A model of growth and finance: FIML estimates for India

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14 May 2008

Wednesday, 14 May 2008

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Abstract

Many empirical works addressed the nature of the relationship between economic growth and financial developments. Although these studies concede that they are interdependent, they have used single equations methods for estimation. In particular in the country specific studies the Granger causality tests are applied to equations estimated with the single equations methods to determine whether financial developments cause growth or vice versa. This paper uses the full information maximum likelihood method to estimate a two equations model of growth and finance for India. We also argue that in virtually all these empirical works the specification of the output equation is unsatisfactory. Our results with the Indian data show that there is no evidence to support the view that finance follows where enterprise goes. Furthermore, financial developments have a small but significant permanent growth effect in India.

JEL Codes: 011, 016, E44, C320

Keywords: Steady State Growth Rate, Financial Development, Solow Model, Simultaneous Equation Model

[1] We thank Rup Singh and V. Krishna Chaitanya for help with data collection.

1. Introduction

The relationship between the rate of growth of output and developments in the financial sector has been estimated by several studies with the panel data methods. Demirgüç-Kunt and Levine (2008) recently surveyed this literature based on the cross country methods.[2] A few works have also estimated these equations with country specific time series data; see Ang and McKibbin (2007), Ang (2008) and Luintel, Khan, Arestis and Theodoridis (2008). Luintel et al. (2008) find that country specific time series estimates seem to be more useful than panel data methods. According to them cross country studies make the unrealistic assumption that "one size fits all" but the growth effects of financial variables differ between groups of countries depending on their stage of financial maturity. Arestis (2005) and Rioja and Valev (2004) made a similar observation because the more developed a financial system is, the higher the likelihood of growth causing finance and not vice versa.[3]

These studies generally acknowledge that growth of the financial sector and output are mutually dependent. But no attempt seems to have been made to specify a simultaneous equations model to analyse the strength of this interdependence. Some routinely apply the Granger causality tests to equations based on the single equations time series methods.[4]

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[2] Demirgüç-Kunt and Levine (2008) have surveyed works based on the panel data methods with stationary variables. Recently Luintel, Khan, Arestis and Theodoridis (2008) have used Pedroni's (1999 and 2001) panel data methods for non-stationary variables. Since Demirgüç-Kunt and Levine (2008), Rioja and Valev (2004) and Luintel et al., (2008) have listed several works, to conserve space, many of works papers are not listed in our paper.

[3] Rioja and Valev (2004) have actually used panel data methods but divided their 74 countries into 3 groups (low, intermediate and advanced) according to the development of their financial sectors. They found that financial development has uncertain growth effects in countries with low levels of financial development, high growth effects in the intermediate category and smaller but significant effects in countries with highly developed financial sector. This suggests that cross country studies should allow for nonlinear growth effects for financial developments.

[4] Ang and McKibbin (2007, p. 216), for example, noted that finance and growth may be interdependent and a simultaneous equations model is more appropriate. But they used the Granger causality tests for their equations for Malaysia. These equations are estimated with a single equation time series methods to conclude that growth causes finance and not vice versa. Later Ang (2008) has estimated a 6 equations model for Malaysia but used again a single equations estimation method. Therefore, his findings—though very

This approach has limitations because the Granger causality tests are not true cause and effect tests. The often cited justification that "cause occurs before the effect" depends on selecting the dates for 'before' and 'after'. Granger (1988, p.201) explicitly stated that "The name is chosen to include the *unstated assumption* that possible causation is not considered for any arbitrarily selected group of variables, *but only for variables for which the researcher has some prior belief that causation is, in some sense, likely*." (our italics). The basis for any prior belief is a well justified theoretical argument. These causality tests are essentially tests for specifications for the best forecasting equations of changes in the dependent variable. This is emphasized by Stock and Watson (2003, p.449) with the observation that ``While `Granger predictability' is a more accurate term than `Granger causality' the latter has become part of the jargon of econometrics''. Therefore, to understand the interrelationship between growth and finance it is necessary to estimate, at the least, a minimal simultaneous equations model and this is the main purpose of our paper. We estimate a two equation model with the full information maximum likelihood method (*FIML*) for India for the period 1970-2006.

The outline of this paper is as follows. Sections 2 and 3 discuss the specification and estimation issues respectively. Empirical results are presented and discussed in Section 4; and Section 5 concludes.

2. Speciation Issues

In many studies on the effects of the growth enhancing variables like developments in the financial sector or trade openness or foreign aid etc., the specifications used for the output equation are arbitrary. Commenting on such unsatisfactory specifications Easterly, Levine and Roodman (2004) observed that "This literature has the usual limitations of choosing a specification without clear guidance from theory, which often means there are more plausible speci?cations than there are data points in the sample." Another weakness is that annual growth rates of output in the country specific studies and five year average growth rates in the panel data studies do not accurately measure the unobservable steady state growth rate of output (*SSGR*) of the theoretical growth models. Conceptually *SSGR* is similar to the natural rate of unemployment and their estimates should be derived by

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perspective—are unlikely to throw light on the true simultaneous nature of the growth-finance relationships. Furthermore, his specification of the output equation is arbitrary.

estimating the non-steady state models with observable variables. Furthermore, simulations with the closed form solutions show that a typical economy takes several decades to reach its steady state; see Sato (1963), Jones (2000) and Rao (2006). That five year average growth rates, which are typically used in many panel data studies, are unsatisfactory to proxy *SSGR* is corroborated by Easterly et al. (2004). When they have used panels of various lengths instead of five year average growth rates in a well known paper on the effects of aid by Burnside and Dollar (2000), some crucial parameters have become insignificant. Therefore, it seems that what can be estimated with the annual or short panel data, at best, is the production function. The *SSGR* can be derived from the production function by solving for the equilibrium growth rate.

For this purpose we extend the Solow (1956) growth model to capture the permanent growth effects of financial developments (FD) through their effects on the total factor productivity. FD may also have a level effect which can be captured by making the exponent of capital a function of FD. Therefore, we start with a standard and a modified Cob-Douglas production functions with constant returns and Hicks neutral technical progress as follows.

$$y_t = A_0 e^{gT} k_t^{\alpha} \tag{1}$$
$$y_t = A_0 e^{(g_0 + g_1 FD_t)T} k_t^{(\alpha_0 + \alpha_1 FD_t)} \tag{2}$$

where y = per worker output, A_0 = initial stock of technology, T = is time, FD = a measure of financial development and k = capital per worker. The standard and modified production functions are in (1) and (2) respectively. The level and growth effects of FD will be zero if α_1 and g_1 equal to zero and (2) reduces to (1). The steady state properties of the Solow (1956) model, based on the standard production function, are well known. The level (y^*) and the rate of growth rate of the steady state per worker output ($\Delta \ln y^*$ = $SSGR$) are:

$$y^* = \left(\frac{s}{d+n+g} \right)^{\frac{\alpha}{1-\alpha}} A \tag{3}$$
$$\Delta \ln y^* = \Delta \ln A = g \tag{4}$$

where s = saving rate, d = rate of depreciation, n = rate of growth of labour force and A = stock of knowledge in the steady state. If FD has both growth and level effects as in equation (2), then the permanent growth effect of FD is a bit more complicated to compute because α like A is no more a constant. The permanent level effect of equation (2) is:

$$y^* = \left(\frac{s}{d+n+g} \right)^{\frac{\alpha_0+\alpha_1 FD}{1-\alpha_0-\alpha_1 FD}} A \tag{5}$$

The $SSGR$ implied by the above is:

$$\Delta \ln y^* = \left(\frac{\alpha_1}{(1-\alpha_0-\alpha_1)} \right) \left(1 + \frac{\alpha_0+\alpha_1 FD}{(1-\alpha_0-\alpha_1)} \right) \Delta FD + g_0 + g_1 \Delta FD \tag{6}$$

When FD has no level and growth effects i.e., $g_1 = \alpha_1 = 0$, equation (6) reduces to (4).

3. Estimation Issues

Estimation of simultaneous equations models with non-stationary variables are not well developed compared to estimation with the classical methods. One simple procedure is to convert the non-stationary into stationary variables by differencing. However, in such an approach some important information on the relationship between the levels of these variables will be lost. It is precisely for the purpose to retain this valuable information the London School of Economics (LSE) economists and econometricians have developed the general to specific approach ($GETS$) of which Professor David Hendry is the most ardent exponent.

We shall use this method (more on this shortly) to estimate our model. Our output equation is the production function in equation (2). In the specification of financial development (FD), it is assumed to depend basically on output and the reserve ratio set by the central bank. Our minimal model, in the levels of the variables with growth and level effects for FD and without error terms for simplicity, is follows.

$$y_t = A_0 e^{(g_0 + g_1 FD_t)T} k_t^{(\alpha_0+\alpha_1)} \tag{7}$$

$$FD_t = \beta_0 + \beta_1 T + \beta_2 \ln y_t + \beta_3 LGSRAT_t \tag{8}$$

$$\ln y_t \equiv \ln(y_t) \tag{9}$$

where $LGSRAT$ = the ratio of bank reserves to total deposits. Some additional variables have been used in some empirical works to explain *FD*. These are usually dummy variables to capture financial repression i.e., controls on the interest rates and credit policies. Generally $LGSRAT$ may be adequate because it will be correlated with these dummy variables. Variations on our specification are also possible to capture non-linear effects, if any, of FD. Such nonlinear effects, as noted by Rioja and Valev (2004), may be appropriate for the panel data studies.

GETS specification, based on the assumption that disequilibrium in one equation also affects the other variable, is as follows:

$$\begin{aligned}\Delta \ln y_t = {} & \lambda_{11}[\ln y_{t-1} - (\ln A_0 + (g_0 + g_1 FD_{t-1})T + (\alpha_0 + \alpha_1)\ln k_{t-1})] \\ & + \lambda_{12}[FD_{t-1} - (\beta_0 + \beta_1 T + \beta_2 \ln y_{t-1} + \beta_3 LGSRAT_{t-1})] \\ & + \text{Lagged differences of } \ln(k),\ \ln(y),\ FD \text{ and } LGSRAT \qquad (10)\end{aligned}$$

$$\begin{aligned}\Delta \ln FD_t = {} & \lambda_{21}[\ln y_{t-1} - (\ln A_0 + (g_0 + g_1 FD_{t-1})T + \alpha \ln k_{t-1})] \\ & + \lambda_{22}[FD_{t-1} - (\beta_0 + \beta_1 T + \beta_2 \ln y_{t-1} + \beta_3 LGSRAT_{t-1})] \\ & + \text{Lagged differences of } \ln(k),\ \ln(y),\ FD \text{ and } LGSRAT \qquad (11)\end{aligned}$$

The λs are the adjustment coefficients with respect to the lagged error correction terms (*ECMs*) which are shown in the square brackets. They measure the deviation from the relevant equilibrium for the variable and their signs should be negative for the negative feedback adjustments to work. For simplicity we have not shown the lagged first differences of the variables i.e., the *ARDL* terms. For obtaining the parsimonious versions of these equations, only significant lagged changes are generally retained in the empirical work.

GETS specifications are generally misunderstood after the popularity of the unit roots, cointegration and *VAR* methodologies. Since most macro variables are *I(1)* in levels, *GETS* approach is seen as an unbalanced method because both *I(0)* and *I(1)* variables are present in the estimated equations; and the standard classical methods, instead of time series methods, are used for estimation. This is in spite of repeated clarifications by

Hendry that if the underlying economic theory is valid, a linear combination of the variables in the *ECM* should be *I(0)*.[5]

Due to the lack of a well developed time series method to estimate simultaneous equations models, *GETS* approach seems to be a pragmatic option. Therefore, we have estimated the above model and its variants with *FIML*. *FIML* has several advantages over other instrumental variables methods like the three squares least squares (3SLS). Amemiya (1977) showed that *FIML* in non linear systems is asymptotically more efficient than *3SLS* under assumption of normal distribution in error terms. Subsequently Phillips (1982) offered an excellent example of a non linear model for which *FIML* is consistent for a wide class of error distributions. The main advantage of *FIML* is that, as shown by Hausman (1975), it may be interpreted as an instrumental variables estimator in which all the nonlinear restrictions on the reduced form coefficients are taken into account in forming the instruments. This is contrary to the case for *3SLS*, which forms the instruments from unrestricted estimates of the reduced form equations. Consequently, *FIML* uses more information about the model than *3SLS*. Finally, *FIML's* asymptotic efficiency does not depend on the choice of instruments. The optimal instruments are generated within the estimation procedure. This contrasts with the instrumental variable estimators where the choice of instruments could be more complex in nonlinear models; see Hayashi (2000).

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[5] Hendry (2000) actually thinks that the concept of cointegration is blindingly obvious and does not even warrant formalization implying that the need for time series econometrics is overestimated. Rao (2007) and Rao, Singh and Kumar (2008) elaborate some merits of *GETS*. Granger (1990) in his appraisal of *LSE*'s *GETS* approach says that the *LSE* methodology is a mid-point between the classical econometrics strategy, with heavy dependence on economic theory, and the theoretical pure time series techniques. While this is a pragmatic observation, it is difficult for those with a good training in economic analysis to accept Granger's implicit suggestion that relationships between economic variables can be dscovered and understood with single equation time series methods. For this reason the Sims (1980) *VAR* methodology, where all the variables are interdependent, sounds more reasonable though it is difficult to implement. It is also noteworthy that a prize offered in the 1990s by a leading econometrics journal to submit one example with the time the series methods—where a specification based on economic theory is shown to be wrong—seems unclaimed to date.

4. Empirical Results

Our model of two equations and an identity is estimated with *FIML* for India for the period 1970 to 2006.[6] Definitions of the variables and sources of data are in the appendix. *FD* is constructed as a weighted average of (i) the ratio of commercial bank assets to the assets of the central bank plus commercial banks, (ii) the ratio of *M3* to *GDP* and (iii) the ratio of reserves of commercial banks to *GDP*. The weights are selected with the principal components method; see Ang and McKibbin (2007) for a similar method.

All variables are tested for unit roots and are found to be *I(1)* in levels and I(0) in their first differences[7]. These results are not reported to conserve space and may be obtained from us. Three basic specifications viz., (a) *FD* has both growth and level effects (b) *FD* has only growth effects and (c) *FD* has only level effects are estimated. In the first instance we have retained in these three estimates both the own and cross equation *ECM* terms. But the cross equation *ECM*s were insignificant and in our subsequent estimates only the own *ECM* terms are retained. Three other modifications are also made. Firstly, the trend in the *FD* equation is found to be nonlinear and we have used a cubic trend. Next, in the dynamic part of the output equation only $\Delta \ln y_{t-2}$ is significant and for the *FD* equation only ΔFD_{t-2} and ΔFD_{t-3} are significant. Finally, the coefficient of autonomous *TFP* i.e., g_0 in equation (10) was very small and insignificant. This may be due to a high correlation of 0.976 between trend and trend multiplied by *FD*. Therefore, it is arbitrarily constrained to be 0.01. When this coefficient is constrained to be zero, there is virtually no change in the estimated parameters. Specifications with these changes of the model, with minor changes in the notation for the coefficient in equations (10) and (11) are:

$$\Delta \ln y_t = \lambda_{11}[\ln y_{t-1} - (a_0 + (g_0 + g_1 FD_{t-1})T + (\alpha_0 + \alpha_1)\ln k_{t-1})] + \phi \Delta \ln y_{t-2} \tag{10a}$$

$$\Delta \ln FD_t = \lambda_{22}[FD_{t-1} - (b_0 + \beta_{11}T + \beta_{12}T^2 + \beta_{13}T^3 + \beta_2 \ln y_{t-1} + \beta_3 LGSRAT_{t-1})] + \gamma_1 \Delta FD_{t-2} + \gamma_2 \Delta FD_{t-3} \tag{11a}$$

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[6] Additional identities used are $\Delta \ln y_t \equiv \ln y_t - \ln y_{t-1}$ and $\Delta FD_t \equiv FD_t - FD_{t-1}$.

[7] The *ADF* and *KPSS* tests are applied. While the *ADF* test showed that $\Delta \ln k$ is *I(1)* the *KPSS* test showed that it is *I(0)*. For the other three variables $\ln y, \ln FD$ and $\ln LGSRAT$ the results from these two tests are the same.

where the new intercepts a_0 and b_0 are for $\ln A_0$ and β_0, respectively, in equations (10) and (11). Estimates of these two equations are in Table 1.

In the estimates of column (1) where FD is assumed to have both growth and level effects all the coefficients are significant at the conventional levels except the intercept and the coefficient of output in the finance equation. It is noteworthy that both adjustment coefficients λ_{11} and λ_{22} are highly significant and the speed of adjustment in the finance equation is more than twice for the output equation. The share of profits α_0 is almost the same as its stylised value of one third in many growth accounting exercises. However, due to the level effects of FD this increases to 0.455 at the mean value of FD. The permanent growth effect of FD is small but significant. At the mean values of FD and ΔFD, using equation (6), this is 0.7 percent if autonomous TFP is zero.[8] This estimate is close to an estimate of 0.6 percent by Levine (1997) with panel data methods.

Parameters of the FD equation are also well determined. The coefficient of $LGSRAT$ has the expected negative sign implying that higher reserve ratios have negative effects on the development of the financial sector. $LGSRAT$ has the highest value of 17 percent in 1994 with a low value of 5.5 percent in 2003. From 1970 to 1994 its trend is positive (4.3%) and since then it is negative (-7.6%) due to the liberalisation policies of the government after the 1991 financial crisis. The coefficient of output in the FD equation has the expected positive sign but it is insignificant. We have also tested the residuals of both equations for unit roots and serial correlation up to the 4th order. Both residuals are found to be *I(0)*.[9] The coefficients of the lagged error terms are insignificant except that of the 2 period lagged error of the output equation. But this is significant at 6.5% but not at 5%.

Alternative estimates of our model with the assumptions that (i) level effects of FD do not exist but the growth effects exist and (ii) only level effects of FD exist but its growth effects do not exist did not make the coefficient of output in the FD equation significant. Estimates with these two assumptions are in columns 2 and 3 of Table 1.

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[8] The mean values of FD and ΔFD are 46.9280 and 1.0264 respectively.

[9] The ADF (3) test statistics, respectively, are -3.7563 and -3.4330. The 5% critical value is -2.9706.

Table 1

FIML Estimates of the Growth-Finance

Model for India, 1973-2006

	(1)	(2)	(3)
LLH	66.446	63.748	61.888
Output Equation: Dependent variable $\Delta \ln y_t$			
$ECM_{t-1}(\lambda_{11})$	-0.414 [0.00] *	-0.181 [0.17]	-0.074 [0.56]
$Intercept\,(a_0)$	-2.933 [0.00] *	-3.100 [0.00]	-1.682 [0.19] *
$T\,(g_0)$	0.01#	0.01#	0.01#
$T \times FD_{t-1}(g_1)$	0.571E-05 [0.00] *	0.517E-05	0#
$\ln k_{t-1}(\alpha_0)$	0.303 [0.00]*	0.364 [0.05]**	0.795 [0.01]*
$FD_{t-1} \times \ln k_{t-1}(\alpha_1)$	0.323E-02 [0.00]*	0#	-0.251E-02 [0.80]
$\Delta \ln y_{t-2}(\theta)$	0.229 [0.08]**	0.163 [0.263]	0.134 [0.44]
SEE	0.013	0.0114	0.013
DW	2.288	2.406	2.390
FD Equation: Dependent variable ΔFD_t			
$ECM_{t-1}(\lambda_{22})$	-0.892 [0.00]*	-0.900 [0.00]*	-0.894 [0.00]*
$Intercept\,(b_0)$	60.8255 [0.17]	56.688 [0.11]	55.246 [0.13]
$T\,(\beta_{11})$	4.065 [0.00]*	4.017 [0.00]*	4.036 [0.00]*
$T^2(\beta_{12})$	-0.192 [0.00]*	-0.189 [0.00]*	-0.190 [0.00]*
$T^3(\beta_{13})$	0.302E-02 [0.00]*	0.298E-02 [0.00]*	0.300E-02 [0.00]*
$\ln y_t\,(\beta_2)$	**8.542** **[0.39]**	**7.587** **[0.34]**	**7.277** **[0.38]**
$LGSRAT_t(\beta_2)$	-53.835 [0.00]*	-53.263 [0.00]*	-53.623 [0.00]*
$\Delta FD_{t-2}(\gamma_1)$	0.350 [0.05]**	0.353 [0.04]*	0.345 [0.00]*
$\Delta FD_{t-3}(\gamma_2)$	0.395 [0.02]*	0.387 [0.02]*	0.384 [0.04]*
SEE	0.600	0.600	0.600
DW	1.655	1.667	1.671

Notes: # constrained estimate. * and ** are for significance at 5% and 10% levels respectively. *LLH* is value of the log likelihood. *p*-values are in the square brackets.

It can be seen that while the restriction that the level effect of *FD* is zero of the estimates in column (2) gave reasonably good estimates of the parameters, estimates in column (3) with the restriction that growth effects are zero did not yield good estimates of the output equation. In both equations of columns (2) and (3) the coefficient of the lagged *ECM* of the output equation and the coefficient of output in the *FD* equations are insignificant. While the share of profits in column (2) is close to one third, in the equation of column (3), with no growth effects, it is more than twice at 0.8. It is significantly higher than the stylised value of one third at the 10% level. The log-likelihood ratio test conclusively rejects that the restrictions used on the coefficients of the equations in columns (2) and (3). The computed $\chi^2_{(1)}$ test statistics for these restrictions, respectively, are 5.396 and 9.116. These values are exceed the 5% critical value of $\chi^2_{(1)} = 3.84$. Therefore, the null that these restrictions are valid cannot be accepted and our preferred equation is the one in column 1 with both the growth and level effects for *FD*.

Since in all the three equations the coefficient of output in the *FD* equation is highly insignificant, the Indian data do not to support the often quoted view of Robinson (1952) that "finance follows where enterprise goes". In this respect Arestis (2005) may be more accurate with an observation that the chances of finance causing growth, not vice versa, are higher in developing country than in advanced countries. Needless to say this needs further work with a group of countries and this is beyond the scope of our present paper.

In the developing countries governments generally impose controls on the financial sector to achieve other distributional objectives such as meeting the credit needs of the farmers, small scale industries and the poor. The Gramina Bank movement in Bangladesh and India is a good example. Such distributional objectives should not be dismissed as thwarting the growth rate of output without an understanding of the priorities of the governments in the developing countries. Our model seems to indicate that the trade-off between growth and the distribution objectives may be very flat because the growth effects of *FD* are small. For example, if the mean value of *FD* is doubled in India, the additional increase in the permanent growth rate is hardly 0.1%. This seems to support the Lucas (1988) view that the importance of liberalising financial markets to improve economic growth is somewhat overemphasised in the finance-growth literature. Furthermore, as noted by Banerjee, Cole and Duflo (2004) the growth of financial sector in India was unprecedented since 1969 after the commercial banks were nationalised. However, this does not mean that liberalisation policies are unimportant because such policies may improve the effects of other growth enhancing policies. As Arestis (2005) has observed, it is desirable to peruse these liberalisation policies gradually because a faster pace, without developing adequate regulatory mechanisms, may cause financial crises as in the East Asian countries during 1997-1998 and the collapse of several non-bank financial intermediaries (known as Chit-Funds) in India during this period.

5. Conclusions

In this paper we have developed and estimated with *FIML* a simultaneous equations model for India to understand the nature of independence between financial developments and the rate of growth of output. Our estimates showed that while growth depends on developments in the financial sector, there is no evidence to say that finance follows where enterprise goes. Our model has some new features. Firstly, we have used a growth theory based specification for the output equation. Secondly, we argued that annual growth rates and growth rates with 5 year averages are not good proxies for the unobservable long term equilibrium growth rate. This long term growth rate, which is our *SSGR,* should be derived from the estimates of appropriate specifications of the non-steady state equations. Thirdly, we have used the *LSE GETS* specifications which are estimated with a systems method and showed their use in empirical work with non-stationary variables. If some commonly used specifications for the output and finance equations are estimated with a single equations time series method, e.g., the fully modified OLS of Phillips and Hansen (19xx), it will be found that output is a significant determinant of *FD*. Whether *FD* affects output depends on the specifications used for the output equation.[10] Fourthly, although we have estimated a model with a country specific data, our specification and methodology also have implications for the cross country studies. Fifthly, we have used Finally, our estimates showed that although the growth effects financial development are significant they are very small. Therefore the trade-off between liberalising financial markets and

[10] The estimated cointegration equations with *FMOLS* are: (a) $ln(y) = -5.836+0.036FD+ 0.327LGRAT$ and (b) $FD = 150.888+24.637ln(y) - 21.621LGRAT$. The coefficients of *FD* in the output equation and output in the *FD* equation are significant. Since it is hard to justify that $\ln(y) = f(FD, LGSRAT)$ is a meaningful specification of a production function. Therefore, if it is assumed that $\ln(y) = \phi(\ln k, FD)$ where *FD* is treated as an arbitrary shift variable *FMOLS* gives $ln(y) = -1.4586 + 0.788ln(k) – 0.162E^2FD$. While the coefficient of capital is significant that of *FD* is insignificant and has the wrong sign. These results support the view that finance follows where enterprise goes. The aforesaid arbitrary specification of the production function was used by Luintel et al., (2008) and Ang (2008). In contrast our *FIML* estimates imply that there is no evidence to support the view that finance follows enterprise.

growth is very flat. This does not mean that financial markets should be controlled by the governments in the developing countries like India. It seems that Arestis' (2004) perspective observation that gradual liberalisation policies, with simultaneous developments of regulatory institutions to avoid financial crisis, seems to be a pragmatic alternative because the costs of financial crises may far exceed the benefits of small gains in growth through rapid liberalisation policies. However, this aspect needs further study since our paper only suggests that the growth effects of financial liberalisation are very small.

There are some limitations in our paper. Firstly, our model of two equations is only a minimal model. Secondly, the specification of our *FD* equation is also parsimonious. Thirdly, the role of non-bank financ ial institutions and the stock market in India have been ignored. Thirdly, our model has ignored other growth enhancing variables like trade openness etc. Instead we assumed that these variables are trended but we could not adequately capture the effects of these trended growth improving variables. Finally, although we hinted that *FD* may have some indirect growth effects, we did not explore these possibilities. We hope that other researchers will use our model, results and methodology to discover further possibilities in Indian and other countries.

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Data Appendix

Indicator	Source
Y is the real GDP at constant 1990 prices (in millions and national currency)	Data are from the UN National accounts database.
L is labour force or population in the working age group (15-64), whichever is available	Data obtained from the World Development Indicators. WDI online. URL:http://www.worldbank.org/data/onlinedatabases/onlinedatabases.html
K is real capital stock estimated with the perpetual inventory method with the assumption that the depreciation rate is 4%. The initial capital stock is assumed to be 1.5 times the real GDP in 1969 (in million national currency).	Investment data includes total investment on fixed capital from the national accounts. Data are from the UN National accounts database.
The ratio of *M3* to *GDP*	Data are taken from the updated version (as for August, 2007) of Beck, T., Demirgüç-Kunt, A. and Levine, R. (2000).
The ratio of commercial bank assets to the assets of the central bank plus commercial banks	Data are taken from the updated version (as for August, 2007) of Beck, T., Demirgüç-Kunt, A. and Levine, R. (2000).
LGSRAT is the ratio of reserves of commercial banks to GDP	IMF International Financial Statistics.