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The Role of Financial Development in Determining Infrastructure Development: An Empirical Analysis of Pakistan

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	Abstract
<p>Muhammad Yaqoob PhD Scholar, Institute of Business Management & Administrative Science, The Islamia University, Bahawalpur, Pakistan</p> <p>Dr. Hassan Mujtaba Nawaz Saleem Associate Professor, Institute of Business Management & Administrative Science, The Islamia University, Bahawalpur, Pakistan</p>	<p>The purpose of this study is to explore the impact of financial development on infrastructure development in Pakistan. The study uses infrastructure development as the dependent variable while financial development, urbanization, tourism, and gross domestic product (GDP) are used as explanatory variables. The secondary data in this research is sourced from global financial development database, World Development Indicators (WDI), and various economic surveys of Pakistan. Error correction model (ECM) is used. This study uses time series secondary data to examine the causal relationship. The data range from 1991 to 2022. The regression results indicate that there is a direct relationship between financial development and infrastructure development, and has a significant effect. Similarly, international tourism and GDP are positively linked with infrastructure development and has significant effect. There is an inverse relationship between urbanization and infrastructure development. This study suggests that policymakers should focus on ways to enhance financial resources from different sources to develop the infrastructure conditions in Pakistan.</p>
Keywords	Financial Development, Infrastructure Development, GDP, WDI



1. Introduction

Infrastructure is fundamental to a country's economic progress, environmental well-being and social equity. In today's world, nations are challenging multiple pressures containing fast-paced climate change, demographic shifts, urban growth, and rapid technological advancements which have significantly increased the need for infrastructure that is efficient, accessible and durable to all. Although its serious role is broadly acknowledged, many nations, whether developed or developing continue to experience considerable infrastructure shortages (Abisoye, 2023).

In many low- and middle-income nations, essential facilities such as transportation networks, reliable electricity, clean water supply, and digital access are either unavailable or inadequate to large portions of the population. Similarly, wealthier nations face different but equally serious challenges. Aging services, limited reinvestment, and increasing system difficulty have resulted in infrastructure that often struggles to meet current demands. Regional connectivity involves the integration and development of transportation networks such as sea routes, road systems and air corridors that strengthen support in resource sharing and trade. Growing infrastructure including rail lines, seaports, highways, and energy pipelines facilitates commercial exchange and attracts domestic and foreign investment (Khan, 2020). Pakistan is also strategically positioned in terms of geography in this broader regional paradigm. The neighboring region has a high geo-strategic, cultural, political, and economic value, which is largely attributed to the high potential of connectivity. The geographical location of Pakistan gives it the natural edge of a bridge between South Asia and Central Asia and thus its significance in world trade networks and regional integration (Yaseen et al., 2023).

The multiplier effect of an important growth in the level of investment by the government in the infrastructure segment has a direct effect on the economic performance of the economy leading to a long-term and greater growth. The infrastructure has an indirect and direct effect on the economy and is a key contributor in the social, political and economic spheres. Through its provision of essential services like water supply, transport systems, and services and good electricity it enhances the overall socio-economic welfare. Availability of proper infrastructure is very important as it determines the growth and expansion of activities performed by businesses, households and government institutions thereby triggering economic growth. (Carvalho et al., 2022). The development of infrastructure is paramount in stimulating the growth of the economy particularly in areas like Probolinggo Regency where the sectors within it including air transport, road networks and power facilities are direct offerings towards the Gross Regional Domestic Product (GRDP). The shrinkage of the GRDP in 2020, which was caused by the COVID-19 pandemic, revealed the susceptibility of the regional economy to external shocks. Nevertheless, the recovery, which was experienced in 2021, demonstrates that economical growth in infrastructure can accelerate and facilitate economic recovery. CPEC (China-Pakistan Economic Corridor) has evolved as one of the flagship advantages in the last ten years. It is a multi-billion-dollar activity that is intentional to connect China with Gwadar Port on the Arabian Sea. The corridor has a large concentration of railway lines, highways, and energy infrastructures projects. Other than the institutional domestic connectivity in Pakistan, it is also envisioned to enhance more regional integration between South Asia and Central Asia and. CPEC is also likely to boost economic growth and make Pakistan one of the main strategic and economic players in the region by expanding trade routes and energy collaboration (Rahim et al., 2018).

Besides its local significance, projects like CPEC have the potential of getting Pakistan more closely connected to world economies, constructing new economic possibilities. The corridor has the potential to enhance the competitiveness of Pakistani exports to the world by reducing transportation costs and enhancing logistical efficiency. The major industries such as agriculture, textiles, and manufacturing can especially be equipped to enjoy the advantages of an improved regional connectivity as well as the increased access to global trade networks (Hussain, 2019). Infrastructure has a key role in driving sustainable tourism and has a great impact.

Satisfaction of visitors (Dalimunthe et al., 2020). The availability and quality of infrastructure shape tourists' overall experiences in several means. Transportation systems such as railways, buses, airports and taxi services are essential for moving and accessing within a destination. When these facilities work efficiently and reliably, they reduce travel time and inconvenience, thereby improving the overall travel experience. At the destination itself, properly managed accommodations and essential services including restaurants, hotels, electricity supply, and internet access contribute to higher levels of satisfaction and comfort, which in turn foster destination loyalty. Additionally, the presence of effective emergency healthcare, strong security arrangements facilities, and responsive emergency services, enhances tourists' sense of safety and protection, further strengthening their overall satisfaction (Saleh & Mahmood, 2024).

Keeping in view the importance of Financial development on infrastructure development, the extent of literature is scarce. According to the author's best knowledge, no study has utilized financial development, tourism, urbanization, and GDP in the context of Pakistan. The current study aims to fill this gap.

1.1 Objectives

- i) To explore the relation between financial development and infrastructure development.



- ii) To examine the connection between urbanization and infrastructure development.
- iii) To analyze the relation between tourism and infrastructure development.
- iv) To see the relationship between GDP and infrastructure development.

2. Literature Review

Yan et al. (2026) examined how transportation infrastructure effects Green Total Factor Productivity (GTFP) and evaluated the role of the Belt and Road Initiative (BRI) in shaping GTFP across 50 participating nations over the period 2001–2021. The study highlights the significance of strengthening institutional frameworks to confirm that foreign capital inflows within BRI economies support sustainability objectives. Particularly, policymakers are encouraged to adopt measures that alleviate the environmental pressures especially increased emissions related with road infrastructure growth. Thuku et al. (2026) examined the connection between economic growth and transport infrastructure investment in Kenya, employing annual time-series data from 1975 to 2023 and applying the ARDL technique. Their findings suggested that continued investment in rail, port and road, infrastructure alongside improvements in labor development and capital formation is essential for encouraging both long-term and short-term economic growth.

Demir and Zakaria (2025) examined the essential role played by infrastructure to economic development. The analysis of them focused on the fact that both digital systems (including physical infrastructure (including transport systems) and telecommunications) are essential to enhance productivity and allow sustainable development. The study provides notable information on how infrastructure may help as a force of economic change and valuing inclusiveness and sustainability. Wang et al. (2024) examined effect of artificial intelligence (AI) on sustainability in 51 urbanizing nations. They found that urbanization is an agent cut-off point in the AI-sustainability interaction. Particularly at the degree of urbanization is not above a specific threshold, AI infrastructure development and research and development. The contributions of (R&D) activities to sustainable development are positive. However, an excessive Artificial intelligence concentration can burden sustainability results in less than ideal markets conditions.

Hakim et al. (2025) examined the link between economic growth and infrastructure growth. The paper focuses on the fact that economic growth is a fundamental element of regional growth, and is a performance indicator of growth, as well as a future direction. It asserts that insufficient infrastructure may hamper or stifle the process of development because it is very limited capacity infrastructures restrict economic activity at regional and national scales. The contribution of regional connectivity initiatives was analyzed by Rashid and Sarwar (2025) including the CPEC (China-Pakistan Economic Corridor), CASA-1000 and TAPI to Pakistan. Their study concludes that such schemes significantly support economic progress by expanding strengthening infrastructure, trade opportunities, meeting energy demands, and attracting foreign direct investment (FDI) through improved regional integration.

The article by Munir et al. (2025) examined the effect of both institutional quality and tourism, as well as place attachment and maintainable tourism infrastructure. The research also compared the role of institutions, infrastructure and place attachment determine tourist satisfaction in Khyber Pakhtunkhwa. The findings show that tourist satisfaction is a very powerful force to sustainable tourism. In turn, tourist confidence in institutional performance and the matter of satisfaction is largely affected infrastructure and infrastructure availability and quality.

3. DATA AND METHODOLOGY

Infrastructure development in Pakistan is influenced by, financial development, urbanization, Tourism and GDP per capita. This empirical study explores short-run and long-term connections within the framework of political economy among these variables in Pakistan.

3.1 Theoretical Model and Selection of Variables

To comprehend the impact of Financial Development on Infrastructure development, the following model has been produced.

$$\text{Infrastructure development} = f(\text{Financial Development, Urbanization, Tourism, GDP per capita})$$

The functional form of the model is given as:

$$\text{LnINF} = \alpha_0 + \alpha_1 \text{LnFD} + \alpha_2 \text{LnURBAN} + \alpha_3 \text{LnTOUR} + \alpha_4 \text{LnGDP} \dots \dots \dots (1)$$

Where LnINF= log of infrastructure development

LnFD = Log of financial development

LnURBAN = Log of urbanization

LnTOUR = log of tourism

LnGDP = log of Gross domestic product

This research work has used annual time series data to avoid seasonality problems. It covers the years 1991 to 2022. The secondary data in this research is sourced from the global financial development database, World Development Indicators (WDI), and various economic surveys of Pakistan.

3.2 Measurement of Variables:

The present study measures various variables in given table.

Table 1: Infrastructure Development Index

Variable name	Measurement
Road	Length of the road in km
Railway	Rail lines measure in total route km
Telecommunication	Mobile cellular subscriptions measure per 100 people

Table 2: Financial Development Index

Variables name	Measurement
Stock market capitalization	% of GDP
Stock market total value traded	Total traded shares as a % of GDP.
Stock market turnover ratio (percentage)	The total value of shares traded during the time divided by the average market capitalization for the time.
Deposit money banks' assets to GDP (percentage)	Claims on a domestic real nonfinancial sector by deposit money banks as a share of GDP.
Liquid liabilities to GDP (percentage)	The ratio of liquid liabilities to gross domestic product.
Private credit by deposit money banks to GDP (percentage):	Private credit by deposit money banks and other financial organizations to GDP.
Domestic credit by deposit money banks to GDP (percentage):	Domestic credit to the private sector mentions to monetary assets distributed to the private sector.

Notably, other variables such as tourism is measured by international tourism, receipts (percentage of total exports), urbanization as Urban population growth (annual percentage), and GDP as per capita (constant 2015 US\$).

3.3 ARDL Estimation Technique

The representation of equation number 3.3 in ARDL approach can be expressed by as:

$$\begin{aligned} \text{LnINF} &= \alpha_0 + \alpha_1 \text{LnFD} + \alpha_2 \text{LnURBAN} + \alpha_3 \text{LnTOUR} + \alpha_4 \text{LnGDP} \\ \Delta \ln(\text{INF})_t &= \alpha_0 + \sum_{i=4}^{\rho} \alpha_{1i} \Delta \ln(\text{INF})_{t-i} + \sum_{i=2}^{\rho} \alpha_{2i} \Delta \ln(\text{LnFD})_{t-i} + \sum_{i=4}^{\rho} \alpha_{3i} \Delta \ln(\text{URBAN})_{t-i} + \sum_{i=4}^{\rho} \alpha_{4i} \Delta \ln(\text{TOUR})_{t-i} \\ &+ \sum_{i=4}^{\rho} \alpha_{5i} \ln(\text{GDP})_{t-i} + \beta_1 \ln(\text{INF})_{t-i} + \beta_2 \ln(\text{FD})_{t-i} + \beta_3 \ln(\text{URBAN})_{t-i} + \beta_4 \ln(\text{TOUR})_{t-i} + \beta_5 \ln(\text{GDP})_{t-i} + \mu_t \end{aligned} \quad (3.3)$$

Short and long-term effects, along with reliable asymptotic inferences, can be attained by applying the Ordinary Least Squares (OLS) technique within an Autoregressive Distributed Lag (ARDL) framework, employing an appropriate selection of lag lengths. The general form of this model can be represented as:

In above equation $\alpha_1, \alpha_2, \dots, \alpha_5$ denotes the short-run dynamics of the model whereas parameters $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5$ signify long-term relationships. The null hypothesis is

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$$

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$$

The rejection of null hypothesis (H0) would confirm the existence of co-integration.

3.4 Long Run Estimation

If co-integration exists then we will find long run connection in the next step by estimating the following equations.

$$\begin{aligned} \Delta \ln(\text{INF})_t &= \alpha_0 + \sum_{i=4}^{\rho} \alpha_{1i} \Delta \ln(\text{INF})_{t-i} + \sum_{i=2}^{\rho} \alpha_{2i} \Delta \ln(\text{LnFD})_{t-i} + \sum_{i=4}^{\rho} \alpha_{3i} \Delta \ln(\text{URBAN})_{t-i} + \sum_{i=4}^{\rho} \alpha_{4i} \Delta \ln(\text{TOUR})_{t-i} \\ &+ \sum_{i=4}^{\rho} \alpha_{5i} \ln(\text{GDP})_{t-i} + \mu_t \end{aligned} \quad (3.4)$$

3.5 Error Correction Model (ECM)

LURBAN(-2)	-0.182870	-1.681730	0.1436
LURBAN(-3)	0.083187	0.999580	0.3561
LURBAN(-4)	0.122462	2.173016	0.0728
LTOUR	0.012551	0.243428	0,8158
LTOUR(-1)	-0.151851	-2.255244	0.2279
LTOUR(-2)	0.002953	0.078049	0.9403
LTOUR(-3)	-0.161253	-3.022580	0.0233
LTOUR(-4)	-0.096567	-2.613999	0.0399
LGDP	0.070150	1,959632	0.0977
LGDP(-1)	0.038780	1.922793	0.1029
LGDP(-2)	0.005807	0.414261	0.6931
LGDP(-3)	0.023100	1.507135	0.1825
LGDP(-4)	0.060825	2.714016	0.0349
C	-1.250846	-1.1969613	0.0964

ARDL (4, 2, 4, 4, 4) Selected based on AIC

4.3 Results of Bound Test Approach

For testing longer association among the variables of the model we engaged bound test. By using Wald test, the long-run coefficients of all variables are set to zero to assess the null hypothesis.

The results will be as:

Null hypothesis:

$$\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0 \dots\dots\dots \text{(No Co-Integration Exists)}$$

Alternative hypothesis:

$$\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0 \dots\dots\dots \text{(Co-Integration Exists)}$$

If the value of F-statistics is more than the upper bound value given in Pesaran’s table one can reject the null hypothesis. So, we may say there is long run link between the variables in the ARDL model.

Table 4.3: Bound Test Approach using ARDL

(F- statistics)	(95% lower bound value)	(95% upper bound value)	(90% lower bound value)	(90% upper bound value)
6.646011	2.56	3.49	2.2	3.09

Using the results of bound test in above table, one can reject the null hypothesis of no co-integration and zero relationship on the basis of significant F- statistics. While the calculated F-statistics 6.646011 is greater than the both higher bound values 3.49 at level of Significance 95% and other upper values 3.09 at 90% significance level when infrastructure development is taken as a dependent variable and all others are independent variables. Resultantly, we can say that there is long run co-integrational relllation between infrastructure development, Financial development, tourism, urbanization, and GDP.

4.4 Diagnostic Test

Autocorrelation is tested by Breusch-Godfrey LM test. In case LM exceeds value of 5 percent, 95 percent confidence interval indicates no occurrence of serial autocorrelation. Outcome is expressed in table 5.4.

Table 4.4: Test for Serial Correlation

(Test)	(Statistics)	(Probability)
Breusch-Godfrey LM test	1.627678	0.3040

4.5 Stability of the Model

To find the stability of the model we have applied CUSUM and CUSUMSQ tests. Results of the stability tests are shown in the fig. 4.5A and 4.5B.

Figure 4.5 A: CUSUM Test for Stability of the Model

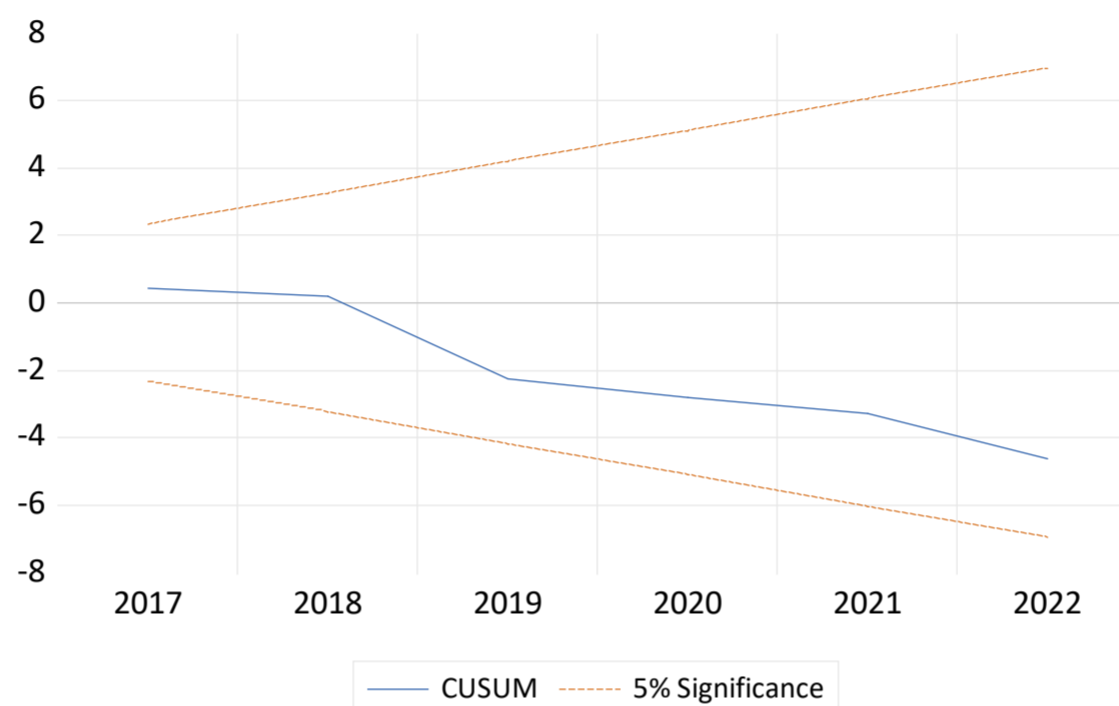


Figure 4.5 B: CUSUMSQ TEST

The stability tests of the model show the significance of the model. We can see it from the figure 4.5A and 4.5B that the plot of CUSUM statistics and CUSUMSQ statistics is well within the 5 percent of critical bounds inferring that model is stable.

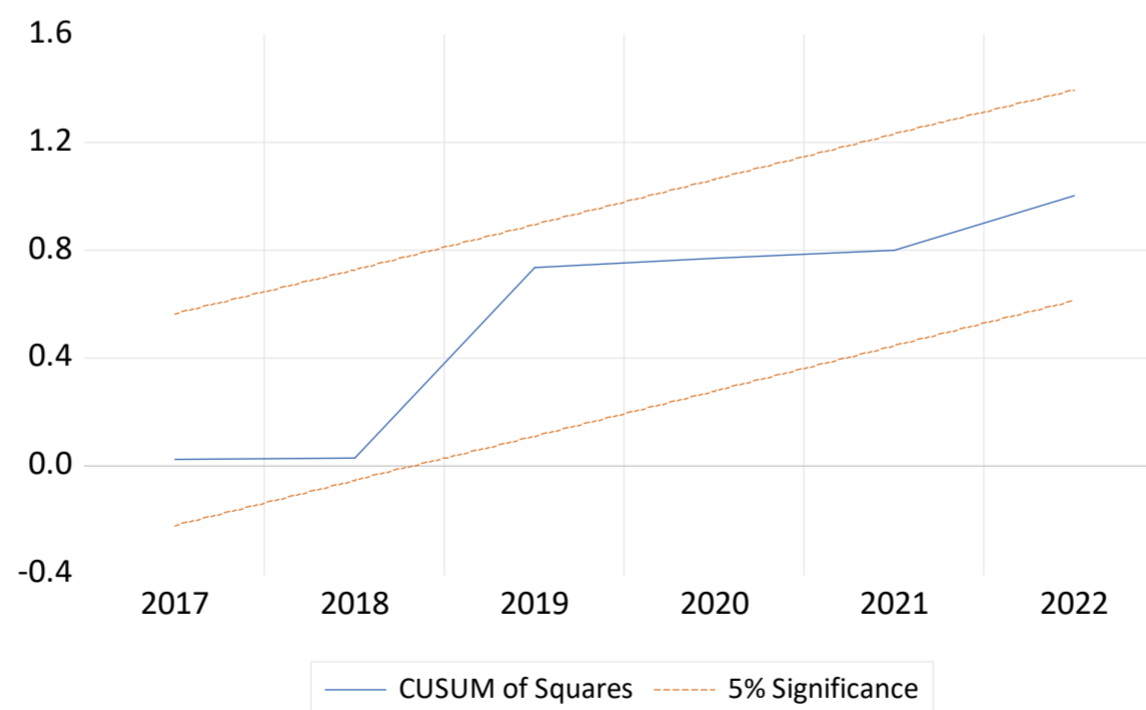


Table 4.5: Long Run Estimated Coefficients using ARDL Approach

Dependent variable = LINF				
Estimation 1991 to 2022				
(Regressor)	(Coefficient)	(Standard error)	(t- ratio)	(Probablity)
LFD	0.153029	0.056792	2.694573	0.0358
LURBAN	0.241542	0.106039	2.277850	0.0630
LTOUR	0.182691	0.157062	1.163177	0.2889
LGDP	0.401189	0.196321	2.043541	0.0870
C	2.526032	1.788217	1.412566	0.2075

ARDL (4, 2, 4, 4, 4) selected based on AIC

4.6 Discussion

4.6.1 Financial Development

Financial development shows the financial growth level of a country and it shows positive relationship in the present study, the assessed coefficients relationship of long run indicate that financial development is positively connected with infrastructure development in Pakistan. LFD Coefficient value demonstrates that 1% change in LFD will bring a 0.153029 percent alteration of the dependent variable. This is because of the fact that financial development provides resources to improve infrastructure with respect to various sectors of the county. Large projects mainly depends upon the level of funding available to complete. In the same manner, financial development improves access to credit, and supports public private partnerships. Hence, financial development provides funding to complete the infrastructure-related projects efficiently.

4.6.2 Urbanization

Variable LURBAN has positive relationship with infrastructure development and it is affecting positively. Coefficient value of LURBAN indicates that one percent change in LURBAN would bring 0.241542 percent change in the infrastructure development. One the basic requirements of the tourist are security and protection of their lives. Its is because of the fact that urbanization requires more buildings and infrastructure in the cities. Which results in infrastructure development.

4.6.3 TOURISM

Variable LTOUR has positive relationship with infrastructure development and it is affecting positively. Coefficient value of LTOUR indicates that one percent change in LTOUR would bring 0.182691 percent change in the infrastructure development. Tourism requires better transportation and related services. Moreover tourism demands access to amenities and facilities which requires investment in this sector for better infrastructure.

4.6.4 GDP

Variable LGDP has a positive relationship with infrastructure development and it is affecting positively. Coefficient value of LGDP indicates that one percent change in LGDP would bring a 0.401189 percent change in the infrastructure development. Economic growth helps the various sectors, including the infrastructure of the country, to grow. Due to economic growth, the availability of funds opens the doors for infrastructure development.

Table: 4.6 ECM: Error Correction Short Run Estimates

Dependent variable _____ LINF				
Estimation _____ 1991 to 2022				
(Repressor)	(Coefficients)	(Standard error)	(T-ratios)	(Probablity)
D(INF_INDEX (-1))	-1.164762	0.234029	-5.062463	0.0023
D(INF_INDEX (-2))	-0.468982	0.161068	-2.911699	0.0269
D(INF_INDEX (-3))	-0.325127	0.114276	-2.845114	0.0294
D(FD_INDEX)	-0.031608	0.004794	-6.593045	0.0006
D(FD_INDEX(-1))	0.007900	0.003508	2.252308	0.0652

D(LURBAN)	-0.031247	0.029252	-1.068215	0.3265
D(LURBAN(-1))	-0.022778	0.036048	-0.631895	0.05508
D(LURBAN(-2))	-0.205649	0.034646	-5.935789	0.0010
D(LURBAN(-3))	-0.122462	0.029781	-4.112147	0.0063
D(LTOUR)	0.012521	0.020580	0.612013	0.5630
D(LTOUR(-1))	0.254867	0.035555	7.168320	0.0004
D(LTOUR(-2))	0.257820	0.039707	6.493069	0.0006
D(LTOUR(-3))	0.096567	0.022876	4.121394	0.0056
D(LGDP)	0.070150	0.011271	6.223930	0.0008
D(LGDP(-1))	-0.089732	0.011615	-7.725794	0.0002
D(LGDP(-2))	-0.083924	-0.010611	-7.908943	0.0002
D(LGDP(-3))	-0.060825	0.010116	-6.012643	0.0010
CointEq(-1)	-0.495182	0.057915	-8.550212	0.0001

ARDL (4,2 , 4, 4, 4) selected based on AIC

The Error Correction term has got a negative sign and is statistically significant. The ECM exists due to variation in the coefficient of -0.495182 which represents an approximation of 49 percent of any deviation in the long-run. The correction of equilibrium is made next year.

Besides, the negative and significant ECM coefficient is a confirmation of the company of a stable longrun relationship, indicating long-run co-integration of variables. The negative sign implicates that every disequilibrium is corrected in a speedy and effective and in the long run.

5. CONCLUSION AND POLICY IMPLICATIONS

5.1 Conclusion

Financial development plays a pivotal role in enhancing infrastructure development in Pakistan. By mobilizing savings, facilitating investments, and improving access to financial services, the financial sector can significantly contribute to bridging Pakistan's infrastructure gap. However, challenges such as limited financial inclusion, high borrowing costs, and governance issues need to be addressed to maximize the impact.

5.2 Policy Implications

Government should frame such policies which enhances the flow of financial development so that more finance can be used for infrastructure development projects. Moreover, tourism brings foreign exchanges, government should make such tourist friendly policies so that foreign earnings could be used on infrastructure developments. Last but not the least government should increase its GDP as more GDP indicates more funds are available for development of infrastructure.

5.3 Limitation and Future Direction

This study is conducted within the Pakistani economy and it is a developing one. Its results may not be applicable or generalizable to developed or other nations. Sample size could be enhanced depending upon the objective of the study. As far as future guidelines are concerned, a similar study can be used in other developing nations. Further, future researchers could explore the comparative analysis between other countries. In future, AI related variables might be explored. Last but not the least moderation of potential variables could be investigated.

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