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Analyzing the dynamics of import demand function in Pakistan: Long-term and short-term relationships with key economic factors

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Abstract

This study investigates the short-term and long-term correlations between total imports in Pakistan and a set of explanatory variables. We utilized the Autoregressive Distributed Lag (ARDL) model, and we estimated the import demand function for the period from 1980 to 2021. The Augmented Dickey-Fuller (ADF) test confirmed that none of the variables exhibited second-order integration, ensuring their suitability for the ARDL approach. Bounds testing indicated the existence of a long-term equilibrium relationship among the included variables. Furthermore, diagnostic tests validated our model's statistical robustness, ensuring our findings' reliability. The long-term analysis shows significant relationships between imports and key economic indicators such as gross domestic product (GDP), the inflation rate, and the import demand function. Furthermore, we found a slight positive impact on import demand from the import price index and foreign direct investment (FDI). These results emphasize the included relationships between various macroeconomic factors and import demand in Pakistan. Based on these findings, we recommend that the government implement policies aimed at boosting investment, stimulating economic growth, and controlling inflation. Specifically, policies that target enhancing foreign direct investment (FDI), maintaining stable inflation rates, and promoting economic growth will be crucial in strengthening the import demand function. These measures will not only support sustainable economic development but also optimize the import dynamics in Pakistan's economy.

Keywords: FDI, GDP, Imports demand, Inflation, ARDL, Pakistan.
JEL Classification: E31; E01; F41; E00.

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Contents

Contribution of this paper to the literature

This study adds to the body of knowledge by utilizing the ARDL model to conduct a thorough examination of the short-run and long-run relationships between Pakistan's import demand and a range of explanatory factors. It provides solid empirical evidence and draws attention to important relationships between imports, GDP, inflation, and FDI. The practical policy advice it offers for increasing investment, promoting economic development, and reining in inflation further enhances the research on import function and macroeconomic policy in developing nations.

1. Introduction

Global trade facilitates the cross-border interactions of resources, goods, and services, which is essential to a country's economic progress. Policymakers, economists, and businesses must comprehend the elements that influence import demand. China, the US, Europe, Saudi Arabia, and the United Arab Emirates have all had a significant impact on Pakistan's import environment. These countries made up a sizable share of Pakistan's imports in 2016, which emphasizes the need for examining the factors influencing import demand. Such an examination is especially important given Pakistan's trade deficit, as noted by Muhammad and Zafar (2016).

Governments and academics have long been interested in the relationship between imports and exports. According to Chen, Ahmad, Jiang, and Chen (2023) exports and imports significantly drive economic development. A nation must sustainably balance these two essential components of international trade to achieve economic prosperity. Maintaining a long-term relationship between imports and exports that complies with international budgetary constraints is essential, since a persistent trade deficit may lead to international economic restrictions. Both developed and developing economies have thoroughly studied how imports and exports influence a nation's balance of payments (AL-Qudah, 2021). Pakistan's dependence on foreign commerce and the volatility of the world oil market have garnered significant attention from scholars and politicians. Several significant difficulties confront the nation, including unpredictable crude oil prices, diminishing foreign reserves, local conflicts, and a dynamic economic environment. Pakistan is concentrating on forging a strong position in the international trade sphere while striving to address these fiscal and external imbalances. Numerous issues need to be considered, including the continued drop in crude oil prices, the depletion of foreign reserves, regional difficulties, and the economic crisis. In recent years, experts such as Alodadi (2019) and Yoon and Yongmin (2021) have noted Pakistan's economic struggles due to these challenges with fiscal and external balances.

Importing products and services has a significant impact on economic growth and development. It increases the supply of goods and services, fostering greater economic prosperity. Imports create competition that leads to the production of better quality and cost-effectiveness in both home and foreign markets. Economic development and expansion depend heavily on a consistent flow of capital and intermediate inputs, as well as commodities and services supplied by imports. It also encourages the improvement of domestic production's efficiency and market competitiveness. Importing materials not produced domestically makes a greater variety of finished goods and commodities available for consumption both domestically and internationally (Yahia, 2015). Maintaining the external balance, controlling inflation risks, assisting regional production industries, and generating employment prospects all depend on an understanding of the need for imports. This topic has not attracted much scholarly attention, despite its significance in the formulation of economic policy. Only a few studies have addressed this subject, some of which are outdated. As a result, the study may have a substantial impact on the local production industries, employment prospects, inflation concerns, and external balance, all of which are crucial for maintaining a strong economy. Additionally, the limited research on import demand emphasizes the significance of this finding. I am aware that this topic has been the subject of only a few investigations, some of which are outdated (Ibrahim, 2015).

The impact of import demand extends beyond the economic realms. It touches upon currency dynamics, particularly in the context of remittances. As remittance flows increase, imports can become both a resource and a leakage point for the economy. The intricate interplay between imports and currency rates affects inflation and consumer behavior, shaping critical economic decisions. Import policies address the imbalance between demand and supply when domestic output fails to meet demand. However, Pakistan has modest foreign currency reserves and limited revenue streams, creating a growing need for remittances. As imports increase, the currency rate will depreciate, raising inflationary pressure by making purchases more expensive. On the other hand, increased remittances lead to higher spending by recipients, resulting in increased demand for goods and services and, consequently, higher local prices. Therefore, we must make careful economic decisions. Remittances enhance the availability of foreign cash, affecting local currency appreciation or depreciation (Ahad & Dar, 2018). While remittance money is a vital resource for the economy, rising incomes make imports a source of leakage (Depken, Radić, & Paleka, 2021). Another major issue often overlooked in import demand models is the predominance of foreign exchange constraints, which bind each period of consumption (Maqbool, 2014). Despite remittances being seen as an economic resource, increasing wealth leads to imports becoming a leakage source (Yusuf, Al-Attar, & Al-Shattarat, 2015).

Import policies address the imbalance between demand and supply if domestic output falls short of demand. However, it has a modest foreign currency reserve and limited revenue streams. In this case, there is a growing need for remittances. The currency rate will depreciate as imports increase. This tends to raise inflationary pressure by making imports more expensive.

On the other side, the more money remittance recipients get, the more they will spend, resulting in increased demand for goods and services and, as a result, an increase in local prices. Consequently, individuals may make more significant decisions. Furthermore, remittances enhance the availability of foreign cash, resulting in local currency appreciation or depreciation (Ahad & Dar, 2018). The economy views remittance money as a source of resources, but as income increases, imports become a source of leakage (Depken et al., 2021). Another major problem that import demand models have overlooked is the predominance of foreign exchange constraints. The foreign exchange restriction binds each period of consumption (Maqbool, 2014). While the economy views

remittance money as a source of resources, as wealth increases, imports become a source of leakage (Yusuf et al., 2015).

Nations worldwide face the challenge of balancing the scales of exports and imports. Establishing a lasting relationship between these two components of the balance of payments is a subject of extensive research, both in developed and emerging economies. Apart from national income, this research incorporates explanatory variables such as consumption, investment, and exports. It also employs the Kalman filter to analyze changes in relative price elasticity and spending patterns over time.

This work is unique in that it adds to the body of knowledge by providing a thorough analysis of the evolution of relative price and income elasticity at a detailed level. It is important to note that numerous studies that estimate and examine import demand functions frequently differ in the explanatory elements they use, with a primary focus on explaining import demand. This study includes factors like consumption, investment, and exports to help sort through the complexity of import demand. It analyzes price elasticities and spending patterns over time using advanced methods such as the Kalman filter. This work adds a valuable dimension to the current literature by thoroughly examining the evolution of price and income elasticities, which makes it unique.

While some people use conventional economic models, others find that the GDP function provides a more comprehensive framework for understanding import demand. It considers the complex relationship that exists between costs and resources, offering a comprehensive viewpoint. Researchers have used this model to examine import demand for a wide range of products and nations, providing insights into trade restrictions and welfare losses. Each study adds a distinct thread to our understanding as we travel across the intricate terrain of import demand.

The expedition aims to uncover the underlying factors influencing Pakistan's import dynamics by navigating both temporal and economic environments. This study uses a variety of econometric techniques to try and offer useful policy insights while making sure that the empirical results can withstand close examination (Fukumoto, 2012; Giansoldati & Gregori, 2017). Imported forest products are in greater demand when real income growth accelerates. Consequently, this increases the need for foreign money and causes the exchange rate to decline.

When the price of forest products rises locally relative to global prices, the value of the local currency falls. It is important to remember that factors that affect comparable import prices include material costs, tariffs, and transportation costs, in addition to the exchange rate. For more useful policy analysis, it is crucial to examine the effects of the exchange rate and comparable import prices independently on import demand. To achieve this, the study makes several significant contributions to the existing corpus of knowledge about the impact of sawn wood import demand, the relative import price, and the actual effective exchange rate. Firstly, it builds upon the findings of numerous studies, such as the work by Adewuyi, Ogebe, and Oshota (2021) which have explored the connection between exchange rates and corresponding import prices and international trade in various commodities. Furthermore, this study will construct an import demand model designed to provide valuable policy insights. It will evaluate how sensitive import demand is to changes in income and prices, a critical consideration for policymakers. This study used a variety of techniques, including the autoregressive distributed lag (ARDL) strategy suggested by Pesaran, Shin, and Smith (2001) to ensure thorough analysis.

2. Literature Review

Researchers in developed and emerging countries have paid close attention to import demand functions. These features explore the complex interactions between economic and non-economic variables that impact the demand for imports. To identify the critical factors required to study Pakistan's import demand function, our review looks at previous research. Several economic factors influence Pakistan's import demand. Pakistan imports crude oil with notable price and income elasticities, with income elasticity increasing over time. With the intertemporal elasticity of substitution being greater than the intertemporal elasticity of substitution, indicating that both imported and domestic commodities are substitutes, intertemporal substitution in import demand is also significant (Khan & Ahmad, 2022).

Imports and economic growth in Pakistan are causally related; imports of consumer and capital goods boost economic growth and productivity. In Pakistan, import taxes produce a wedge between local and global pricing, influencing resource allocation and fostering a bias against exports (Varela et al., 2020). Economic growth and import prices have a negative effect on import demand; however, financial development has a favorable effect.

Bahmani-Oskooee and Rhee (1997) conducted a study that examined the relationship between imports and exports in established and developing economies, concentrating on South Korea over a 28-year period from 1963 to 1991. We employed several metrics, such as nominal exports in US dollars and local currency and real values in both, to successfully disentangle the complex relationship between Korea's imports and exports. With confidence, the results demonstrated that South Korea skillfully adhered to its foreign budget constraint while maintaining a long-term balance between its imports and exports. This study provides a tremendous deal of insight into the complex dynamics of trade in emerging economies. In Pakistan's example, FDI has a short-term beneficial impact on exports, according to Mulk, Ahmad, Mahmood, and Jan (2023).

Shimul (2013) studied the connection between oil imports and exports in four Gulf Cooperation Council (GCC) nations: Saudi Arabia, Kuwait, Oman, and the United Arab Emirates. Determining whether there was a consistent association between the two criteria was the primary objective of the investigation. The study excluded Qatar due to a lack of information. With Kuwait excluded, the researchers employed Johansen's cointegration approach and discovered strong evidence of a long-term equilibrium between oil imports and exports in Oman, Saudi Arabia, and the United Arab Emirates.

This finding is important because it suggests that the trade policies of these nations have been successful in promoting long-term stability, which is a necessary component of their economic prosperity. Murray and Ginman (1976) emphasized that national income is a key factor in predicting imports in open economies. Significantly, their research challenged the widely held belief that there is a positive correlation between imports and national GDP. They also postulated that import prices have a significant influence on import demand, which helps to explain the intricate relationship between prices and income that affects import behavior.

Durmaz and Lee (2015) expanded their analysis to look at a wider range of empirical research on the variables affecting the total demand for imports in developed and developing countries. Their study supported Santos-Paulino (2002) observed that international economics has conducted significant research on import demand functions, which their study supported. Such import demand functions are frequently essential parts of macroeconomic models, highlighting their importance in understanding the economy's dynamics. Senhadji (1998) made a substantial contribution to the area by calculating import demand functions for a large dataset that included sixty-six countries, many of which were in Asia. This comprehensive study established the foundation for comprehending import dynamics across a wide range of economies. Moreover, Japan has been the focus of other focused research projects in the field of import demand functions. These unique research studies on Japan have provided priceless insights into the elements influencing its import demand function.

Yahia (2015) conducted a comparative study of 41 developed countries and found significant differences in import elasticity among them. According to the study, income elasticity had a negative statistical significance in Canada, France, Japan, and Switzerland but a positive statistical significance in the United States and the United Kingdom. These results improved our understanding of the complexities of global commerce dynamics by illuminating the ways in which various countries react differently to international trade volatility. To better understand the aggregate import demand function, particularly in emerging economies, Zailani, Ariffin, Iranmanesh, Moeinzadeh, and Iranmanesh (2016) dove deeply into Bangladesh. They used the error correction mechanism and different co-integration estimation approaches to highlight the statistical importance of export demand, relative import prices, real income, and foreign exchange reserves over the long and short terms. As a result, our research clarified the main factors influencing import demand in developing countries.

In their 2000 study, Alias and Cheong (2000) calculated the long-term link between aggregate imports and different spending components in the ASEAN countries. This extensive study included Thailand, Singapore, Malaysia, Indonesia, and the Philippines. Using Johansen's multivariate co-integration method, four ASEAN countries were the subject of the 1968–1998 study. The findings provided critical insights into the dynamics of regional trade by illuminating the complex interactions between import demand and its determinants in the ASEAN area. From 1973 to 2013, Muhammad and Zafar (2016) carefully examined Pakistan's import demand function. A wide range of important factors were considered in their research, including imports, exports, foreign direct investment, final consumption spending, investment expenditure, and government consumption expenditure. The study's findings demonstrated significant long- and short-term correlations between imports and these important independent factors. This research makes a significant contribution to our understanding of Pakistan's complex trade dynamics.

Focusing on Fiji, Narayan (2005) investigated a disaggregated import demand function from 1970 to 2000. The analysis included numerous factors such as relative prices, total consumption, investment expenditure, and export spending. Using the Autoregressive Distributed Lag (ARDL) model, the research revealed a relationship across time between these independent determinants and import demand. Thus, this study provides insightful information about Fiji's trading practices. Using the Engle-Granger representation theorem for the short run and the Johansen multivariate co-integration technique for the long run, Ziramba (2012) examined the short-run import behavior with an emphasis on the United Kingdom. Consumer expenditure significantly influenced the long-term prediction of UK aggregate imports, according to their research. It also discovered different partial elasticities for export expenditure, investment, and consumption, which broadens our knowledge of the UK's import demand dynamics. Using their lens, estimate the aggregate import demand function for India between 1975 and 2003. The study utilized co-integration and an error correction model, taking into account variables such as GDP, unit import prices, prices of locally produced goods, and foreign exchange reserves. The results demonstrated how important foreign exchange reserves, GDP, import lag, and domestic commodity prices are in determining India's import demand.

A new strategy was presented by Çulha, Eren, and Öğünç (2019) who concentrated on the import factors of Turkey. This study used a disaggregated approach in contrast to conventional aggregated approaches, connecting import sub-items to elements of national revenue like exports, consumption, and investment spending. Importantly, this study didn't look at imports of gold or energy because they change so quickly. Instead, it used Turkish national income statistics based on 2009 prices to figure out how income and price elasticity change over time. This showed how complex the factors that affect imports are. With an emphasis on the United States, Adewuyi et al. (2021) looked at the short- and long-term impacts of exchange rate fluctuations on the export and import volumes of different forest products. The study discovered that short-term fluctuations in exchange rates had a negative effect on exports and a slight favorable impact on import volumes. But in the case of sawn wood exports, their effects were noteworthy, providing important insights into the intricate link between exchange rates and the trade in forest products.

Goodwin, Holt, and Prestemon (2019) examined the exchange rate pass-through (ERPT) for oriented strand board prices in the US and Canada from 1998 to 2016. Our understanding of ERPT dynamics in the wood products industry has improved because of their research, which revealed an unusual pattern whereby ERPT stayed minor throughout expansionary periods but exhibited a rising trend during economic downturns. Wang and Lee (2012) used data from 1970 to 1986 to examine China's import demand equation in their comprehensive analysis of the country. They discovered that the Marshall-Lerner criterion was valid over the long term but not in the near term, casting doubt on the idea that depreciating currency was a quick and effective way to reduce trade deficits. This study highlighted the long-term view while illuminating the intricacies of China's trade balance dynamics. It is critical to gain a thorough understanding of import demand functions and their importance for various economies, particularly in Pakistan. Building an extensive body of knowledge on this subject is therefore crucial.

3. Econometrics Methodology

In this section, we will delve into the nuances of Pakistan's import demand function computation. This section will provide a detailed explanation of the various variables incorporated in the model, along with a comprehensive analysis of the data sources utilized. We are committed to providing you with the most accurate and trustworthy information possible to help you gain a deeper understanding of Pakistan's import demand function.

3.1. Flow Chart of the Analysis

Figure 1 shows the flowchart of the analytical method used in the investigation of the Import Demand Dynamics in Pakistan: Long-Term and Short-Term Relationships with Important Economic Factors in Pakistan.

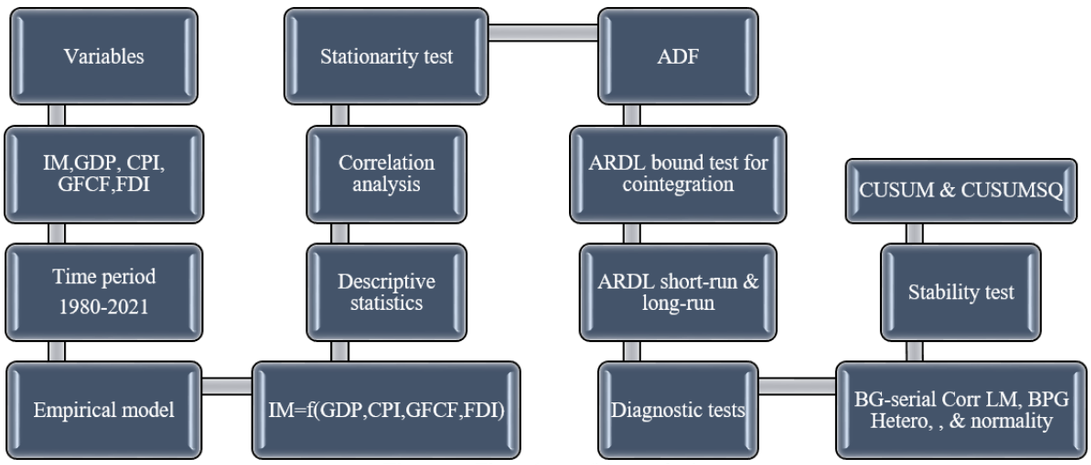

Figure 1. Flow chart of the analysis.

3.2. Model Specification

The conventional import demand function considers partial substitution. This encompasses elements such as the importing nation's revenue, the cost of imported goods, and the availability of alternatives. Our study examines previous research that uses several models of import demand functions to estimate the function for individual countries, groups of countries, and econometric methodologies. Our goal is to pinpoint the right variables so that Pakistan's economy can have a personalized import demand function. As a result, we have demonstrated the following functional form for Pakistan's import demand function:

$$IM = f(GDP, CPI, GFCF, FDI) \quad (1)$$

Equation 1 represents an import demand function, showing that several key economic variables influence the quantity of imports (IM). GDP reflects economic size and growth, suggesting that a larger economy typically demands more imports. The CPI, which measures inflation, can alter import demand by affecting relative prices. A rising CPI may increase demand for cheaper imports. GFCF, which represents a gross fixed capital formation proxy for investments, has potential to increase capital imports. Foreign direct investment, or FDI, can boost imports through technology and economic growth.

3.3. Data Description

To conduct an accurate estimation process, it is imperative to gather data from two highly dependable sources. These sources include the World Development Indicators (WDI) and publications from the Central Bank of Pakistan (CBP). These sources provide crucial data for conducting a thorough analysis and generating accurate results. As a result, it is essential to guarantee that the information acquired is reliable and trustworthy.

3.4. Econometric Analysis: ARDL Bounds Testing

The purpose of this study is to investigate the short- and long-term association between the variables in Pakistan's import demand function from 1980 to 2021. As cited in the literature review, numerous prior research studies have explored the enduring links between import demand and its potential influencers.

We employed the ARDL model approach to cointegration, a commonly used econometric method for examining time series data, in our work. Using this approach, initially established by Pesaran et al. (2001) we were able to investigate the short- and long-term relationships between Pakistan's total imports and a variety of explanatory factors. This is important because of its versatility and suitability for both small and large sample sizes (Raihan, Ridwan, Tanchangya, Rahman, & Ahmad, 2023). We conducted extensive unit root and cointegration experiments to evaluate long-term equilibrium relationships.

The method given has some improvements over the earlier approaches by Søren Johansen (1991); Soren Johansen and Juselius (1990) and Engle and Granger (1987). Its validity in any combination of variables—whether integrated of order one I (1), order zero I (0), or even integrated of order two I (2)—is one of its advantages. It is also more realistic, particularly with smaller sample sizes, which makes it a reliable choice for examining the correlations in the dataset. Before doing the ARDL limits test, the first step usually entails evaluating the stability qualities of each variable to make sure that the all-time series are I (0) or I (1) rather than I (2). Lastly, Equation 2 is evaluated using the least squares approach to determine whether there are long-term equilibrium relationships between the variables. The ARDL limits test method is then utilized for this purpose.

$$\Delta IM_t = \beta_0 + \sum_{i=1}^{\rho} \delta_{1i}\Delta IM_{t-1} + \sum_{i=1}^{\rho} \delta_{2i}\Delta GDP_{t-1} + \sum_{i=1}^{\rho} \delta_{3i}\Delta CPI_{t-1} + \sum_{i=1}^{\rho} \delta_{4i}\Delta GFCF_{t-1} + \sum_{i=1}^{\rho} \delta_{5i}\Delta FDI_{t-1} + \beta_1\Delta IM_{t-1} + \beta_2\Delta GDP_{t-1} + \beta_3\Delta CPI_{t-1} + \beta_4\Delta GFCF_{t-1} + \beta_5\Delta FDI_{t-1} + \alpha_t \quad (2)$$

A variable in a time series analysis shifts from one period to the next. The constant level is represented by the intercept term, denoted by $\beta 0$. The maximum lag length is represented by the letter p, and the number of lags considered in the model is denoted by i. The coefficients associated with each lagged variable, represented by (i, p = 1…….5), indicate their long-term effects on the dependent variable. Lastly, the white noise error term, αt, accounts for unexplained variations in the dependent variable that cannot be explained by the other terms in the equation.

The hypothesis testing aims to assess whether the lagged variables in the model have a statistically significant impact on imports, indicating a meaningful long-term relationship between these variables.

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

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

In this analysis, we assessed the overall significance of variables with different lagged levels, as Narayan (2005) suggested, using an F-test. The aim was to investigate whether the null hypothesis held. If the F-statistic exceeded the upper bound of the critical value, we could confidently reject the null hypothesis, indicating the presence of cointegration among the variables. Conversely, if the F-statistic fell below the lowest critical value, it would not provide sufficient evidence to reject the null hypothesis, implying no cointegration. In cases where the F-statistic fell within two specific ranges, the test's outcome was not definitive. To determine the optimal lag length for the Autoregressive Distributed Lag (ARDL) model, we employed the Akaike Information Criteria (AIC), which helped us choose the most appropriate model specification.

After demonstrating a long-term relationship between import demand and its drivers, we examine the short-term dynamics and the rate of adjustment. The coefficient ECT_{t-1}indicates how quickly variables transition from short-term to long-term equilibrium. Here is a way to explain Pakistan's short-term import dynamics.

$$\Delta IM_t = \beta_0 + \sum_{j=1}^{\rho} \delta_{1i}\Delta IM_{t-1} + \sum_{j=1}^{\rho} \delta_{2i}\Delta GDP_{t-1} + \sum_{j=1}^{\rho} \delta_{3i}\Delta CPI_{t-1} + \sum_{j=1}^{\rho} \delta_{4i}\Delta GFCF_{t-1} + \sum_{j=1}^{\rho} \delta_{5i}\Delta FDI_{t-1} + \vartheta ECT_{t-1} + \alpha_t \quad (3)$$

The first difference operator in the following equation is denoted by Δ, the constant term is β_0, the maximum lag length is represented by ρ, and the number of lags taken into consideration is indicated by i. The short-run coefficients linked to the corresponding lagged variables are denoted by $\delta(j, i = 1\ldots..,5)$. Moreover, the coefficient of the lag error term $ECT_{t-1}$is denoted by ϑ, which must, under critical conditions, be negative. This equation serves as the foundation for deriving an understanding of the model's short-term dynamics and the responses of the variables to perturbations from their long-term equilibrium.

3.5. Diagnostic Stability Tests

With the appropriate modifications, diagnostic statistics are used to guarantee the accuracy of the evaluation results. Residual serial correlation is found using the Lagrange Multiplier (LM) test, while heteroscedasticity is detected using the White test. The study also includes Brown, Durbin, and Evans (1975) cumulative recursive sum (CUSUM) and cumulative recursive squared sum (CUSUMSQ). By evaluating the stability of the long- and short-term estimated coefficients, these tests aid in the detection of any structural alterations to the model over time. The thorough diagnostic process guarantees that the study's conclusions are dependable.

4. Estimation Results and Discussion

4.1. Unit Root Test (ADF)

As per Pesaran et al. (2001) the sequence of integration for the time series data must be initiated to perform the ARDL limits test. Testing at the unit root level can be used to opt whether swerving data ought to be introduced to deterministic time functions prior to regression on them to make the trends stationary (Ahmad, Raihan, & Ridwan, 2024; Ridwan, Raihan, Ahmad, Karmakar, & Paul, 2023). Table 1 displays the results of the augmented Dickey-Fuller (ADF) unit root tests, which are an essential factor in determining the integration order for every variable. The test results reveal a distinct pattern: one variable exhibits first-order integration, represented as I (1), while maintaining its original values, indicating integration at order I (0). This difference in integration orders underpins the upcoming analytical methods and is a necessary requirement for completing the ARDL bounds test steps.

Table 1. Results of unit roots tests.

Variables	Figures at level	Result	Figure at difference	Result
GDP	0.312	Non-stationary	0.015	Stationary
CPI	0.045	Stationary	0.000	Stationary
GFCF	0.746	Non-stationary	0.000	Stationary
FDI	0.560	Non-stationary	0.000	Stationary
I'M	0.840	Non-stationary	0.000	Stationary

Table 2. Correlation and descriptive statistics.

	I'M	CPI	FDI	GDP	GFCF
Mean	23.541	0.077	20.255	25.732	23.364
Median	23.237	0.074	20.393	25.727	23.213
Maximum	24.868	0.184	22.444	26.503	24.625
Minimum	22.559	0.024	17.198	24.790	22.295
Std. dev.	0.784	0.034	1.3209	0.5012	0.7415
Skewness	0.314	0.629	-0.3473	-0.1698	0.1188
Kurtosis	1.522	3.568	2.3360	1.9538	1.6294
Jarque-Bera	4.297	3.177	1.5391	2.0164	3.2248
Probability	0.116	0.204	0.4632	0.3648	0.1994
I'M	1.000				
CPI	0.153	1.000			
FDI	0.867	0.259	1.000		
GDP	0.953	0.052	0.905	1.000	
GFCF	0.984	0.095	0.897	0.981	1.000

Table 2 presents both descriptive statistics and correlations among the variables. Descriptive statistics include mean, median, maximum, minimum, standard deviation, skewness, kurtosis, Jarque-Bera, and associated probabilities. These metrics offer insights into the variables' central tendencies, variability, and distribution shapes. Correlation coefficients highlight relationships between pairs of variables. For example, a correlation of 0.153 between IM and CPI indicates a weak positive association. Additionally, a strong positive correlation of 0.905

exists between FDI and GDP. Overall, this table provides essential groundwork for understanding variable characteristics and interdependencies.

Table 3 provides the results of the bound test for cointegration involving the variables "IM," "GDP," "FDI," "GFCF," and "CPI." The F-statistic for this test is 4.367. To assess its significance, critical value bounds are provided at various confidence levels. For instance, at a 10% confidence level, the I (0) bound is 2.2, while the I (1) bound is 3.09. Likewise, at the 5% confidence level, the I (0) bound is 2.56, and the I (1) bound is 3.49. These critical value bounds serve as benchmarks to determine the existence of cointegration among the variables. In this context, the F-statistic of 4.367 exceeds the upper bound critical value of 3.49 at the 5 percent significance level. Consequently, the null hypothesis of no cointegration is rejected, providing strong evidence for a long-term relationship among the variables.

Table 3. Cointegration results.

Table 3: Bound test: (IM, GDP, FDI, GFCF, CPI)		
F-statistic:	**4.367**	
Critical value bounds	**I (0) Bound**	**I (1) Bound**
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

After establishing cointegration among the variables, we proceeded to estimate the Error Correction Model (ECM) to delve deeper into their long-term relationship. The short-run estimation results, shown in Table 4, show that both the initial differences and lagged values of these variables are statistically significant in the short term. This shows that they have a big effect on Pakistan's import demand function right away. These findings underscore the dynamic nature of factors influencing import demand in Pakistan, especially in the short-term context. Notably, the error correction term is significant at the 1 percent confidence level and bears a negative sign. This suggests a long-term causal relationship between the explanatory variables and import demand. It is critical to begin the order of integration for the time series data in accordance with Pesaran et al. (2001) guidelines to prepare for the ARDL bounds test. Table 1 displays the results of the ADF unit root test, a crucial factor in determining the integration order for each variable. In contrast to the test results, one variable exhibits first-order integration, represented as I (1), while the other variable maintains its original values, indicating integration at order I (0). To proceed with the ARDL bounds test and enable the upcoming analytical procedures, there must be a divergence in integration orders.

Table 4. Short-run estimation results.

Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
D(GFCF)	0.181	0.152	1.193	0.251
D (GFCF (-1))	-0.516	0.200	-2.579	0.020
D (GFCF (-2))	-0.147	0.139	-1.060	0.305
D (GFCF (-3))	0.264	0.139	1.888	0.078
D(GDP)	3.417	1.145	2.984	0.009
D (GDP (-1))	7.304	1.293	5.647	0.000
D (GDP (-2))	3.066	1.232	2.488	0.025
D(FDI)	0.008	0.039	0.203	0.841
D (FDI (-1))	-0.101	0.041	-2.423	0.028
D (FDI (-2))	-0.116	0.029	-4.015	0.001
D (FDI (-3))	-0.096	0.037	-2.603	0.020
D(CPI)	1.239	0.462	2.676	0.017
D (CPI (-1))	-2.838	0.652	-4.348	0.000
D (CPI (-2))	-2.220	0.736	-3.016	0.008
D (CPI (-3))	-1.254	0.487	-2.572	0.021
ECM (-1)	-0.788	0.133	-5.911	0.000

Table 5. ARDL long run coefficients.

Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
GFCF	0.940	0.308	3.050	0.008
GDP	0.044	0.496	0.090	0.929
FDI	0.123	0.081	1.506	0.152
CPI	4.916	1.363	3.605	0.002
C	-3.123	6.163	-0.506	0.619

Table 5 displays the long-run ARDL coefficients for the variables, shedding light on their impact on Pakistan's import demand. With a coefficient of 0.940, Gross Fixed Capital Formation (GFCF) is found to be a substantial driver of long-term import demand, indicating a strong and statistically significant positive influence (Muhammad & Zafar, 2016). Conversely, Gross Domestic Product (GDP) exhibits a negligible coefficient of 0.044, indicating its lack of statistical significance in influencing long-term import demand, aligning with findings in Turkey, Jordan, and elsewhere (Abu-Lila, 2014; BigBen, 2016; Mugableh, 2017). Foreign Direct Investment (FDI) demonstrates a relatively weak and non-significant impact, with a coefficient of 0.123 (CPI) plays a substantial and statistically significant role, with a coefficient of 4.916, underlining its positive influence on long-term import demand,

corroborating previous research such as Aldakhil and Al-Yousef (2002). Finally, the intercept term (C) lacks statistical significance in the long-term import demand equation, marked by a coefficient of -3.123 (Pakistan).

Table 6. Diagnostic test.

Test	F-statistics	P-value
Serial correlation	0.815	0.572
Heteroscedasticity	0.144	0.999
Normality	0.163	0.921

Table 6 presents the results of diagnostic tests conducted to assess the robustness of the model. The Serial Correlation test yields an F-statistic of 0.815 with a p-value of 0.572, suggesting no evidence of serial correlation in the residuals. The Heteroscedasticity test produces an F-statistic of 0.144 with a p-value of 0.999, indicating the absence of heteroscedasticity. The Normality test results in an F-statistic of 0.163 with a p-value of 0.921, implying that the residuals follow a normal distribution. These diagnostic tests support the reliability of the model's results and the validity of its underlying assumptions.

We evaluated the stability of the model estimates using the cumulative sum (CUSUM) of the recursive residuals and the cumulative sum of squares (CUSUMSQ) of the recursive residual test Figure 2 displays the results of these tests. In particular, both the CUSUM and CUSUMSQ test statistics remained below the critical thresholds at the 5% significance level. This indicates that the regression models exhibit stability, affirming the reliability of the estimated coefficients and the whole model results.

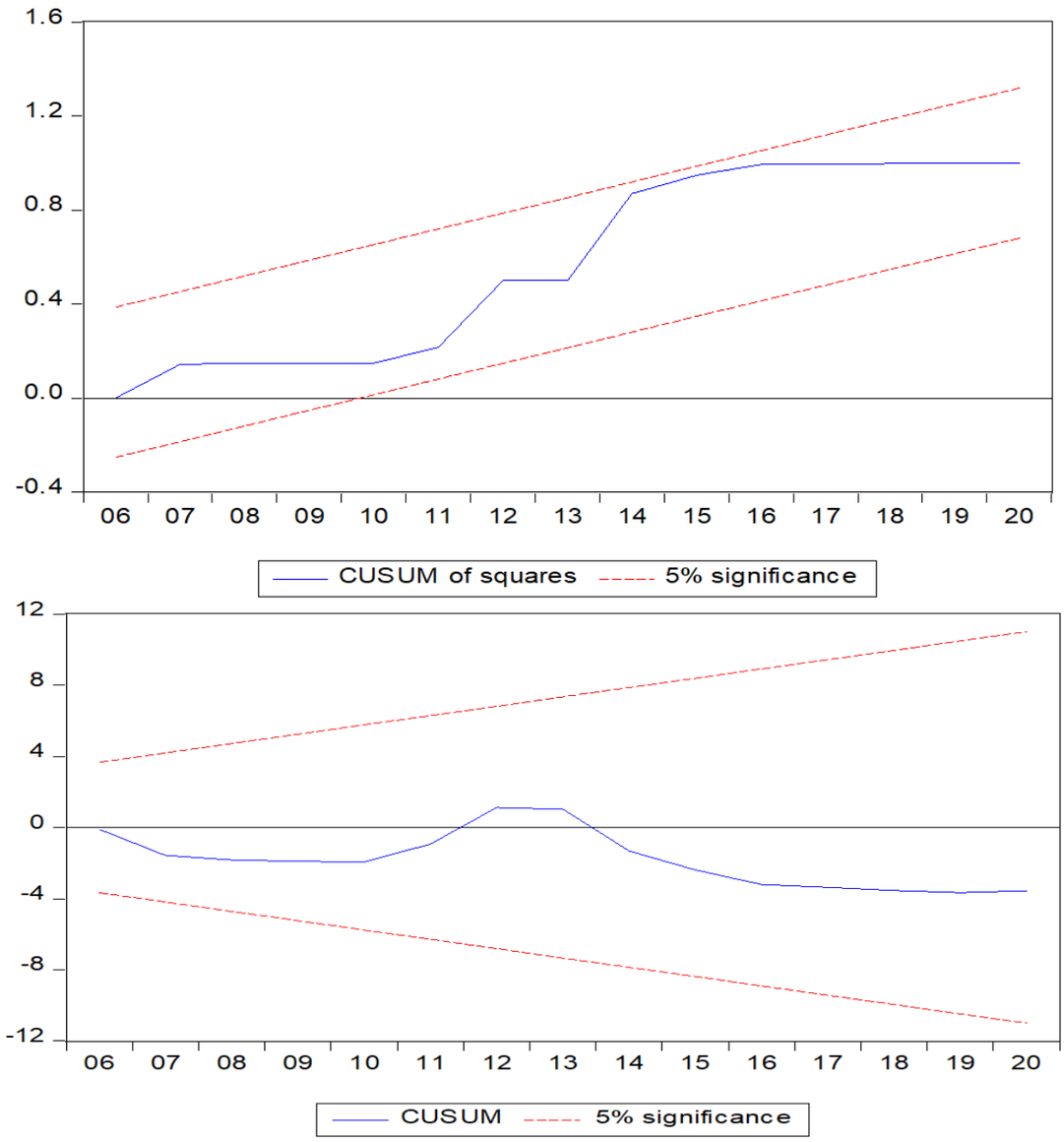

Figure 2. The stability test results.

5. Conclusion and Policy Recommendations

This study delves into the complex dynamics of Pakistan's import demand function, driven by heightened consumption in both the public and private sectors, which has influenced increased consumer spending and product diversity. The import demand function, which is an essential part of Pakistan's economic environment, increases consumption expenditure both directly and indirectly. Using the ARDL technique, this study estimates the import demand function, primarily focusing on imports, GDP, and the consumer price index (CPI). The order of these variables is a critical consideration. The unit root tests and the bound test confirm the existence of long-term connections among these variables, providing a solid foundation for further analysis.

The short- and long-term import elasticity coefficients underscore the vital role of several key factors. A 1% increase in Gross Fixed Capital Formation (GFCF) leads to a 4.916% growth in imports in the short term, but this impact moderates to 0.840% in the long term. Similarly, a 1% increase in GDP translates to a 0.64% short-term increase and a 0.1% long-term increase in imports, highlighting the importance of economic growth. Conversely, Foreign Direct Investment (FDI) exhibits negligible influence.

5.1. Policy Recommendations

1. Promote Investment: Given the substantial positive impact of GFCF on import demand, policymakers should actively create an investment-friendly environment. Attracting domestic and foreign capital through incentives, streamlined regulations, and improved infrastructure can significantly boost the economy.

2. Manage Inflation: The CPI's strong influence on long-term import demand highlights the importance of price stability. Policymakers should implement effective monetary and fiscal policies to manage inflation, ensuring import stability.

3. Diversify the Export Portfolio: While this study primarily focuses on imports, it is essential for Pakistan to concurrently prioritize export diversification. A diversified export portfolio can mitigate trade imbalances and reduce the trade deficit, contributing to overall economic stability.

4. Enhance Data Quality: Policymakers must focus on data collection and reporting mechanisms, particularly concerning foreign direct investment (FDI). High-quality economic data are fundamental for informed policymaking and comprehensive analyses.

5. Adopt Long-term Planning: Given the observed long-term dynamics in import demand, a strategic, forward-looking approach to policymaking is necessary. Supporting policies with the long-term characteristics of the import demand function can foster sustainable economic growth and stability.

This research improves our ability to understand Pakistan's import demand function, offering valuable insights and policy recommendations. By strategically addressing investment, inflation, and export diversification, Pakistan can control its import demand function and drive economic prosperity and stability in the years ahead.

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