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FINANCIAL DEVELOPMENT, GROWTH AND STOCK MARKET DEVELOPMENT: THE TRILATERAL ANALYSIS IN INDIA

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Abstract

The paper examines the long run relationship between financial development and growth in India in a trivariate framework by incorporating stock market development. It finds that stock market development has substantial impact on finance- growth nexus. While financial development and economic growth are bidirectional, economic growth and stock market development are unidirectional. The paper concludes that stock market development is an integral part economic growth, which is, in turn, associated with financial development in the Indian economy.

Keywords: Financial Development, Economic Growth, Stock Market Development

JEL Classifications: E44, H54, O16

1. Introduction

Finance is a key to economic growth. The relation between the two has, however, received much attraction in the recent finance literature on endogenous growth (Haber, 2008; Brasoveanu et al., 2008; Odhiambo, 2008; Levine 2003; Carlin and Mayer, 2003; Calderon and Liu, 2002; Arestis et al., 2001; Levine et al., 2000; Luintel and Khan, 1999; King and Levine, 1993). The attention is mostly on the direction of causality between financial development and economic growth, as it has significantly different implications for development policy. The debate is generally argued under three broad heads: (1) financial deepening promotes economic growth; (2) economic growth stimulates financial development; and (3) financial development and economic growth influence each other (Billmeier and Massa, 2009).

Over the last decade, stock markets, however, have received a great deal of attention, both as a source of financial development and ultimately economic growth, and in the context of large swings in stock market valuation (Bose, 2005). This is, in fact, very true in the emerging markets like India. The depth of stock market, as captured by the market capitalization, is an important measure of one aspect of financial development, much in the same way as monetization or the amount of private sector credit measure the depth of financial intermediation.

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In fact, commercial banking and stock markets both contribute in a major way to the transformation of savings into investment, thereby enabling financial development and economic growth. It is, however, not clear, whether these two types of financial markets should be considered complements or substitutes (Billmeier and Massa, 2009). The research on stock markets in many emerging countries- particularly Latin America- is very high, while it is relatively low in the case of Asian countries. So this study, in this present context, is very relevant in the finance literature, particularly in the Asian countries. The paper makes an attempt to trace the role of stock market development on finance-growth nexus in India.

The majority of the premature studies on this subject are mainly based on cross sectional data and bivariate framework and hence, bounded with two major limitations. First, the cross sectional data and bivariate data itself cannot satisfactorily address the country-specific issues. Second, the inference drawn from the bivariate causality framework may be invalid, because of omission of the relevant variables. Put differently, the introduction of third variable, affecting both financial development and economic growth, in the bivariate set up may not only alter the direction of causality between financial development and economic growth, but also change the magnitude of the estimates. Hence, the main innovation in this paper is the use of trivariate framework in which, in addition to growth and financial development, we incorporate stock market development, particularly in the context of India. This marries the Granger causality literatures on the finance-growth nexus and stock market-growth nexus. The inclusion of stock market in the finance-growth nexus is very relevant, as it will highlight the issue of finance stability in the economy. The direct link between stock market and growth has been widely studied, particularly because control of stock price is often seen as most important goal to which monetary policy can aspire in the pursuit of financial stability. On the contrary, the lack of control has been increasingly linked to banking and financial crises.

The other innovation of this paper is to investigate the causality among financial development, economic growth and stock market development in India, especially in the globalization era of 1990s. India all through followed a closed economy policies since her independence. It was only after 1985, a shift towards globalization was started. The attempts were, however, seems to be considered as half-hearted, self-contradictory and often self-reversing in nature (Harris, 1987). In contrast, globalization in the 1990s had been much wider and much deeper and decidedly marked a U-turn in many ways in the direction of economic policy followed by India during the last fifty-eight years of centralized economic planning (Pradhan, 2010; Sachs et al., 1991).

The globalization of 1990s were undertaken in many ways such as devaluation of rupee, dismantling import license system, full convertibility on trade account, fiscal retrenchment and credit squeeze, abolition of export subsidies, introduction of import entitlement scheme for exporters, unification of the exchange rates, removal of the quantitative restrictions, massive reduction in the tariff rates and protection rates, easing the restrictions on foreign investments and so forth (Ramakrishna, 2003). The impact of globalization is, however, multidimensional and can be judged in many ways in the direction of socio-economic development. That involves both benefits and failures in the Indian economy.

The major benefits that the country has received during this globalization of 1990s are financial sector development and its link with economic growth and stability. But the impact may be slightly affected by the recent global financial crisis, which hit in the world economy in the middle of 2008. Hence, the investigation will give some limelight on the nexus between finance-growth and stock price- growth in India. The residual of the paper is divided into three sections. Section 2 describes the methodology and discussions. Section 3 provides conclusion and policy implications.

2. Econometric Methodology and Data Descriptions

In this section, we discuss the methodological issues for investing the nexus between financial development, growth and stock market development. We first begin with the investigation of integration properties of data. The unit root test is used for the same. If the variables are integrated of order one, the cointegrated test is applied to know the existence of long run equilibrium relationship between them. On the basis of order of integration and their cointegration, we test the direction of causality using error correction model (ECM). The details of econometric setting on the aspects of unit root test, cointegration test and ECM are described below.

2.1 Testing for Integration

It is very common for time series data to demonstrate signs of non-stationarity; particularly both mean and variance of macroeconomic variables trend upwards over time. In any case, test of non-stationarity are carried out as a preliminary step to explore the possibility of a significant long run relationship between the variables concerned, i. e. cointegration tests. The test for non-stationarity is to know the order of integration, where the time series variables are stationary. We apply Phillips- Perron (Phillips and Perron, 1988) test to examine the stationarity of variables. The Phillips and Peron test follows the estimation of following equation:

$$Z(t_\mu) = \langle S_u | S_{tk} \rangle t_\mu -$$

$$\frac{1}{2} \; S_{tk}^2 - S_u^2 \; \left[S_{tk} \left\{ T^2 \sum_{t=2}^{T} \; Y_t - Y_{t-k} \;\; ^2 \right\}^{\frac{1}{2}} \right]^{-1} \qquad \text{... (1)}$$

Where, $S_u^2 = T^{-1} \sum_{t=1}^{T} U_t^2$ ... (2)

$$S_{TK}^2 = T^{-1} \sum_{t=1}^{T} U_t^2 \;\; + 2T^{-1} \sum_{t=1}^{K} \sum_{t=j+1}^{T} u_t u_{t-j} \qquad \text{... (3)}$$

Let “d” is number of times the variable needs to be differenced in order to attain stationarity. Such variable is said to be integrated of order “d” and denoted by I (d). If the variable is stationary at the level data, it is integrated of order zero [I (0)] and so on.

2.2. Testing for Cointegration

Cointegration is a technique to recognize the existence of long run relations. The long run relationship, as a statistical point of view, means the variables move together over time so that short term disturbances from the long term trend will be corrected. A lack of cointegration suggests that such variable have no long run equilibrium relationship and in principle, they can wander arbitrarily far away from each other (Dickey et al., 1991). Note that regression among integrated series is meaningful, if they involve cointegrated variables.

Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary variables could be stationary. If such stationarity combination exists, then the non-stationarity time series are said to be cointegrated. Johansen (1988, 1991, 1995), however, developed a VAR based cointegration technique to examine the cointegration between two or more variables. This method is more advanced and more powerful than the Engle and Granger cointegration method. The test (Johansen and Juselius, 1990) is described as follows:

Let X_t be a (n X 1) vector of variables with time period t and they follow I (1) process. The investigation of number of cointegrating vector involves the estimation of unrestricted Vector Auto-regression model.

$$\Delta X_t = A_0 + \prod X_{t-p} + \sum_{i=1}^{p-1} A_i \Delta X_{t-i} + \varepsilon_t \quad \text{... (4)}$$

where, Π is impact matrix and contains information about long run relationships between variables in the data vector. If the rank of Π (say r) is equal to zero, the impact matrix is a null vector. If Π has full rank, n, then the vector process x_t is stationary. If $0 < r < n$, then there exists r cointegrating vectors.

The cointegrating rank, r, can be formally tested with two statistics. The test statistic for the null hypothesis that there are at most r cointegrating vectors is the trace test and is computed as:

$$\text{Trace} = -T \sum_{i=r+1}^{n} \text{Log}\ 1 - \hat{\lambda}_i \quad \text{... (5)}$$

where $\hat{\lambda}_{r+1}$, ….. $\hat{\lambda}_n$ are (n-r) smallest estimated eigenvalues. The test statistic for the null hypothesis of r cointegrating vectors against the alternative of r + 1 cointegrating vectors is the maximum eigenvalue test and is given by

$$\lambda_{max} = -T\text{Log}\ 1 - \hat{\lambda}_{r+1} \quad \text{... (6)}$$

Here, the null hypothesis of r cointegrating vectors is tested against an alternative hypothesis of r +1 cointegrating vectors. Hence, the null hypothesis r = 0 is tested against r = 1 and r =1 is tested against r = 2 and so on. It is well known that the cointegration test is very sensitive to choice of lag length. The Schwarz Bayesian Criterion (SBC) is used to select the number of lags required in the cointegration test.

2.3 Granger Causality in the ECM-VAR

In this section, Granger causality test is deployed to scan the causal nexus between financial development, economic growth and stock market development in India. We first start with bivariate causality between financial development and economic growth and then trivariate causality test by incorporating stock market development in the finance-growth nexus. The

Granger causality test based on error correction model (ECM) between financial development and economic growth can be expressed as follows:

$$\Delta EG_t = \alpha_0 + \sum_{l=1}^{p} \alpha_{1l} \Delta EG_{t-l} + \sum_{l=1}^{p} \alpha_{2l} \Delta FD_{t-l} + \alpha_3 ECT_{t-1} + u_t \quad \text{... (7)}$$

$$\Delta FD_t = \beta_0 + \sum_{l=1}^{p} \beta_{1l} \Delta EG_{t-l} + \sum_{l=1}^{p} \beta_{2l} \Delta FD_{t-l} + \beta_3 ECT_{t-1} + v_t \quad \text{... (8)}$$

where, EG is economic growth; FD is financial development; ECT is error correction, captured from the cointegration regression; u and v are mutually uncorrelated white noise residuals. The error correction model has an interesting temporal causal interpretation in the sense that a bivariate cointegrated system must have a causal ordering in at least one direction (Granger, 1988).

Although cointegration indicates the presence of Granger causality, at least in one direction, it does not indicate the direction of causality between variables. The direction of the Granger causality in this case can only be detected through the error correction model (ECM) derived from the long run cointegrating vectors. In addition to indicating the direction of causality amongst variables, the ECM also enables us to distinguish between the short run and the long run Granger causality. The F-test and the explanatory variables indicate the short run causality, whereas the long run causality is implied through the significance of the t-test of the lagged error correction term. For instance, the financial development is said to Granger cause economic growth in the long run, if $\alpha_{2i} \neq 0$ and $\alpha_3 \neq 0$. Similarly, economic growth is said to Granger cause financial development, if $\beta_{1i} \neq 0$ and $\beta_3 \neq 0$.

Unfortunately, causality tests based on a bivariate framework have been found to be very unreliable as the introduction of a third important variable in the causality model can change both the causal inference and the magnitude of the estimates (see Odhiambo, 2008; Loizides and Vamvoukas, 2005; Caporale et al., 2004; Caporale and Pittis, 1997). Given this weakness, the present study uses a trivariate causality framework to examine the causality between financial development, economic growth and stock market development in India. The trivariate Granger causality test based on VAR error correction model (Toda and Phillips, 1993) can be expressed as follows:

$$\begin{bmatrix} \Delta \ln FD_t \\ \Delta \ln EG_t \\ \Delta \ln SMD_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix} + \begin{bmatrix} \beta_{11,1}\beta_{12,1}\beta_{13,1} \\ \beta_{21,1}\beta_{22,1}\beta_{23,1} \\ \beta_{31,1}\beta_{32,1}\beta_{33,1} \end{bmatrix} \begin{bmatrix} \Delta \ln FD_{t-1} \\ \Delta \ln EG_{t-1} \\ \Delta \ln SMD_{t-1} \end{bmatrix} +$$

$$\begin{bmatrix} \beta_{11,2}\beta_{12,2}\beta_{13,2} \\ \beta_{21,2}\beta_{22,2}\beta_{23,2} \\ \beta_{31,2}\beta_{32,2}\beta_{33,2} \end{bmatrix} \begin{bmatrix} \Delta \ln FD_{t-2} \\ \Delta \ln EG_{t-2} \\ \Delta \ln SMD_{t-2} \end{bmatrix} + \ldots\ldots\ldots\ldots\ldots\ldots + \quad \text{... (9)}$$

$$\begin{bmatrix} \beta_{11,p}\beta_{12,p}\beta_{13,p} \\ \beta_{21,p}\beta_{22,p}\beta_{23,p} \\ \beta_{31,p}\beta_{32,p}\beta_{33,p} \end{bmatrix} \begin{bmatrix} \Delta \ln FD_{t-p} \\ \Delta \ln EG_{t-p} \\ \Delta \ln SMD_{t-p} \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \end{bmatrix} \left[ECT_{t-1} \right] + \begin{bmatrix} \zeta_{1t} \\ \zeta_{2t} \\ \zeta_{3t} \end{bmatrix}$$

where, FD is financial development, EG is economic growth and SMD is stock market development. ECT_{t-1} is the error correction term lagged one period. ζ_1, ζ_2, and ζ_3 are mutually uncorrelated white noise residuals. The main difference between the bivariate model, presented in equations (7) and (8), and the trivariate model, presented in equation (9), is the introduction of a third variable (i.e. stock market development) in the nexus between financial development and economic growth. Based on the model in equation (9), it is possible that the causal link between financial development and economic growth estimated from equations (7) and (8) could be due to the omission of the stock market development. With the introduction of the stock market development, the model can now capture the causal relationship between financial development and economic growth with respect to changes in stock market development. In this manner, it is possible that stock market development could not only alter the direction of causality between financial development and economic growth, but also the magnitudes of the estimates (Odhiambo, 2008; Loizides and Vamvoukas, 2005).

The variables used under this study are broad money supply (M_3), used as a proxy for financial development (FD), and is measured as a percentage of GDP; Index of Industrial Production (IIP), used as a proxy for economic growth (EG); market capitalization, used as a proxy for stock market development (SMD). The data are monthly observations from 1994 to 2010 and has been collected from Handbook of Statistics on Indian economy, Reserve Bank of India, Mumbai.

3. Results and Discussion

In this section, we first start with discussing the stationarity properties of time series variables and then the cointegration and causality tests. The Table 1 reports the unit root test results, particularly with respect to ADF and PP test. A plot of the variable against time does not indicate the presence of any trend in the variables. Hence, we calculate unit root only at a constant level. The results of the stationarity tests at the level data do not show any stationarity. Having found that the variables are unit root at level, the next step is to difference the variables once in order to perform stationary tests on differenced variables. The results, in the later case, confirmed that all the variables are stationary. This concludes that all the variables (financial development, economic growth and stock market development) are integrated of order one [i.e. 1 (1)].

Table 1. Unit Root Test Results

ADF Test				
Variables	*Level Data*	*Stationary Status*	*First Difference Data*	*Stationary Status*
FD	1.01	Non stationary	-2.59***	Stationary
EG	2.38	Non stationary	-3.23**	Stationary
SMD	0.18	Non stationary	-12.3*	Stationary
PP Test				
FD	0.19	Non stationary	-35.61*	Stationary
EG	1.87	Non stationary	-15.52*	Stationary
SMD	0.075	Non stationary	-12.29*	Stationary

Note: ADF: Augmented Dickey Fuller Test; PP: Phillips and Perron Test; EG: Economic Growth; FD: Financial development; SMD: Stock Market Development; *: Indicates Statistical Significance at 1%; and **: Indicates Statistical Significance at 5%; and ***: Indicates Statistical Significance at 10%.

Having confirmed that all variables included in the causality test are integrated of order one, the next step is to test for the existence of cointegration relationship between financial development, economic growth and stock market development. The Johansen- Juselius cointegration technique, based on maximum likelihood estimation, is deployed for the same. The test basically depends upon two statistics, known as trace statistics and maximum eigenvalue statistics. If cointegration is detected between these variables, then the existence of Granger causality either way cannot be ruled out. The results of both the tests, under both bivariate and trivariate framework, are given in Table 2. The results indicate the existence of a stable long run relationship between financial development and economic growth and among financial development, economic growth and stock market development. Both the trace statistics and maximum eigenvalue statistics reject the null hypothesis of no cointegration. In particular, the results show that there is one cointegrating vector between financial development and economic growth and two cointegrating vectors between financial development, economic growth and stock market development.

Table 2. Cointegration Results

Trace Test				*Maximum Eigen value Test*			
Null	*Alternative*	*λ- Tra*	*CV*	*Null*	*Alternative*	*λ- Max*	*CV*
Cointegration between ED and FD							
r = 0	r ≥ 0	29.6*	15.49	r = 0	r = 1	27.8*	14.26
r ≤ 1	r ≥ 1	1.81	3.841	r ≤ 1	r = 2	1.81	3.841
Cointegration between ED, FD and SMD							
r = 0	r ≥ 0	32.72*	29.79	r = 0	r = 1	32.72*	21.13
r ≤ 1	r ≥ 1	6.678	15.49	r ≤ 1	r = 2	6.678	14.26
r ≤ 2	r > 2	1.446	3.841	r ≤ 20	r = 3	1.446	3.841

Note: r stands for the number of cointegrating vectors. The lag structure of VAR is determined by the highest values of the Akaike information criterion and Schwarz information criterion. The critical values are taken from Johansen and Juselius (1990). *: Indicates Statistical Significance at 5%. And other notations are defined earlier.

Having confirmed the existence of cointegration between financial development, economic growth and stock market development, the next step is to estimate an error correction model by including error correction term (ECT_{t-1}) lagged once in the bivariate and trivariate causality model respectively. The Table 3 reports the causalities among the financial development, economic development and stock market development. The lag order has been selected on the basis of AIC and SIC criterion only (see Table 4). The results depicts that error correction term (ECT) is significant for financial development and economic development, both under bivariate and trivariate models. This represents that financial development and economic development can adjust each other for any deviations from the long run relationship.

Coming to the short run causality, we find the existence of bidirectional causality between financial development and economic growth. We also find the existence of unidirectional causality from stock market development to economic growth. But we do not find any causality between stock market development and financial development. This result is very similar to the findings of

Dritsaki and Dritsaki-Bargiota (2005). This does not mean that stock market has no role in financial development. Rather it is affected via economic growth (see Table 3). That means the integration of these three (stock market development, financial development and economic growth) are very essential to achieve the sustainable economic growth. The lack of one may affect the others, both directly and indirectly, and hence, affect the overall development in the economy.

Table 3. The Results of Granger Causality

DV	*ΔEG*	*ΔFD*	*ΔSMD*	*ECT*	*Inferences*
Bivariate Analysis between FD and EG					
ΔEG	-------	10.46* [0.00]		-2.599* [0.00]	FD = > EG
ΔFD	11.17* [0.00]	-------		5.397* [0.00]	EG = > FD
Overall Conclusion:					FD < = > EG
Trivariate Analysis between FD, EG and SMD					
ΔEG	-------	11.06* [0.00]	7.279 [0.02]	-2.798* [0.00]	FD = > EG SMD = > EG
ΔFD	11.23* [0.00]	-------	1.891 [0.39]	5.384* [0.00]	EG = > FD
ΔSMD	0.395 [0.82]	0.856 [0.65]	-------	-0.364 [0.33]	
Overall Conclusion:					FD < = > EG SMD = > EG

Note: ECT: Error Correction Term; *: Indicates Statistically Significant at 1%; and other notations are defined earlier.

Table 4. VECM Lag Order Selection

Lag	*Variables*					
	EG		*FD*		*SMD*	
	AIC	*SIC*	*AIC*	*SIC*	*AIC*	*SIC*
1	-5.09	-5.01	-6.58	-6.50	-3.67	-3.59
2	-5.09	-4.95	-6.58	-6.44	-3.69	-3.50
3	-5.14	-4.95	-6.85	-6.66	-3.61	-3.42

Note: AIC: Akaike Information Criterion; SBC; Schwarz Information Criterion; EG: Economic Growth; FD: Financial development; and SMD: Stock Market Development.

In short, the empirical result support the causal flow from economic growth to financial development, but reject the causal flow from stock market development to financial development. The causal flow from economic growth to financial development is supported by error correction term and the lagged economic growth, which are all statistically significant, whilst the causal flow from stock market development to financial development is rejected by the lagged financial development and lagged stock market development, which turned out to be statistically insignificant. In short, it is observed that both financial development and stock market development cause growth. That means the improvement of financial development and stock market development will lead to economic growth. So the development of stock market in particular and financial market in general is urgent need in the country for attaining sustainable economic growth.

The above results were also verified through generalized impulse response functions (GIRFs). The GIRFs trace the effect of a one-time shock to one of the innovations on current and future values of endogenous variables. The generalized impulse responses provided more insight into how a shock to stock market development and financial development has an effect on economic growth. The results of generalized impulse responses for all these variables are presented in Figures 1 and 2 for bivariate and trivariate analysis respectively. The GIRFs provided the support of causality status between financial development, economic growth and stock market development in the VECM system. To complement this study, it is important to investigate whether the above long run relationship that we found are stable over the period of study. We conduct the diagnostic tests for serial correlation (LM test), autoregressive conditional heteroskedasticity (ARCH test), heteroskedasticity (White test) and stability test (Ramsey test). The estimated results are reported in Table 5. The results confirm the stability of the model on the nexus between stock market development, financial development and economic growth in the Indian economy. Overall, the analysis reveal that the Indian economy generally responds to shocks with a high degree of efficiency, suggesting little opportunity to benefit from lead-lag relationships among the stock market development, financial development and economic growth.

Table 5. Short Run Diagnostic Tests

Variables	*LM*	*ARCH*	*White*	*Ramsey*
EG	133.1*	285.8*	11.47*	250.1*
FD	269.5*	158.2*	20.29*	818.7*
SMD	472.4*	302.3*	2.739*	14.77*

Note: *: Indicates Statistically Significant at 1%; and other notations are defined earlier.

4. Conclusion

The study examines the cointegration and causality relationship between financial development, economic growth and stock market development in India during the period 1994 to 2010, using trivariate causality framework. The empirical investigation has been undertaken by Error Correction Model (ECM). It first explored the stationarity of the variables and their long run equilibrium relationship. The empirical investigations confirm the followings:

First, the time series variables are stationary at the first differences, indicating that they are integrated of order one.

Second, there is presence of one cointegrating vector between financial development and economic growth and two cointegrating vectors between financial development, economic growth and stock market development. This indicates the presence of long run equilibrium relationship between financial development, economic growth and stock market development.

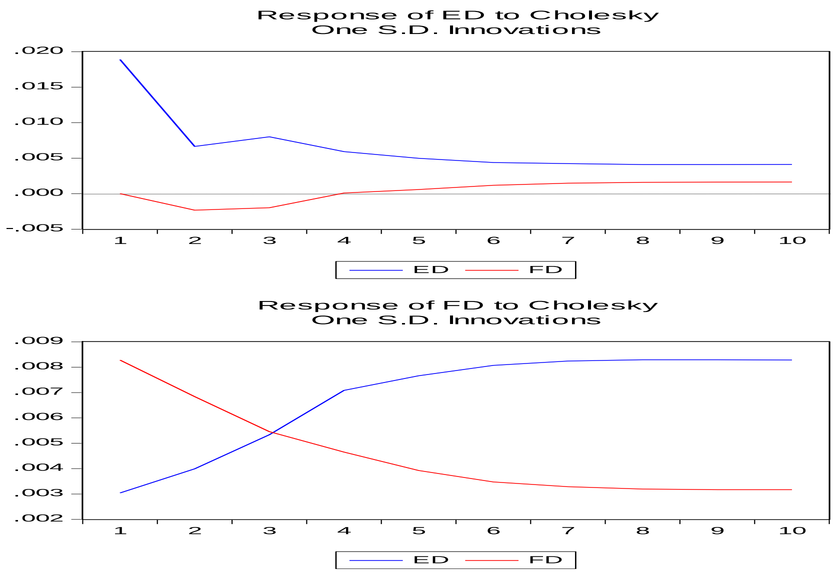

Figure 1. Impulse Response Functions under Bivariate Causality

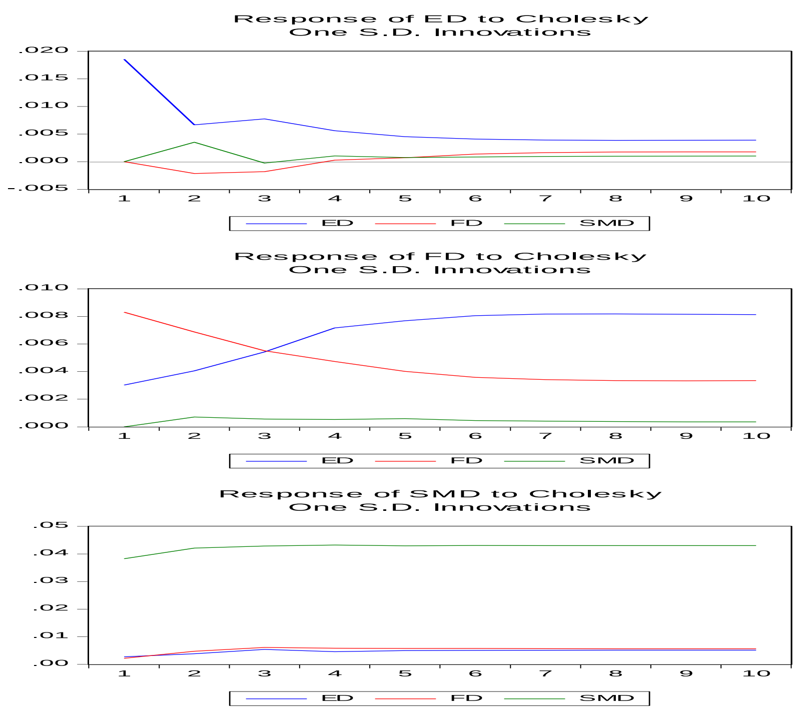

Figure 2. Impulse Response Functions under Trivariate Causality

Third, error correction model specifies the existence of bidirectional causality between financial development and economic growth; and a unidirectional causality from stock market development to economic growth. The study, however, does not find any causality from stock market development to financial development.

This concludes that stock market development is an integral part of economic growth, which is, in turn, associated with financial development in the economy. So the integration of stock market and financial market is of urgent need. The lack of same may affect the economic growth negatively. Hence, it warns that any argument that financial development unambiguously leads to economic growth should be treated with extreme caution.

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