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Revisiting Finance Growth Relations in Bangladesh

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Abstract

This paper examines the channels through which financial development affects economic growth in Bangladesh along with probable feedback effects. Using Toda-Yamamoto Granger no causality approach the paper finds that finance causes growth through both capital accumulation and total factor productivity growth, albeit the former seems to be a more important route than the later. On the other hand, while there is evidence of feedback effect from finance to growth, the channel is not that clear.

1. Introduction

The relationship between finance and growth is well explored both theoretically and empirically. Literature mostly focused on how financial development plays a positive role in economic growth and development. Financial sector development may augment both capital accumulation and productivity growth. A number of studies also focused on the direction of the relationship between finance and growth. Both cross country and time series studies on individual countries, by and large confirmed the positive relationship between financial development and growth. However, in terms of the direction of relationship, empirical evidence is mixed. While some papers find finance causes growth, others find the opposite. Many papers find a bi-directional causality between finance and growth.

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While once considered a "bottomless basket" or 'a test case of development', Bangladesh experienced impressive economic growth in the last two decades. The period also roughly coincides with the implementation of economic reforms. While once financial sector was quite small, it also marked considerable advancement over the last decades, particularly with the implementation of the financial sector reforms program since the late 1980s. Hence, it is quite imperative to explore the finance growth relationship in Bangladesh. However, there have been very few studies exploring finance growth relationship in Bangladesh, and none of them explored the channel of financial development to growth. This paper adds to the literature by making an attempt to address both the issues of the channels of finance to growth and the direction of finance-growth relation simultaneously, in the context of Bangladesh by using a relatively modern and flexible method of causality test. Major finding of the paper is that finance causes growth in Bangladesh through both the capital formation and total factor productivity growth, although the former appears to be a more important channel. There is also evidence of feedback effect from growth to finance, although the channel of feedback effect is not that clear.

Structure of the paper is; section 2 presents a brief overview of financial sector reform and financial development in Bangladesh Section 3 makes a selective literature review on finance growth relation. Section 4 explains the model, data and methodology of the paper. Empirical results are presented in section 5. Finally, section 6 concludes the paper.

2. Financial Sector Development in Bangladesh: A Brief Overview

Bangladesh started its journey with a nascent and underdeveloped financial sector. Over time, financial sector grew gradually. Since the 1990s this sector is experiencing dynamic changes out of the Financial Sector Reforms program, Central Bank reforms and other economic policy reforms. In the early days, financial sector was heavily regulated by the government and the central bank. Financial sector was dominated by the state owned commercial banks. Interest rates were set by the central bank. Since the

1980s non-bank financial institutions started to grow in limited scale. One or two private banks started to operate on a small scale. Major waves of development in the financial sector came up with the implementation of Financial Sector Reform Program (FSRP) starting in1989 as a component of structural adjustment program (SAP) endorsed by the multilateral donor agencies. Under this reform program, interest rates were liberalized over several phases. Although central bank keeps an eye on the market interest rate, it is by and large determined by the market. Both banks and non-bank financial institutions were allowed to operate in the private sector, although permission to set up new financial institutions is quite restrictive. Nevertheless, a number of private commercial banks emerged since 1990s. Private Banks now dominate in deposit collection and advancing loans. Non-bank financial institutions in the private sector also grew at a similar pace. Reforms also took place in the operations of the central bank. Since the 1990, Bangladesh Bank (the central Bank of Bangladesh) started to move away from the use of direct quantitative monetary control to more indirect way of monetary management. It now conducts monetary policy relying more on market based instruments along with direct instruments within a more vigilant environment. As a result of all these reforms in the financial sector and overall economic policy reforms, the financial sector of Bangladesh has developed a lot. Financial deepening measured by broad money to GDP increased from around 12 per cent in early 1980 to more than 50 per cent in recent years. Private sector credit grew from around 6 percent to more than 40 percent of GDP during this time span. Stock market capitalization increased from less than 2 percent to around 15 percent of GDP. However, market for fixed income securities and financial derivatives are still virtually absent. Thus, on the whole, the financial sector in Bangladesh is now more vibrant, although the sector is not yet comparable to that of developed market economies.

3. Finance - Growth Nexus: A Literature Review

There is a vast literature examining the finance growth relationship covering both developed and developing countries. We will make a selective

review of the literature to identify major issues on the topic. Theoretical literature goes back even to Schumpeter (1912) which viewed that a well-functioning financial system would induce technological innovation by identifying, selecting and funding those entrepreneurs that would be expected to successfully implement their products and productive processes. There is a broad literature discussing the channels through which financial development can affect economic growth. The theorists in this regard can be grouped into two schools of thought: (1) the structuralists and; (2) the repressionists. The structuralists (Goldsmith, 1969; Gurley and Shaw, 1955; Patrick, 1966; Thornton, 1996; Demetriades and Luintel, 1996; Berthelemy and Varoudakis, 1998) contended that the quantity and composition of financial variables induce economic growth by directly increasing saving in the form of financial assets, thereby, encouraging capital formation. It may also help increase productivity of capital and thus help growth raising total factor productivity (Goldsmith, 1969). The repressionists' view led by McKinnon (1973) and Shaw (1973) asserted that maintaining a low or negative real interest by financial repression is not an efficient one as it discourages savings. Rather, financial liberalization that ensures an appropriate rate of return on real cash balances encourages savings and enhances the availability of loanable funds. This in turn helps augment investment and efficiency of capital allocation that promotes economic growth. Thus, financial development may promote economic growth at least in two ways. First it may promote economic growth by enhancing capital accumulation. Second, it may also foster growth in terms of enhancing productivity that comes out of increasing efficiency or technological innovation. The later role of finance in growth has become important with the emergence of endogenous growth theory since the late 1980s. A good number of papers (Greenwood and Jovanovic, 1990; Bencivenga and Bruce, 1991; Levine, 1991; Saint-Paul, 1992) developed endogenous growth model that emphasize productivity growth or innovation based on the role of financial intermediation. Levine (1997) postulated a schematic view of functions of financial sector and identified two channels through which it affects growth: capital accumulation and technological innovation. Cross country study by King & Levine (1993) found that higher levels of financial

development are positively associated with faster rate of economic growth, physical capital accumulation and economic efficiency improvement. Similarly, Benhabib and Spiegel (2000) found that indicators of financial development are correlated with both total factor productivity (TFP) growth and investment.

Another issue that appeared as important one is the direction of the finance growth relation. Patrick (1966) recognized two possible directions of causality. The first goes from the real economy to the financial sector. This "demand following" view suggests that financial intermediation increases in order to provide services to an expanding real economy. On the other hand, the "supply leading" view works in the opposite direction, from financial sector to economic growth, as discussed above. The most interesting scenario, as suggested by Lewis (1955) postulated a two way relationship between financial development and economic growth. This means that financial market develops as a consequence of economic growth which in turn feeds back as a stimulant to real growth. Thus, there are three possible relationships between financial development and economic growth: finance-led growth, growth driven finance, and the two-way causal relationship that is termed feedback. Empirically the causality issue is examined by and large through Granger causality test. However, the evidence about causal relationship between financial depth and economic growth is not uniform at all. For example, Jung (1986) found bi-directional causality between financial and real variables using post-war data for 56 countries. While Demetriades and Hussein (1996) found little evidence that financial sector development causes economic growth, Wachtel and Rousseau (1995) found that financial sector development does Granger cause economic growth. While Kamat and Kamat (2007) found robust empirical evidence in favor of supply leading hypothesis for the Indian economy, Islam, Habib & Khan (2004) found demand driven hypothesis for Bangladesh. Akinlo and Egbetunde (2010) found that financial development Granger causes economic growth in Central African Republic, Congo Republic, Gabon, and Nigeria while economic growth Granger causes financial development in Zambia. However, bidirectional relationship between financial development

and economic growth was found in Kenya, Chad, South Africa, Sierra Leone and Swaziland. Sinha and Macri (2009) found a two-way causality relationship between income and financial variables for India and Malaysia, one-way causality from financial variables to income variables for Japan and Thailand and reverse causality for Korea, Pakistan and Philippines.

A few attempts have been made to study the finance growth relationship in Bangladesh, but the conclusions are not uniform. Rahman (2004) estimates SVAR model and finds evidence that financial development has long run impact on both investment and per capita income, particularly in the post financial sector reform period. On the other hand, Islam, Habib & Khan (2004) conducted a conitigration and causality analysis for financial development and economic growth in Bangladesh and found somewhat opposite results. Contrary to popular belief, the paper found that finance does not Granger cause growth, but rather growth cause financial development in Bangladesh. The studies however did not make any explicit attempt to examine the channels of finance growth relationship.

4. The Model, Methodology and Data

3.1 The Model

The two routes of financial development to growth and the possible feedback can be explained by the following equations:

$$y = f(k, A) \quad (1)$$
$$k = f(FD) \quad (2)$$
$$A = f(FD) \quad (3)$$
$$FD = f(y) \quad (4)$$

Where, y = Per capita income, k = per capita capital, A = index of total factor productivity (TFP) and FD = index of financial development. Equation (1) is the production function in intensive form, equation (2) and (3) denote the impact of financial development on capital formation and

productivity improvement. Equation (4) defines probable feedback from finance to growth. To keep our research tractable with Toda–Yamamoto (1995) procedure in a multivariate setting we consider two alternative VAR models. Model 1 considers the linkage among financial development, productivity growth and economic development with possible feedback. Model 2 considers the linkage among financial development, capital accumulation and economic development with possible feedback. These two models can capture two alternative routes of financial development to growth along with any possible feedback effect.

3.2 Methodology

Granger Causality test is widely used to test the causal relationship between financial development and economic growth. While most of the studies used Granger causality procedure in a bivariate setting, a large number of papers examined the causal relationship in Vector Autoregressive (VAR) framework. Motivated by number of studies (Shan and Morris 2002; Sari and Soytas, 2009; Akçay, 2011; Khan, 2013; Khan and Hossain, 2013) in investigating causal relationship between variables in other fields, the Toda–Yamamoto (1995) procedure is applied in this study in a multivariate setting to test for long run Granger causality among finance, growth and the channel through which finance stimulates growth. The Toda–Yamamoto procedure is more flexible than other procedures of Grangers causality test because it does not require any knowledge of the integration of data series and co-integration properties of the Vector Autoregressive (VAR) system. The method can be applied regardless of the existence of cointegration as long as the order of integration of the process does not exceed the true lag length of the model (Toda and Yamamoto, 1995, p.225). Causality is established through a standard Wald test for restriction on parameters of the estimated augmented VAR model. Parameters of the system are estimated using Zellners' (1970) seemingly unrelated regression (SUR) method as it increases the efficiency of the causality test particularly when disturbances of equations are correlated. Augmented VAR is estimated with lag length of $k+d_{max,}$ where k is the optimum lag length of the VAR system and d_{max} is the

maximum order of integration of the variables.

The following two alternative VAR models are estimated using the SUR method to examine causality among financial development, growth and the two possible channels through which finance affects growth:

$$\begin{bmatrix} \ln YL_t \\ \ln TFP_t \\ \ln FD_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} \ln YL_{t-1} \\ \ln TFP_{t-1} \\ \ln FD_{t-1} \end{bmatrix} + \ldots + A_k \begin{bmatrix} \ln YL_{t-k} \\ \ln TFP_{t-k} \\ \ln FD_{t-k} \end{bmatrix} + \ldots + A_{k+d} \begin{bmatrix} \ln YL_{t-k-d} \\ \ln TFP_{t-k-d} \\ \ln FD_{t-k-d} \end{bmatrix} + \begin{bmatrix} e_{G_t} \\ e_{TFP} \\ e_{FD} \end{bmatrix} \quad (1)$$

$$\begin{bmatrix} \ln YL_t \\ \ln KL_t \\ \ln FD_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} \ln YL_{t-1} \\ \ln KL_{t-1} \\ \ln FD_{t-1} \end{bmatrix} + \ldots + A_k \begin{bmatrix} \ln YL_{t-k} \\ \ln KL_{t-k} \\ \ln FD_{t-k} \end{bmatrix} + \ldots + A_{k+d} \begin{bmatrix} \ln YL_{t-k-d} \\ \ln KL_{t-k-d} \\ \ln FD_{t-k-d} \end{bmatrix} + \begin{bmatrix} e_{G_t} \\ e_{I_t} \\ e_{FD} \end{bmatrix} \quad (2)$$

Where, A_i's are vectors of coefficients of the per capita GDP growth variable YL, level of per capita capital stock is KL, financial development variable FD and total factor productivity TFP with A_0 as an identity matrix. VAR model (1) explores finance growth relation through augmenting TFP and VAR model (2) explores finance growth relation through capital formation.

Implementation of Toda and Yamamoto (TY) procedure requires three steps. First, we need to find maximum order or integration (d_{max}) in the variables along with determination of optimal lag length (k) of the VAR system. While alternative information criteria may be used in selecting lag length, ADF test is preferred to determine the order of integration in data. In the second step, a VAR in level needs to be estimated using SUR method. Finally, standard Wald tests are applied to the first *k* vector autoregressive (VAR) coefficient matrix to make causal inference in Granger sense. The Wald statistic follows a Chi-square distribution asymptotically where degrees of freedom equals the number of "zero restrictions". This asymptotic distribution holds regardless of the order of integration and hence the test is applicable as a

causality test whether the data series are stationary or not. The test also does not need any reference to co-integration.

3.3 The Data and Construction of Variables

Annual data from FY 1976 to FY 2012 is used for empirical analysis. The ratio of broad money (M2) to GDP is used as the financial development indicator of Bangladesh. This is basically the liquid liabilities of the financial system that includes currency plus demand and interest bearing liabilities of financial intermediaries. Although there are few alternative measures of financial development, we use M2/GDP as it is the most comprehensive measure of financial development. This data is available for a long span from relevant sources. An increase in the monetary aggregate ratio may also be interpreted as an improvement in financial deepening in the economy. Economic growth in Bangladesh is measured by the per capita real GDP (Y). Capital stock data for the period 1981-2001 is taken from Rahman and Rahman (2002) that estimates the capital stock for this period using perpetual inventory method with a detail estimate of depreciation rate. Estimate of capital stock is extended both backward and forward using same methodology and comparable measure of gross fixed capital formation to cover our sample period of study. Data source for GDP per capita, M2/GDP and gross fixed capital formation is World Development indicators. Labour force is measured by number of workers which is extracted from the relevant data series of Penn World Table Database 7.3. Total factor productivity is estimated by using a Cobb-Douglas production function assuming constant returns to scale.

$$Y = AK^{\alpha}L^{(1-\alpha)}$$

Here, Y, K, L are output (GDP), capital and labour respectively. A is the Total factor productivity or productive efficiency, α symbolizes the capital coefficient or output elasticity of capital and (1- α) symbolizes labor coefficient or output elasticity of labour. Given the data on Y, K, and L we can easily get an index of productivity once we have the value of α. We use α

= 0.49 following Rao-Hassan (2011).

4. Empirical Results

4.1 Determination of the Order of Integration and Optimum Lag

The existence of causal relationship between economic growth, TFP, capital formation and financial development in Bangladesh is examined following three steps of Toda and Yamamoto (TY) procedure mentioned above. All the variables are measured in log for our empirical analysis.

We start with finding order of integration in data series by applying ADF test in both levels and first difference in data series of the variables. Table 1 report the results of ADF test. It is evident that null of unit root cannot be rejected in levels for all variables except TFP. Null of unit root is rejected for TFP. Thus, all the data series are nonstationary in levels, but TFP is stationary in levels. However, null hypothesis of unit root is rejected for all the four variables when the test is conducted in difference. Thus, YL, KL and FD data series are integrated of order one, whereas TFP data series is integrated of order zero.

Table 1
ADF Statistics for Testing for Unit Roots in log of Variables

Variables	ADF Test Statistics at Level		ADF Test Statistics at 1st Difference		Order of Integration
	t-ADF	P- value	t-ADF	P- value	
LnYL	-1.852	0.657	-4.98	0 .002	I(1)
lnTFP	-5.388	0.001	-5.663	0.000	I(0)
lnKL	1.866	0.999	-2.989	0.046	I(1)
lnFD	-2.918	0.169	-6.029	0.000	I(1)

To determine the optimal lag length of the VAR system, we used several criterion viz. the Sequential modified LR test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SIC), and Hannan-Quinn information criterion (HIQ) lag selection criteria are used to determine optimal lag length of VAR system of this study. Result under alternative criteria is reported in Table 2A and 2B. In

case of model 1, except SIC, all criteria indicate that the optimum lag length of the variables is three. In case of model 2, all criteria indicate that the optimum lag length of the variables is three. Hence, we take lag order of VAR(k) as 3. Therefore, the equations of the system according to Toda and Yamamoto (TY) methodology above has to be estimated as a VAR($k+ d_{max}$) = VAR(4).

Table 2A
Lags under Different Criteria for VAR model - 01

Lag	LogL	LR	FPE	AIC	SC	HQ
0	105.7410	NA	3.97e-07	-6.226726	-6.090680	-6.180951
1	265.6716	281.0901	4.24e-11	-15.37403	-14.82985	-15.19093
2	282.7188	26.86236	2.65e-11	-15.86175	-14.90943	-15.54132
3	299.8280	23.84913*	1.68e-11*	-16.35321	-14.99275*	-15.89546*
4	309.5008	11.72463	1.74e-11	-16.39399*	-14.62539	-15.79891

VAR Lag Order Selection Criteria
Endogenous variables: G, TFP, FD
Exogenous variables: None

Table 2B
Lags under Different Criteria for VAR model -02

Lag	LogL	LR	FPE	AIC	SC	HQ
0	76.38563	NA	2.35e-06	-4.447614	-4.311568	-4.401838
1	231.3518	272.3648	3.39e-10	-13.29405	-12.74986	-13.11095
2	250.6043	30.33723	1.85e-10	-13.91541	-12.96309	-13.59498
3	267.8390	24.02416*	1.17e-10*	-14.41449*	-13.05402*	-13.95673*
4	276.4660	10.45697	1.29e-10	-14.39188	-12.62328	-13.79680

VAR Lag Order Selection Criteria
Endogenous variables: G, K, FD
Exogenous variables: None

4.2 Testing for Causality

To implement the Toda and Yamamoto Granger causality test, we have to estimate the augmented VAR model with lag length four (4) as suggested in the previous section. Both the systems of equation (1) and (2) with suggested lag length are estimated as a "Seemingly Unrelated Regression" (SUR) model by Maximum Likelihood. We then apply Wald test for restrictions on the parameters of the estimated VAR(4).

Table 3
Toda and Yamamoto 'Granger No-causality Test' Tri-variate VAR Results of Model-01

Null Hypothesis	$k+d_{max}$	Wald Statistics	p-values	Direction of Causality
lnTFP does not Granger Cause lnYL	3+1	13.0206	0.0112	TFP ↔ YL
lnYL does not Granger Cause lnTFP	3+1	23.9800	0.0001	
lnM2 does not Granger Cause lnYL	3+1	13.5428	0.0089	M2→ YL
lnYL does not Granger Cause lnM2	3+1	9.03805	0.0602	
lnTFP does not Granger Cause lnM2	3+1	3.1697	0.5298	M2 → TFP
lnM2 does not Granger Cause lnTFP	3+1	16.1207	0.0029	

Table 3 presents tri-variate causality test results among financial development, total factor productivity (TFP) and per capita income (PCI). First, we observe a two-way causality between TFP and per capita income. Two-way causality between TFP and PCI is quite obvious as TFP growth is a part of output growth. Secondly, while M2 Granger causes PCI, the null of no-causality in reverse direction is not rejected. Thus, there is a unidirectional causality from financial development to growth after we control for TFP. This may be an indirect indication of the importance of other channel in directing financial development to growth. There is also a unidirectional causality from financial development to TFP as evidenced from the fact that M2 Granger causes TFP but not the reverse. This is quite consistent with the theoretical literature that emphasizes the role of financial development in productivity growth; but the effect of productivity growth on financial development is not even considered. Combining all three causality results of table 3, we can say that finance causes growth through the TFP growth channel. It also provides indirect indication of the positive role of other channels through which finance stimulates growth. Feedback effect from growth to financial development is not revealed once we control for TFP.

Table 4
Toda and Yamamoto 'Granger No-causality Test' Tri-variate VAR Results of Model-02

Null Hypothesis	$k+d_{max}$	Wald Statistics	p-values	Direction of Causality
lnKL does not Granger Cause lnYL	3+1	13.0900	0.0108	KL ↔ YL
lnYL does not Granger Cause lnKL	3+1	32.0149	0.0000	
lnM2 does not Granger Cause lnYL	3+1	6.5889	0.1593	YL → M2
lnYL does not Granger Cause lnM2	3+1	12.7892	0.0124	
lnKL does not Granger Cause lnM2	3+1	11.0995	0.0255	M2 ↔ KL
lnM2 does not Granger Cause lnKL	3+1	19.4032	0.0007	

Table 4 presents tri-variate causality test results among financial development, per capita capital (KL) and per capita income (PCI). Similar to the results reported in previous table a two-way causality between per capita capital and per capita income is observed. Not only capital growth augments income growth, but also income growth causes capital growth. The feedback effect from growth to capital accumulation is the recognition of the fact that capital accumulation is endogenous in the sense that savings and investment depend on income. Possible endogeneity of capital growth is recognized in several economic papers such as Caselli et al (1996) and Krueger and Lindahl (2001). We also see a two-way causality between financial development and per capita capital. Financial development causes capital accumulation through mobilizing savings and investment. As capital growth results in overall economic development, it has also a feedback effect on financial sector of the economy. However, there is only a unidirectional causality from per capita income to financial development. The result is quite interesting as it implies that once we control for capital accumulation, finance to growth causality disappears and feedback effect from growth to finance become prominent. This is an indication of the importance of capital accumulation channel for the causality from finance to growth. However, the route is not that important for the reverse causality from growth to finance as

it exists even controlling for capital accumulation.

Thus, finance to growth relation in Bangladesh is corroborated through both the channels: capital accumulation and TFP growth. This is supportive of theoretical prediction that finance may stimulate both capital and productivity. However, accumulation channel seems to be stronger as finance to growth causality exists even if TFP is controlled and the causality disappears when capital is controlled. This is consistent with the fact that growth accounting exercise in Bangladesh shows that capital accumulation counts a larger fraction of GDP growth compared to that of TFP growth (Mujeri, 2004). On the other hand, Feedback effect from finance to growth is somehow complicated. Feedback effect from growth to finance disappears when TFP is controlled and feedback effect appears prominent when capital is controlled, giving an impression that feedback channel mostly works through TFP channel. However, there is strong bidirectional causality between finance and capital. Thus, exact route of the feedback affect is not that clear. Despite this complicacy, this finding is consistent with economic theory that it is the overall development that has a feedback effect on financial development. With economic development, financial sector experience an induced growth and the channel of it is non-important.

5. Conclusion

This paper investigated the financial development and economic growth relationship in Bangladesh and tried to identify the importance of routes through which the probable two-way relationship works. The Toda and Yamamoto granger no-causality test is applied into two alternative VAR Models to identify tri-variate causality among the relevant variables. Our first finding is that, finance causes growth through both capital accumulation and total factor productivity growth. However, capital accumulation seems to be a more important route than the TFP growth in the finance growth relationship of Bangladesh. On the other hand, although there is evidence of feedback effect from finance to growth, the channel of feedback is not that clear.

These findings have important implications. Financial sector reforms that started in late 1980s in Bangladesh have augmented financial development in this country which were helpful in stimulating both capital formation and TFP growth. Probable feedback effect is an indicator that economic growth itself may take care of further development of financial sector. However, as the financial sector has not yet developed enough to result in significant improvement in total factor productivity along with the fact that feedback channel from finance to growth is not that clear, one can infer that reliance on endogenous growth of financial sector may not be sufficient to accelerate economic growth at a desired level in Bangladesh. Rather, further reform of the financial sector is needed to foster financial sector development so as to increase efficiency and accelerate economic growth. In particular, government needs to work in creating a variety of financial instruments and improve the efficiency of financial sector so that it has impact on augmenting the total factor productivity growth.

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Appendix 1:

Summary of the SUR Estimation in VAR System of Model-1

Independent Variable	$lnYL_t$		$lnTFP_t$		$lnFD_t$	
	Coefficient	*p*-value	Coefficients	*p*-value	Coefficients	*p*-value
$lnYL_{t-1}$	2.232577	0.0000	1.168683	0.0002	3.806899	0.0279
$lnYL_{t-2}$	-1.176338	0.0063	-1.431760	0.0002	-4.664536	0.0293
$lnYL_{t-3}$	-0.213485	0.6465	-0.011906	0.9765	1.194495	0.6101
$lnYL_{t-4}$	0.191905	0.4298	0.357449	0.0938	0.200954	0.8691
$lnTFP_{t-1}$	-1.179619	0.0040	-0.224170	0.5151	-3.492874	0.0829
$lnTFP_{t-2}$	1.076997	0.0044	1.381655	0.0001	5.216264	0.0060
$lnTFP_{t-3}$	0.270066	0.5328	0.146317	0.6973	-2.870446	0.1901
$lnTFP_{t-4}$	-0.419947	0.1453	-0.615813	0.0156	1.457388	0.3129
$lnFD_{t-1}$	-0.009501	0.7892	-3.58E-05	0.9991	1.171612	0.0000
$lnFD_{t-2}$	-0.024353	0.6274	-0.008180	0.8511	-0.606559	0.0188
$lnFD_{t-3}$	0.107755	0.0154	0.046549	0.2203	0.303998	0.1672
$lnFD_{t-4}$	-0.046543	0.1740	-0.027027	0.3620	-0.230045	0.1816
C	-0.064257	0.8757	-0.437029	0.2240	-5.002207	0.0181

Appendix-2

Summary of the SUR estimation in VAR system of Model-2

Independent Variable	$lnYL_t$		$lnKL_t$		$lnM2Y_t$	
	Coefficients	*p*-value	Coefficients	*p*-value	Coefficients	*p*-value
$lnYL_{t-1}$	1.511654	0.0000	-0.034825	0.8647	2.264698	0.0076
$lnYL_{t-2}$	-0.707892	0.0148	0.829665	0.0180	-2.187659	0.1169
$lnYL_{t-3}$	-0.042387	0.8795	-0.497666	0.1446	-0.750743	0.5823
$lnYL_{t-4}$	-0.005207	0.9731	0.038379	0.8372	1.207496	0.1125
$lnTFP_{t-1}$	0.494017	0.0024	0.546051	0.0053	2.087157	0.0080
$lnTFP_{t-2}$	-0.399009	0.0127	0.467998	0.0154	-2.783236	0.0005
$lnTFP_{t-3}$	-0.134266	0.5118	0.031475	0.8986	1.073388	0.2834
$lnTFP_{t-4}$	0.198432	0.1307	-0.325069	0.0422	-0.323051	0.6107
$lnFD_{t-1}$	-0.037529	0.3324	0.076416	0.1051	1.126443	0.0000
$lnFD_{t-2}$	-0.015031	0.7724	-0.042676	0.4977	-0.533858	0.0384
$lnFD_{t-3}$	0.069490	0.1209	0.096705	0.0752	0.232134	0.2853
$lnFD_{t-4}$	-0.049971	0.1641	-0.010958	0.7992	-0.214650	0.2193
C	0.394003	0.2361	0.125467	0.7537	-5.244585	0.0018