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An Asymmetric Econometric Investigation of the Impact of Economic Growth and Fiscal Nonlinearities: An Evidence Regarding Decline of Private investment in Pakistan

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ABSTRACT

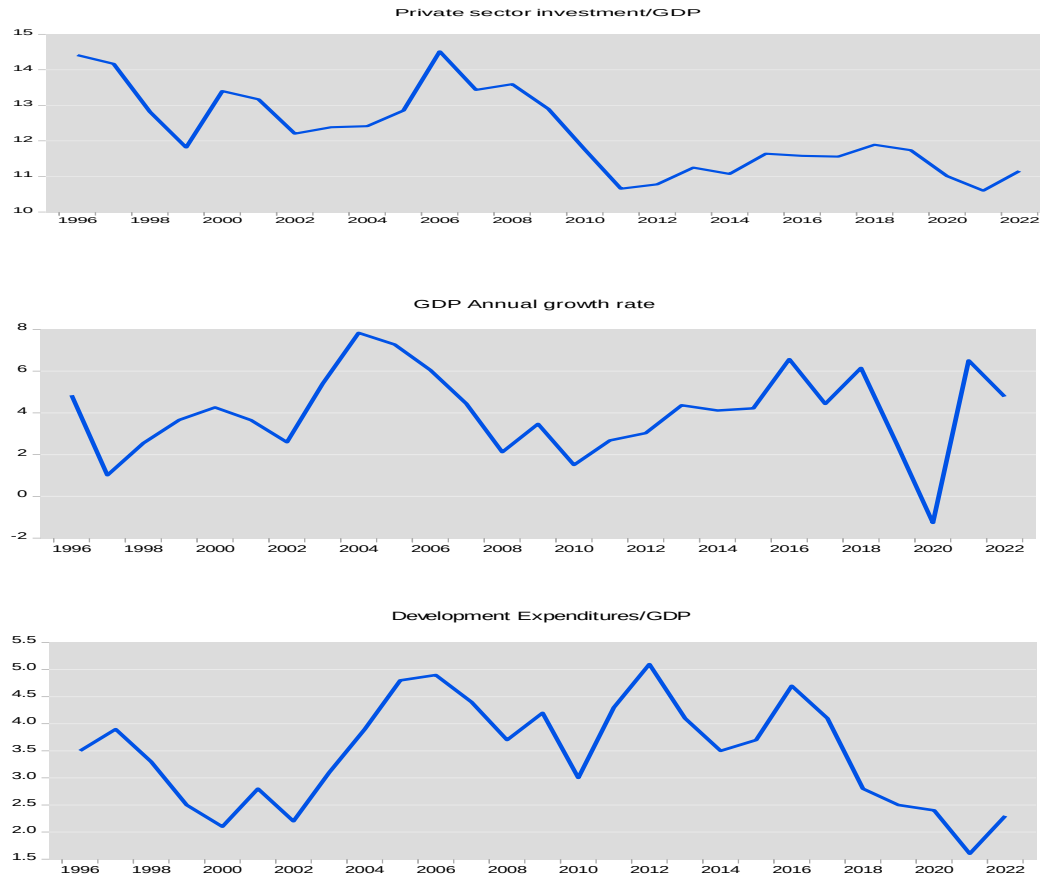
To quantitatively evaluate the existence of the crowding-in versus crowding-out, this effort will seek to examine the asymmetric econometric association between the level of private investment, GDP growth and the level of public sector development expenditures in Pakistan. Utilizing the time series data, the NARDL regression technique was applied to generate the short run and long-run coefficients of the proposed model. In the short run, the outcomes obtained reveal the positive effects generated by negative development expenditures, contrary to the negative implications associated with positive development expenditures. The study suggests the formulation and implementation of investment encouragement policies to promote economic progress in the country.



Introduction

The term 'investment' usually means the net change in capital equipment used to generate more income. Investment spending is a key to boost the country's capacity to manufacture goods and services. Many studies stress how important private sector investment is for a nation's economic expansion. Research shows that private sector capital spending strongly supports faster economic growth (Acosta & Loza, 2005; Adams, 2009; Alfa & Garba, 2012; Sadiq et al., 2021). The private sector is often seen as more efficient than government spending because it is less linked to corruption (Dupasquier & Osakwe, 2003; Everhart & Sumlinsk, 2002; Kinkyo, 2007; Rousseau & Kim, 2007). A strong private sector helps drive growth, create jobs, and reduce poverty. In Pakistan, private sector investment dropped sharply from 1996 to 2022, except for a short increase in 2006 and 2007. Although private sector investment in Pakistan has clearly declined, the other

two key economic indicators, GDP growth rate and public sector development spending have followed the asymmetric kind of pattern.



Source (WDI)

Economic Significance of Investment

In the modernized economies, no one can even imagine production without investing in capital goods. It's hard to conceptualize economic growth without investment money into essential infrastructure like tools, machinery, bridges, dams, and other elements that constitute the economic infrastructure. Investing in capital goods makes the economy more productive.

Ayeni and Kolade (2014) contended that the private sector significantly contributes to economic advancement, positing that corruption is less prevalent within this sector. The United Nations (2002) says that the resources of the government sector in many countries are not enough to meet the goals of development. There are many ways that a country's private sector can help reduce poverty. Suryadarma and Suryahadi (2007) put forward the different ways that the private sector can help the country. First, the government can use taxes that businesses and people pay to pay for public services. Second, spending money on things like starting a new business can help create new jobs. Third, the private sector promotes competition between businesses, which makes them more efficient, which in turn increases productivity and profits. This lowers costs, which is good for everyone.

Literature Review

When BMA modeling technique was applied by Majdzadeh al (2014) in Iran to inquire into the few key elements that affect private sector investment, it was found that growth performance of GDP and import dynamics are significant contributors to accelerate the private sector investment in Iran.

Upon conducting an econometric analysis in Brazil by Silva and Tadeu (2013) looked into the economic characteristics that make individuals firms choose to invest in the private sector. The conclusion was made that there is an affirm proportionate alignment between the rate of economic growth and private investment which is strong. Another important finding in their study was that the government fiscal outlays brings more investment by the private units, therefore their study concluded in favor of the strong crowding in effect in Brazil.

Buyinza and Francis (2013) analyzed the Uganda's economy by employing the johansen cointegeratin approach. They showed that government spending and GDP had an enormous and favorable effect regarding the way private investment behaved over the long term., while inflation, the exchange rate, and public debts had a bad effect. The long run investment function of Pakistan was estimated by Sharafat (2013) by using the time series data. While they include many important variables in their proposed econometric model, their study arrived at the conclusion of favorable shocks on private sector investment generated by GDP growth performance of the country. Their study supported a crowding in economic concept.

Ghassan (2011) has used different econometric models to analyze the investment behavior of the private firms in Saudi Arabia. In this study, the crowding-out effect of fiscal outlays on the long-run and short-run of the private sector's capital stance was recognized.

Haroon and Nasr (2011) endeavored to assess the factors influencing Pakistan's private capital expenditures. The authors ascertain that investment from private is proportionally correlated with governments provided subsidies, savings, and expenditures incurred by the government, while depressingly allied with debt services and indirectly imposed taxes.

Research Methodology

This investigation addresses the nonlinear implications of economic output and fiscal development spending on private sector investment in Pakistan. It analyzes asymmetric growth and fiscal impacts on private sector investment behavior from 1996 to 2022. Key macroeconomic variables of the study contains, private sector investment, measured as a percentage of GDP, is the endogenous variable, while GDP, fiscal expenditures (current and development), and fiscal revenue (tax and non-tax) are considered as explanatory variables. The data for these variables were sourced from the Economic Survey of Pakistan and the World Bank's World Development Indicators. A linear equation is used to describe the mechanical relationship among the variables in this empirical investigation.

$$Prinv_t = \beta_0 + \beta_1 GDP_t + \beta_2 Cexp_t + \beta_3 Dexpt + \beta_4 Trev_t + \beta_6 Ntrev_t$$

After verifying the mixed order stationary properties, it is appropriate to employ the ARDL technique. Additionally, to account for asymmetric effects, the model incorporates nonlinear expressions as:

$$Prinv_t = f(GDP^{+,-}_t + Cexp_t + Dexpt + Trev_t + Ntrev_t)$$

In order to capture the nonlinear implications, the nonlinear form can be expressed as

$$Prinv_t = \eta_0 + \eta_1, \eta_2 (GDP^{+,-})_t + \eta_3(Cexp)_t + \eta_4, \eta_5(Dexp^{+,-})_t + \eta_6(Trev)_t + \eta_7(Ntrev)_t$$

Whereas to get into asymmetric implication by introducing the econometric form can be expressed in the following mechanical way to computation of dynamic parameters of the model

$$Prinv_t = \eta_0 + \sum_{i=1}^n \eta_1, \eta_2 (GDP^{+,-})_t + \sum_{i=1}^n \eta_3(Cexp)_t + \sum_{i=1}^n \eta_4, \eta_5 (Dexp^{+,-})_t + \sum_{i=1}^n \eta_6(Trev)_t + \sum_{i=1}^n \eta_7(Ntrev)_t + u_t$$

The NARDL modeling approach is the modified and extended aspect of ARDL which is adopted to decompose the concerned variable into positive and negative shocks, Shin et al. (2014). Similarly (Ullah et al., 2021) carryout this approach to capture the fiscal asymmetric behavior, such as;

$$GDP_POS_t = \sum_{j=1}^n \Delta(GDP)_j^+ = \sum_{j=1}^n \max(\Delta GDP_j, 0)$$

$$GDP_NEG_t = \sum_{j=1}^n \Delta(GDP)_j^- = \sum_{j=1}^n \min(\Delta GDP_j, 0)$$

$$Dexp_POS_t = \sum_{j=1}^n \Delta(Dexp)_j^+ = \sum_{j=1}^n \max(\Delta Dexp_j, 0)$$

$$Dexp_NEG_t = \sum_{j=1}^n \Delta(Dexp)_j^- = \sum_{j=1}^n \min(\Delta Dexp_j, 0)$$

Data Analysis

Table 1: Results of ADF test

Variable	ADF Statistic (Level)	Test Critical Values (Level) 0.01(α_1) 0.05(α_2) 0.10(α_3)	ADF Statistic (1st Diff)	Test Critical Values (1st Diff) 0.01(α_1) 0.05(α_2) 0.10(α_3)	Order of Integration
GDP	-3.676120	-4.356068 -3.595026 -3.233456	-3.319184	-4.356068 -3.595026 -3.233456	1
Cexp	-5.471280	-4.374307 -3.603202 -3.238054			0
Dexp	-1.919387	-4.356068 -3.595026 -3.233456	-4.101798	-4.394309 -3.612199 -3.243079	0
Trev	-10.48457	-4.356068 -3.595026 -3.233456			0
Ntrev	-11.76135	-4.356068 -3.595026 -3.233456			0
Prinv	-2.733825	-4.356068 -3.595026 -3.233456	-4.696380	-4.374307 -3.603202 -3.238054	1

An application of Augmented Dicky Fuller (ADF) to scrutinize the stationary properties in the data, it is revealed that there exists mixed order of integration among the variables under study. Which makes it appropriate evident to employ the NARDL approach to estimate the short and long run values of parameters of the model?

Table 2: Bound Test

Sig.Level	I(0)	I(1)
10%	2.05	4
5%	2.53	3.83
1%	3.73	4.72

F- Statistics value=3.978739

H₀: No long-run cointegration

The obtained F-Statistics value (3.978739)>the I (1) value obtained at 10% and 5% level.

NARDL Estimates: :(1, 1, 0, 1, 1, 1, 0, 0)

Selection method: (AIC)

Table 3:

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Prinv(-1)	0.556876	0.188748	2.950376	0.0121
GDP_POS	0.052136	0.122719	0.424841	0.6785
GDP_POS(-1)	0.326289	0.154128	2.117000	0.0558
GDP_NEG	0.336675	0.134911	2.495524	0.0281
Cexp	-0.044520	0.075560	-0.589207	0.5666
Cexp(-1)	0.111919	0.105442	1.061430	0.3094
Dexp_POS	-1.266371	0.461291	-2.745276	0.0178
Dexp_POS(-1)	1.149391	0.497124	2.312082	0.0393
Dexp_NEG	1.068731	0.589747	1.812187	0.0950
Dexp_NEG(-1)	-0.969759	0.518915	-1.868821	0.0862
Ntrev	0.017918	0.234963	0.076261	0.9405
Trev	-0.229302	0.188632	-1.215607	0.2475
C	8.476629	3.926298	2.158937	0.0518
R ²	0.864637			
Adjusted R ²	0.729274			
F-stat	6.387541			
Prob	0.001540			

Our selected NARDL model (1, 1, 0, 1, 1, 1, 0, and 0) by using the AIC reveals the certain important properties regarding the estimated model. The results evidenced that model has a strong overall fit due to its highly obtained R-squared (goodness of fit) value. The large value of the F-Statistic also indicates collective significance of exogenous variables.

Table 4: ECM Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP_POS)	0.052136	0.063551	0.820386	0.4280
D(Cexp)	-0.044520	0.037499	-1.187240	0.2581
D(Dexp_POS)	-1.266371	0.239105	-5.296300	0.0002
D(Dexp_NEG)	1.068731	0.198765	5.376858	0.0002
CointEq(-1)*	-0.443124	0.057286	-7.735333	0.0000

As the coefficient of positive development expenditures (-1.266371) deteriorates, while the reduced public sector expenditures having a coefficient value (1.068731) that accelerates the investment from the private sector, therefore, it is a clear indication that in the short run time period, a clear indication of asymmetric implications of development public sector expenditures can be visualized in the above tabulated values. These results show the crowding-out patterns of Pakistan's fiscal spending on the private investment. The value of the error correction term describes the 44% annual convergence from disequilibrium to equilibrium.

Table 5: Long Run Coefficients

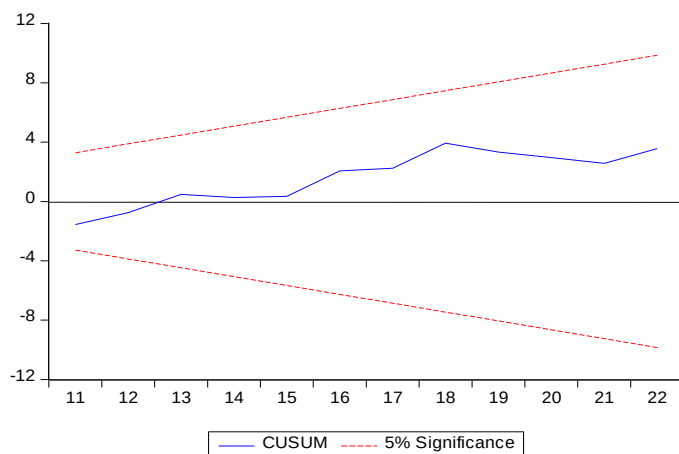
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.476629	3.926298	2.158937	0.0518
Prinv(-1)	-0.443124	0.188748	-2.347706	0.0369
GDP_POS(-1)	0.378425	0.187113	2.022445	0.0660
GDP_NEG	0.336675	0.134911	2.495524	0.0281
Cexp(-1)	0.067399	0.114464	0.588821	0.5669
Dexp_POS(-1)	-0.116980	0.204413	-0.572275	0.5777
Dexp_NEG(-1)	0.098972	0.271409	0.364661	0.7217
Ntrev	0.017918	0.234963	0.076261	0.9405
Trev	-0.229302	0.188632	-1.215607	0.2475

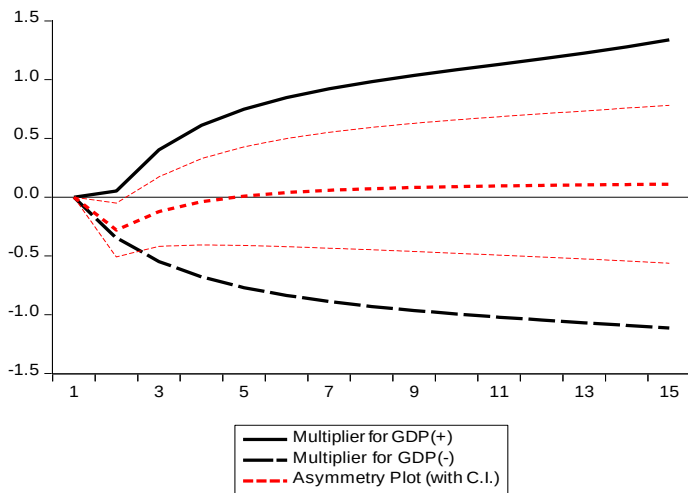
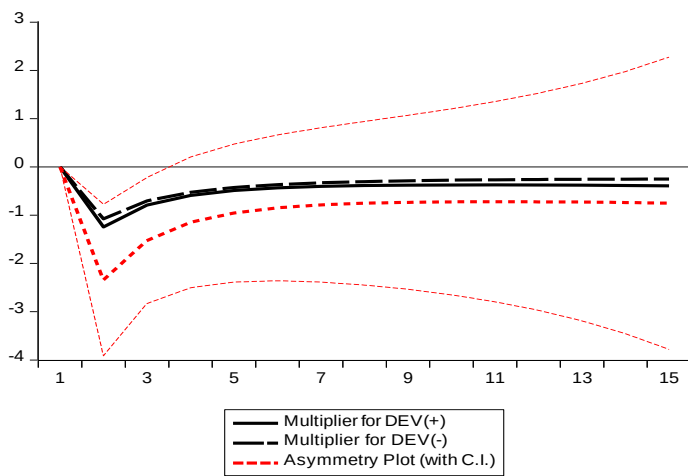
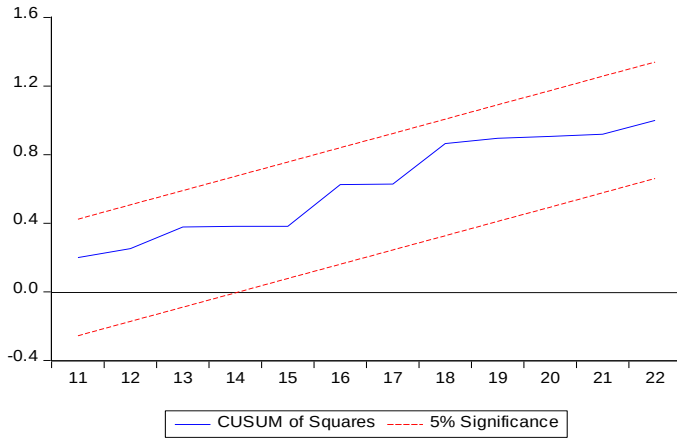
The long-run NARDL generated results, revealing the significant negative impact of Prinv(-1) on the current dependent variable value. It is also shown that the accelerated effects on private sector investment generated by negative GDP shocks, a situation exhibiting the countercyclical investment behavior by the private firm's capital expenditures. While other variables of the model remain insignificant.

Table 6: Diagnostic Analysis

Issue	Test	Statistic Value	P.Value
Normality of Residuals	Jarque-Bera Test	0.183124	0.09238
Serial Correlation	Breusch-Godfrey Serial	2.655210	0.08779
Heteroskedasticity	Breusch-Pagan-Godfrey	0.623878	0.07117
Model Specification	Ramsey RESET Test	4.339108	0.07743

In order to check the health of our model, the study employs certain diagnostic tests; these results demonstrate the fulfillment of all necessary (CLRM) conditions by the model.





Conclusion and Policy Implications

While taking into account the short-run obtained coefficients of NARDL, it was evident that Pakistan's fiscal asymmetric expenditure patterns significantly crowd out the private sector investment, as the coefficient of $Dexp$ (negative) is positive and vice versa. On the other hand, the fluctuation in the economic growth of the country remains irrelevant during the short-run interval. Contrary to this, in the long run, only the variable of GDP proves it counter cyclical significant implication on the private investment in the country. The phenomena portrayed by the obtained

outcomes depict the consumption led growth rather than investment led economic growth, which raises the need to improve the policy formulation and implementation, along with improved governance mechanisms in the country.

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