A Restricted Co-integration Analysis of Financial Development and Economic Growth: Evidence from Pakistan

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ABSTRACT

The current financial crises once again highlighted the importance of financial sector. Credit availability to firms improves the productivity and encourages private investment both through aggregated demand and aggregated supply. Accumulation of capital and its optimal utilization is important for sustainable growth of an economy. The objective of the current study is to find the effect of financial development on economic growth. The study utilized the restricted cointegration analysis to quantify the long run association between the financial development and economic growth. The result indicates that credit, GDP growth and private investment are cointegrated and in addition, credit trigger economic growth in long run via direct and indirect channel. The study suggested that easy access to credit should be given to augment economic growth.

1.   Introduction

        Accumulation of capital and its optimal utilization is important for sustainable growth of an economy, whereas investment in both physical and human capital is indispensible. In this regards financial sector–that pools individuals' savings and meets financing requirements of businesses–plays a pivotal role in channelizing their resources to productive use. Hypothetically, availability of bank credit and its expansion to the firms induces economic activities both from aggregate supply and demand side[1]. On demand side, reduction in credit affects consumption patterns and invariably pass on to investment behavior of the firm, which in turns slowdown the overall economic activities.

        Empirical literatures discern credit (CPS) as an indicator of financial development and use it to explore its impact on economic growth. Some of the studies find that financial sector developments have a positive and significant impact on productivity growth (King & Levine, 1993). Moreover, increase in financial intermediation has strong association with long-term economic growth (Levine, 1999; Levine & Zervos, 1998) and (Beck et al., 2000). Calza et al. (2003) have used co-integration technique for Euro area to investigate the

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[1] According to Neo-Classical growth models, bank credit is an important determinant of real economic activities.

relationship between real loans and real GDP and came up with the result that real loans are positively related to real GDP in long run and the relation is negative with real short-term and long-term interest rates. Some of the studies focused on the question about the existence of a stable relation between credit and economic activities especially in USA. Among them, few authors argued that if the relation exists than it would be negative in real term (Bernanke & Gertler, 1995; Friedman et al., 1993). Bernanke and Gertler (1990) have described that "a reduction in the supply of bank credit, relative to other forms of credit, is likely to increase the external finance premium and reduce real activity". Further, Calza et al. (2006) have described a positive relation between stock of loans and real GDP[2]. More recently, Eller et al. (2010) have used Johansen cointegration test to estimate the long-term relationship as well as short-term dynamics between credit volume, industrial production, interest rates and inflation rates in CESEE[3] and results indicate that at least one cointegration relation exits in all countries except Slovakia, and partly in Hungary and Croatia. On the contrary, others argued that there is no or little impact of financial developments on neither productivity nor economic growth (Aghion et al., 2005). Using endogenous growth model De Gregorio (1996) examined the relationship between borrowing constraints, human capital accumulation, and economic growth and concluded that "tight borrowing constraints are negatively correlated with enrollment ratios and growth" also empirical evidence showed that constraints on borrowing will reduce the economic growth.

On the other hand, economic theory explains the importance of credit in the development and growth of the economy, as credit is required to finance and fulfill transaction demand of the economy. Moreover, this relation can be explored using two channels; i.e. working capital channel and private sector investment channel. In working capital channel, the firms avail credit to acquire raw material for its production and pay expenses (Blinder & Bernanke, 1989; Calza et al., 2006). On the other hand, the private investment channel explains that the firm uses financial credit for extension of business (i.e. fixed investment) and thus raising the productivity of the firm (increasing return to scale) and has a positive impact on overall growth of the economy. So keeping in view the significance of financial sector for economic development, current study tries to address the important research question.

2.   Review of Literature

Choong et al. (2004) observed financial sector development through FDI ,by choosing specific developed and East Asian countries i.e. Japan ,USA,UK ,Indonesia Korea ,Malaysia, Philippines Singapore and Thailand taking FDI and GDP as variables by using multivariate co integration and an error correction model. It is concluded that the impact of FDI is variant in developed and developing countries. This study supports a strong financial sector promotes growth.

Rahman (2004) explored the long run relationship between financial development and economic growth by taking investment and per capita income as independent variables and economic growth as dependent variable. He used Blanchard-QAH techniques of SVARs model to solve some equations based on theoretical predictions. By collecting the data from 1976-2005, the overall findings indicate that the financial development has positive effect on investment, GDP ratio and income per capita.

Ahmadi and Ghanbarzadeh (2011) scrutinized the influence of Foreign direct investment and trade openness on the economic growth of Iran by taking the data of 1978 2008. They used Bounds testing approach and found that openness is positively integrated and consequential determinant of economic growth in short run as well as long run, while foreign direct investment is positive in short run and negative in long run. A new variable exchange rate is also included in the study that remained positive in both short and long run. This study referred trade openness a key variable for economic growth.

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2 Bernanke and Gertler (1995) have argued that this relation may also include a component of countercyclical which is associated with economic agents desire to smooth the business cycle impacts on their spending.
3 CESEE includes eleven countries of Central, Eastern and South Eastern Europe (CESEE).

Salami and Oluseyi (2013) explored the connection among financial development and economic growth by taking the annual statistics covering for the duration (1960-2010) using ARDL technique. They concluded that financial development negatively affected growth. The pre and post results of reforms showed that they are not recognizable and create confusion about the efficiency of financial reforms. They suggested that if Nigeria's government wants to improve its financial sector they need solid structural reforms to trigger their economy.

Hsueh et al. (2013) scrutinized the causality between financial enhancement and economic evolution by taking 10 Asian countries using the cross section data on the RGDP and financial development from (1980-2007). They concluded that financial development augment economic growth. They reasoned that in short run monetary development is influenced by changes in the offer of speculation however researcher need to investigate long run approaches as, keeping money division and securities exchanges ought to embrace new strategies for budgetary advancement. It is additionally centered on a need to make minimal effort venture conditions for a long run development.

Asghar and Hussain (2014) observed the association between financial development and economic growth in developing countries during 1978- 2012, by taking the independent variables foreign direct investment and trade openness. They used Panel co integration test by constructing financial development index. They found trade and financial openness as key factors that affect economic growth, whereas they equal weightage human capital. Their results indicate low contact of financial development on economic growth, which is due to less developed financial structure in these countries. They further focused on the need of strong financial sector and to strengthen the long run relationship between development and economic growth.

Jedidia et al. (2014) focused on the empirical analysis of whether financial development can uplift economic growth in Tunisia during (1973- 2008) by utilizing auto-regressive lag technique to the fund development connection assuming private acknowledgment, esteem exchanged and issuing bank securities on the monetary market as money related improvement pointers. This investigation did on account of particular nation by time arrangement examines. It presumes that the local credit to the private segment positively affects monetary development while taking budgetary advancement as a driver of a long term financial development.

Caporale et al.(2015) evaluated the relationship between budgetary advancement and its result on monetary development, by utilizing board information for 10 nations. It is watched that the impact of money related advancement relies upon the development of private credit to the genuine yield development. They presumed that the beneficial outcome of fund on development is full under the adjust development of monetary divisions. Financial sector and real sector are interdependent on each other.

Madsen et al. (2018) investigated the informal relationship among financial development and economic growth by taking 65 countries, 15 of them were OECD other 50 were non OECD above the period of 1975-2000 using panel data analysis technique by taking economic growth as dependent variable while human capital, investment and international trade. They concluded that there is explicit and statistically notable symmetry between financial development and economic growth for all different financial indicators. The effect of auxiliary variables remains positive and statistically significant for OECD countries but its impact on the non-OECD countries was negative.

Wang et al. (2021) investigated the effect of financial crises arises due to pandemic on the overall economic health of the nations. The study utilized the data set of

3.   Data and Methodology

The study utilized the time series data from 1970 to 2020. The variable of GDP is dependent variable. The variable of credit to private sector is used as an independent variable, it is also a measure of financial development (Asghar & Hussain, 2014; Jedidia et al., 2014; Masoud & Hardaker, 2012). The general form of the model is given as:

$$Y_t = \mu + \sum_{i=1}^{p} \theta_i Y_{t-i} + \varepsilon_t \qquad t = 1,2,\cdots,T \tag{1}$$

where Y_t is a (4×1) vector of endogenous variables[4] such as log of Credit (*LCPS*), log of GDP (*LGDP*), log of Private Sector Investment (*LPRI*), Real Lending Rate (*RLR*) and θ_i is a (4×4) matrix of coefficients while ε_t be a (4×1) white noise process of unobservable zero mean and with a time invariant covariance matrix Σ. Log of Public Sector Investment (*LPUI*) is assumed to be exogenous in the system. Considering vector error correction mechanism (VECM), which captures the long-term as well as short run dynamics between the concerned variables, can be specified as below:

$$\Delta y_t = \mu + \prod y_{t-p} + \sum_{i=1}^{p-1} A_i \, \Delta y_{t-i} + B_i X_t + u_t \tag{2}$$

Where Π is the matrix of long run parameters that can be decomposed as $\Pi = \alpha\beta'$ in which β is the matrix of cointegrating parameters and α is the matrix of speed of adjustment parameters[5].

4. Results and Discussion

Table 1
Summary of Unit Root Tests

Variable	ADF Test**				DF-GLS Test***		Order of Integration
	Level Test Statistic	p-value	1st Difference Test Statistic	p-value	Level Test Statistic	1st Difference Test Statistic	
lCPS	-1.0402	0.7282	-3.5398	0.0124	-0.3376	-3.1959	I(1)
lGDP	-1.3985	0.5725	-4.6362	0.0007	-0.1566	-4.3015	I(1)
lPRI	-0.6797	0.8396	-5.8554	0.0000	-0.9969	-4.0292	I(1)
lPUI	-3.3750	0.0704	-4.8858	0.0019	-0.4880	-3.0535	I(1)

* Include constant and a linear trend while testing for unit root.
** Indicate rejection of null hypothesis of unit root at 10% level of significance.
*** Mackinnon (1996) critical values are used for decision making.

Table 2
Summary of the Rank Test

	Vector of Cointegration	Test Statistic	p-value
	$H_0: r = 0$	89.1506	0.0001
Trace test	$H_0: r \leq 1$	42.6788	0.0528†
	$H_0: r \leq 2$	13.7372	0.6792
Maximum Eigenvalue test	$H_0: r = 0$	46.4719	0.0005
	$H_0: r \leq 1$	28.9416	0.0788†
	$H_0: r \leq 2$	10.6757	0.5470

The conventional lag length criterion suggests that optimal lag length for Johansen methodology should be two[6]. After optimal lag length selection, Johansen cointegration test is applied which provides information about cointegrating relationships. Johansen (1988) and Johansen and Juselius (1990) have described two different likelihood ratios tests (Trace and Maximum Eigen-Value test) that determine the number the cointegrating vectors and results of these two tests are furnished in Table-2 above.

The result of Trace test and Maximum Eigen-value test shows that, at 10% level of significance, two cointegrated relationship exists between endogenous variables that is analogous with the economic theory. According to economic theory, credit impacts the economic growth via two channels (i.e. working capital channel and private sector investment channel).

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4 For simplicity, we have excluded the exogenous variable (i.e. Public Investment) from the system.
5 The speed of adjustment parameters which represent the proportion that is corrected in each short term period in case of any long term disequilibrium occur in independent variable.
6 Optimal lag length is selected on various lag length criterion i.e. Sequential modified LR test statistic, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ). LR, FPE and SC support in our case.

After detecting the cointegrated relations, we have applied Vector Error Correction Mechanism (VEM). The resulting cointegrated relationships (both the long-term coefficients and short-term dynamics) after imposing the linear restriction the two equation are given below

$$\varepsilon_t^1 = lGDP_{t-1} - 8.88 - 0.024Trend - 0.343lPRI_{t-1} - 0.078lCPS_{t-1}$$
$$\text{t-statistic} \qquad -5.8443 \qquad -4.8547 \qquad -1.3209$$
$$\varepsilon_t^2 = lPRI_{t-1} - 11.567 - 0.041Trend - 0.017lCPS_{t-1} + 0.012RLR_{t-1}$$
$$\text{t-statistic} \qquad -3.9261 \qquad -0.0914 \qquad 3.9176$$

The signs of all coefficients in both cointegrated equations are well aligned with the economic theory.

Table 4
Short Term Dynamics

Panel-A	$\Delta LGDP_t$	$\Delta LPRI_t$	$\Delta LCPS_t$	ΔRLR_t
C	0.0569	-0.0471	2.9663	80.7784
	(6.0787)	(-1.1189)	(3.2210)	(80.7784)
EC1	-0.0347	1.7448	1.0855	-12.1085
	(-0.3661)	(6.4972)	(2.2689)	(-0.7157)
EC2	-0.0765	-0.6782	-0.0798	-21.3226
	(-2.6695)	(-9.2685)	(-0.7195)	(-4.5951)
$\Delta LGDP_{t-1}$			1.2890	
			(1.6966)	
$\Delta LGDP_{t-2}$			-0.6923	
			(-0.9802)	
$LGDP_{t-1} - LGDP_{t-3}$	-0.1892	0.6204		
	(-1.7149)	(1.5148)		
$LPRI_{t-1} - LPRI_{t-3}$	0.0374	0.3103	0.3999	
	(1.5573)	(4.2429)	(2.8299)	
$\Delta LCPS_{t-1}$			0.2698	
			(1.8619)	
$\Delta LCPS_{t-2}$		0.1086	-0.1896	-11.9829
		(1.8774)	(-1.2659)	(-2.7226)
$LCPS_{t-1} - LCPS_{t-3}$	0.0669			
	(2.5779)			
ΔRLR_{t-1}	-0.0015			
	(-2.3957)			
ΔRLR_{t-2}	0.0006			
	(1.1439)			
$RLR_{t-1} - RLR_{t-3}$		0.0063	-0.0007	
		(3.1398)	(-0.3179)	
$\Delta LPUI$	0.0567	-0.1359	-0.2444	6.7359
	(3.3530)	(-1.6831)	(-3.2239)	(1.7960)
Panel-B				
R^2 Adjusted	0.601	0.7131	0.4761	0.4472
Jarque-Bera Test	0.547	0.9007	0.4323	0.0950
	(0.7608)	(0.6374)	(0.8056)	(0.9536)
LM Test	0.3138	1.7601	1.2467	0.6227
	(0.9659)	(0.1465)	(0.3382)	(0.7774)
BPG Test	0.6051	1.9725	1.2826	0.3162
	(0.7651)	(0.0966)	(0.2944)	(0.8649)
$Q_{(1)}$	1.26	0.15	0.08	0.38
	(0.26)	(0.70)	(0.77)	(0.54)
$Q_{(1)}^2$	2.13	2.14	0.73	0.26
	(0.14)	(0.14)	(0.39)	(0.61)

In Panel A, t-Statistics are in parenthesis while p values are in Panel-B.

In the long run coefficient matrix, investment and credit are positively associated with GDP and vice versa (Chaitip et al., 2015; Wang et al., 2021). whereas real interest rate is inversely correlated with investment and GDP and vice versa while there is a positive association between credit and interest rate (Lerskullawat, 2018; Masoud & Hardaker, 2012). For short-term dynamics, we have employed general-to-specific approach proposed by Hendry and Krolzig (2004) and results of short-term dynamics are reported in Table-4 below.
Based on these equations, the matrix of long run coefficient is derived as under:

Table 5
Long Run Coefficient Matrix

Variables		R.H.S. Coefficients			
		IGDP	IPRI	RLP	ICPS
L.H.S. Coefficients	*lGDP*	1.000	0.343	-0.004	0.078
	lPRI	0.200	1.000	-0.012	0.017
	RLR	-240.6	-82.64	1.000	13.88
	lCPS	12.804	59.52	0.720	1.000

Both error correction terms are significant in all four equations, therefore, referring towards the fact that no variable is weakly exogenous in the system. In the short run, real GDP and real private investments are positively associated with each other and with the private credit but both have no impact on real interest rates. However, real private credit is positively associated with growth and investment but inversely related with real interest rates. Real interest rate has a negative short run relation with real GDP and private credit. Finally, increase in public sector investment contracted the private credit and private investment by increasing the interest rates in the economy. However, the public investment has positive spillovers for economic growth. The diagnostic tests confirm the validity of short run equations.

5.   Conclusion and Policy Implications

In our research the effect of financial liberalization on economic growth is evaluated by taking the time series data from 1970-2020. The restricted cointegration approach is used to analyze data. The results indicate positive affect on financial development. The unit root test of ADF demonstrates that all factors are nonstationary at their level. According to co-integration test there is a long run relationship among economic growth and financial liberalization indicators. It has been observed that that the changes occur in credit to private sector are highly sensitive to the changes in economic development in Pakistan. As the increasing share of credit to private sector shows that it is highly significant and the country is growing economically. Stock market is positively significant at one percent level of significance which shows that stock market is leading towards economic activity.

One the basis of empirical findings the study suggests that credit to the private sector must be given on dire premise. The part of banks in designating credit to the private sector must be upgraded and the end-utilization of credit affirmed checked to maintain a strategic distance from the issue of non-performing credits. The minimal effort speculation activities can be empowered with respect to government makes monetary development and money related extending. Trainings related to business programs should be arranged to increase financial development in the country. To increase the easy access of finance can lead towards high investment. Use of advance technology can upgrade the performance of financial institutions.

Authors Contribution
Syed Muhammad Imran: conceived of the presented idea, developed the theory and estimated the empirical results.
Syed Mumtaz Ali Kazmi: completed the Literature Review and verified the analytical methods.
Syeda Sadia Bokhari: collected the data and contributed to the interpretation of the results.
Samiullah: took the lead in writing the manuscript and edited the citation and references.

Conflict of Interests/Disclosures
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