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Estimating the permanent growth effects of financial liberalization: The case of Malaysia

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Abstract

We argue that the specifications used to estimate the permanent growth effects of reforms in the financial sector are unsatisfactory. Using a modified specification and data for the period 1970 to 2004, we show developments in the financial sector in Malaysia have a small but significant permanent effect on the growth of output. Our results are different from the conclusions in a recent work on this topic.

JEL classification: E44; O11; O16; O53
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1. Introduction

Ang and McKibbin (2007) is a welcome addition to the growth literature with country specific time series data. They found that, in Malaysia, *growth* of financial sector is caused by *growth* of output but not vice versa. While this is an important finding, their specifications of the cointegrating equations and econometric methodology seem to be inadequate to support their conclusion. We show that when a proper specification for output is used, growth of financial sector has a permanent, albeit small, growth effect in Malaysia.

2. Testing for Permanent Growth Effects

Permanent growth or the steady state growth rate is an unobservable variable. Conceptually it is similar to the natural rate of unemployment implying that it has to be derived by estimating an appropriate non-steady state model after imposing the steady state equilibrium conditions. Therefore, to examine whether policies and developments have any permanent growth effects, it is necessary to estimate an appropriate specification in which the growth effects of the policy and development variables are captured to some extent. For this purpose one may use an extended Solow (1956) model or an appropriate endogenous growth model. However, an extended Solow model is simpler to estimate.[2]

Ang and McKibbin did not estimate a well justified or even an *ad hoc* output or growth equation. What they have estimated are some cointegrating equations consisting of linear specifications between the level of developments in the financial sector (*FD*) and the level

[2] In many applied papers, with panel data and country specific time series type, the rate of growth of output is simply regressed on a few growth enhancing variables. Panel data studies use typically 5 year average growth rates as a proxy for the steady state growth rate. However, simulations with the closed form solutions show that an economy can take several decades to reach the steady state. Therefore, 5 year averages are not a good proxy for the steady state growth rate; see Easterly, Levine and Roodman (2004), Demirgüç-Kunt and Levine (2008) and Rao (2008) for a similar view. Panel data works based on this methodology may overestimate the growth effects because average growth rates based on short panels also have a short run growth component and this is zero by definition in the steady state.

of per capita output (*ED*). This is augmented with additional potential determinants of the growth of *FD* viz., the real rate of interest (*RI*) and a measure of financial repression (*FR*) and their model can be denoted as $f(FD, ED, RI, FR) = 0$.

Although they used three other alternative variables to measure *FD* and estimated four cointegrating equations, to conserve space we shall confine to the specifications based on $FD = \Phi(ED, IR, FR)$. If this were to be used to determine the growth effects of *FD*, it may be normalized on *ED* so that $ED = \Psi(FD, RI, FR)$. Needless to say one has yet to come across an output, or more specifically a production function without factor inputs, where the level output *ED* depends only on variables like *FD*, *RI* and *FR*. Therefore, the specifications of Ang and McKibbin, which may be adequate to analyze the effects of *ED* on *FD*, are inappropriate for analysing the effect of *FD* on *ED* or its growth rate.

To determine the permanent growth effects of *FD* or other policies it is convenient to assume that their permanent growth effects, if any, take place through their effects on the rate of growth of total factor productivity (*TFP*). Edwards (1998) has suggested a similar approach to analyze the permanent growth effects openness. For the purpose at hand we extend the Solow (1956) growth model as follows by making *TFP* to depend on *FD*. We also add trade openness (*TRA*) as an additional determinant of *TFP*. With these modifications the production function in the Solow model, with constant returns and the Hicks neutral technical progress, can be expressed as:

$$y_t = A_0 e^{(g_1 + g_2 TRA_t + g_3 FD_t)T} k_t^{\alpha} \qquad (1)$$

where y = per worker output, A_0 = initial stock of technology and k = capital per worker and *TRA* = ratio of exports plus imports to output. In the steady state, the growth effects of *TRA* and *FD* are given, respectively, by g_2 and g_3. The effects of other omitted growth improving factors, if significant and trended, will be captured by g_1.

We have estimated the cointegrating equation between the variables in equation (1) for the period 1970-2004 with the Johansen method.[3] Definitions of the variables and data sources are in the appendix. Both the Eigenvalue and Trace tests showed that there is a single cointegrating equation and the estimates, normalized on *y*, and with the t-values in the parentheses, are:

$$\ln y = \underset{(5.695)^{***}}{0.3468} \ln k + (\underset{(1.685)^{*}}{0.0023} FD + \underset{(2.013)^{**}}{0.0033} TRA)T \qquad (2)$$

***, ** and ** signify significance at the 1%, 5% and 10% levels respectively. The estimates of the coefficients in (1) are all significant at the conventional levels and are highly plausible. The implied share of profits is close to the stylized value of one third. A 1% growth in *FD* per period permanently increases the growth rate by 0.2% and a 1% increase in *TRA* adds permanently 0.42% to growth at their mean values. These are plausible magnitudes and imply that growth of financial sector is productive and has a small permanent growth effect in Malaysia.[4] It is not appropriate to apply the Granger causality tests[5] to determine whether this cointegration equation can be identified as the output or as an equation for financial development because equation (1) is a production

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[3] We have conducted *ADF, KPSS* and Elliot, Rothenberg and Stock Point Optimal (*ERS*) unit root tests and found that the variables are *I(1)* in levels and *I(0)* in their first differences except *log k*. *ADF* tests could not reject the null that $\Delta \ln k$ has a unit root, the *KPSS* test accepted the null that $\Delta \ln k$ is stationary at the 1% level and the *ERS* test conclusively rejected the null at the 5% level. Therefore, we proceed with the assumption that $\Delta \ln k$ is stationary. These test results, not reported to conserve space, may be obtained on request. A first order *VAR* is selected because our sample size is small.

[4] When *TRA* was removed, the coefficient of *FD* increased to 0.004 and when *FD* is removed the coefficient of *TRA* increased to 0.005. The share of profits marginally decreased to 0.31 in the first but increased to 0.38 in the second respectively.

[5] The Granger causality tests are not true cause and effect tests. The often cited justification that "cause occurs before the effect" also depends on the selected time to distinguish between before and after. Granger (1988, p.201) explicitly says 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*." (My italics). Needless to say many believe that an inverted production function is highly inappropriate to explain *FD*.

function and not an equation to explain *FD*. Since the Johansen method is a systems method the endogenous variable bias will be minimal.

To examine how well our estimates can explain the observed facts we have estimated a few alternative specifications of the *VECM* equations and our selected equations are given in Table 1. In equation (I) of Table 1 the lagged *ECM* term, implied by equation (2), is augmented with the lagged changes of the variables of the model. The optimal lag order is estimated with a routine in PcGets; see Hendry and Krolzig (2001 and 2005). However, in equations (II) and (III) we have retained some current period changes in the variables because this has significantly increased the explanatory power. The downside is that if there is endogeneity, because $\Delta \ln k_t$ is likely to be correlated with $\Delta \ln y_t$, the estimated coefficients will be biased. Although this bias is not of a serious consequence for our conclusion based on the cointegrating equation in (2), a comparison between the estimates of equation (I) with (II) and (III) indicates that the adjustment coefficient may have been overestimated in the two latter equations. In order to minimize this bias, we have used the London School of Economics and Hendry general to specific (GETS) method with the two stage nonlinear instrumental variables option in Microfit (2000); see Hendry and Krolzig (2001 and 2005). These estimates are in the last column of Table 1 as equation (IV). The implied cointegrating equation of this equation is as follows.[6]

$$\ln y = (\underset{(2.639)^{*}}{0.0038}\ TRA + \underset{(1.840)^{**}}{0.0021}\ FD)T + \underset{(9.313)^{*}}{0.4168}\ln k \qquad (4)$$

with the t-ratios in the parentheses. Comparison between this estimate with GETS with the Johansen method in (2) shows that their differences are minor. The Wald test could not reject the null (at the 5% level) that the share of profits of about 0.42 in (4) is not significantly different from 0.33 in equation (2).

Comparisons of the estimates of the speed of the adjustment coefficients in (II) and (III) with that of (IV) show that the overestimation bias is not large in the two equations with

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[6] Ericsson and MacKinnon (2002) give a cointegration interpretation for GETS and computed the critical values based on the surface response approach. The computed test static is the t-ratio of the adjustment coefficient which is 4.9138 in (IV) and exceeds the 5% critical value of Ericsson and MacKinnon.

contemporaneous changes of the explanatory variables. In any case this is not the main issue in Ang and McKibbin and this paper. Of the four equations in Table 1, equation (II) has the highest explanatory and predictive power and may be used by the policy makers in Malaysia for forecasting the growth effects on output of further growth in *FD* and *TRA*, both in the short and long runs.

3. Conclusions

In this paper we showed that growth of the finance sector in Malaysia has permanent and significant growth effects on output although they are small. These growth effects are about half of such effects due to improvements in trade openness. The main implication of our paper is that specifications used for explaining growth in the financial sector are inappropriate to test for its growth effects on output. While we cannot deny that growth in output does cause growth of the finance sector, it is also necessary to reform the finance sector to improve the steady state growth rate of the economy. However, further work on the lines of our present paper and Ang and McKibbin is necessary, preferably with country specific time series data, to determine the simultaneous relationships between the growth of output and the growth of the financial sector in other developing countries. In the meantime, the conclusions of our paper should be treated with caution. The same caveat also applies to Ang and McKibbin's claim that their results support Robinson's (1952) view that 'where enterprise leads finance follows' but not the hypothesis that a bank-based financial system induces long-term growth in the real sector.

Table 1

VECM Equations

	I	II	III	IV
Intercept	---	-6.0586 [0.000]	-5.9313 [0.000]	-8.3403 [0.000]
Trend	-0.0021 [0.028]	0.00391 [0.000]	0.0036 [0.001]	---
ECM_{t-1}	-0.01237 [0.003]	-0.78698 [0.000]	-0.7724 [0.000]	-0.6000 [0.000]
$\Delta \ln k_t$	----	1.79752 [0.000]	1.53836 [0.000]	1.8840 [0.000]
$\Delta \ln k_{t-1}$	----	-1.0503 [0.002]		-0.6600 [0.067]**
$\Delta \ln k_{t-2}$	----	0.7874 [0.006]		
$\Delta \ln k_{t-3}$	-0.7203 [0.008]			
ΔTRA_{t-2}	0.1914 [0.010]			
ΔTRA_{t-3}		-0.0891 [0.038]		
ΔFD_t		-0.0455 [0.064]**		
ΔFD_{t-2}	0.0718 [0.089]**			
$\Delta \ln y_{t-1}$		0.5460 [0.007]		
$\Delta \ln y_{t-3}$	0.3231 [0.078]**			
$\bar{R}^2$	0.3209	0.7934	0.6526	0.57018
SEE	0.0321	0.0180	0.0230	0.0256
LLH	103.0934	125.8296	111.6022	Sargan χ^2 0.7638 [0.979]
Normality test	5.9521 [0.051]	0.1282 [0.938]	6.8588 [0.032]*	0.9669 [0.617]
AR 1-4 test	0.9138 [0.476]	0.2914 [0.879]	2.0088 [0.130]	3.3782 [0.066] (AR-1 only)

Notes: *P*-values are in square brackets and * and ** stand for 5% and 10% levels of significance. The first 3 equations are estimated with PcGets and the 4th equation is estimated with the 2 Stage Non-linear Instrumental Variables option in Microfit. Lagged values of the variables are used as instruments. The intercept in IV was insignificant and constrained to be zero. *ECM* term in the 4th equation is estimated as:

$$\ln y_{t-1} - \left[(0.0038\ TRA_{t-1} + 0.0021\ FD_{t-1})T + 0.4168 \ln k_{t-1}\right]$$

Data Appendix

Y is the real GDP at constant 1990 prices (in million of 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 are obtained from the World Development Indicator CD-ROM 2002 and updated with the new WDI online available at 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 of the national currency). Investment data includes total investment on ?xed capital from the national accounts. Data are from the UN National accounts database.

TRA is computed as a ratio of exports and imports of goods and services on GDP. Data are obtained from UN's national accounts.

FD is the first principal component of the logs of (a) the ratio of M3 to output, (b) the ratio of broad money to output and (c) the ratio of credit to private sector to output. Data on these monetary variables are from the 2005 CD of IMF International Financial Statistics.

$y = (Y/L)$ is per worker output and $k = (K/L)$ is per worker capital

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