

Sensitivity Analysis of Domestic Credit to Private Sector in Pakistan: A Variable Replacement Approach Applied with Con-integration

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ABSTRACT

This study has been conducted to empirically examine the determinants of domestic credit to private sector (DCPS) in Pakistan over the period from 1980 to 2009. The relationship is determined using Johansen and Juselius's framework and NLS and ARM based error correction model to complete the long run and short run relationship analysis. We have conducted variable replacement based sensitivity analysis by examining two sets of exogenous variables. It showed that DCPS has no relationship with economic growth in Pakistan so far. Consequently, in Pakistan the development of financial sector is not making any contribution to the economic development. Further government borrowings for non development expenditures is making the lending actions of the banks oligopolistic, which is hindering the conventional flow of financing to private sector for economic development. Therefore, the monetary authority in Pakistan should adopt steeper target oriented policies for financial sector to extend credit for economic development.

JEL Classifications: E44, E51

Keywords: Pakistani financial sector; DCPS; Unit root; Cointegration; Sensitivity analysis

I. INTRODUCTION

For determination of Domestic Credit to Private Sector (DCPS) empirical studies focus on GDP, interest rates, and price indices in any form (Backe and Zumer, 2004). A common result of such research works so far is that the interest rates and national income are the most dominant variables that can explain DCPS (Backe and Zumer, 2004). Further, while discussing the relation between Finance and Income inequality (Clarke et al, 2002) states that the inequality decreases as the provision of finance increases in the economy.

Pakistani Financial Sector has been pushed in an awkward direction due to political uncertainties occurring in Pakistan during the last 30 years in comparison with the international trends in Financial Sector. While the “works” done so far reveal that the level of financial development can significantly predict economic growth (King and Levine, 1993; Levine and Zervos, 1998; Neusser and Kugler, 1998; Rousseau and Wachtel, 1998; Levine et al, 2000), but there are no “works” available about analysis of DCPS in Pakistan which examine the existence of similar relationships. It is therefore quite relevant to study the dynamics of DCPS in Pakistani economy and find out the variables that affect DCPS as exogenous factors; in doing so we will also endeavor to analyze whether there exists any relationship between the development of the economy and the growth in DCPS.

Therefore, we have the following objectives for the purpose of our study: Whether there exists any relationship between economic development and DCPS in Pakistan? In doing so we will also examine the following additional issues relating to DCPS in Pakistan:

- What contributes more to GDP; Economic Development or Financial Performance?
- As a country where government borrowings dominate the financial sector lending abilities, we will also examine the impact of government borrowing impact on DCPS in Pakistan?

The above questions are significant for the reason that in Pakistan the Financial Sector has shown significant developments during the last ten years, despite the fact that the country's economic development is at its minimal and the government borrowings have been increased manifold (SBP, 2010). For similar situations in their studies (Backe and Zumer, 2004) argued that such financial expansion would erode gradually if the underlying economic development fails to trigger at the same rate. Therefore, for examining such relationships it appears relevant to initiate some co-integrated analysis to study how the DCPS relationship varies in the short run and in the long run with respect to inclusion and exclusion of certain variables in a specific model.

II. LITERATURE REVIEW

Loans to private sector are characterized by many factors over and above its interest rates (Baltensperger, 1976; Field and Torero, 2006). The abilities of the Financial Institutions to make DCPS therefore can also get stretched and eventually adversely affected if the underlying economic growth is not accompanied with it (Backe and Zumer, 2004). In some countries the growth of DCPS has left positive impacts on economic and financial growth therefore the literature relating to such developments also provides a base for this study. An analysis of the literature available in the areas as

indicated above also shows that many studies have been made only by including the non financial variables like GDP, price indices, etc., to predict the relationship between the financial development and economic growth without considering the variables that relate directly to the financial sector.

As regards the finance-growth relationship, certain propositions state a positive relationship between financial sector development and GDP growth (Terrones and Mendoza, 2004; Mooslechner, 2003). While conducting such studies during the phases of credit expansions, prominent studies emphasize many activities, such as “(i) real business cycles caused by technological or terms-of-trade shocks (with highly procyclical output elasticity of credit demand), (ii) financial liberalization of an initially repressed financial system, (iii) capital inflows triggered by external factors, and (iv) wealth shocks originating e.g., from comprehensive structural reforms” (Gourinchas et al., 2001). Furthermore, politically driven policies such as exchange rate-based stabilizations also contribute in accelerating credit expansions by blowing up a weak consumption expansion trend (Calvo and Vegh, 1999).

Most of the work done on DCPS is in high income countries where main findings rest upon income and interest rates as exogenous variables of DCPS. Although they do consider that the supply of money affects DCPS but the strong relation there comes out to be with output in the long run. The studies state that DCPS-to-GDP has a significant positive correlation with GDP. This process is termed in financial literature as “financial deepening”. Concerning the researches on credit supply, studies have looked into the prevalence and the significance of the credit channel for a range of countries, using both macro and micro data. Although the findings take many dimensions, yet many researches including some papers on CEE countries reveal facts in favor of the credit channel. About the positive relations between finance and growth, pragmatic work has studied the direction of causality; where much of the findings are about financial deepening which stimulate economic development (Beck et al., 2000).

The significance of domestic credit to private sector is also relevant while conducting research on financial crises and in particular while discussing their forecasting; also such rapid increases in DCPS has been observed as a pivotal factor for financial crises. Although many financial crises also initiate economic depressions however, one cannot conclude from this literature that lending booms typically lead to financial crises. As Gourinchas et al. (2001) point out, “while the conditional probability of a lending boom occurring before a financial crisis may be quite high, this does not tell much about the converse, i.e., the conditional probability that a financial crisis will follow a lending boom”. In this regard we have evidences from analysis of DCPS in Pakistan during the period from 2001-2007 when the interest rates were at its minimum and the DCPS in Pakistan was booming and during the period 2008-2009 when the interest rates are on the rise and DCPS and economic growth are decreasing yet the financial sector has evidenced growth during both these periods (SBP, 2010).

In Pakistan DCPS has slowed down over the last two years due to very heavy public sector borrowings (SBP, 2010). Eventually, dynamics behind DCPS are expected to be low for quite some time as liquidity hindrances on economic segments which will not receive credit (small and medium-sized enterprises, households) are expected to increase. Further, the debt levels in such sectors are not expected to benefit which is not rationale from an intertemporal perspective. Therefore, in the longer run, DCPS expansion is expected to be mainly driven by the convergence process in per capita GDP terms (Backe and Zumer, 2004).

IMF working paper (WP/10/49) emphasizes that the financial sector attempts to reduce the cost of capital and encourages the efficient distribution of capital which helps promote the DCPS. Commenting on the financial anomaly Rajan and Zingales (1998) stated that the firms receiving majority of their operational fundings from financial institutions do not expand normally in the economies which are financially developed. Fisman and Love (2004) in their studies stated similar results in the short run horizon which pointed that the, development of financial sector helps in the redistribution of finances to industries which have high growth rates. Hartman et al. (2007) while stating results of his study wrote that the capital reallocation should not be underestimated as it is a driving force of financial development in most of the studies. According to of Hsieh and Klenow (2009), the achievements of the high performers of last decade mainly China and India are credited to the reassignment of financial resources from lesser to higher productive sectors.

What would be the importance of financial development for economic growth? The empirical literature available provides multiple viewpoints emphasizing that a financial system that performs well encourages competition, lessens and reassigns the cost of capital and capital efficiency respectively. In the economies which are financially developed, innovation also becomes higher than their counterparts in less developed economies which also yield higher returns. The large impact of capital reassignment in quantitative terms observed by Hsieh and Klenow (2009) also support the views of higher returns as stated hereinabove.

All the above researches focus on the analysis of availability of credit to domestic sector using different variables and techniques but there is no research available that takes into account financial and non financial variables at the same time and also studies sensitivity of the model with respect to inclusion or exclusion of variables specifically in Pakistan. Our methodology of this research is therefore hereunder:

III. METHODOLOGY

A. Econometric Models

Model to be evaluated:

$$\log DCPS = a_0 + a_1 \log IND_VA + a_2 \log M2 + a_3 \log T_TRADE + \varepsilon \quad (1)$$

Basic alternative models to be evaluated for sensitivity of DCPS to change in variables:

$$\log DCPS = a_0 + a_1 \log CPT + a_2 \log GDP + a_3 \log GDS + \varepsilon \quad (2)$$

$$\log DCPS = a_0 + a_1 \log GDP + a_2 \log IND_VA + a_3 \log LM2 + \varepsilon \quad (3)$$

Definitions of the Variables: DCPS = domestic credit to private sector; IND_VA = industrial value addition; M2 = supply of money; T_TRADE = total trade of import and export; GDP = gross domestic product; GDS = gross domestic savings; DCPT = domestic debt to public sector; and ε = The Error Term

B. Econometric Methodology

1. Unit Root Tests

The first step in error correction model is to determine whether the variables under consideration are stationary or not since most macro economic variables are not stationary, that is, they tend to exhibit a determine and/or deterministic and/or stochastic trend. In this paper we have applied Augmented Dicky-Fuller (ADF, 1979) test to check the order of integration. However, for the purpose of our research we have taken the logs of data before taking unit root tests.

2. Co-integration

After evaluating stationarity of each variable and specifying optimal lag length, the next step is to find out whether they are co-integrated or not, using Johansen and Juselius's (1990) framework. To carry out this test have to formulate the following mode as indicated in Equation (4):

$$Y_t = \Gamma_1(L)Y_{t-1} + \Gamma_2(L)Y_{t-2} + \dots + \Gamma_p(L)Y_{t-p} + \varepsilon_{t-p} \quad (4)$$

where Y_t represents independent variables where applicable, is a column vector and $\Gamma_i(L)$ with $i=1, \dots, p$ is a lag operator, ε is the white noise residual of mean and constant variance. The order of the model, p must be determined in advance using Schwartz Information Criterion (SIC). The null hypothesis that there is a fewer co integrating vectors have be tested using Maximal Eigen Value Test.

3. Maximal Eigenvalue

This test evaluates the null hypothesis $H_0: r=r_0$ against $H_A: r=r_0+1$ using Equation (5):

$$\varepsilon_{\max} = -T \ln (1-\lambda_{r+1}) \quad (5)$$

In this test the null hypothesis of r co integrating vectors is tested against the alternative of $r+1$ co-integrating vectors.

C. Error Correction Model

In order to calculate the long term relationship among the variables of the model NLS and ARMA least squares techniques have been used to construct Error correction model which was used by Sargan (1964) and thereafter by Engle and Granger (1987). After confirmation of co-integration in the first stage the lag order of the variables will be selected using R^2 , or Akaike Information Criteria, or Schwarz Bayesian Criteria or by Hannan-Quin Criteria. In the next step of the determination of the lag order, coefficients of the model for long run have been estimated and then estimations are carried out followed by the Error Correction Model (ECM), using the following ECM Equation (6) where ζ is the error correcting term:

$$\Delta LDCPS = a_1 \log IND_VA + a_2 \log M2 + a_3 \log T_TADE + \zeta (LDCPS_{t-1} - \beta_0 - \beta_1 LIND_V_{t-1} - \beta_2 LM2_{t-1} - \beta_3 LT_Trade_{t-1}) \quad (6)$$

1. Collection of Data

The study uses annual data on domestic credit to private sector, gross domestic product, gross domestic savings, money supply (M2), domestic credit to public sector and total trade for the period 1980-2009. The data obtained from World Development Indicators of World Bank 2010. All the variables are in Pak Rupees.

2. Results and Interpretation

The first step in determining long run relationship using error correction model is to check that whether the variables under consideration are stationary or not. A univariate analysis of each variable is carried out to check the stationarity properties of the data. Tables 1 and 2 present the results from Dickey-Fuller (ADF) test statistics for the log levels and first differences of logs of the variables domestic credit to private sector, industrial value addition, money supply (M2), total trade, gross domestic product, gross domestic savings and domestic credit to public sector, respectively. According to the results shown in Table 1, the tests indicate that the level of the series contains a unit root. In order to make the data stationary, unit root tests are re-run by taking first difference of the series. Results reported in Table 2 show that first difference series are stationary in first difference form. The series are in level form at I(0) and in 1st difference form they are I(1) (Engle and Granger, 1987). The results of stationarity tests are given in Table 1 and 2 hereunder:

Table 1
Augmented Dicky-Fuller tests: Level series

Variables	ADF	C.V (5%)
LDCPS	0.6103 (0.9873)	-2.9677
LIND_VA	-1.5875 (0.4719)	-3.0048
LM2	-0.6563 (0.8419)	-2.9718
LT_TRADE	0.9491 (0.9948)	-2.9677
GDP	0.6774 (0.9895)	-2.9677
GDS	-1.7071 (0.4165)	-2.9762
LCPT	-0.6651 (0.8402)	-2.9677

Null hypothesis is that the series has a unit root.

Table 2
Augmented Dicky-Fuller tests: 1st difference

Variables	ADF	C.V (5%)
LDCPS	-4.4687* (0.0015)	-2.9718
LIND_VA	-2.9955* (0.0476)	-2.9718
LM2	-3.7105* (0.0095)	-2.9718
LT_TRADE	-5.2671* (0.002)	-2.9718
GDP	-4.5433* (0.0013)	-2.9762
GDS	-6.4756* (0.0000)	-2.9718
LCPT	-4.5565* (0.0012)	-2.9618

* denoted rejection of null hypothesis at 5% level of significance.

3. Testing for Co-integration

Having established that all the variables in the study are integrated of order one, i.e., I (1), the second step is to test whether they are co-integrated or not (Engel and Granger, 1987). For this purpose Johansen likelihood co-integration is applied. To proceed further in the application of Johansen's test lag length has been considered as 1.

Table 3
Johansen co-integration test

Variables	Hypothesized No. of CE(s)	Eigenvalues	Maximum Eigen Statistic	5% CV
LDCPS	None*	0.7387	36.2343	28.5881
DLIND_VA	At most 1	0.4606	16.6675	22.2996
DLM2	At most 2	0.2872	9.1438	15.8921
DLT_TRADE	At most 3	0.1430	3.885	9.1645

* at None indicates only 1 co-integrating equation.

The estimated co-integrating relationship and standard errors are given in Equation (8) below:

$$\begin{aligned} \log DCPS = & -0.033899 - 1.123972 \log LIND_VA + 1.431781 \log M2 \\ & + 0.836699 \log LIT_TRADE \end{aligned} \quad (8)$$

S.E = (0.01813)(0.42760)(0.28349)(0.20985)

Johansen co-integration results are reported in Table 3. Results of maximal Eigen value tests suggest the existence of unique co-integrating relationship among the variables under consideration at 5% level of significance. This implies that the series under consideration are driven by at least one common trend. This represents the existing relationship among domestic credit to public sector, industrial value addition, money supply (M2) and total trade is not spurious.

Equation (8) above exhibits the normalized and co-integrating variables. The signs of the variables are also in line with the economic theory except the sign of industrial value addition, which was also expected to be positive. The reason for such negative relationship might be higher cost of funds resulting from tacit collusion among Financial Institutions. This appears also true in Pakistani context where the focus of Central Bank is firstly on protecting Financial Sector due to the fact that they are the only sector showing progress, and secondly in generating funds for government operations. Also the effect of the magnitude of money supply (M2) on DCPS is higher than any other variable in the model which reflects that the ability of the Banks to finance private sector depends heavily on the supply of money in the country. An interesting fact about the negative relationship of DCPS with industrial value addition and positive relationship with total volume of trade which suggests that Banks are not willing to finance industrial production but are rather interested in financing trade as one of the prime area of their business. From this we can also infer that tendency in Pakistan economy towards using imported goods is increasing.

Table 4
Table of error correction model

Variables	Coefficients	Standard Error	t-Values
Δ LIND_VA	0.3219	0.3383	0.9515
Δ LM2	0.2393	0.2382	1.0046
Δ LT_TRADE	0.3035	0.1461	2.5651
EC(-1)	-0.3693	0.1779	-2.0753
Constant	2.0082	1.2721	1.5786

$R^2 = 0.4844$; F Statistic = 2.8191; Probability = 0.0309; DW Stat = 2.2494

The results of the error correction model in Table 4 above reveal that our model is a good fit as the value of error correcting term EC(-1) is negative and significant at 5% level of significance which means that our model is convergent. Further -0.3693 value of EC (-1) shows that error in our model will be removed in 3 periods with 36.93% approx of the values will converge in 1st time period and the remaining 63.07% will converge in next two periods. Also the value of R^2 shows that our model is able to predict 48.44% dependence of DCPS on the exogenous variables which we have chosen for our study. The overall relationship of this error correcting model is also significant at 5% level of significance as the value of F statistic is within acceptable range with its probability at 0.0309. Further, Durbin Watson test statistic is also important which is near 2 and is also within its acceptable range.

4. Sensitivity Analysis

We have also checked the sensitivity of our model by analyzing the effects of two sets of exogenous variables in order to find out the results of the long term relationship of our dependent variable with the growth of our economy. The first set of exogenous variables was domestic debt to public sector, gross domestic product and gross domestic savings. These variables represent economic development and government financing for the purpose of the economy. According to the results in Table 5 it has been observed that although the value of EC (-1) is still convergent and significant at 5% level of confidence. The value of R^2 has been reduced by more than 20% from 48.44% to 37.11%. The value of F statistic has also been reduced to 1.7704 which is also not significant at 5% level of confidence. The second set of exogenous variables was gross domestic product, industrial value addition and supply of money. In other words we have now included only variable representing economic development in our model. According to the results given in Table 6 it has been observed that although the overall relationship represented by F statistic 2.6268 is significant, however, the value of error correcting term is insignificant.

IV. CONCLUSION

The objective of this paper was to empirically examine whether there exists any relationship between domestic credit to private sector and economic development in Pakistan. As a corollary to our main objective we have also conducted sensitivity analysis of relationship with certain financial and non financial variables.

Table 5
Results for sensitivity analysis

Variables	Coefficients	Standard Error	t-Values
Δ LDCT	0.0758	0.1277	0.5936
Δ LGDP	0.6517	0.2818	2.3126
Δ LGDS	-0.0918	0.0725	-1.2666
EC(-1)	-0.3692	0.1781	-2.0720
Constant	-0.4046	0.4519	-0.8952

$R^2 = 0.3711$; F Statistic = 1.7704; Probability = 0.1467

Table 6
Results for sensitivity analysis

Variables	Coefficients	Standard Error	T-Values
Δ LGDP	0.6603	0.2575	2.5636
Δ LIND_VA	0.2896	0.3594	0.8057
Δ LM2	0.5161	0.2453	2.1036
EC(-1)	-0.1669	0.1585	-1.0526
Constant	1.8360	1.2915	1.4215

$R^2 = 0.4668$; F Statistic = 2.6268; Probability = 0.0408

Using Johansen's multivariate approach to co-integration findings suggest that domestic credit to private sector is co-integrated with industrial value addition, money supply (M2), and total volume of trade. The long run relationship is determined using NLS and ARMA error correction model. The test results indicate that the model is convergent and it indicates more than 36.93% of the values in 1st period.

In the sensitivity analysis of our model we first took variables that represent economic development and government financing for the purpose of the economy. It has been observed that the growth in domestic credit is not supported by the growth in the economy, because our alternative model shows insignificant F statistic. In another sensitivity analysis we included only one variable that represents economic development in our model. This made the error correcting term very insignificant. This shows very alarming situation as in many research DCPS is used as an indicator of economic development. Also it is evident from our research that the data relating to variables in our basic model basically stem from the operations of the Banks, from where we can infer that the growth in domestic debt to private sector is purely a financial phenomenon and has very low linkages with economic development. This also leads us to the conclusion that the financial sector in Pakistan is economically ineffective and is not contributing towards the economic development of the country. The State Bank of Pakistan's report for September 2010 also shows similar results where it has been reported that the profitability of the banking sector has increased over the years while the growth of the economy has slowed down over the same period (SBP, 2010).

This requires serious policy considerations from the monetary authorities of the country to push steeper targets for FI's for extending credits to private sector. Finally, the government also needs to reduce its borrowings for non development expenditures

which are also a cause of this anomaly in the development of financial sector without economic development which is oligopolistic nature. We can observe from our model that public sector borrowings also have very strange significant positive impact on DCPS, mainly because such borrowings just enable financial institutions to issue loans without considering the development requirements of the country.

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