Financial development and economic growth in India: some evidence from non-linear causality analysis

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Abstract

In the light of the recent observation that the relationship between financial development and economic growth is one of non-linear and limitations of granger test, this paper re-examined relationship in the framework of non-linear Granger causality employing (Diks and Panchenko in Stud Nonlinear Dyn Econ 9(2), 2006) test. The limitation of non-stationarity of earlier study is also addressed using the Toda and Yamamoto (J Econ 66:225–250, 1995) test. The present study attempts to undertake this exercise, as causal inference is sensitive to the twin limitations of non-stationarity and non-linearity. We used principal component analysis to construct index of financial development comprising alternative measures of financial development. The analysis has been carried out for the period 1990–

2010. The results of Toda–Yamamoto and Diks–Panchenko tests reveal that financial development and economic growth bear no causal relationship, a finding contrary to the findings of several of the existing studies in the Grangerian framework.

Notes

1. For detailed literature review see among others, Levine (1997, 2005), Trew (2006) and Ang (2008).

2. In India M3 is used as measure of broad money.

3. Results are given “Appendix 2”.

4. We have skipped the details of the test. Interested readers may refer to Kapetanios et al. (2003) and Tiwari and Shahbaz (2014).

5. We have also performed TY test on the level data, but there is no difference in findings. Results can be obtained, upon request.

6. For Methodological details please refer to Johansen (1988) and Johansen and Juselius (1990).

7. D–P test also has been performed on the unfiltered data; there is no difference in overall findings, though values of statistics differ.

8. As Diks and Panchenko (2006) suggested that value of epsilon depends on the length of time series and given 1.5 for 100 observations. We have also used epsilon value of 0.7, but there is no difference in inference.

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Appendices

Appendix 1

The main data sources include global financial development (GFDD), Reserve Bank of India (RBI), Prowess and Bombay stock exchange (BSE). All data are annual. The sample period is 1990–2010. The variables taken from other than GFDD, have been calculated following the same procedure as mentioned in GFDD database.

Proxy to measure	Indicator code	Description of variables	Source
Financial institution access	ABA	Bank accounts per 1000 adults	RBI (no. of Bank accounts) and World Bank (Population) data
	ABB	Bank branches per 100,000 adults (commercial banks)	RBI (no. of branches of commercial Banks) and World Bank (Population) data
Financial market access	AMcap	Market capitalization outside of top 10 largest companies to total market cap. (%)	Prowess
Financial institution depth	DBPCG	Bank private credit to GDP (%)	Global financial development Database (GFDD: 2012), please visit www.worldbank.org/financialdevelopment for detail definition
	DDMBG	Deposit money bank assets to GDP (%)	
	DDMBC	Deposit money bank assets to deposit money bank assets and central bank assets (%)	
	DLLG	Liquid liabilities to GDP (%)	
	DCAG	Central bank assets to GDP (%)	
	DFDG	Financial system deposits to GDP (%)	
	DLVG	Life insurance premium volume to GDP (%)	

Proxy to measure	Indicator code	Description of variables	Source
	DNLVG	Non-Life insurance premium volume to GDP (%)	
	DPCG	Private credit by deposit money banks and other financial institutions to GDP (%)	
Financial market depth	DSMG	Stock market capitalization to GDP (%)	(GFDD: 2012)
	DSTG	Stock market total value traded to GDP (%)	
	DOPDG	Outstanding domestic private debt securities to GDP (%)	
	DOPPDG	Outstanding domestic public debt securities to GDP (%)	
	DIDG	International debt issues to GDP (%)	
Financial institution efficiency	ENIM	Ratio of net interest income to total assets (%)	RBI
	ENITI	Non-interest income to total income (%)	
	EOCA	Intermediation cost to total assets (%)	
	EROA	Return on assets (%)	
	EROE	Return on equity (%)	
	ECTI	Cost to income ratio (%)	

Proxy to measure	Indicator code	Description of variables	Source
	ECEG	Credit to government and state-owned enterprises to GDP (%)	(GFDD: 2012)
Financial market efficiency	ESTRNR	Stock market turnover ratio (value traded/capitalization) (%)	(GFDD: 2012)
Financial institution stability	EBCTA	Bank capital to total assets (%) (bank capital = capital plus reserves; assets = total assets	RBI
	EBCBD	Bank credit to bank deposits (%)	(GFDD: 2012)
	ELADF	Liquid assets to deposits and short term funding (%)	
Financial market stability	EVOLST	Volatility of stock price index	BSE

Appendix 2

PCA has been applied on the raw data and has been performed on the symmetric correlation matrix. The first principal component explains the variations of the dependent variable better than any other linear combination of the indicators used. We therefore consider the first principal component as an appropriate measure of four characteristics of financial system as well financial sector development in each PCA performed. The component scores/loadings indicate the contributions of variables included in the PCA to the standardized variance of the first principal component. These contributions are the weights used to construct the financial indexes by using aggregation method.

Variables/indicators	Component scores/loadings used to generate factor scores

Variables/indicators	Component scores/loadings used to generate factor scores
Weights used to construct financial access (AFS) index	
ABA	0.42
ABB	0.438
AMcap	0.519
Weights used to construct financial depth (DFS) index	
DBPCG	0.028
DDMBG	0.128
DDMBC	0.231
DLLG	0.141
DFDG	0.136
DLVG	0.050
DNLVG	0.220
DPCG	0.028
DSMG	−0.068
DSTG	0.140
DOPDG	−0.217

Variables/indicators	Component scores/loadings used to generate factor scores
DOPPDG	0.197
DIDG	−0.233
Weights used to construct financial efficiency (EFS) index	
ENIM	0.145
ENITI	0.192
EOCA	0.030
EROA	0.282
EROE	0.252
ECTI	−0.170
ECEG	0.169
ESTRNR	0.183
Results of PCA to construct financial stability (SFS) index	
SBCTA	0.110
SBCBD	0.508
SLADF	−0.515
SVOLST	0.057

Variables/indicators	Component scores/loadings used to generate factor scores
Weights used to construct financial development (FDI) index	
AFS	−0.223
DFS	0.469
EFS	0.426
SFS	0.161

See Tables 3 and 4.

Table 3 Variations explained by the principal components out of total variance

Table 4 Correlation between retained (first) components of PCA for all sub-indices and final index of financial development and GDP

Appendix 3

Status of variable	Levels		DF-GLS	PP	KPSS
Level	Constant	AFS	−1.021	−1.142	0.526**
		DFS	−1.929	−0.996	0.516**
		EFS	−2.521	−1.935	0.437***

Status of variable	Levels		DF-GLS	PP	KPSS
		SFS	−1.255	−0.593	0.466**
		GDP	−0.272	9.916	0.619**
		FDI	−1.458	−1.258	0.494**
	Constant + trend	AFS	−1.201	−0.414	0.402*
		DFS	−1.945***	−1.234	0.162**
		EFS	−1.867***	−2.32	0.152**
		SFS	−0.284	−1.35	0.165**
		GDP	0.349	1.931	0.174**
		FDI	−1.138	−0.997	0.128***
First difference	Constant	AFS	−6.561*	−4.976*	0.375
		DFS	−2.237*	−2.125	0.173
		EFS	−5.756*	−6.16*	0.150
		SFS	−3.526**	−2.667***	0.336
		GDP	−3.569**	−0.676	0.457***
		FDI	−5.601*	−5.154*	0.181
	Constant + trend	AFS	−5.087*	−6.301*	0.073

Status of variable	Levels		DF-GLS	PP	KPSS
		DFS	−1.855**	−2.251	0.123
		EFS	−5.607*	−8.107*	0.077
		SFS	−2.666*	−3.439*	0.070
		GDP	−3.569**	−3.269**	0.119
		FDI	−5.035*	−5.317*	0.141

The statistics are the *t*-statistics for DF-GS, adjusted *t*-statistics for PP tests and the LM statistics for KPSS test. The optimal lags for DF-GLS test were selected by Schwarz information criterion; the bandwidth for PP and KPSS tests was selected with Newey–West using Bartlett kernel. *, **, and *** denotes statistical significance at 1, 5, and 10 % level of significance, respectively

See Tables 5, 6 and 7.

Table 5 Results of non-linear unit root test

Table 6 Johansen cointegration test between GDP and sub-indices and final index of financial development

Table 7 Results of vector error correction model for GDP and SFS

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