebold, Gardeazabel, and Yilmaz (1994); Engsted and Tanggaard (1994); Harris, McInish, and Schoesmith (1995); Mukherjee and Naka (1995); Chinn and Frankel (1995); Lo, Fund, and Morse (1995); Cushman and Lee (1996); and Dutton and Strauss (1997); Nishat and Saghir (1991) and Hussain and Mahmood (2001))]. Also, we demonstrate the effects of macro-economic factors on the Pakistani stock market by constructing the impulse responses as well as variance decompositions.

The paper proceeds along the following lines. Section 2 presents the asset valuation model and its implications for pricing of macroeconomic factors. Section 3 discusses the data and the methodology. Section 4 reports results, and Section 5 offers conclusions.

2.1. The Asset Valuation Model and Pricing of Macroeconomic Factors

Stock Prices and interest Rates

The intuition regarding the relationship between interest rates and stock prices is well established, suggesting that an increase in interest rates increases the opportunity cost of holding money and thus substitution between stocks and interest bearing securities, and hence falling stock prices. Moreover, any change in an asset's cash flows (CF) should have a direct impact on its price Thus, the asset's expected growth rates which influence its predicted cash flows will affect its price in the same direction. Conversely, any change in the required rate of return (RRR) should inversely affect the asset's price. The required rate of return has two basic components—the nominal risk-free rate and the premium commensurate with the asset's risk. The nominal risk-free rate in addition is comprised of the real rate of interest and the anticipated inflation rate. We expect a positive correlation between the nominal interest rate and the risk-free rate of the valuation model. Thus, a change in nominal interest rates should move asset prices in the opposite direction.

Stock Prices and Inflation Rate

Actual inflation will be positively correlated with unanticipated inflation, and will *ceteris paribus* move asset prices in the opposite direction. It may be argued that the effect on the discount rate would be negated if cash flows increase at the same rate as inflation. However, cash flows may not go up with inflation. DeFina (1991), among others, suggests that pre-existing contracts would deny any immediate adjustments in the firm's revenues and costs. Indeed, one might argue that cash flows should initially decrease if output prices lag input costs in response to rising inflation.

Stock Prices and Output Growth

Industrial production presents a measure of overall economic activity in the economy and affects stock prices through its influence on expected future cash flows [Fama (1990)]. Thus, we would expect a positive relationship between stock prices and industrial production.

Stock Prices and Money Supply

The direction of impact of money supply on stock prices needs to be determined empirically. On the one hand, it can be argued that monetary growth, due to its positive relationship with the inflation rate [Fama (1982)], will adversely affect stock prices. On the other hand, it may also be argued that monetary growth brings about economic stimulus, resulting in increased cash flows (corporate earnings effect) and increased stock prices. One may also add that in the case of Pakistan the money stock might very well convey information about Pakistan’s risk-free rate, which is otherwise masked by the government control of nominal interest rate in much of our study period. When the interest rate is pegged by the government, underlying pressure from agents’ liquidity preference which is ordinarily reflected in the interest rate is instead reflected in changes in the money stock. Since the money supply has a negative relationship with interest rates, this implies a direct relationship between the former and the stock price.

3. METHODOLOGY AND DATA

3.1. Data

Hardouvelis (1987); Keim (1985); Litzenberger and Ramaswamy (1982) empirically investigated whether the main economic indicators (e.g., inflation, interest rates, treasury bond’s returns, trade balance, dividend returns, exchange rates, money supply, and crude oil prices) are effective to explain the share returns. If there was a co-integration relation between macroeconomic indicators and share returns, there would be a causal relation between these variables, too. Otherwise, share returns cannot be explained by main macroeconomic variables. In this study, the relationships between share returns and selected macroeconomic variables have been examined for the Pakistani equity market

The variables which we use to represent Pakistan's stock market and its output, inflation, money stock and interest rate are respectively the KSE Index, the Industrial Production Index, the Consumer Price Index, a narrowly defined money supply (comparable to M_1), and the money market rate in the inter bank market. This Quarterly data covers the period of 1973:1 to 2002:4. All variables except interest rates are transformed into natural logs. Logged values of the nominal stock index, industrial output, inflation, and money are denoted as SPIL, IIPL and CPIL , and interest rate as MR.

All data sets were extracted from the International Financial Statistics (IFS). Similar sets of variables have been used by Chen, *et al.* (1986); Darrat and Mukherjee (1987); Hamao (1988); Brown and Otsuki (1988); Darrat (1990); Lee (1992) and Mukherjee and Naka (1995).

3.2. Empirical Methodology

This section outlines Johansen's (1991, 1995) vector error-correction model (VECM) for testing for cointegration between integrated time-series. In estimating the VECM we first consider whether each series is integrated of the same order, to do this we consider the standard Augmented Dickey-Fuller test. Assuming that each series contains a single unit root, and thus each series is integrated of order one, the potential for co-movement between series exists, suggesting the existence of a long-run relationship amongst these variables. Thus, we can test for cointegration that is the existence of at least one long-run stationary relationship between these series, using the method of Johansen (1991, 1995), which involves investigation of the *p*-dimensional vector autoregressive process of *k*-th order:

$$\Delta Y_t = \mu + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \Pi Y_{t-k} + \varepsilon_t \qquad (1)$$

where Δ is the first difference lag operator, Y_t is a $(p \times 1)$ random vector of time series variables with order of integration equal to one, I(1), μ is a $(p \times 1)$ vector of constants, Γ_i are $(p \times p)$ matrices of parameters, ε_t is a sequence of zero-mean *p*-dimensional white noise vectors, and Π

is a ($p \times p$) matrix of parameters, the rank of which contains information about long-run relationships among the variables.

As is well known, the VECM expressed in equation (1) reduces to an orthodox vector autoregressive (VAR) model in first-differences if the rank (r) of Π is zero, whilst if Π has full rank, $r = p$, all elements in Y_t are stationary. More interestingly, $0<r<p$, suggests the existence of r cointegrating vectors, such that there exist ($p \times r$) matrices, α and β each of rank r and such that $\Pi = \alpha\beta'$, where the columns of the matrix, α are adjustment (or loading) factors and the rows of the matrix β are the cointegrating vectors, with the property that $\beta' y_t$ is stationary even though Y_t may comprise of individually I(1) processes. Tests of the hypothesis that the number of cointegrating vectors is at most $r\ (r = 1,..., p)$ are conducted using the likelihood ratio (trace) test statistics for reduced rank in the context of the restrictions imposed by cointegration on the unrestricted VAR involving the series comprising Y_t.

4. EMPIRICAL RESULTS

Table I presents the unit root tests for our data. The tests of a unit root in levels using the Augmented Dickey-Fuller (ADF) method are estimated using two specifications: a constant and trend; and a constant only. The unit root tests for first-difference stationarity are conducted with just a constant term. The results suggest that all series contain a single unit root, which requires first-differencing to achieve stationarity. Given that all series are integrated of the same order, we are able to consider whether they are determined by some common set of fundamentals, that is whether a stationary linear combination exists between these variables.

The lag lengths in Vector Autoregression (VAR) are determined by the Akaike Information Criterion, and these are decided at one lag (Table 2), further, these lag lengths also ensure that the errors exhibit no remaining autocorrelation. Test statistics are calculated allowing for an intercept and trend term in both the cointegrating equation and the VAR.

4.1. Testing for Granger Causality

The procedure for testing statistical causality between stock prices and the economy is the direct “Granger-causality” test proposed by C. J. Granger in 1969. Granger causality may have more to do with precedence, or prediction, than with causation in the usual sense. It suggests that while the past can cause/predict the future, the future cannot cause/predict the past. According to Granger, *X* causes *Y*, if the past values of *X* can be used to predict *Y* more accurately than simply using the past values of *Y*. In other words, if past values of *X* statistically improve the prediction of *Y*, then we can conclude that *X* "Granger-causes" *Y*. It should be pointed out that given the controversy surrounding the Granger causality method, our empirical results and conclusions drawn from them should be considered as suggestive rather than absolute. This is especially important in light of the "false signals" that the stock market has generated in the past.

The steps in testing whether macroeconomic factors "Granger cause" stock prices are as follows. First, we regress share price index with each macroeconomic variable in two variables equation then we obtain residuals. In next step, we regress lagged values of shares price index with lagged vales of residuals, lagged valued of specific macroeconomic variable at first difference and lagged values of shares price index at first difference. This is the unrestricted regression. After we run this regression, we obtain the unrestricted residual sum of squares, RSS_{UR}. Second, we run the regression by eliminating the lagged valued of specific macroeconomic variable at first difference, this is the restricted regression After we run the regression, we obtain the restricted sum of squares, RSS_R. The null hypothesis is $bi = 0$ for all values of *i*. To test this hypothesis, the *F*-test is applied, as shown below:

$$F = \frac{RSS_R - RSS_{UR} / k\text{-}k_0}{RSS / N\text{-} k}$$

If the *F*-value exceeds the critical *F*-value at the chosen level of significance, the null hypothesis is rejected, in which case the lagged macroeconomic variable belongs in the regression. This would imply that macroeconomic variable "Granger cause" or improve the prediction in stock prices. We then use the same steps to test whether the stock prices causes "Granger-causes" in macro economy (Table 3). These results indicate that in short run, only industrial production does" Granger cause" in stock prices. Both the monetary aggregate and market rates have minor short-term impact on stock prices. But in long run all macroeconomic variables except inflation have significant impact on stock price fluctuations. (Tables 4 and 5).

The test results presented in Table 8 support the existence of two cointegrating vectors between the share price index and industrial production, inflation and long-term interest rates at 5 percent(1 percent) significance level. Thus, we proceed in estimating a vector error-correction model and report the cointegrating vectors, β, from the VECM and the coefficients, α, which show the speed of return to equilibrium. Additionally, we normalize the cointegrating vector so that the coefficient on the share price index is unity, thus allowing us to examine the relationship between this variable and the financial and macroeconomic variables (Table 8).

Table 8 presents the cointegrating vectors and speed of adjustment parameters between the variables. The results show significant long-run relationships between share price index and industrial production, inflation and interest rates with all parameters in the cointegrating vector significant. This result would tend to support the view that the changes in stock price index are linked to general macroeconomic risk factors, and suggests the value premium largely arises due to rational, non-diversifiable risk, and not from sub-optimal behaviour by market agents. These two results suggest that, inherently value and growth stocks may respond to different stimuli, such that value stocks, whose investor-type is more likely to be dominated by large institutional holders, will respond more directly to interest rate changes (that is, the change in the return of a competing asset), while growth stocks, which may be additionally held by investors who adopt non-rational trading strategies, typically referred to as 'noise' traders, such as those following a 'fad', may respond more directly to general economic well-being. Inflation has a negative and significant relationship with the stock prices.

The lower section of Table 8 shows the corresponding error-correction coefficients in the VECM. These represent the speed of adjustment back to long-run equilibrium and the results again show similarities in the behavior of stock price index and macroeconomic variables.

Variance Decompositions

This section examines the variance decompositions of the estimated models. The variance decompositions show which macroeconomic factors can provide explanatory power for variation in stock prices over periods of one, four and eight years, thus extending from the short-to medium-run**.** Variance decompositions are constructed from a VAR with orthogonal residuals and can directly address the contribution of macroeconomic variables in forecasting the variance of stock prices [Sims (1980); Litterman and Weis (1985)]. Cointegration implies that the variance decomposition in levels approximates the total variance of stock prices, that is $R^2 \rightarrow 1$, however, a limitation of the variance decomposition approach is the dependency on the ordering of the explanatory variables. The presence of common shocks and co-movements among the variables implies that ordering is important. This should place the "most exogenous" variables last. Since SPI is our primary variable, we place it first. The other three variables are ordered IIPL, CPIL, ML and MR.

The results from variance decomposition show that any one of the factors explains a substantial amount of variation in the stock prices over both the short- and medium-run. More specifically, over the time-horizon on one, four and eight years, industrial production accounts for 2.5 percent, 9.5 percent and 12.7 percent of variation in the stock prices , inflation rate explains

0.15 percent, 0.89 percent and 0.94 percent of variation respectively. Marker rate accounts for 0.23 percent, 2.6 percent and 4.12 percent of the variations and money stock explains the 0.84 percent, 5.97 percent and 9.5 percent o variation in stock prices over the time period of one, four and eight years respectively (Table 9).

While analyzing impulse responses of the SPI, shocks to the variables are assumed to be one standard deviation above zero (i.e., a large, but not uncommon positive shock). The largest effect is from consumer price, where a positive shock forces the market down by 17.5 percent over six years. This is consistent with our hypothesis. Similar results have been reported by Fama and Schwert (1977); Fama (1981); Geske and Roll (1983); Chen, *et al.* (1986) and Lee (1992) for the U.S.A., Darrat and Mukherjee (1987) for India, Hamao (1988) and Mukherjee and Naka (1995) for Japan, and Darrat (1990) for Canada.

The next largest effect is from industrial production, where a positive shock leads to about a 10 percent increase in stock prices over six years. The same relationship is found by Fama (1981, 1990); Chen, *et al.* (1986); Geske and Roll (1983) and Lee (1992) in the U.S.A., by Mukherjee and Naka (1995) in Japan, and by Darrat (1990) in Canada, among others. Smaller effects are found from the other three variables. Shocks to stock prices lead to virtually no change in stock prices. Shocks to money lead to a small increase in stock prices. Shocks to market interest rate lead to a small short-run increase in stock prices, which dissipates over time. This is somewhat at odds with the valuation model. However, recall that the nominal rate includes an expected inflation component, which is negatively correlated with stock prices.

5. SUMMARY AND CONCLUDING REMARKS

This paper analyzes long-term equilibrium relationships between a group of macroeconomic variables and the Karachi Stock Exchange Index. The macroeconomic variables are represented by the industrial production index, the consumer price index, M1, and the value of an investment earning the money market rate. We employ a vector error correction model to explore such relationships in order to avoid potential misspecification biases that might result from the use of a more conventional vector Autoregression modeling technique. We find that these five variables are cointegrated and two long-term equilibrium relationships exist among these variables. Analysis of our results indicates that industrial production is the largest positive determinant of Pakistani stock prices, while inflation is the largest negative determinant.

Our results indicated a “causal” relationship between the stock market and the economy. We found that while macroeconomic variables Granger-caused stock price movements, the reverse causality was observed in case of industrial production and stock prices. Furthermore, we found that statistically significant lag lengths between fluctuations in the stock market and changes in the real economy are relatively short. The longest significant lag length observed from the results was only one quarter (AIC).

The possibility for future research is to further evaluate where fluctuations in stock prices are coming from. Our results reveal that stock prices movements are not simply formed by looking at the past trend in the economy, as the adaptive expectations model would suggest. Expectations are being formed in other ways, but how?

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Table 1

ADF Unit Root Tests

Variable	Test in Levels with Constant and Trend	Test in Levels with Constant	Test in Differences with Constant
D(CPIL)	-2.442534 (-3.4491)	-0.756665 (-2.8865)	-3.922352 (-2.8865)
D(IIPL)	-0.525361 (-3.4491)	-1.097741 (-2.8865)	-4.521294 (-2.8865)
D(SPIL)	-1.973879 (-3.4491)	-2.293806 (-2.8865)	-5.077564 (-2.8865)
D(ML)	-1.871893 (-3.4491)	-1.253285 (-2.8865)	-4.712205 (-2.8865)
D(MR)	-2.218669 (-3.4491)	-2.232175 (-2.8865)	-6.183154 (-2.8865)

(The number in parentheses are Critical Values at 5 percent)

Table 2

Akaike Information Criteria

AIC Value	Lag
-17.37706	(1 1)
-18.64374	(1 2)
-19.6006	(1 3)
-25.36969	(1 4)

This criteria is used to determine the lag length of VAR, the smaller the value of the information criteria, the "better" the model

Table 3

Granger Causality Test Results

To show short term relationship between macro variables and stock prices

Direction of Causality			**F-Test Statistics**
CPIL	→	SPIL	0.5222
SPIL	→	CPIL	0.1328
IIPL	→	SPIL	8.6331
SPIL	→	IIPL	8.2934
MQL	→	SPIL	1.8198
SPIL	→	MQL	0
MRL	→	SPIL	1.1424
SPIL	→	MRL	0

Table 4

Long term relation ship between macro variables and stock prices

Variable	Independent Variable	Dependent Variable	Coefficient	Std. Error	t-Statistic	Prob.
RS1(-1)	CPIL	SPIL	-0.0617	0.0332	-1.8596	0.0655
RS2(-1)	IIPL	SPIL	-0.0713	0.0353	-2.0186	0.0459
RS3(-1)	MQL	SPIL	-0.0659	0.0328	-2.0073	0.0471
RS4(-1)	MR	SPIL	-0.0724	0.0323	-2.2394	0.0271

RS shows the error term with lag 1

Table 5

Variable	Independent Variable	Dependent Variable	Coefficient	Std. Error	t-Statistic	Prob.
RSS1(-1)	SPIL	CPIL	-0.0074	0.0028	-2.5649	0.0116
RSS2(-1)	SPIL	IIPL	-0.0685	0.0313	-2.1842	0.031
RSS3(-1)	SPIL	MQL	-0.0005	0.0048	-0.1131	0.9101
RSS4(-1)	SPIL	MR	-0.3756	0.084	-4.4621	0

Long term relati

on ship between stock prices and macro variables

RSS shows the error term with lag 1

Table 6

Cointegration Results

Likelihood Ratio Tests for Cointegrating Rank

	Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
Hypothesized Rank (r)	**Lags interval: 1 to** 1				
$r = 0$	0.6893	211.1385	68.52	76.07	None **
$r \leq 1$	0.3294	73.1812	47.21	54.46	At most 1 **
$r \leq 2$	0.1487	26.0213	29.68	35.65	At most 2
$r \leq 3$	0.0392	7.0212	15.41	20.04	At most 3
$r \leq 4$	0.0193	2.2998	3.76	6.65	At most 4

Notes: The cointegration tests are conducted assuming the presence of a constant and trend in both the cointegrating equation and test VAR.

Table 7

Cointegrating Relationships

Cointegrating and Vector Error Correction Model Estimates

Normalized Cointegrating Coefficients

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

SPIL	IIPL	CPIL	ML	MR	C
1	-9.49093	-6.4244	7.6151	-0.0383	-27.8203
	-1.476	-1.62944	-1.4835	-0.0393	

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

SPIL	IIPL	CPIL	ML	MR	C
1	0	21.7395	-12.1162	-0.7445	56.6884
		-10.0312	-5.5318	-0.3842	
0	1	2.9674	-2.0789	-0.0744	8.90415
		-1.0391	-0.5730	-0.0398	

Table 8

Vector Error Correction Coefficients and t statistics

Error Correction:	D(SPIL)	D(CPIL)	D(IIPL)	D(MR)	D(ML)	AIC
Coint. Eq(0)	-0.0144 (-1.6996)	0.0056 (4.5085)	0.0534 (5.6987)	-0.1843 (-1.4843)	-0.0032 (-1.883)	-7.8188
Coint. Eq(1)	0.0047 (-0.3186)	-0.0051 (-2.4807)	0.1495 (-14.8835)	0.5527 (-2.8305)	-0.0051 (-1.8048)	-8.5631

Table 9.

Variance Decomposition

Variance Decomposition of IIPL

Period	S.E.	SPIL	IIPL	CPIL	ML	MR
4	0.2391	2.4405	92.231	0.6001	2.7915	1.9359
16	0.3511	9.529	77.7843	0.7212	8.0098	3.9552
32	0.3741	12.6867	70.9655	0.8459	11.2663	4.2354

Ordering: IIPL CPIL MR SPIL ML

Variance Decomposition of CPIL

Period	S.E.	SPIL	IIPL	CPIL	ML	MR
4	0.2391	0.1585	19.0342	69.6531	3.9130	7.2410
16	0.3511	0.8927	13.1956	57.0717	22.0701	6.7697
32	0.3741	0.9439	8.9301	46.8661	38.7802	4.4794

Variance Decomposition of ML

Period	S.E.	SPIL	IIPL	CPIL	ML	MR
4	0.2391	0.8436	1.4844	3.4614	92.1443	2.0659
16	0.3511	5.9727	1.4635	7.9747	82.1611	2.4278
32	0.3741	9.5101	1.4629	10.3900	76.5004	2.13636

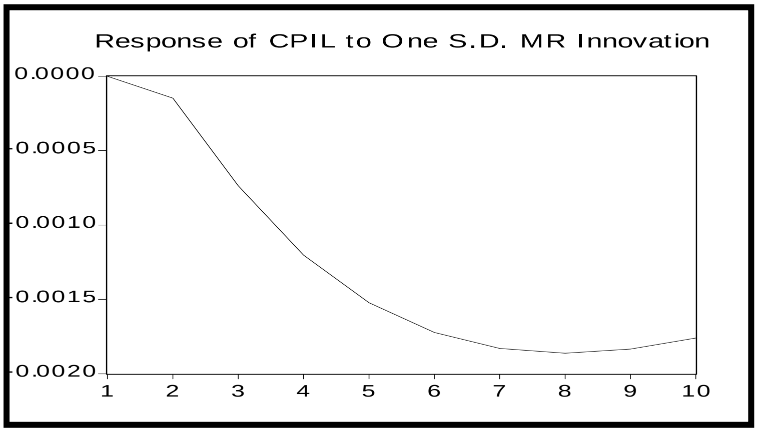
Ordering: IIPL CPIL MR SPIL ML

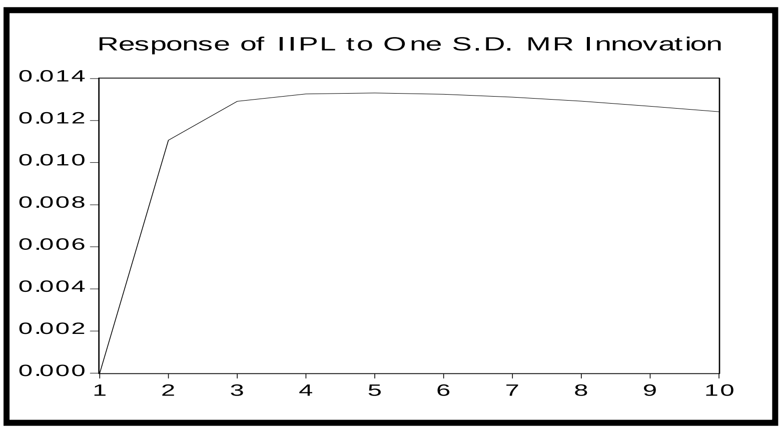
Variance Decomposition of MR

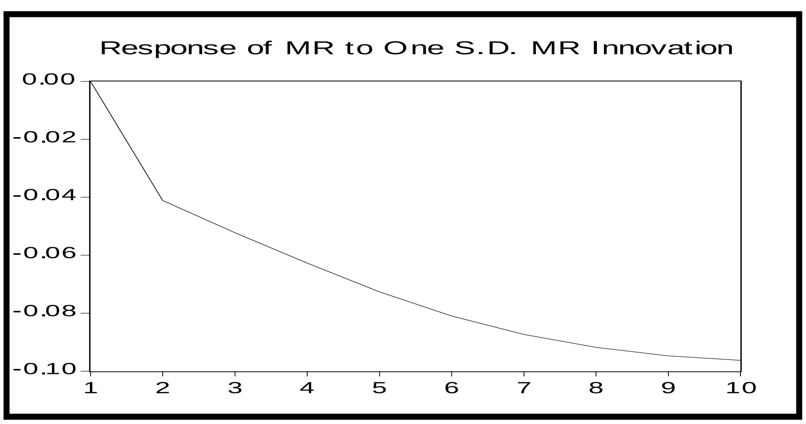
Period	S.E.	SPIL	IIPL	CPIL	ML	MR
4	0.2391	0.2288	4.8745	12.1202	1.3793	81.3971
16	0.3511	2.5894	6.9382	13.4663	2.5354	74.4705
32	0.3741	4.1201	7.4148	13.2788	2.5869	72.5994

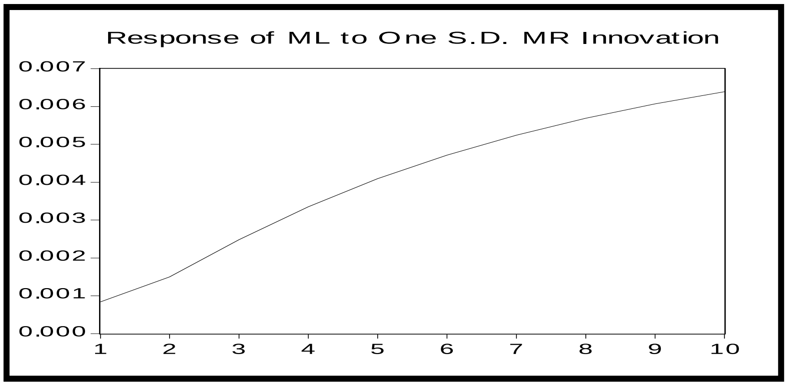
Ordering: IIPL CPIL MR SPIL ML

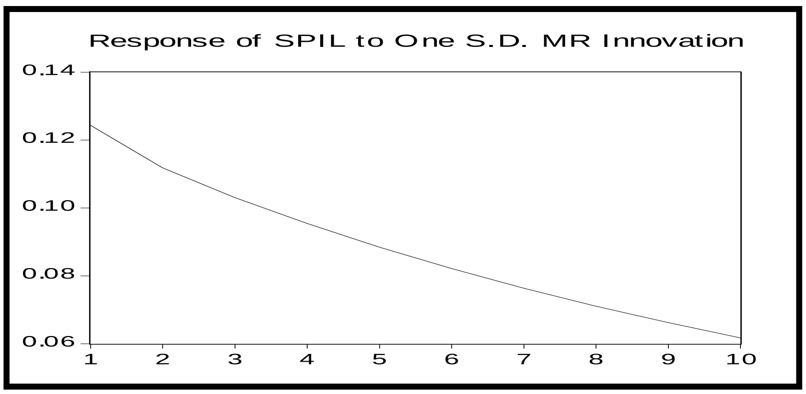
Impulse Responses to Karachi Stock Exchange Index








Response of ML to One S.D. MR Innovation
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
1
2
3
4
5
6
7
8
9
10


Response of SPIL to One S.D. MR Innovation
0.14
0.12
0.10
0.08
0.06
1
2
3
4
5
6
7
8
9
10