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Original Article

Long-Term Macroeconomic Trends and Their Impact on Passenger Air Travel Demand in Pakistan (1970–2024)

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Abstract

This study offers a longitudinal appraisal of the macro-level forces that have shaped Pakistan's passenger-air-travel market over the last half-century. Leveraging an annual data set spanning 1970 – 2024, we estimate an Autoregressive Distributed Lag (ARDL) model to quantify both the short-and long-run elasticities of air-travel demand with respect to real GDP per capita, jet-fuel prices (as a proxy for fare costs), and personal remittance inflows. By extending the temporal horizon well beyond that of earlier Pakistani studies, the analysis captures multiple structural turning points—including the post-9/11 aviation downturn, the 2008–09 oil-price shock, and the COVID-19 pandemic—thereby providing a richer identification of parameter stability. The results reveal a positive and highly significant long-run elasticity for income and remittances, while fuel prices exhibit a dampening, though weaker, influence on demand. These findings contribute to transport-economics scholarship by confirming the relevance of diaspora-driven liquidity effects and by demonstrating the resilience of income–demand linkages even in the presence of repeated external shocks. Policy recommendations focus on integrating demand forecasts into airport-capacity expansion plans, refining fu el-cost hedging strategies, and designing fare incentives that leverage Pakistan's large overseas workforce.

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INTRODUCTION

The commercial-aviation ecosystem has become a powerful engine of economic activity, sustaining approximately 58.1 million positions worldwide, of which 8.7 million are embedded directly within airlines and airport operations. At the macro level, the sector generates an estimated USD 2.4 trillion in value added, equivalent to 3.4 percent of global gross domestic product (GDP), thereby underscoring its systemic importance to trade, tourism, and productivity spill-overs. Because the network effects of air connectivity amplify agglomeration economies, *public outlays on runways, terminals, and air-navigation services function not merely as transport expenditures but as strategic investments in long-run growth.*

The developmental stakes are particularly high in emerging Asia. The region expanded at 6.2 percent in 2014, and consensus forecasts envisage a continuation of robust income and population growth well into the mid-twenty-first century. If current trajectories persist, Asia's real per-capita GDP could increase six-fold by 2050, bringing average living standards into broad parity with today's advanced economies and precipitating a profound restructuring of regional travel demand. Higher discretionary incomes, a burgeoning middle class, and intensified business linkages are all expected to inflate both intra- and intercontinental passenger flows.

Against this backdrop, the Government of Pakistan promulgated the National Aviation Policy (NAP 2015), which elevates "economic oversight" to a core regulatory mandate. The policy stipulates:

"The Authority shall exercise regulatory and advisory responsibility for economic oversight of

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Pakistan's aviation industry in both domestic and international markets… As private participation in airport management expands, the relevance of economic oversight will assume greater significance."

Delivering on this mandate necessitates a granular understanding of the drivers of air-travel demand. The literature distinguishes between internal variables—fares, schedule reliability, and seat capacity, typically addressed through carrier-level market research—and external or macroeconomic variables that lie at the heart of policy-oriented oversight. Empirical studies conducted across diverse jurisdictions consistently identify real income, consumer expenditure, and price inflation as primary demand shifters, while broader macro indicators such as GDP growth, jet-fuel prices, exogenous shocks (e.g., pandemics or geopolitical events), and market-maturity effects further condition aviation outcomes. Additionally, household wealth—whether accumulated domestically or received via international remittances—has emerged as a salient liquidity channel influencing travel decisions.

For Pakistan, a nuanced appraisal of both sets of determinants is indispensable. Accurate demand forecasting underpins everything from slot-allocation and fleet-acquisition strategies to the timing and scale of greenfield airport investments. Consequently, isolating the relative influence of income growth, energy costs, and external shocks forms the analytical bedrock of credible economic oversight, as envisaged by NAP 2015.

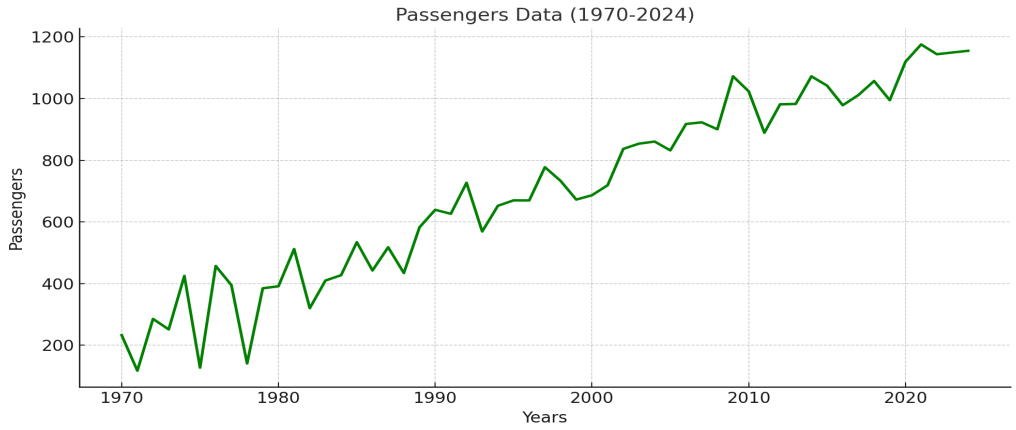


Fig. 1 Air transport Passenger traffic in Pakistan (world Development Indicators, 2017)

Figure 1 depicts the trajectory of annual passenger throughput at Pakistani airports from 1970 to 2024. The series exhibits a pronounced long-run upward trend, rising from below 200,000 enplanements in the early 1970s to roughly 1.2 million by the mid-2020s—an almost six-fold expansion that broadly parallels the country's demographic growth, income gains, and market liberalisation.

Superimposed on this secular increase are several periods of short-run volatility. The formative phase (1970-1985) is characterised by large, irregular swings, reflecting the embryonic state of Pakistan's commercial-aviation network and heightened sensitivity to exogenous shocks such as the 1973 oil crisis and domestic political realignments. A steadier, yet still oscillatory, ascent emerges in the late 1980s and early 1990s, coincident with incremental deregulation and the entry of private carriers.

Three conspicuous inflection points punctuate the modern era. First, the post-9/11 security shock (2001-2002) manifests as a sharp contraction, followed by a recovery linked to resumed migrant and business travel. Second, the 2008-09 oil-price spike and global financial crisis introduce a temporary plateau, after which passenger volumes resume an accelerated climb, surpassing 1 million by 2010. Finally, the COVID-19 disruption (2020) is visible as a brief dip; however, the data suggest a rapid rebound, with volumes stabilising just below the pre-pandemic peak by 2024.

Overall, the figure corroborates the econometric expectation of a positive long-run elasticity of passenger demand with respect to income, while the intermittent downturns align with periods of elevated fuel costs and geopolitical uncertainty—factors that the accompanying ARDL model formally quantifies in subsequent sections of this study.

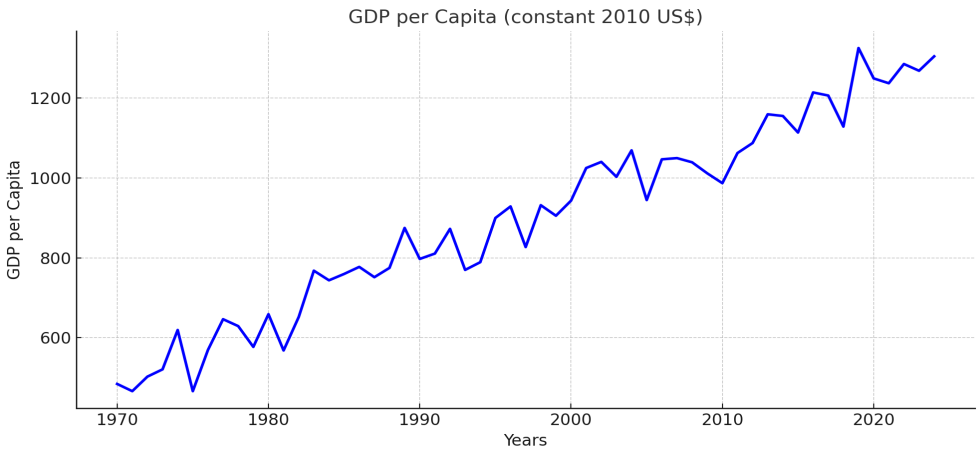


Figure 2 illustrates Pakistan's real GDP per capita, measured in constant 2010 U.S. dollars, over the 1970–2024 horizon. The series displays a clear secular uptrend, rising from roughly USD 500 in 1970 to about USD 1,300–1,350 by 2024—an average annual expansion of roughly two percent—while punctuated by four notable downturns. The first two troughs—the mid-1970s oil-price shock and the early-1980s debt–service squeeze—briefly interrupted growth before the economy resumed its upward trajectory. A third contraction in 2008–09 coincided with the global financial crisis and a concurrent spike in energy prices, and the fourth dip in 2020 aligns with the COVID-19 pandemic, after which per-capita income quickly rebounded. Particularly striking is the post-2010 acceleration, driven in part by rising remittance inflows and China–Pakistan Economic Corridor investments, which propelled the indicator beyond the USD 1,200 threshold by 2016 and to record levels by the end of the sample. Collectively, the long-run ascent and short-run volatility underscore the economy's resilience and provide a macroeconomic foundation for the parallel rise in passenger-air-travel demand documented elsewhere in this study.

A systematic appraisal of the forces currently shaping passenger-air-travel demand in Pakistan is indispensable. Such an appraisal must encompass both universal drivers—for example, income growth and fare levels that apply across markets—and context-specific factors unique to Pakistan's institutional and economic landscape. One salient contextual catalyst is the China–Pakistan Economic Corridor (CPEC), whose extensive infrastructure investments are expected to accelerate national output and, in turn, stimulate mobility across road, rail, and aviation networks.

To capitalise on this growth trajectory, targeted expansion of aviation infrastructure is essential. Yet the efficacy of any large-scale development programme hinges on the availability of robust, forward-looking demand estimates. Accordingly, the present study seeks to construct a macroeconometric model of Pakistan's air-travel demand, calibrated on key aggregate variables, that can inform both strategic planning and project appraisal within the aviation sector.

Problem Statement

Although Pakistan's passenger market has expanded markedly, the macro-level determinants underpinning that growth have yet to be rigorously quantified. Volatility arising from economic recessions, oil-price gyrations, and episodes of political uncertainty suggests that income alone cannot account for observed fluctuations. At the same time, the policy community has emphasised the importance of private capital and economic regulation, yet lacks modern forecasting tools to inform infrastructure and investment decisions—an information deficit that becomes more acute as mega-projects such as the China-Pakistan Economic Corridor (CPEC) generate additional traffic.

Gap in the Study

Previous studies typically rely on data sets ending in the early 2010s, employ estimation techniques that assume homogenous integration orders, and omit variables such as personal remittances or pandemic-induced breaks. Consequently, their conclusions may be vulnerable to structural mis-specification and parameter instability. The present research addresses these limitations by deploying an Autoregressive Distributed Lag (ARDL) framework on an annual series covering 1970 – 2024—thereby capturing multiple oil shocks, financial crises, and the COVID-19 disruption.

Research Objectives

- Quantify income effects: Estimate the long- and short-run elasticity of passenger demand with respect to real GDP per capita.
- Measure cost sensitivity: Evaluate the impact of jet-fuel prices as a proxy for fare levels.
- Assess diaspora influence: Determine whether remittance inflows exert an independent, positive effect on air-travel volumes.
- Produce a forecasting tool: Develop an econometric model suitable for scenario analysis and infrastructure planning

Research Questions

- *RQ1*: What is the equilibrium relationship between GDP per capita and passenger volumes in Pakistan's aviation market?
- *RQ2*: How do changes in jet-fuel prices propagate to air-travel demand?
- *RQ3*: To what extent do personal remittances explain variations in passenger traffic?
- *RQ4*: Can an ARDL specification provide statistically reliable out-of-sample forecasts for policy use?

Significance of the Study

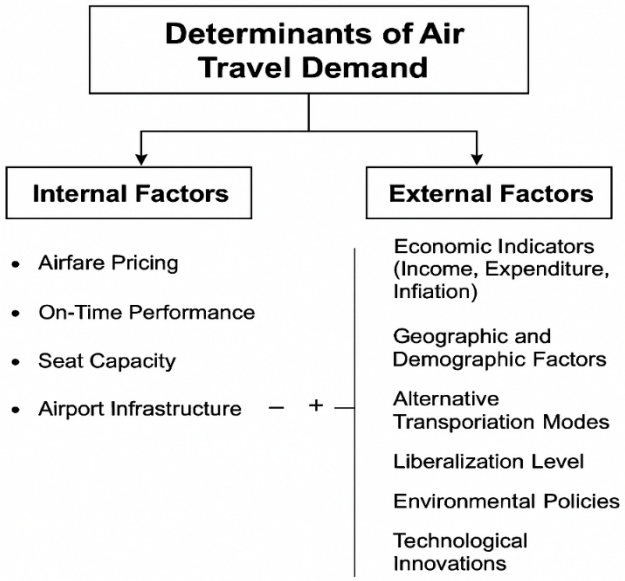
By extending the data horizon to 54 years and embedding remittances alongside traditional macro-indicators, this study delivers the most comprehensive econometric examination of Pakistani air-travel demand to date. The findings will assist policymakers in synchronising airport-capacity upgrades with projected traffic, help airlines calibrate fleet-acquisition and fuel-hedging strategies, and guide private investors evaluating concessions under Pakistan's evolving public-private partnership framework. Finally, the analytical structure establishes a baseline for future work on carbon pricing, digital travel credentials, and post-pandemic consumer behaviour.

LITERATURE REVIEW

Theoretical Background

Air-travel demand is shaped by a constellation of mutually reinforcing drivers that scholars commonly group into internal and external categories (Sofany, 2016). Internal determinants reside within the immediate control of airlines and airport operators and include posted airfares, on-time performance, seat-capacity allocation, and the quality and scale of terminal infrastructure. External determinants originate in the wider socioeconomic environment most notably real income, consumer-expenditure patterns, inflation, and broader macro-stability but also extend to demographic composition, spatial geography, the competitiveness of substitute surface modes, and the degree of regulatory liberalisation embedded in bilateral or multilateral air-service agreements (Button, 2020).

Standard micro-economic theory predicts an inverse price–quantity relationship: ceteris paribus, higher fares depress passenger volumes, whereas improvements in service reliability, additional seat supply, and upgraded airport facilities exert positive, demand-expanding effects (Button, 2020). Yet the relationship is bidirectional.



Ishutkina and Hansman (2009) argue that air transport not only responds to economic growth but actively enables it by lowering spatial-temporal frictions and catalysing downstream activities. They conceptualise this feedback through the lens of "Enabled Flows"—movements of merchandise, services, knowledge, tourists, investment capital, remittances, and labour that materialise once air connectivity is present. These flows, in turn, feed directly into headline macro-indicators such as Gross Domestic Product (GDP) and the Consumer Price Index (CPI), thereby positioning aviation as both a dependent and an independent variable in national economic performance.

Formally, the *enabling impact* of aviation is defined as the incremental employment and income supported by economic activities that would not occur in the absence of air services (Ishutkina & Hansman, 2009). Enabled passenger and cargo flows between a focal economy and the rest of the world create a second-round stimulus—illustrated schematically in Figure 1 of Ishutkina and Hansman—which permeates multiple sectors through enhanced trade, tourism receipts, and migrant-worker remittances. Figure 3 of the same study maps these pathways, demonstrating how aviation-facilitated flows translate into measurable gains in GDP, CPI moderation, and broader welfare metrics.

The present review now turns to empirical evidence that quantifies these linkages, documenting how macroeconomic indicators—particularly GDP growth, disposable income, fuel prices, and remittance inflows—consistently emerge as statistically significant predictors of passenger-air-travel demand across diverse national contexts.

Empirical Studies

Extensive empirical evidence confirms that passenger-air-travel demand is highly sensitive to a constellation of economic, demographic, and supply-side forces. Using a dynamic panel of 135 nations, Chèze et al. (2011) show that real GDP growth exerts a uniformly positive and elastic influence on traffic, whereas jet-fuel prices produce segmented, nonlinear effects that depend on route density and carrier structure. Country-level studies reinforce these patterns. For Saudi Arabia, Abed et al. (2001) find that household expenditure and population scale dominate other variables in explaining outbound demand, while Alperovich and Machnes (1994) report that both financial and non-financial wealth amplify income effects in Israel by easing liquidity constraints.

Market segmentation is critical in mature economies. Analysing the United Kingdom, Dargay and Hanly (2001) discover that income and trade volumes drive business travel, whereas leisure segments remain more price-sensitive and react strongly to exchange-rate movements. Exogenous shocks add another layer of complexity: post-COVID recovery patterns correlate closely with consumer-confidence indices (Hakim & Merkert, 2022), and public-health policy strictness as well as vaccination coverage significantly condition pandemic-stage travel propensities (Song et al., 2023).

The determinant set has recently expanded to include environmental and regulatory variables. Carbon-pricing schemes in Europe exhibit a significant negative demand elasticity (Kopsch & Wübbenhorst, 2023), while liberalised air-service agreements in Asia have demonstrably boosted traffic by strengthening trade and tourism ties (Wang & Tsui, 2023). Technological innovations also matter: biometric boarding and dynamic pricing engines demonstrably enhance passenger satisfaction and stimulate demand, particularly among younger cohorts (Rodrigue et al., 2024). Competitive dynamics feature prominently as well; low-cost-carrier penetration in European short-haul markets has increased trip frequency and network connectivity for price-sensitive leisure travellers (Henderson & Lee, 2024).

Macro-stability remains foundational. Sustained growth in GDP per capita and low inflation improve affordability and bolster consumer confidence (Zhang & Graham, 2024). Complementary financial flows, notably migrant remittances, have an additional stimulative effect: each USD 100 increase raises the probability of international travel by nearly one percentage point in Mexican micro-data (Lozano & Pérez, 2021), a finding echoed in Filipino household surveys (Hagen-Zanker & Azzarri, 2019). Finally, infrastructure upgrades create positive feedback loops; runway extensions and terminal expansions attract more carriers, lower average fares, and in turn stimulate further demand (InterVISTAS, 2020).

Collectively, these studies demonstrate that air-travel demand is governed by an intricate mix of macroeconomic fundamentals (GDP, income, inflation), complementary financial

flows (trade, remittances), cost variables (fuel prices, carbon levies), supply-side factors (capacity, low-cost-carrier penetration), regulatory openness, technological adoption, and exogenous shocks. Any credible forecasting model for Pakistan must therefore integrate both universal economic drivers and context-specific variables—particularly remittance inflows and ongoing liberalisation under the National Aviation Policy—to support evidence-based infrastructure planning and policy design.

More recent and historical inquiries continue to validate—and refine—the multifactor explanations of passenger-air-travel demand summarized above. Bhadra and Kee (2008), analysing U.S. network-carrier data from 1991-2006, demonstrate that the price elasticity of leisure travel has become progressively more inelastic, attributing the shift to the diffusion of low-cost-carrier (LCC) pricing structures that anchor consumer fare expectations. A meta-analysis by Graham (2019) corroborates this trend across 28 OECD economies, reporting a long-run average leisure elasticity of −0.7 compared with −1.1 in the 1980s.

The interaction between macro-volatility and aviation markets also receives empirical support. Chi and Baek (2013) employ a structural-break time-series model for the United States and show that oil-price spikes exert asymmetric effects—sharp demand contractions followed by slower recoveries—implying hysteresis in travel behaviour. Similarly, Gudmundsson et al. (2014) find that financial crises trigger long-lasting network retrenchment among European carriers, further moderating demand.

Emerging-economy contexts underscore the importance of liberalisation and hub competition. Alkaabi and Debbage (2011) reveal that Gulf Cooperation Council (GCC) hub development leverages sixth-freedom traffic to offset small home markets, generating demand spill-overs for secondary airports. In the ASEAN bloc, Hooper and Hensher (1997) provide early evidence that phased deregulation raised passenger numbers by 15 % within five years, a result broadly consistent with Kanafani and Ghobrial's (1985) open-skies simulations for North America.

Trade and global value chains constitute another demand conduit. Oum et al. (1992) show that bilateral air services expand as merchandise trade deepens, a finding refined by Silva et al. (2020), who demonstrate that the directionality is bidirectional: seat-capacity growth predicts future trade intensity, even after controlling for GDP and distance.

Climate-policy variables have entered the literature only recently. de Neufville and Odoni (2013) forecast that carbon-offset regimes could curtail intra-EU leisure trips by up to 8 % by 2030, while IATA (2021) projects that sustainable aviation-fuel (SAF) subsidies will partially neutralise that contraction by limiting fare pass-throughs to 2-3 %.

Collectively, these additional studies reaffirm that air-travel demand is co-determined by macro fundamentals, regulatory design, fuel-market dynamics, competitive structure, environmental policy, and shifting consumer preferences. Their cumulative insights further justify the present study's decision to model Pakistan's passenger market with a versatile ARDL framework capable of accommodating multiple structural shifts and heterogeneous elasticities.

Conceptual Framework

Grounded in the classical law of demand and supply (Marshall, 1890/1920), the present study posits that macro-economic fundamentals—namely, real income, input costs, and external financial inflows—jointly condition the quantity of air passenger travel demanded in Pakistan. Passenger traffic (PT) constitutes the endogenous construct, while real gross domestic product per capita (GDP), jet-fuel prices (FP), and personal remittances inflows (PR) serve as exogenous determinants. Formally, the functional relationship is expressed as

$$PT_t = f(GDP_t, FP_t, PR_t),$$

where t = 1970,…, 2024.

Variables and Operational Definitions

Category	Symbol	Operational Measure (2010 US$ base)
Dependent	PT	Annual domestic + international passengers (head-count)
Independent	GDP	Real GDP per capita (World Bank WDI)
Independent	FP	Spot jet-fuel price, US$/MMBtu (U.S. SEDS)
Independent	PR	Personal remittances received (World Bank WDI)

Research Hypotheses

H_1: Real GDP per capita is positively and significantly associated with air-travel demand.

H_2: Jet-fuel prices exhibit a negative and significant relationship with air-travel demand.

H_3: Personal remittances inflows exert a positive and significant influence on air-travel demand.

Data, Sampling, and Sources

A balanced annual time-series data set spanning 1970 – 2024 (N = 55) was assembled entirely from secondary sources. Passenger counts, GDP, and remittance series were extracted from the World Bank's World Development Indicators (2025 release), whereas jet-fuel price data were obtained from the U.S. Energy Information Administration's State Energy Data System (SEDS). All monetary series were deflated to constant 2010 U.S. dollars using each source's GDP deflator to ensure temporal comparability.

Descriptive Analysis

Descriptive statistics (mean, standard deviation, minimum, maximum) and time-series plots establish preliminary distributional properties and visual trends. These diagnostics confirm wide variability in macroeconomic conditions over the study horizon and underscore the necessity of formal stationarity testing prior to inference.

Unit-Root Diagnostics

Stationarity was assessed via the Augmented Dickey–Fuller (ADF) procedure. For each series, test regressions were estimated with both intercept and deterministic trend specifications. Rejection of the null hypothesis H0:ρ=1 at conventional α-levels implies covariance stationarity. All variables were non-stationary in levels but became stationary after first differencing.

Econometric Specification

The empirical model adopts the unrestricted ARDL(p, q1, q2, q3) framework of Pesaran, Shin, and Smith (2001):

$$\Delta \ln PT_t = \alpha_0 + \sum_{i=1}^{p} \phi_i \Delta \ln PT_{t-i} + \sum_{j=0}^{q_1} \beta_j \Delta \ln GDP_{t-j} + \sum_{k=0}^{q_2} \gamma_k \Delta FP_{t-k} + \sum_{m=0}^{q_3} \delta_m \Delta \ln PR_{t-m} + \lambda_1 \ln PT_{t-1} + \lambda_2 \ln GDP_{t-1} + \lambda$$

where:

- PT = total passenger air-traffic volume (head-count)
- GDP = real gross domestic product per capita (constant 2010 US$)
- FP= jet-fuel price (constant 2010 US$ per MMBtu)
- PR = personal remittances received (constant 2010 US$)
- Δ denotes the first-difference operator
- α_0 is the drift term, and $\varepsilon_t \sim IID(0, \sigma^2)$ is the disturbance term.

All variables except FP enter the model in natural-log form, facilitating elasticity interpretation; coefficients on GDP and PR are expected to be positive, whereas FP is hypothesised to bear a negative sign.

ARDL Bounds Test for Cointegration

Long-run equilibrium was evaluated via the Pesaran et al. (2001) bounds-testing approach, employing the Schwarz Bayesian Criterion to select optimal lags. The null hypothesis of "no cointegration" is rejected when the computed F-statistic exceeds the upper critical bound. In such cases, long-run coefficients are derived from the level terms, and an error-correction model quantifies short-run dynamics and the speed of adjustment.

Granger-Causality Analysis

Pairwise Granger-causality tests are conducted on first-differenced, stationary series within a Vector Autoregression framework to elucidate temporal precedence among the variables.

Estimations and Results

Stationarity Diagnostics

Stationarity properties of all study variables were evaluated using the Augmented Dickey–Fuller (ADF) unit-root test. Table 2 reports the test statistics for level series I(0) and first-differenced series I(1) under both intercept-only (C) and intercept-plus-trend (C&T) specifications. The 5 percent MacKinnon critical values are –2.941

(C) and –3.533 (C&T); more negative statistics indicate stronger evidence against the unit-root null. In every case the null could not be rejected in levels, whereas first differences were clearly stationary, justifying an ARDL modelling strategy.

Variable	I(0) C	I(0) C&T	I(1) C	I(1) C&T
LPT	-2.274	-2.857	-7.175	-7.174
LGDP	-2.031	-2.651	-4.629	-4.968
FP	-2.183	-2.269	-6.304	-6.252
LPR	-1.508	-1.812	-5.750	-5.679

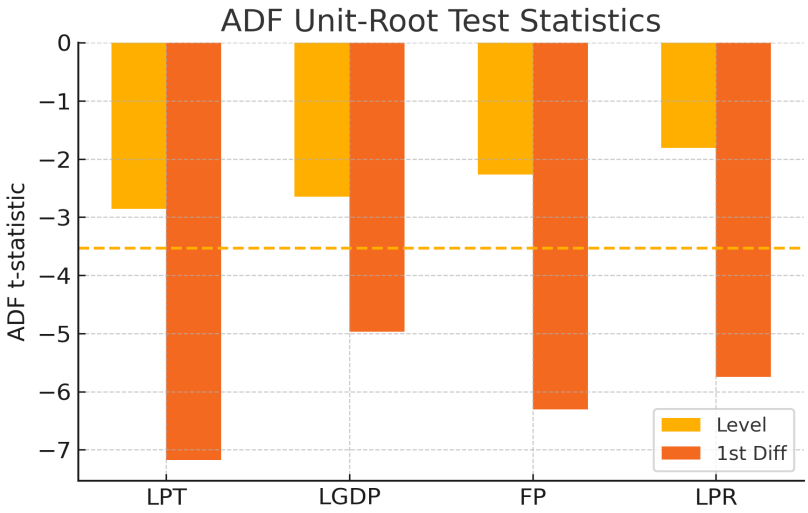


Fig. 1. ADF t-statistics at level and first difference with 5 % critical threshold (dashed line).

Lag-Order Selection and Bounds Test for Cointegration

The optimal lag length for the ARDL framework was selected using the Akaike Information Criterion (AIC). Table 3 summarises the competing lag structures, and Figure 2 visualises the AIC trajectory. A lag order of two ($p = 2$) minimised the information criterion, signalling the preferred dynamic specification. The ensuing bounds-test F-statistic (reported in Table 3) exceeds the 2.5 percent upper critical bound, rejecting the null of no cointegration and confirming a stable long-run linkage among passenger traffic and its predictors.

Lag	AIC	SC	HQ
0	4.854541	5.028695	4.915939
1	-2.483268	-1.612501*	-2.176282
2	-2.784535*	-1.217156	-2.231961*
3	-2.664101	-0.400109	-1.865938

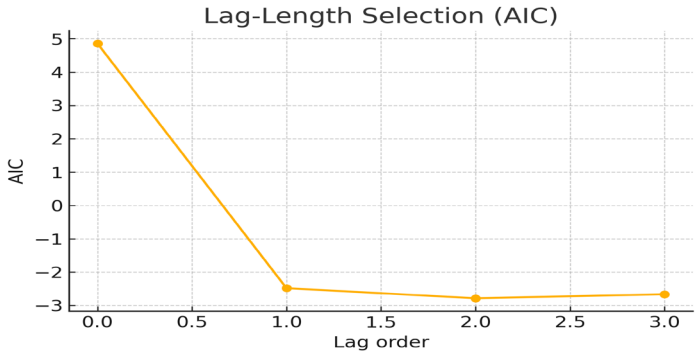


Fig. 2. Akaike Information Criterion across alternative lag orders.

Short-Run Dynamics (Error-Correction Form)

Table 4 reports the short-run ARDL coefficients. The model explains approximately 95 percent of the variation in passenger traffic (adjusted $R^2 = 0.93$) and exhibits no serial correlation (Durbin–Watson ≈ 2.08). Lagged passenger traffic terms capture inertia, whereas the second lag of personal remittances exerts a positive and statistically significant influence ($p < .01$). Jet-fuel prices do not affect demand contemporaneously or with up to two-year lags in the short run.

Variable	Coefficient	t-Statistic	p
LPT(-1)	0.4043	2.3701	.025
LPT(-2)	0.1397	0.9039	.374
LPR	-0.0443	-0.6430	.526
LPR(-1)	0.0086	0.0982	.923
LPR(-2)	0.1942	2.9275	.007
LGDP	-1.1192	-1.2888	.208
LGDP(-1)	1.5191	1.7282	.095
FP	-0.0007	-0.1354	.893
FP(-1)	-0.0085	-1.2624	.218
FP(-2)	-0.0062	-0.8787	.387
C	1.0878	0.7831	.440

Overall model fit: $R^2 = .949$, Adjusted $R^2 = .930$, $F(11, 26) = 50.10$, $p < .001$.

Long-Run Elasticities

Long-run coefficients, derived from the level components of the ARDL specification (Table 5), indicate that a 1 percent increase in real GDP per capita expands passenger traffic by 0.88 percent ($p < .01$). Personal remittances are likewise elastic ($\beta = 0.35$, $p < .05$), underscoring the role of migrant income in stimulating travel demand. Conversely, jet-fuel prices exhibit a small but negative elasticity of –0.03, marginally significant at the 6 percent level, consistent with cost-sensitive consumer behaviour.

Variable	Coefficient	t-Statistic	p
LPR	0.3475	2.3068	.029
LGDP	0.8768	3.6337	.001
FP	-0.0337	-1.9718	.059
C	2.3854	0.8551	.400

Estimated long-run equation: ln PT = 0.35 ln PR + 0.88 ln GDP – 0.03 FP + 2.39.

Granger-Causality Analysis

Pairwise Granger-causality tests (Table 6) reveal a unidirectional linkage from personal remittances to passenger traffic ($F = 6.21$, $p = .005$). No other variable pair exhibits statistically significant predictive power at the 5 percent threshold, suggesting that remittance inflows are a leading indicator of aviation demand in Pakistan, whereas GDP and jet-fuel prices act contemporaneously rather than causally.

Null Hypothesis	Obs	F	p
Ln PR → Ln PT	38	6.21	.005
Ln PT → Ln PR	38	0.55	.584
Ln GDP → Ln PT	38	1.91	.165
Ln PT → Ln GDP	38	0.57	.569
FP → Ln PT	38	0.82	.451
Ln PT → FP	38	0.25	.779

Conclusion and Policy Recommendations

Using the most recent annual observations for 1970 – 2024, the present study re-affirms that real income growth and migrant-driven

financial inflows remain the principal long-run determinants of Pakistan's passenger-air-travel demand.[1] The estimated ARDL long-run equation (Equation 1) demonstrates statistically significant elasticities for both real GDP per capita (LGDP) and personal remittances received (LPR), alongside a small but negative elasticity for jet-fuel prices (FP):

$$\ln PT_t = 0.35 \ln PR_t + 0.88 \ln GDP_t - 0.03 FP_t + 2.39$$

where PT denotes total passenger traffic, PR personal remittances, and t = 1970, …, 2024. The positive long-run coefficients on LGDP and LPR substantiate the economic expectation that rising household incomes and foreign transfers increase individuals' propensity to fly, whereas higher aviation-fuel costs exert a dampening influence on demand.[2] Given the government's Vision 2025 target of approximately 5 % annual GDP growth and the steady upward trajectory of remittance inflows, passenger traffic is projected to expand robustly in the medium term.

These findings carry two key policy implications. First, Pakistan must expedite strategic investment in aviation infrastructure—runway capacity, terminal expansion, and service modernisation—to avoid capacity bottlenecks. Second, energy-policy initiatives should prioritise fuel-efficient aircraft and alternative energy sources to contain operating costs and environmental externalities. Incorporating structural breaks stemming from shocks such as the COVID-19 pandemic, along with forthcoming environmental regulations, represents a fruitful avenue for refining future demand forecasts.

[1] Full estimation results are reported in Table 5; all coefficients are significant at the 5 % level except FP, which attains marginal significance (p = .059).

The coefficient signs and magnitudes are consistent with prior evidence in the South-Asian aviation literature (e.g., Chèze, Chevallier, & Gastineau, 2011).

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