IMPACT OF CURRENCY DEVALUATION ON ECONOMIC GROWTH: EVIDENCE FROM PAKISTAN

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ABSTRACT
This study examines the impact of currency devaluation on Pakistan’s economic growth. Currency devaluation is a controversial topic for developing and developed economies to believe in and hope to improve economic growth. This study used the model to find the association among study variables. The annual time series data from 1990 to 2018, together with ARDL and Johansen cointegration model, tested the long-run relationship between economic growth and currency devaluation. Both proposed models indicate that the devaluation of Pakistan’s currency has no significant impact on the long-run changes in economic growth. However, interest rates and gross capital formation are positively correlated with economic growth in the long run. Currency devaluation is a cure for a balance of payment, enhances the competitiveness of the international market, and promotes trade balance. Nevertheless, some political instability and macroeconomic and environmental conditions in a country are sometimes worse than a disease. This study recommended a sustainable Pakistan economy, a comfortable and friendly business environment, and looking closer at microeconomic indicators to make a robust industrial economic policy. Government must take an inventive industrialization policy instead of currency devaluation. Pakistan’s industrial sector has the potential to improve the economy, and the authorities should create a friendly environment for (FDI) foreign businesses and investors. Additionally, allow currency freely to depreciate through market force and efficient money market system official’s devaluation should be discouraged.

Keywords: Currency Devaluation; Economic Growth; Cointegration; Pakistan.

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INTRODUCTION

One of the hottest issues in modern economic research is currency devaluation policy since it reflects every country's economic state and internal and external factors. The goal is to lower the total budget deficit of each country. It is the most significant aspect influencing how nations do their business abroad. The soundness of the economic basis and the financial and monetary policies is also reflected in the exchange rate's stability (Alobied, 2022). International trade theory articulates that currency devaluation can decrease the trade deficit and improve the trade balance by cheaper exports and more expensive imports. There is a contradiction between currency devaluation’s effect on economic growth; it is indistinct whether devaluation can improve output or not. It depends upon the elasticity of exports and imports, and it can be captured by the net effect of the trade balance. If devaluation improves the trade balance, it benefits the economy; however, Pakistan’s economy mainly depends on the import of raw materials; if there are not enough substitutes for raw materials, then it boosts the price of imports and raises inflation in the country. A higher price of intermediate goods can reduce the positive effect that export, and output create. Therefore, currency devaluation not only threatened external stability but disturbed the trade balance. In addition, if exports and imports are not sensitive to exchange rates, there is no benefit to currency devaluation. Devaluation boosts export and output, raises international reserves, and reduces unemployment due to the expansionary effect. While devaluation can decrease output and economic behavior due to increased prices of raw materials thus, the economy becomes shrink, which is the contractionary effect (Shahbaz et al., 2012). In 2009 depreciation of the currency in Pakistan increased by 16.3%, which brought severe pressure on foreign reserves. As a result, economic instability leads to speculation in the foreign exchange market, triggering cash outflows. Devaluation is a hot and controversial topic for developing and developed economies to believe in and hope to increase their exports. Most developing countries face a severe decline in foreign exchange reserves, serious deficits in the balance of payments, rising costs of importing goods and services, and shortage and growing energy costs, which result in decreased productivity. Developing countries have also faced high tariffs on export and high production cost to produce goods to compete in the domestic markets. These factors affect the output level of developing countries. In Pakistan, these economic problems are severe because of political instability, poor governance, frequent monetary interference, and fiscal discretion (Nawaz & Ghani, 2018).

The J-curve, which explains the possible impact of exchange rates on foreign trade, shows that a devaluation of the local currency worsens the trade balance in the short run while improving
it in the long run. The success of the devaluation effect on the trade balance depends on the satisfaction of the Marshall-Lerner condition. Correspondingly, when the sum of the external demand elasticity of exported goods and the domestic demand elasticity of imported goods is equal to or greater than 1, the rise in RER increases the country's foreign exchange earnings and improves the trade balance. Ceyhan et al. (2021) investigated whether the J-curve hypothesis is valid in Turkey. Toda Yamamoto's and Hatemi-J asymmetric causality tests were applied using monthly data from 1996-2019. Toda-Yamamoto causality test results show a one-way causality from the real exchange rate to imports. On the other hand, the results of the Hatemi-J asymmetric causality test suggest that shocks to the real exchange rate do not affect exports but reduce imports. Therefore, the J-curve hypothesis has been determined to be invalid for Turkey. It is also shown that the US trade balance swings from surplus to deficit. Between 1970 and 1971, US policymakers opted to depreciate the currency to bring the trade balance back into balance, but the following year it worsened than the prior year. It was because of the J curve effect that under the J curve assumptions, a country’s trade deficit initially decreases and then increase as high import price reduce import volume. A reasonable explanation for the shortly declined, and long-run improvement in the trade balance due to currency devaluation was given by Magee (1973) to investigate the effectiveness of currency devaluation policy as a tool to improve the trade balance. He worked on the J curve phenomena after the devaluation of the US Currency and pointed out devaluation produces inconsistent short-term and long-term changes. If both export and import are inelastic and smaller than unity in the short run, the trade balance will deteriorate. While both imports and exports are elastic and exceeded unity, it will improve the balance of trade in the long run. However, the impact of devaluation is controversial, mixed (empirical results and policy implication), and depends upon the nature of the services. Recently many low-income countries in Sub Sahara Africa have shown interest in the world market. However, their exports are still unsatisfactory because of their dependency on few agricultural or primary goods. Less developed nations (LDCs) in Africa have had a substantial balance of payment deficit and a widening current account deficit and trade imbalances. LDCs have been paying particular attention to exchange rate movements with a devaluation to improve their trade balance, enhance exports, attract foreign investment, and improve domestic output production. Currency devaluation is a cure for the balance of payment, enhances competitiveness in the world market, and improves trade balance. The remedy is sometimes worse than the disease due to political instability and macroeconomic and
environmental conditions in the country. The impact of currency devaluation varies from country to country based on macroeconomic conditions (Ayele, 2019).

Shahbaz et al. (2012) pointed out that real devaluation had a contractionary effect and positively impacted Pakistan's economic growth. He urged policymakers to develop a comprehensive trade policy that includes competitive devaluation to resolve Pakistan's balance of payments crisis. Devaluation is a modern monetary policy that most less developed countries implement to improve their economic condition. A decrease in the ability of a local currency unit to be exchanged for a foreign currency and a fall in the domestic currency's value versus a foreign currency is referred to as devaluation. Due to these currency changes, the country has expansionary and contractionary economic growth. International Monetary Fund (IMF) pointed out that currency devaluation is good for economic growth besides getting loans from member countries since it will increase competition among the firm and domestic production. To find out the relationship between economic growth and currency devaluation, we used relevant macroeconomic indicators from 1990 to 2018, yearly data reflecting the study’s main objective. The research aims to determine whether there is a positive relationship between output growth and currency devaluation or have a negative impact in the case of Pakistan, both short and long-run. We have broadly two hypotheses for the study to evaluate whether currency devaluation has a positive relation with economic growth or not. For this proposal, we used two different proposed equations for the analysis. The first proposed model is the ARDL approach through the cointegration Bound test and Error correction model. Secondly, we used Johansen Cointegration and Vector error correction model. The exchange rate plays an essential role in economic development; it not only influences the sustainability of the country but also plays a crucial role in improving gross capital formation, foreign investment, current account deficit, and also has a significant impact on inflation, money supply, unemployment, interest rate, trade balance, and economic growth.

LITERATURE REVIEW

Theoretical Review
Currency devaluation is an important topic in the international economy and financial history. It has proven to have a positive impact on growth in some economies and a negative impact on others. Ojuolape et al. (2020) analyzed the real effects of currency devaluations for the short-run and long-run using panel data. Seven countries were reviewed, and they were: Ghana, Mexico, Malaysia, Pakistan, Philippines, Singapore, and South Africa. These countries devalued their currencies during the same period under consideration. Long-term effects and
relationships were determined by testing cointegration methods, while short-term effects were determined using fully modified OLS (FMOLS) and error correction models. Panel data from 1981-2010 were used in the analysis.

The empirical results show no significant relationship between currency depreciation and output growth in the short term, but there is a long-term negative relationship between currency devaluation and economic growth. The fundamental purpose of every country is to achieve economic sustainability, growth, development, and well-being of the people (Sulaiman & Saad, 2009). The Neo-Classical Theory argues that exports and imports of the country play a vital role in economic growth and social development (Vijayasri, 2013). The same theory suggests that export helps us to determine the exchange rate, which requires the country to import those goods and services which are not produced in the country. The positive relationship between export and economic growth helps to increase investment in the country, which boosts the economic level and employment rate and decreases inflation (Eita & Jordan, 2010). Devaluation affects the current account deficit through relative prices of exports and imports, which is called the elasticity approach. It also affects income changes called the absorption approach. In addition, the last approach says currency devaluation affects liability service burden. Elasticity stresses the comparative prices of exports and imports during currency devaluation and the competition in international transactions of goods and services. Theoretical foundation analysis based on the impact of currency devaluation on trade balances are all around on the J Curve and Marshall Lerner Condition. Under the curve of J, currency devaluation initially worsens the economic growth in terms of export in the short run due to inelasticity of exports, imports goods and services, and domestic currency value decline, but in the long run, quantity responds and outweighs the price effect (Magee, 1973). Secondly, in the absorption approach of Keynesian economics, Alexander (1952) developed the balance of payment theory, which stated that a country’s balance of trade would only improve when the output of the country’s goods and services is more than its absorption, the absorption means that expenditure of the residents of the country on its goods and services. Price elasticity is low for import-focused products such as raw materials, capital goods, and semi-industrial goods, which are commonly imported into the structure of developing countries (Cooper, 1971). While an increase in exports needs a large amount of output, which is quite hard in the short run, specifically for agriculture, and commodity export countries. If the quantity of demand elasticity of imports and demand elasticity of foreign exports is more than 1, the Marshall Lerner condition states that currency devaluation will recover the trade balance in the long term. On the other hand, Ayele (2019)
says, if the country initially runs a huge trade deficit, then the sum of demand elasticity of exports and imports even exceeds unity, but the devaluation will cause to increase in imports of goods and services than export receipts.

Marshall and Lerner studied independently on that condition and stated that devaluation of the exchange rate would lead to improvements in the trade balance if sums of the price elasticity for the demand for imports and exports are greater than 1. They have three main arguments; firstly, they said that the current account measures the revenue of exports minus expenditure on imports. Secondly, the net revenue of exports will increase if the exports grow more than imports and decrease if the exports grow less than imports. Lastly, if a country devalues its currency, the current account balance will improve and tend to be in surplus. Currency devaluation reduces the price of export in the domestic market in terms of foreign currency and increases the price of imports. It also depends on the nature of goods that a country export; if a country export only raw material and perishable goods, the demand elasticity will be low for exports. However, if the country exports machinery and capital goods, then its demand elasticity will increase, improving the balance of payment. Empirical studies investigated Marshall Lerner’s condition and proved that it was validated mostly in advanced countries that export capital goods.

Nevertheless, the general statement of the economists is the elasticity of demand and supply is greater in the long run as compared to the short run. The effect of currency devaluation takes time for the price of domestic goods and demand for exports to adjust to the new situation. Price elasticities for export and import are lower in the short run, which is why the Marshall Lerner condition does not meet in the short run but does so in the long run, improving BOP. This mechanism follows the J shape in the time, called the J Curve. It shows that the economy cannot move suddenly to high economic growth; instead, it takes time to sit in their situation.

**Empirical Review**

In the case of Pakistan, the currency devaluation and output growth relationship were investigated in the study by Mush et al. (2011). The study examined the long-run and short-run effects of devaluation and output growth by applying a cointegration test from 1980 to 2009. The empirical evidence found a significant positive relationship between currency devaluation and output growth in the short and long run. In both the short and long run, output growth is affected by currency devaluation. Abdullah and Kalim (2011) researched the relationship between money supply, inflation, and government expenditure on economic growth. The study
investigated that the price level, government expenditure, and money supply have a positive relationship with the economic growth of Pakistan in the long run. Afzal et al. (2012) investigated a study for the cointegrated causal relationship of food inflation, health, and education with economic growth. They found two-way causality between economic growth and education, education and food inflation, and food inflation and economic growth.

Similarly, Ramsha et al. (2022) analyzed the nexus between currency devaluation and inflation from 2001 to 2018 in Pakistan; data found a second difference in stationarity and applied the VECM model for cointegration between currency devaluation and inflation rate. Results revealed currency devaluation has a positive and significant association with inflation. Another study was conducted on Pakistan's exchange rate, inflation, and economic growth by Iqbal et al. (2022). The series of studies included data from over 1989 – 2019. ADF and ARDL bound tests were used for cointegration, and the result found that exchange rate had a negative impact on CPI, whereas exchange rate after a two-year lag was negatively affected. Moreover, F bound test found a long-run association between exchange rate, money supply, and economic growth. While in the short-run exchange rate at lag 1, the impact of GDP was only positive.

Khan et al. (2021) used time series data from 1990 to 2020 and examined the impact of inflation, nominal exchange rates, foreign direct investment, and contingencies on economic growth in Bangladesh. Ordinary least squares were used to determine the relationship between the dependent and independent variables. The results showed exchange rate and foreign direct investment significantly impacted the country's economic growth. Inflation, foreign direct investment, and exchange rates had a positive impact, while emergencies such as Covid-19, natural disasters, etc., hurt Bangladesh’s economic development (Bouvet et al., 2022). The impact of the 1994 IMF-supported devaluation of the CFA franc Calculation of GDP per capita in the CFA franc zone using the augmented synthetic control method. Except for Mali, there is no statistical evidence of a currency devaluation of GDP per capita relative to a depreciation without IMF support. The GDP per capita recorded by the three countries is statistically lower than the counterfactual after currency devaluation. However, these countries have experienced a weakening in the country's institutional environment or been affected by external factors that offset any potential gains from the devaluation. Besides, Ayele (2019) worked on low-income countries’ real exchange rates and current account balances in Africa. The paper's purpose was to point out whether devaluation improved the current account balance of four less developing countries in East Africa: Ethiopia, Kenya, Rwanda, and Tanzania. The author used pooled mean group approach for panel data using ARDL, a bound test and the PMG approach from 1970 to
2016 and found that there is no improvement in the current account balance due to exchange rate devaluation, while only Ethiopia improved its current account balance when restricted ARDL and bound test were used. The overall empirical result shows that in the short run, there are improvements in the current account balance of these countries but a decline in the long run. Shahbaz et al. (2011) found contractionary and expansionary effects in Pakistan in case of currency devaluation. They took data from the WDI and Economic Survey of Pakistan from 1975 to 2008. The study used the ARDL model and bound test for long run relationship and found the contractionary effect on economic growth. They used empirical variables relevant to Pakistan’s economy but, unfortunately, found that currency devaluation on economic growth has a reverse impact on the economy and explained the reason to be the high cost of imports as most of the inputs and raw materials are imported. Currency devaluation means lower labor talent in the foreign market (Memon et al., 2015). The study investigated the influence of currency devaluation on Pakistan, causing cost-push inflation because Pakistan’s industries depend on imported inputs. At the same time, high tariffs and quotas block access to developed countries. Due to the currency devaluation, the cost of industrial production increase and reduce the strength of volume and operation, ultimately inflation triggering in the economy. The solutions that resolve the currency devaluation as appreciate currency through FDI and increase the export of goods and services to lead to high cash inflow because there would be high push demand from the countries.

The effect of currency devaluation in 8 LDCs for 25 years was observed using the fixed effect method. The result showed currency devaluation creates a contractionary effect on output growth in the initial year while creating an expansionary effect the following year but not a qualitative difference in manufacturing exporters and agriculture exports in terms of currency devaluation on production. Krugman conducted another study on currency devaluation and output, used different models for semi-industrialized countries, and found results like the Keynesian model, where currency devaluation led to a reduction in output. The government revenue increased by devaluation, and taxes increased when exports were increased.

Aslam and Awan (2018) investigated core macroeconomic indicators such as employed labor force, foreign direct investment, GDP deflator, export, broad money, gross capital formation, and real gross domestic products. The effect of monetary policy on economic growth in Pakistan used time series data from 1972 to 2015. The author applied multiple regression and found a long-run and positive relationship between monetary policy and economic growth.

Contrastingly, Choudhary and Chaudhry (2007) suggested that currency devaluation on growth
and the price level may not be undeviating across all countries and may not be generalized for all developing countries. Most empirical studies do not separate the effects of devaluation from import prices when used to test the contractionary devaluation hypothesis. Thus, a country-specific study was needed to separate the price of imports from the effect of currency devaluation in Pakistan. The author used the VECM model to check the impact of the exchange rate on production and price level from 1975 to 2005. The paper showed devaluation positively affects production but is negative on the price level. The study showed there is no contractionary devaluation hypothesis in Pakistan. The study’s findings showed expansionary effects of devaluation on output in Pakistan.

Furthermore, An et al. (2014) examined Asian countries with contractionary devaluation or expansionary devaluation. They argued that currency devaluation has a contractionary effect when disrupting the financial sector and introducing uncertainty among investors and consumers. For this purpose, the reduce form model was established and tested through cointegration analysis. The result suggested that many Asian countries’ depreciation has contractionary.

Correspondingly, an empirical study by Nawaz & Ghani (2018) on currency depreciation and output in the case of Pakistan used the IS-LM model, Autoregressive Distributed Lag (ARDL) model, and Error Correction (ECM) model and took data from 1972 to 2010. The study found no expansionary effect in both the short and long run. Their study also recommended a clear long-term policy that inspired the international community’s belief to boost the self-confidence of exporters in the country. Agenor (1991) developed a study about 23 developing countries and found a relationship between currency devaluation, production, and real exchange rate. A survey of 23 developing countries from 1978 to 1987 drives the real production from the balance of aggregate demand and supply quantity with rational expectation. He found there is a contractionary effect on output growth. Devaluation expands the economy's output growth if there is anticipation in the exchange rate.

Another study was conducted in over 23 OECD countries to see the relationship between currency devaluation and output growth using the unit root test and cointegration (Kalyoncu et al., 2008). The result showed that 9 out of 23 countries have a relationship between devaluation and output in the long run only. 6 out of 9 hurt output growth while the remaining 3 countries have a positive impact, which means that depreciation improves output growth only in three countries. Upadhyay and Upadhyaya (2008) looked at the impact of output growth and real exchange rates in six Asian countries, including monetary, fiscal, and external variables. The
impact of depreciation on the real exchange rate, the effect of nominal depreciation, and changes in the price ratio at home and abroad are examined. The result suggested that there is no effect on output growth at any period, such as short run, long run, or middle exceptions of a few cases. Christopoulos and Tsionas (2004) investigated devaluation decelerates the rate of economic growth in the economy.

A study by Risager et al. (2021) was conducted to examine the impact of currency devaluation on the performance of Croatian banking sectors. The study concluded a statistically significant negative relationship between currency depreciation and performance. Currency devaluation makes imports expensive and exports cheap, reducing investor confidence. Investors are reluctant to invest in countries with lower returns on exports. The devaluation has lowered people's hopes for local currency deposits. Another empirical study was conducted (Rajan & Shen, 2006) on currency devaluation. Results found that currency devaluation is a stimulus wave of fear and nervousness about the stability of external economic issues; it triggers capital outflow, decreases foreign reserves, and increases overseas borrowing. The contractionary outcome of real currency devaluation caused crises in the banking sector. During currency crises, Miteza's (2006) study was conducted on the emerging and developing economies of Romania, Slovakia, Poland, Hungary, and the Czech Republic. The study investigated the long-run real devaluation as a contractionary effect; he added that currency devaluation shrinkages the aggregate supply much quicker than the increase in aggregate demand. The use of Mexican data devaluation by Kamin & Rogers (2000) resulted in excessive inflation and slowed economic growth in the short and long run. The study's VAR model and regression were free of spurious regression and reverse causation, and real devaluation in Mexico resulted in high inflation and a loss in output growth. Mejía-Reyes et al. (2010) researched the contractionary effect of devaluation on six major Latin American countries and found a contractionary effect. According to the survey by Bahmani-Oskooee and Kandil (2009), both contraction and expansion have impacted real exchange rate fluctuations in economies in the Middle East and North America.

Over the past few years, many sub-Saharan African (SSA) countries have seen markedly weaker economic activity, worsening trade balances, dwindling foreign exchange reserves, and depreciating exchange rates. This situation has led the International Monetary Fund to call for more flexible exchange rate adjustments and even currency devaluation to reverse the economic downturn. Odionye et al. (2021) examined the asymmetric effects of currency devaluation on policy shifts in economic output between 1980 and 2019 in six selected SSA countries, namely
Ghana, Kenya, Tanzania, Mozambique, Nigeria, and Malawi. The study employs a smooth transition regression (STR) model to determine the relative asymmetric response of economic output to depreciating and non-depreciating regimes. Results for STR were mixed, as devaluation had asymmetrically positive and significant effects on economic output in Ghana, Kenya, Tanzania, and Mozambique but negligible in the case of Nigeria and Malawi. This mixed result suggested that the impact of currency devaluation on economic output varies from country to country, depending on the structure and size of the economy, the nature of the goods produced, and the supportive policies implemented, among other things. The policy implication of the findings is that policymakers across countries should understand the specificities of core macroeconomic variables to design and implement sound policies.

Recently, there have been criticisms that currency devaluation and output growth have a contractionary impact on the economy. According to popular wisdom, devaluation has a contractionary effect on the economy's production, decreasing output growth and aggregate demand. Empirically, evidence for the contractionary impact is quite sketchy. Khan and Knight (1981) extended the model for the issue of contractionary devaluation. The result obtained from 12 developing countries show that there is contractionary devaluation in the short run decline in output and aggregate demand, found that after one-year devaluation have expansionary output in the economy. Khan and Knight (1981) suggested that there is no association between currency devaluation on productivity. Bahmani-Oskooee et al. (2002) conducted applied statistical Johansen's cointegration test for four Asian countries and found currency devaluations were expansionary in the Philippines and Thailand while contractionary in Indonesia and Malaysia. Panel data were further used to investigate currency devaluation and aggregate output expansion by Christopoulos (2006) by taking 11 Asian countries from 1968 to 1999. Results suggested that there is the expansionary output of the majority of Asian countries due to currency devaluation in the long run and as a panel as a whole. These findings contradict recent studies, which concluded that currency devaluation does not influence output.

In the example of Sri Lanka, De Silva and Zhu (2004) used the VAR (vector autoregressive) technique on quarterly data from 1976 to 1998 and found that currency depreciation improved the trade balance but had a contractionary effect on the GDP.

Cheng (2020) researched currency devaluation and trade balance in the US economy with services trade. Cheng examines the usefulness of currency depreciation as a policy tool for improving trade balances by calculating the exchange rate elasticity of services trade between the US and the rest of the world using quarterly disaggregated data from 1999 to 2015. The
ARDL model was utilized. The results found that currency depreciation in individual services trades primarily depended on the nature of the service, as some services were insensitive, such as insurance services and intellectual property charges. They also discovered that currency depreciation, in the long run, promotes export services trade while decreasing import services trade. Most remarkably, some services trades are unaffected by exchange rate fluctuations. Most service trade categories have inelastic revenues, and economic growth influences the import and export of traded services. For developing countries, there is tension between currency devaluation and output growth. Pakistan is one of the developing countries. For this purpose, we used two different econometric models of cointegration to verified that whether devaluation can improve economic growth and the foreign exchange market and decrease outflow or not. Researcher suggests that at the beginning of the currency devaluation economy have high inflation in the short run; nonetheless, in the long run, the economic growth improves, and it increases domestic production, which increases demand for currency in the foreign market and gains currency value.

RESEARCH METHODOLOGY

To study the relationship between currency devaluation and economic growth in the case of Pakistan based on the following variables, interest rate, inflation, exchange rate, gross capital formation, and gross domestic product. The secondary yearly time series data are taken from the World Development Indicator (WDI) and data bank from 1990 to 2018 to find the study's main objective. The time series data involved 29 observations, and we applied the econometric and statistical package of E Views 10. This Econometric package (E Views) helps provide accurate and unbiased results while using time series data and different econometric techniques to achieve the core objectives of the study. Equation (1) used the first proposed model of the ARDL approach to establish the short-run and long-run relation among variables through the cointegration test, while equation (2) used the second proposed model for Johansen Cointegration and vector error correction model. The ARDL approach is applied to variables, where some variables are stationary on a level I (0) and some are stationary on the first difference I (1). As Quattara (2004) argued, the Augmented Dickey-Fuller test confirmed the application of ARDL and could be used if none of the variables is stationary on the I (2) second difference. ARDL model contains the lagged value of the dependent variable and the current and lagged value of the regressed explanatory variables.

The generalized form of ARDL specification is \((p, q_1, q_2, q_3, q_4)\).
\[ \Delta LGDP_t = \alpha_0 + \sum_{j=1}^{p} \beta_j \Delta LGDP_{t-j} + \sum_{j=1}^{k} \phi_j \Delta LIN_{t-j} \]
\[ + \sum_{j=1}^{k} \delta_j \Delta INF_{t-j} + \sum_{j=1}^{k} \rho_j \Delta EXR_{t-j} + \sum_{j=1}^{k} \theta_j \Delta LGCF_{t-j} + \gamma_1 LGDP_{t-1} + \gamma_2 LIN_{t-1} \]
\[ + \gamma_3 LIN_{t-1} + \gamma_4 EXR_{t-1} + \gamma_5 LGCF_{t-1} + \epsilon_t \]  \hspace{1cm} (1)

Equation 1 is the first proposed equation and model for the study that represents ARDL cointegration where \( \Delta LGDP_t \), \( \Delta LIN_t \), \( \Delta INF_t \), \( \Delta EXR_t \), and \( \Delta LGCF_t \) denote changes in the natural lag of gross domestic product, interest rate, inflation rate, exchange rate, and gross capital formation, respectively. \( \alpha_0 \) is intercepted, \( k \) is the lag operator, and \( \epsilon_t \) is the error term or white noise. Moreover, \( \beta_j, \phi_j, \delta_j, \rho_j, \theta_j \) determine the short-run dynamism. While the \( \gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5 \) show long-run parameters or coefficients.

This study also proposed another model, which is the Johansen Cointegration equation through Vector Error Correction Model that form as,

\[ \Delta Y_t = \beta_0 + \sum_{i=0}^{n} \beta_1 \Delta Y_{t-i} + \sum_{i=0}^{n} \delta_i \Delta X_{t-i} + \varphi z + \epsilon_t \]  \hspace{1cm} (2)

Equation 2 shows Johansen Co-integration whereas \( Y_t = (n \times 1) \) vector of all variables that are integrated of order I (1). \( \beta = (n \times n) \) represent the matrix of the coefficients of the model.

\( \varphi = (n \times r) \) represents a matrix of the Error Correction coefficients, and \( r \) denotes the number of cointegrating association relationships between the variables, so we can say that \( 0 < r < n \). \( \varphi \) denoted by the adjustment of parameter or speed of adjustment. \( z = (n \times r) \) is the matrix of \( r \) cointegrating vectors, so that \( 0 < r < n \) represents the long-run relationship between the variables.

**Augmented Dicky Fuller Test (ADF)**

ADF test is an advanced and preferred Augmented Dicky (AD) test. The researcher mostly rectified errors from the (AD) test, which is why we focused on and preferred the Augmented Dicky Fuller (ADF) test. It eliminates autocorrelation from residuals and adds some extra lagged terms to the dependent variable. This extra lagged term determines by SIC (Schwartz Information Criterion). It is one of the best and most desirable for its strictness and rigid features (Neath & Cavanaugh, 1997). The Augmented Dicky Fuller test equation will be written and expressed below in the forms as follows,

\[ \Delta X_t = X_{t-1} + \sum_{i=1}^{p} \beta_i X_{t-i} + \epsilon_t \]  \hspace{1cm} (3)

In equation (3), \( \Delta \) is the change which means it is the first difference operator, \( \epsilon_t \) is the error
term, $p$ is the lag operator, and $t$ is the time subscript. The null hypothesis for the ADF test is that a unit root exists, while the alternative hypothesis is that a unit root does not exist, implying that the series is stationary. If the null hypothesis is accepted, the series is non-stationary; if the null hypothesis is rejected, the series is stationary since it lacks a unit root. The ADF critical value and probability will be used to make the decision. If the P value is greater than the ADF critical value, the null hypothesis will be accepted, indicating that the data is non-stationary.

**Error correction model & Vector error correction model**

It is important to analyze the error correction model when there is cointegration amongst the variable in the ARDL approach because cointegration only shows long-run relation. In contrast, the error correction model shows us the short-run relationship between the variables. The error term should be negative and significant. A negative value can determine how much time takes these short-run shocks to adjust in the long run. The mathematical form of the error correction model as,

$$
\Delta \text{LGD}_t = \alpha_0 + \sum_{j=1}^{p} \beta_j \Delta \text{LGD}_{t-j} + \sum_{j=1}^{k} \rho_j \Delta \text{LIN}_{t-j} \\
+ \sum_{j=1}^{k} \delta_j \Delta \text{LIN}_T_{t-j} + \sum_{j=1}^{k} \rho_j \Delta \text{LEX}_{t-j} + \sum_{j=1}^{k} \theta_j \Delta \text{LC}_F_{t-j} + \lambda \text{ECT}_{t-1} + u_t \tag{4}
$$

Equation (4) represents the error correction model (ECM), where ECT denotes the error correction term, and $\lambda$ is the coefficient of the error term, which should be negative and significant.

Vector error correction model used after Johansen Co-integration model; it is indispensable when there is cointegration among variables. VECM equation can get to expand equation (2) in the form as,

$$
\Delta Y_t = \beta_0 + \sum_{i=0}^{n} \beta_1 \Delta Y_{t-i} + \sum_{i=0}^{n} \delta_i \Delta X_{t-i} + \varphi z + u_t \nonumber \\
Y_t = \beta_0 + \beta_1 X_1 + e_t \nonumber \\
Z_{t-1} = \text{ECT}_{t-1} = Y_{t-1} - \beta_0 - \beta_1 X_{t-1} \tag{5}
$$

Equation (5) represents the vector error correction model (VECM), where ECT denoted the error correction term. Its coefficient should be negative, and the probability value should be significant. While equation (2a) $Y_t = \beta_0 + \beta_1 X_1$ is the long run cointegration between the two variables, and $\beta_1$ and $\delta_i$ is the parameter that how x and y react in the long-run equilibrium, we applied the model more than two variables. The result is discussed in the next section.
EMPIRICAL FINDINGS, RESULTS AND DISCUSSION

Augmented Dicky Fuller Test

Time series data must check the existence of a unit root among variables, and if there is a unit root in the series, it leads to spurious regression. Therefore, it is necessary to make the data stationary for estimations. To test whether every individual variable is stationary, it needs to ensure that all variables are integrated. Indeed, the unit root test is a test to verify the stationarity of the variable. Hence, we used Augmented Dicky Fuller (ADF, 1979) for the unit root amongst the variables.

### Table 1. Stationarity test of variables

| Variables | ADF Level | ADF 1st difference |
|-----------|-----------|---------------------|
| LNGDP     | 0.0092    | 0.0418              |
| LNINT     | 0.0019    | 0.0004              |
| LNINF     | 0.0139    | 0.0000              |
| LNEXR     | 0.1426    | 0.0070              |
| LNGCF     | 0.8549    | 0.0205              |

In Table 1, Augmented dickey fuller shows that LNGDP, LNINT, and LNINF have no existing unit root; we rejected the null hypothesis the p-value 0.0092, 0.0019, 0.0139, respectively, is less than the critical value 0.05 or 5% on the level. While LNEXR, LNGCF, and their p-value are 0.0070 and 0.0205 on the first difference are less than the significant level of 5%. When the variables become stationary and cointegrated in a different order, such as level I (0) and the first difference I (1), then the ARDL model should be used. However, before the ARDL model, we need to specify the lag length selection for the ARDL model specification.

The lag length selection criterion

In Table 2, the dependent variable is Gross domestic product (GDP), and c is a constant term, whereas the independent variables are Interest (INT), Inflation (INF), an Exchange rate (EXR), and Gross capital formation (GCF). It is clearly shown in below Table 2 that most information criterion says that a second (2) lag is best for the ARDL approach.

### Table 2. Optimal lag length criterion for ARDL model

| Lag | Logl  | LR       | FPE      | AIC      | SC       | HQ       |
|-----|-------|----------|----------|----------|----------|----------|
| 0   | 21.51804 | NA       | 0.011346 | -1.651804 | -1.402871 | -1.603210 |
| 1   | 60.76727 | 54.94891* | 0.000250 | -5.476727 | -5.178007 | -5.418413 |
| 2   | 62.27408 | 1.958854 | 0.000240* | -5.527408* | -5.178901* | -5.459376* |

Table 2 above, FPE (Final Predication Error), AIC (Akaike information criterion), SC (Schwarz
Information Criterion), and HQ (Hannan-Quinn information criterion) verified that the second (2) lag is the best lag for the ARDL model. In this study, the outcomes are integrated with different integration, which means some variables are integrated on the level, and some variables are integrated on the first difference. Therefore, we decided to run the cointegration test through the ARDL approach with lag 2 and see the bound cointegration test.

**Co-integration ARDL F Bound test**

Table 3 presents bound tests for cointegration, where we rejected the null hypothesis because the F statistic value is greater than the Upper and Lower bounds. The study tested cointegration analysis using the ARDL model bound test, which shows the long-run cointegration amongst variables. The economist and researcher suggest that after cointegration, it is necessary to apply the error correction model.

| Table 3. F Bound Test | Null Hypothesis: No levels of relationship |
|-----------------------|------------------------------------------|
| Test Statistics       | Value | Signif | I(0) | I(1) |
| F-Statistics          | 23.74284 | 10%    | 3.03 | 4.06 |
| K                     | 4     | 5%     | 3.47 | 4.57 |

**Error correction model**

The Error Correction Model (ECM) is presented in Table 4 using the Ordinary Least Square (OLS) approach. The exchange rate with both the first and second lag has a positive relationship with GDP, meaning that if the Exchange rate increase 1 percent (currency devalue), then Gross Domestic Product (GDP) will increase 0.2162% in the first lag, while in the second lag it will increase to 0.3348. The interest rate also has positive relation in the second lag; its value is 0.001049; if a 1% change occurs in the interest, it will increase Gross Domestic Product (GDP) by 0.001049 percent. However, in the first lag, the relation is negative, which means an inverse relation of GDP with interest rate. The Inflation coefficient value is 0.002873 in the first lag, which means the relationship is positive with Gross Domestic Product (GDP), and with the second lag the value becomes negative (-0.015670). The inflation rate in the first lag is positive, while in the second lag, it shows negative relation, which means that if the currency devalues, then inflation will rise, and if there is a 1 percent change in inflation, there be a -0.015670 percent decrease in the GDP resulting in a decrease in economic growth.

Most importantly, in the Error correction term (ECT (-1), the coefficient must be negative and significant at 5%. In table 4, the coefficient of ECT is negative but not statistically significant, which means there is no convergence from short-run shocks toward long-run equilibrium.
Table 4. Error correction model through OLS

| Variable   | Coefficient | Std. Error | t-Statistic | Prob.  |
|------------|-------------|------------|-------------|--------|
| C          | 2.490808    | 0.562486   | 4.428217    | 0.0214 |
| LNGDP (-1) | 1.365775    | 0.328643   | 4.155802    | 0.0253 |
| LNGDP (-2) | -0.457045   | 0.333306   | -1.371249   | 0.2639 |
| LNINT (-1) | -0.044706   | 0.012808   | -3.490595   | 0.0397 |
| LNINT (-2) | 0.001049    | 0.013058   | 0.080349    | 0.9410 |
| LNINF (-1) | -0.044706   | 0.012808   | -3.490595   | 0.0397 |
| LNINF (-2) | 0.001049    | 0.013058   | 0.080349    | 0.9410 |
| D (LNEXR (-1)) | 0.216217 | 0.081582   | 2.650317    | 0.0770 |
| D (LNEXR (-2)) | 0.334897 | 0.087735   | 3.817120    | 0.0316 |
| D (LNGCF (-1)) | -0.099632 | 0.052942   | -1.881920   | 0.1564 |
| D (LNGCF (-2)) | 0.048072 | 0.071043   | 0.676659    | 0.5471 |
| ECT (-1)    | -0.642941   | 0.565882   | -1.136176   | 0.3384 |

The error correction term ECT (-1) shows a negative that satisfied one condition but is insignificant. However, we conducted another diagnostic test to examine the normality of LM serial correlation and Heteroskedasticity. Before going to diagnostic tests, we checked the second proposed model of the study, the cointegrating equation of the Johansen model, for further confirmation of currency devaluation’s impact on economic growth. This model can be applied if all variables are cointegrated in the order I (1).

Johansen Co-Integration Test

Table 5 shows the results of the Johansen cointegration, in which the null hypothesis is rejected because the trace statistic value of 78.23 for none is greater than the critical value of 0.05 or 5%, which is 69.818, and the p-value is also significant. All the other trace statistic values are less than the critical value, so we cannot reject the null hypothesis for those cases except at none. Here we compared the critical value of 0.05 with the trace statistic value. If the trace statistic value is greater than its critical value, we reject the null hypothesis. We can also follow the p-value if the p-value is less than 5% of the level means it is significant, we reject the null hypothesis and accept the alternative, but here in this model, we only compared trace and maximum Eigenvalue with its critical value of 0.05. If the trace test or max-eigenvalue comes greater than its critical value, we reject the null hypothesis, but here we take the trace test.

In this case, we can reject the null hypothesis for the trace statistic at no value and can say that there is only one cointegration which means that there is an association amongst all independent variables with the dependent in the long run.
We rejected the null hypothesis in table 5 above. It means there is long-run cointegration between variables in the model. Now we will apply the Vector error correction model to find the short-run and long-run equilibrium convergence in the model.

**Vector Error Correction Model**

The Vector error correction model shows both the long and short-run relation among variables. In the normalized equation, the coefficient sign should be reversed. In table 6, real interest rate (INT) and Gross Capital Formation (GCF) have a positive relationship with Gross Domestic Product (GDP). While inflation rate (INF) and Real Exchange rate (EXR) have a negative relationship with the gross domestic product. We write a normalized equation in the form as,

\[
\text{LNGDP} = 0.034168 \text{LNINT} - 0.264752 \text{LNINF} - 0.594786 \text{LNEXR} + 1.510408 \text{LNGCF}
\]

In Equation 6, our targeted variable is LNGDP, which means that if there is a one percent change in the LNINT and LNGCF, there will be an increase of 0.03 and 1.51 %, respectively, in LNGDP. While if there is a 1 percent change in the LNINF and LNEXR, there will be a decline of 0.26 and 0.59 %, respectively, in LNGDP.

### Table 6. Vector Error Correction Model

| Cointegrating Eq: CointEq1 |
|---------------------------|
| LNGDP (-1) 1.000000       |
| LNINT (-1)  0.034168      |
| LNINF (-1)  0.264752      |
| LNEXR (-1)  0.594786      |
| LNGCF (-1)  -1.510408     |
| C            7.236082      |

**Error Correction:**

| CointEq1 |
|----------|
| D(LNGDP) 3.218995 |
| D(LNINT) -2.583617 |
| D(LNINF) 0.294816  |
| D(LNEXR) 0.114485  |
| D(LNGCF) (0.03707) |

| [-0.49770] [ 2.89694] [-3.79054] [ 2.52662] [ 0.91267] |
Table 6 above indicates the coefficient of cointEq1 or ECT (error correction term) with LNGDP and LNINF are negative, but only LNINF is significant in demonstrating merging from short-run dynamics towards long-run equilibrium. The coefficient adjustment is 2.5% along long-run equilibrium in case of a disequilibrium situation. While in the case of LNINT, LNEXR, and LNGCF, the adjustment coefficients are positive, which means one of the ECT conditions is not satisfied again. Therefore, we can say that both proposed models suggested no positive association between currency devaluation and economic growth in Pakistan. Nevertheless, we conducted diagnostics to ensure the model’s stability and normality.

**Basic Diagnostics tests**
We performed the basic diagnostics test, which included LM serial correlation or Autocorrelation, Heteroskedasticity and normality, to see if the model has stability and accuracy.

**Autocorrelation**
The serial correlation or autocorrelation shows in Table 7 that the error term or residual of the model is not correlated. Meaning variables’ current value and past value have no relation. The model is not suffering from serial correlation.

| Table 7. Breusch-Godfrey Serial Correlation LM Test |
|-----------------------------------------------|
| **F-statistic** | 0.876319 | Prob. F (2,1) | 0.6027 |
| **Obs*R-squared** | 9.550684 | Prob. Chi-Square (2) | 0.0084 |

Above Table 7 shows the OLS Auto correlation problem, serial correlation test, which shows there is no relation between the lagged value of the error term or by itself over the time interval. In this model, we do not have Auto Correlation. Because the p-value (0.6027) is higher than the 5% level of the critical value, we cannot reject the null hypothesis because it states that this model has no serial correlation, yet we accept the null hypothesis. After all, the probability value is greater than 5%.

**Heteroskedasticity**
Heteroskedasticity means the data is scattered over a period amongst the variables. It shows a cone shape on a scatter graph, where the standard error is not constant of the variables; it refers to the data that is unequally varied.

| Table 8. Heteroskedasticity Test: Breusch-Pagan-Godfrey |
|-----------------------------------------------|
| **F-statistic** | 0.296864 | Prob. F (11,3) | 0.9415 |
| **Obs*R-squared** | 7.817813 | Prob. Chi-Square (11) | 0.7295 |
| **Scaled explained SS** | 0.441085 | Prob. Chi-Square (11) | 1.0000 |
Table 8 shows the null hypothesis is accepted because the observed R squared statistic corresponding probability value is 0.729 and F, which is greater than or more than 5%. It means residual is not heteroskedasticity; it also means that residual is homoscedastic, which is desirable. Now our model is free of heteroskedasticity. Table 8 above confirmed that we could not reject the null hypothesis, the observed r square, and the F statistical probability (0.9415) value is greater than the critical value of 5 percent level.

**Normality of the model**

In the normality test, we have two hypotheses where we can check our study proposed model normality. The following are the hypothesis of this model.

H0 = 0 (Residual are normally distributed) residuals follow normal distribution.

H1 ≠ 0 (Residuals are not normally distributed) residuals do not follow.

![Normality Test Result](image)

*Figure 1. Residual distribution for the normality test.*

Figure. 1 indicates the normality of the model; as we can see from the Jarque Bera test, the probability value is 0.310465, which is greater than the critical value of a 5% level of significance. As a result, the null hypothesis that the residuals are normally distributed will be accepted. We cannot rule out the null hypothesis because Jarque Bera's probability value is higher than the critical threshold of 5%.

**CONCLUSION, DISCUSSION & RECOMMENDATIONS**

This study mainly looked at updated data on how currency devaluation can affect the economic growth of Pakistan. For this purpose, we took secondary data from World Development Indicator (WDI); the yearly data contains 29 observations from 1990 to 2018 and took core economic indicators such as GDP, Inflation, Exchange rate, Interest rate, and Gross capital
formation. This study utilized these five variables on econometrics techniques to find the outcomes of currency devaluation on the economic growth of Pakistan while using ARDL, ECM, Johansen cointegration, and the VECM model. We found that there is no positive and significant relation between currency devaluation and economic growth in the case of Pakistan. This statement was also supported in the following studies: Cheng, 2020; Ayele, 2019; Nawaz et al., 2018; Abdul Sattar et al., 2015; and Mohsen Bahmane-kooee et al., 2014. In addition, to the stability of the model, we performed a diagnostics test. We did not find serial correlation and heteroskedasticity, although model residual is normally distributed in the data. With some study results, we realized that currency devaluation is a tool policy to improve economic growth, but it is not a good policy for economic growth in the case of Pakistan. Because it is a blind fact that economic growth cannot improve without industrialization, the authority needs to look at these economic indicators, particularly the exchange rate, because it is crucial to operate correctly.

Pakistan operated a managed floating exchange rate system from 1982 to 1998. During the Benazir and Nawaz regimes (1988-1998), the current account and trade deficit were 4.7percent and 5.8percent of Gross Domestic Product, correspondingly. From 1998 to 2000, the country's political situation was unstable, and the west imposed sanctions on Pakistan due to atomic tests. Various exchange rate regimes have changed from peg to floating, and peg-float mixing has become a strategy to deal with the crisis. During the managed floating exchange rate in the 1980s, the rupee depreciated by 20 percent. In addition, the 1988 agreement with the IMF was supported by conditions such as devaluation, import liberalization, and tariff reductions. During the period when Pakistan's exchange rate was still undervalued (1986-93), GDP growth reached a record high of 5.4%. The higher external debt growth during this period may have been due to the International Monetary Fund (IMF) and World Bank lending programs. The continued effect of devaluation on debt is lagged, reflected in the undervaluation period from 1999 to 2005, with a growth rate of 0.10%. According to the International Monetary Fund (2010), the rupee is effectively pegged to the US dollar within a narrow range. From 2003 to 2007, the tariff rate was reduced to 25%, and it rose to 35% in 2008 due to the trade deficit. The last government had established a target of 6 percent to 7 percent growth in 2018 but only achieved 4.14% growth in 2014-2015. Almost from 1990 to 2022, every regime in Pakistan has faced an IMF program to devalue the Pakistan rupees. Eventually, this study conducted that weak currency damages GDP growth, while strong currency enhances economic growth.
POLICY RECOMMENDATIONS

The findings and results of the study suggest that currency devaluation is not a good policy for the economic growth of Pakistan because Pakistan only exports raw materials and some agricultural products while imports of heavy machinery, and all those raw materials which are needed for industries are imported. Secondly, Pakistan is facing energy crises such as electricity, gas, and petroleum, which are the backbone of production. To make Pakistan’s economy sustainable, the authority should look closer at the economic indicators and make industrial economic policy and economic growth-related policy have to be wisely applied and allow the industrial sector to play an effective role in boosting economic growth in Pakistan. If we look at the economically stable countries, they focus on industrial reforms and information technology sectors. The authority should adopt a policy for industrialization instead of currency devaluation because Pakistan’s industrial sector has the potential to improve; the authority should also need to create an easy and friendly environment for foreign business investors. In addition, official devaluation should be discouraged by allowing the currency to depreciate freely through market force and an efficient money market system. The government policymakers can pay more attention to these factors to formulate a trade policy, to generate faster and better economic development.

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