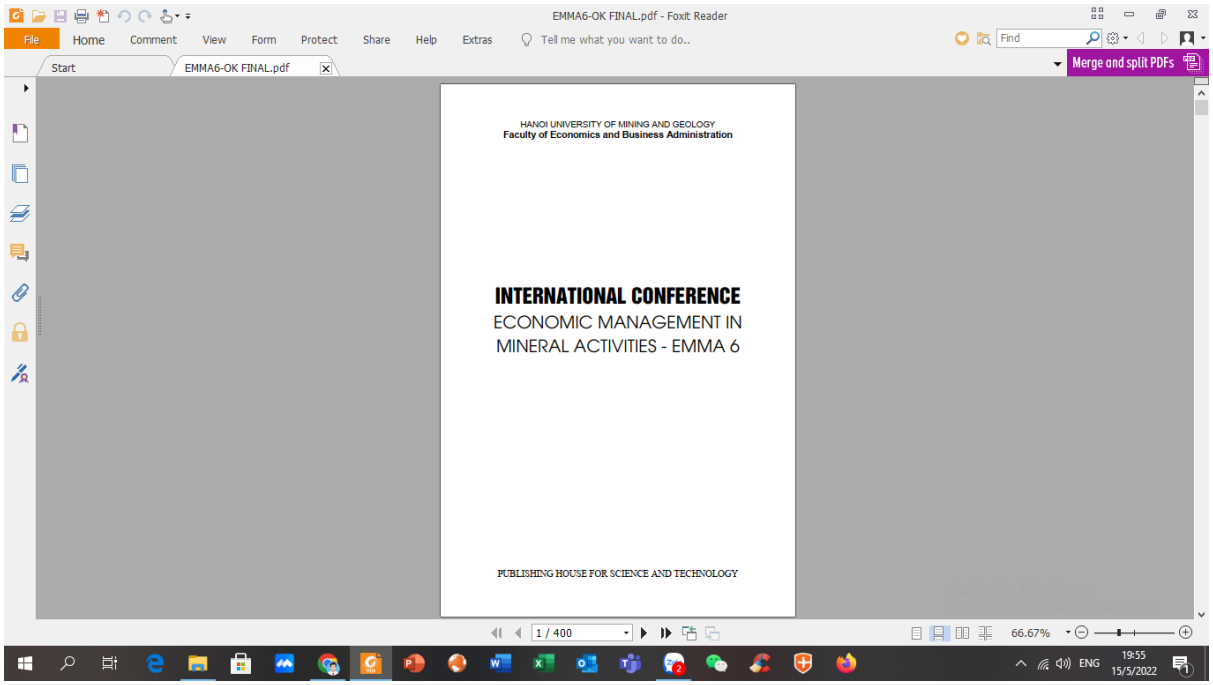
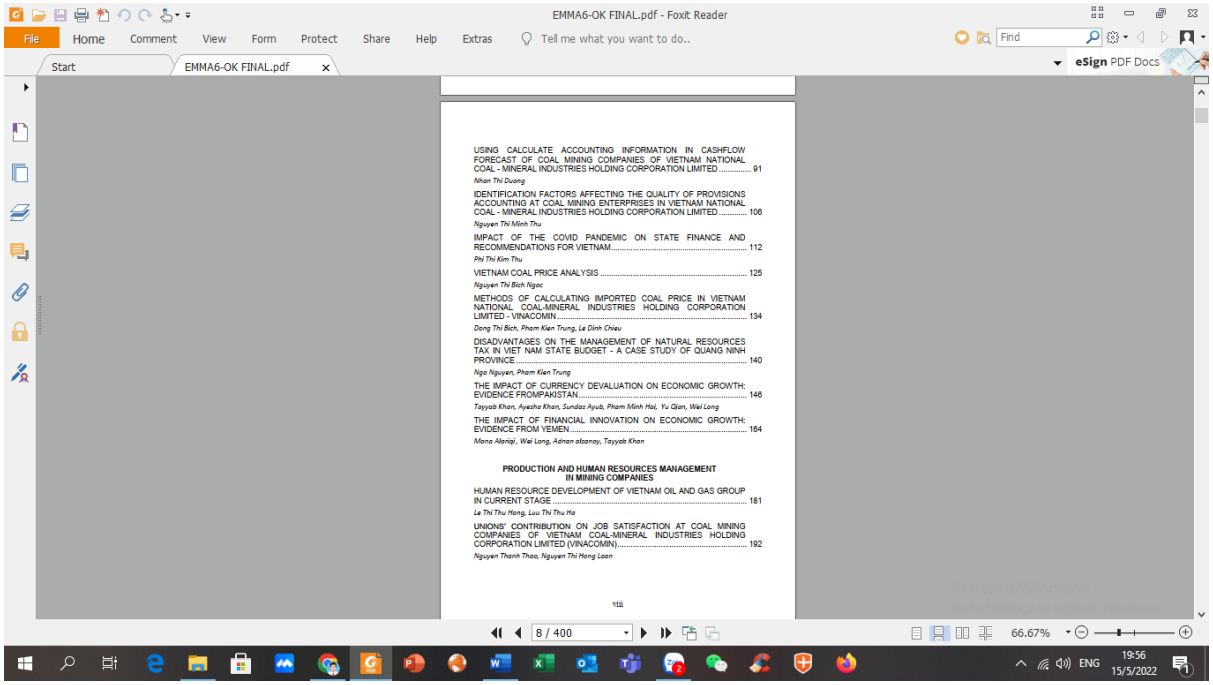

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THE IMPACT OF CURRENCY DEVALUATION ON ECONOMIC GROWTH: EVIDENCE FROMPAKISTAN

Tayyab Khan[a*], Ayesha Khan[b], Sundas Ayub[b], Pham Minh Hai[c], Yu Qian[a], Wei Long[a]

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Abstract: *This study examines the impact of currency devaluation on Pakistan's economic growth. Currency devaluation is controversial topics for both developing and developed economies to believe and hope to improve economic growth. In this study, the model used to find the cointegration between variables. The annual time seriesdata from 1990 to 2018, together with the ARDL model andthe Johansson cointegration model used to test whether there is a long-run relationship between economic indicators. 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 positive correlated with economic growth in the long run. Currency devaluation is a cure for balance of payment, enhances the competitiveness of the international market and promotes trade balance. Due to some political instability, macroeconomic and environmental conditionsin a country, cure is sometimes worse than disease. The paper recommends making the Pakistan economy a sustainable, easy and friendly business environment and looking closer at the economic indicators to make industrial economic policy. Government must make a good policy for industrialization, instead of currency devaluation, Pakistan industrial sector has a potential to improve the economy, and the authorities should need to create an easy and friendly environment for foreigner business and investors. In addition, allow currency freely to depreciate through market force and efficient money marketsystem, official's devaluation should be discouraged.*

Keywords: *Currency devaluation, economic growth, cointegration, Pakistan.*

1. INTRODUCTION

International trade theory says devaluation can decrease trade deficit or improve balance of trade by making exports cheaper and imports relative more expensive. As we know that currency devaluation on the economic growth is not clear, we do not know whether devaluation can improve output or not, it depends upon on the elasticity of export and imports with respect to currency devaluation it can be capture by the net effect of trade balance. If devaluation improves trade of balance, we can say it beneficial for the economy but if the substitutes for raw material are not available then it can increase the price of imports and raise inflation in the country.

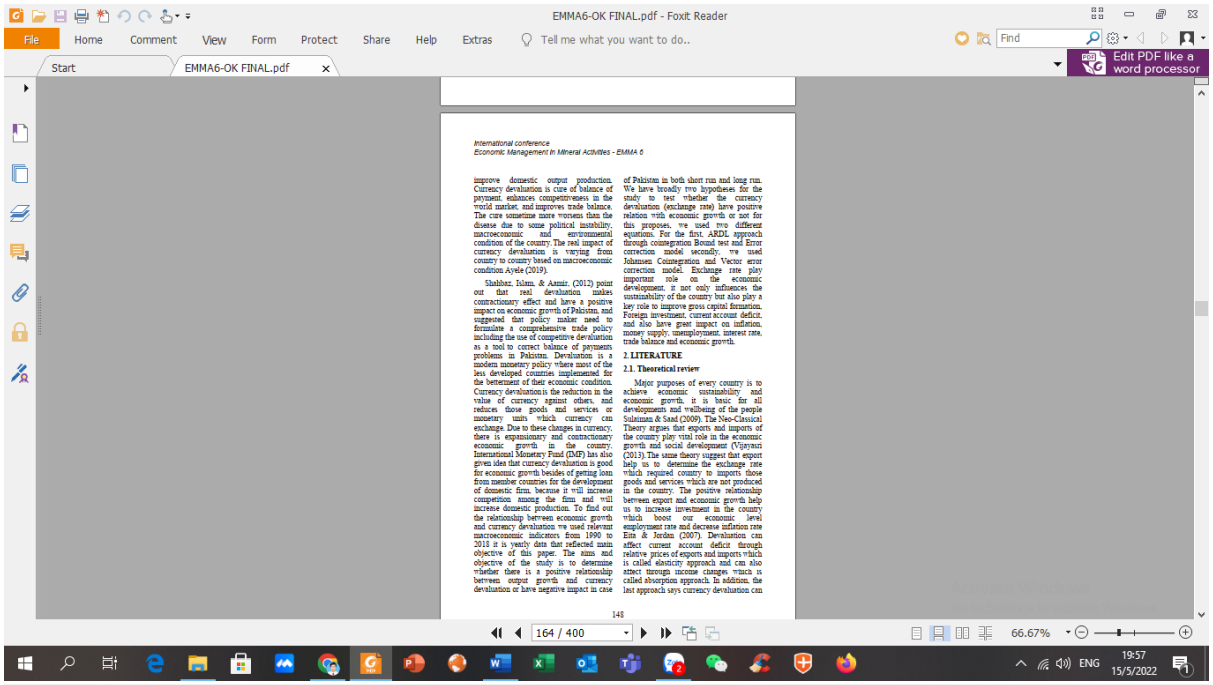
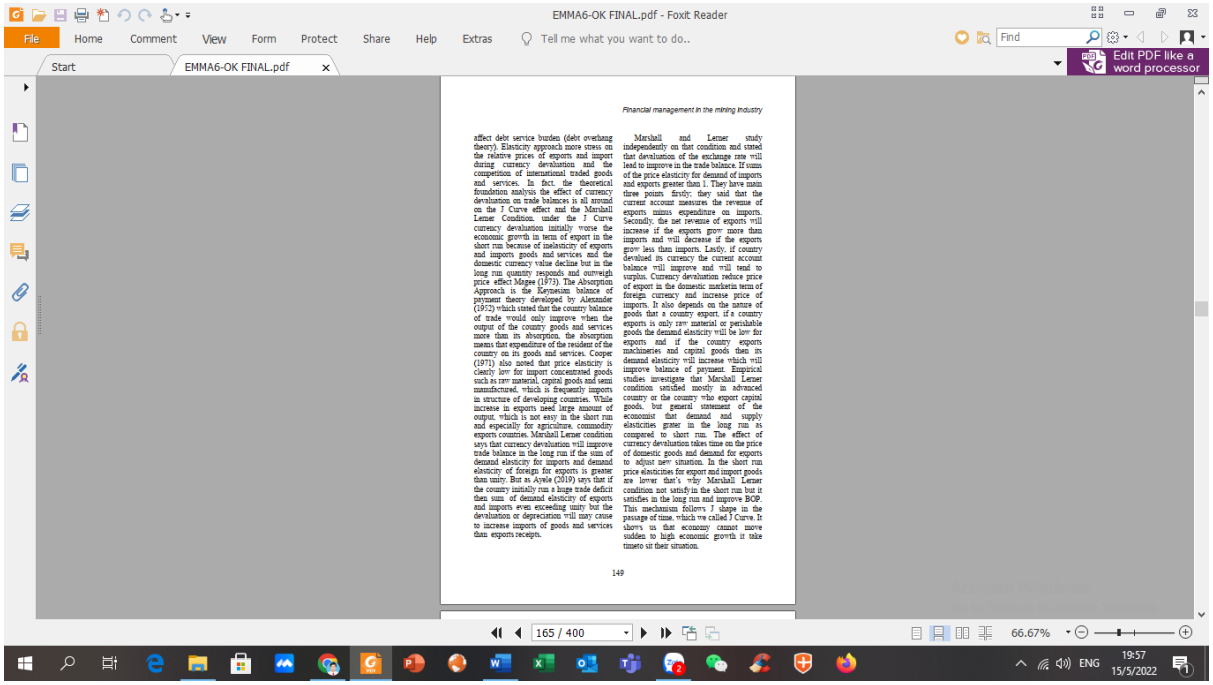
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The impact of higher cost of intermediate goods can offset the positive effect of exports and output growth. Under this scenario, the currency devaluation threatens external stability and disturbs balance of trade. In addition, benefits of currency devaluation are severely restricted if the exports and imports are inelastic with respect to exchange rate. Devaluation boosts export and increase output, raised international reserve and reduces unemployment due to the expansionary effect. While currency devaluation can decrease output and economic activity due to increase prices of raw materials thus the economy become shrink and adversely affect output growth, which is known as contractionary effect Mohammad, Farshid, & Narwed (2011). In 2009 depreciation of currency in Pakistan increased by 16.3 %, which create a huge pressureon the country foreign reserve. As a result, we saw uncertainty in the economy that create speculation in the foreign exchange market and led to cash outflow from the country. Devaluation of currency is hot and controversial topics for both developing and developed economies believed and hope to increase their exports. Most of the developing countries have faces sever declining in their foreign exchange reserve, huge deficit in balance of paymesnt, incressing cost of imports inputs, goods and services and shortage and growing cost of energy, which result to decrese in productivity, producing goods and to compete in the internal market developing countries have also facing high tariffs on export and high production cost, these factors affecting the output level of the developing countries. In case of Pakistan these economic problems are sever because of political instebility, poor governance, frequently resort to the monetary interference and usage of fiscal discretion Nawaz & Ghani (2018).

It is documented that United State trade balance reversed from surplus in 1970 to deficit in 1971, the US policy maker to decided devalue currency to set balance trade but unfortunately the following year it became worsen than previous year. It was because of J curve effect, under the J curve assumptions a country's trade deficit initially decrease or worse than increase because of high import price then reduce of import volume. A reasonable explanation to the short run declined and long run improvement in the trade balance due to currency devaluation given by Magee (1973) to investigate the effectiveness of currency devaluation policy as a tool to improve trade balance. He works on a series of studies on J curve phenomena after the devaluation of US Currency (Driller), he points out the short run and long changes after devaluation. In the short run if both elasticities of export and import are inelastic and less than unity then it will be declined balance of trade. While in the long run if both elasticities of imports and exports are elastic and excessed unity then it will improve balance of trade. However, the impact of devaluation are controversial, mixed (empirically results and policy implication) and depend upon nature of the services. As we saw in recently many low-income countries in Sub Sahara Africa show economic growth while political tensions and environmental shocks are there in the countries and have interest in the world market but still their exports are unsatisfactory because of dependency on few agricultural or primary goods. African less developed countries (LDCs) have experience a large amount of balance of payment and widen current account deficit and trade imbalances. According to the less developed countries (LDCs) have been undertaken and closer look to the exchange rate movement with currency devaluation to improve their trade balance and increase export, attract foreign investment and

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improve domestic output production. Currency devaluation is cure of balance of payment, enhances competitiveness in the world market, and improves trade balance. The cure sometime more worsens than the disease due to some political instability, macroeconomic and environmental condition of the country. The real impact of currency devaluation is varying from country to country based on macroeconomic condition Ayele (2019).
Shahbaz, Islam, & Aamir. (2012) point out that real devaluation makes contractionary effect and have a positive impact on economic growth of Pakistan, and suggested that policy maker need to formulate a comprehensive trade policy including the use of competitive devaluation as a tool to correct balance of payments problems in Pakistan. Devaluation is a modern monetary policy where most of the less developed countries implemented for the betterment of their economic condition. Currency devaluation is the reduction in the value of currency against others, and reduces those goods and services or monetary units which currency can exchange. Due to these changes in currency, there is expansionary and contractionary economic growth in the country. International Monetary Fund (IMF) has also given idea that currency devaluation is good for economic growth besides of getting loan from member countries for the development of domestic firm, because it will increase competition among the firm and will increase domestic production. To find out the relationship between economic growth and currency devaluation we used relevant macroeconomic indicators from 1990 to 2018 it is yearly data that reflected main objective of this paper. The aims and objective of the study is to determine whether there is a positive relationship between output growth and currency devaluation or have negative impact in case of Pakistan in both short run and long run. We have broadly two hypotheses for the study to test whether the currency devaluation (exchange rate) have positive relation with economic growth or not for this proposes, we used two different equations. For the first, ARDL approach through cointegration Bound test and Error correction model secondly, we used Johansen Cointegration and Vector error correction model. Exchange rate play important role on the economic development, it not only influences the sustainability of the country but also play a key role to improve gross capital formation. Foreign investment, current account deficit, and also have great impact on inflation, money supply, unemployment, interest rate, trade balance and economic growth.
2. LITERATURE
2.1. Theoretical review
Major purposes of every country is to achieve economic sustainability and economic growth, it is basic for all developments and wellbeing of the people Sulaiman & Saad (2009). The Neo-Classical Theory argues that exports and imports of the country play vital role in the economic growth and social development (Vijayani (2013). The same theory suggest that export help us to determine the exchange rate which required country to imports those goods and services which are not produced in the country. The positive relationship between export and economic growth help us to increase investment in the country which boost our economic level employment rate and decrease inflation rate Edu & Jordan (2007). Devaluation can affect current account deficit through relative prices of exports and imports which is called elasticity approach and can also affect through income changes which is called absorption approach. In addition, the last approach says currency devaluation can
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affect debt service burden (debt overhang theory). Elasticity approach more stress on the relative prices of exports and import during currency devaluation and the competition of international traded goods and services. In fact, the theoretical foundation analysis the effect of currency devaluation on trade balances is all around on the J Curve effect and the Marshall Lerner Condition. under the J Curve currency devaluation initially worse the economic growth in term of export in the short run because of inelasticity of exports and imports goods and services and the domestic currency value decline but in the long run quantity responds and outweigh price effect Magee (1973). The Absorption Approach is the Keynesian balance of payment theory developed by Alexander (1952) which stated that the country balance of trade would only improve when the output of the country goods and services more than its absorption. the absorption means that expenditure of the resident of the country on its goods and services. Cooper (1971) also noted that price elasticity is clearly low for import concentrated goods such as raw material, capital goods and semi manufactured, which is frequently imports in structure of developing countries. While increase in exports need large amount of output, which is not easy in the short run and especially for agriculture, commodity exports countries. Marshall Lerner condition says that currency devaluation will improve trade balance in the long run if the sum of demand elasticity for imports and demand elasticity of foreign for exports is greater than unity. But as Ayele (2019) says that if the country initially run a huge trade deficit then sum of demand elasticity of exports and imports even exceeding unity but the devaluation or depreciation will may cause to increase imports of goods and services than exports receipts.
Marshall and Lerner study independently on that condition and stated that devaluation of the exchange rate will lead to improve in the trade balance. If sums of the price elasticity for demand of imports and exports greater than 1. They have main three points 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 will decrease if the exports grow less than imports. Lastly, if country devalued its currency the current account balance will improve and will tend to surplus. Currency devaluation reduce price of export in the domestic markets in term of foreign currency and increase price of imports. It also depends on the nature of goods that a country export. if a country exports is only raw material or perishable goods the demand elasticity will be low for exports and if the country exports machineries and capital goods then its demand elasticity will increase which will improve balance of payment. Empirical studies investigate that Marshall Lerner condition satisfied mostly in advanced country or the country who export capital goods, but general statement of the economist that demand and supply elasticities grater in the long run as compared to short run. The effect of currency devaluation takes time on the price of domestic goods and demand for exports to adjust new situation. In the short run price elasticities for export and import goods are lower that's why Marshall Lerner condition not satisfy in the short run but it satisfies in the long run and improve BOP. This mechanism follows J shape in the passage of time, which we called J Curve. It shows us that economy cannot move sudden to high economic growth it take times to stir their situation.
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2.2. Empirical review

A. Muhammad K. Zaman and K. Rashid (2011) investigated relationship between currency devaluation and output growth in case of Pakistan. The study examines long run and short run effect between devaluation and output growth by applying unit root test and co-integration test. forthis purpose yearly data had taken from period of 1980 to 2009. The empirical evidence found significant and positive relationship between currency devaluation and output growth in short run as well as long run. Both in the short run and in the long run output growth is affected by currency devaluation. Abdullah & Kalim (2009). Conduct a research on 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 economic growth of Pakistan during the long run period. Afzal, Malik, Begum, Sarwar, & Fatima (2012).Investigated study for the co-integrated causal and relationship of food inflation, health and education with economic growth. In the study, there is two-way causality between economic growth and education, education andfood inflation and food inflation and economic growth.

Ayele (2019) worked on paper about the real exchange rate and currency devaluation that effect current account balance of four highly indebted low-income countries in East Africa. The purposes of the paper were to point out whether devaluation improved current account balance of the four Less Developing Countries of East Africa named Ethiopia, Kenya, Rwanda and Tanzania. The researcher usedPooled mean group approach for panel data and ARDL and bound test for time series data from the period of 1970 to 2016. He used PMG and ARDL approach in that four countries and he found there is no improvement in the current account balance due to exchange rate devaluation, while only Ethiopia have improved current account balance when restricted ARDL and bound test used. The overall empirical result shows that in the short run there is improvements in the current account balance but declinedin the long run period. Shahbaz et al. (2011) worked on paper to find out contractionary or expansionary effect in Pakistan due to devaluation, they took data from WDI and Economic Survey of Pakistan from 1975 to 2008. Used ARDL model and bound test for long run relationship and find out there is contractionary effect on economic growth. They used some empirical variables which is relevant to Pakistan economy but unfortunately he found Currency devaluation on economic growth have reverse impact on the economy and he explain the reason is high cost of imports, because most of inputs and raw materials are import from outside of the country.

Currency devaluation means lower the talent of labor in the foreign market Shah, Kazi, Khaskheliey, Shaikh, & Shaoib (2015). The paper investigates the impact of currency devaluation on Pakistan economy make cost push inflation because. Pakistan industries depend on the import inputs and their access to advanced countries block by high tariffs and quotas. Due to the currency devaluation the cost industrial product increase and reduce the intensity of capacity, utilization so there will be inflation in the economy. There are many solutions, which can resolve the currency devaluation as appreciate through Foreign Direct Investment, increase the export of goods lead to high cash inflow because there would be high push demand by the countries.

In order to check empirically the effect of currency devaluation in 8 LDC. sfor 25 year, used fixed effect method the result indicate that devaluation create

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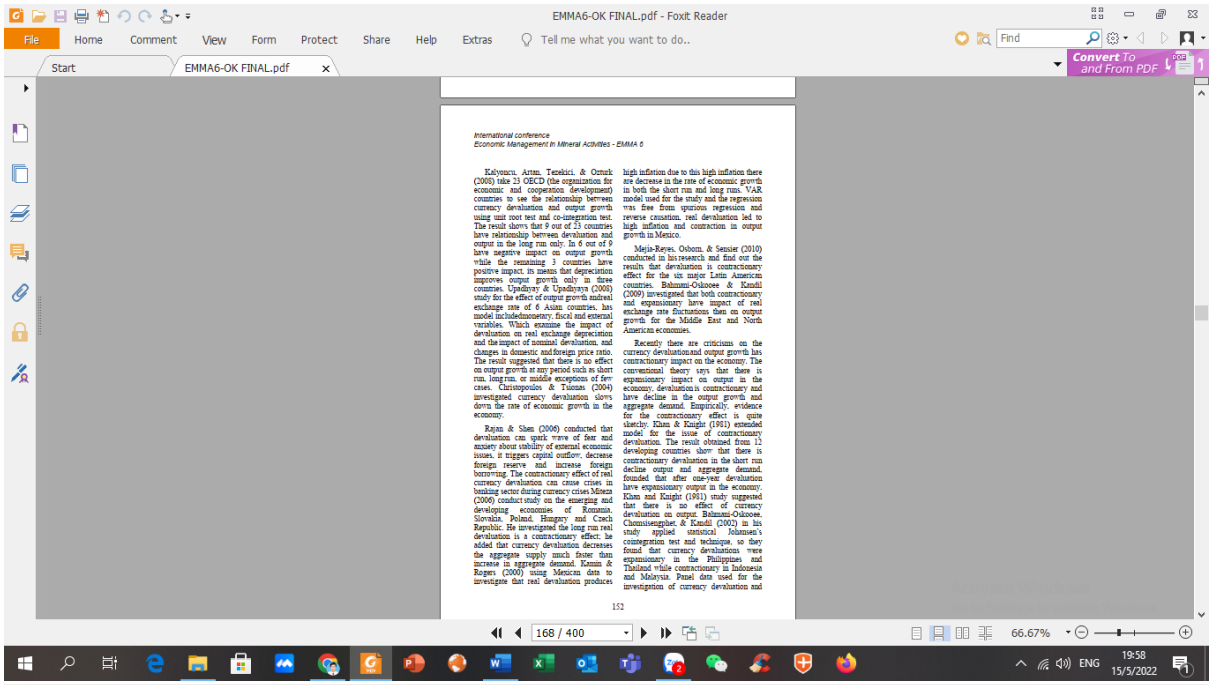
contractionary effect on output growth in the first year whereas expansionary in the following year but notqualitative difference manufacturing exporters and agriculture exports in terms of currency devaluation on output. Shah et al. (2015) suggest for Pakistan economy that FDI and investment can improve Exports growth, but investment need reserve and we have lake of foreign reserve so, we need to increase saving for GDP up to 20% when FDI is not involved in the economy. Krugman conducted another study about the currency devaluation and output. In this study, different model used for semi-industrialized countries, which suggests result like Keynesian model where currency devaluation led to reduction in output. Government revenue increases by devaluation, taxes increased when exports increased.

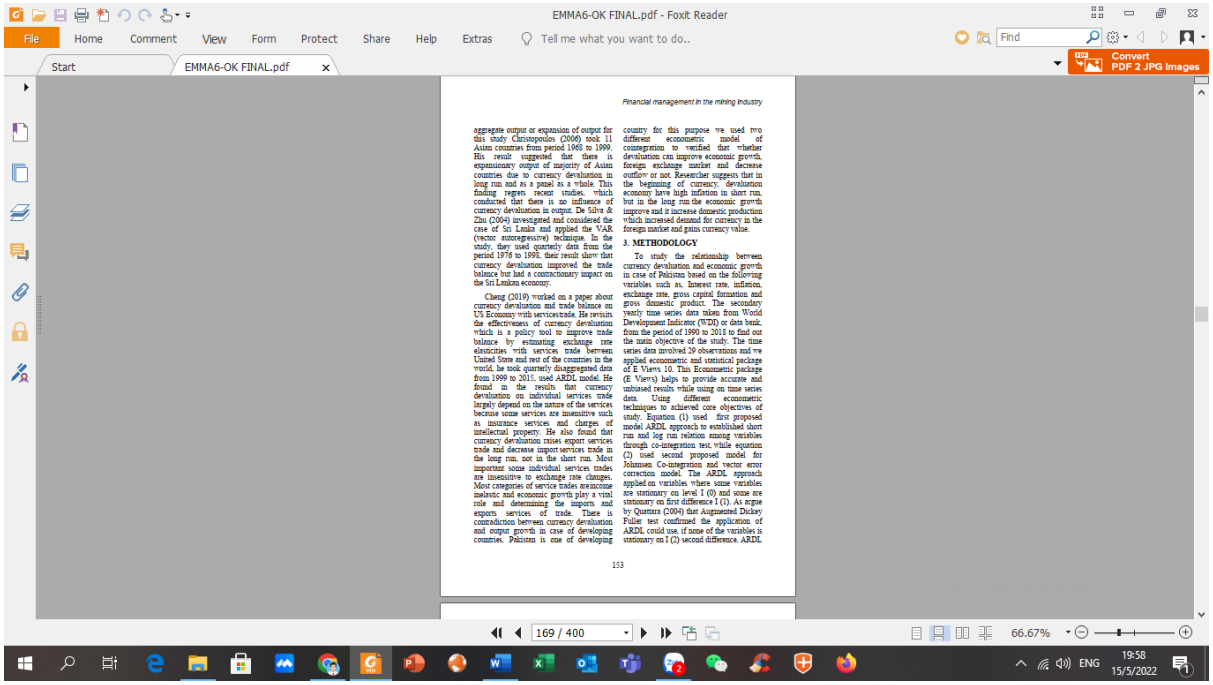
Aslam & Awan (2018) investigated some core macroeconomic indicators like employed labor force, foreign direct investment, GDP deflator, export, broad money, gross capital formation and real gross domestic products. Impact of monetary policy on Pakistan economic growth, used time series data from 1972 to 2015. The variable of the study, the author applied multiple regression method to analyze the data and draw the results. There is long run relationship between monetary policy and the selected variables. It means that monetary policy has significant effect on macroeconomic variables.

Choudhary & Chaudhry (2007) suggested that currency devaluation on output growth and the price level may not uniform across all countries and may not generalized for all developing countries. Mostly empirical studies do not separate the effects of devaluation from import prices when used to test contractionary devaluation hypothesis. Thus, country specific study needed to separate price of import from the effect of currency devaluation, the author of the paper use VEC (vector Error Correction) model to check theimpact of exchange rate on output and price level for Pakistan in the period from 1975 to 2005. Paper shows that devaluation is a positive effect on output but negative on price level, so the paper showed there is no contractionary devaluation hypothesis for Pakistani economy. Findings of paper showed expansionary effects of devaluation on outputin Pakistan. An, Kim, & Ren (2014) investigated Asian countries have contractionary devaluation or expansionary devaluation. They argued that currency devaluation has contractionary effect when there is disrupting the financial sector and by introducing uncertainty among investor and consumer. For this purpose, reduce form model was established where tested by means of co-integration analysis. The result sugessed that many Asian countries depreciation have contractionary.

Muhammad Nawaz, Ejaz Ghani (2018) work on paper about currency depreciation and output in case of Pakistan, used IS-LM model, Autoregressive Distribute Lag (ARDL) model and Error correction (ECM) model, took data from 1972 to 2010. The study found no expansionary effect onoutput in short run as well as long run. Muhammad Nawaz (2018) recommend a clear and long-term policy that inspired the trust of international community to boost up the confidence of exporters in the country. Agenor (1991) developed a study about 23 developing countries and found relationship between currency devaluation, production and real exchange rate. A survey of 23 developing countries from the period of 1978 to 1987 and drives the real production from balance of aggregate demand and supply quantity with rational expectation. He found there is contractionary effect on output growth. While if there is anticipation in the exchange rate then devaluation is expansionary effect over on the output growth of the economy.

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Kalyoncu, Artan, Tezekici, & Ozturk (2008) take 23 OECD (the organization for economic and cooperation development) countries to see the relationship between currency devaluation and output growth using unit root test and co-integration test. The result shows that 9 out of 23 countries have relationship between devaluation and output in the long run only. In 6 out of 9 have negative impact on output growth while the remaining 3 countries have positive impact. its means that depreciation improves output growth only in three countries. Upadhyay & Upadhyaya (2008) study for the effect of output growth andreal exchange rate of 6 Asian countries, has model includeshonetary, fiscal and external variables. Which examine the impact of devaluation on real exchange depreciation and the impact of nominal devaluation, and changes in domestic and foreign price ratio. The result suggested that there is no effect on output growth at any period such as short run, long run, or middle exceptions of few cases. Christopoulos & Tsionas (2004) investigated currency devaluation slows down the rate of economic growth in the economy.
Rajan & Shen (2006) conducted that devaluation can spark wave of fear and anxiety about stability of external economic issues, it triggers capital outflow, decrease foreign reserve and increase foreign borrowing. The contractionary effect of real currency devaluation can cause crises in banking sector during currency crises Mineta (2006) conduct study on the emerging and developing economies of Romania, Slovakia, Poland, Hungary and Czech Republic. He investigated the long run real devaluation is a contractionary effect. he added that currency devaluation decreases the aggregate supply much faster than increase in aggregate demand. Kamin & Rogers (2000) using Mexican data to investigate that real devaluation produces high inflation due to this high inflation there are decrease in the rate of economic growth in both the short run and long runs. VAR model used for the study and the regression was free from spurious regression and reverse causation, real devaluation led to high inflation and contraction in output growth in Mexico.
Mejia-Reyes, Osborn, & Sessier (2010) conducted in his research and find out the results that devaluation is contractionary effect for the six major Latin American countries. Bahmani-Oskooee & Kandil (2009) investigated that both contractionary and expansionary have impact of real exchange rate fluctuations then on output growth for the Middle East and North American economies.
Recently there are criticisms on the currency devaluationand output growth has contractionary impact on the economy. The conventional theory says that there is expansionary impact on output in the economy. devaluation is contractionary and have decline in the output growth and aggregate demand. Empirically, evidence for the contractionary effect is quite sketchy. Khan & Knight (1981) extended 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 output and aggregate demand. founded that after one-year devaluation have expansionary output in the economy. Khan and Knight (1981) study suggested that there is no effect of currency devaluation on output. Bahmani-Oskooee, Chomsisengphet, & Kandil (2002) in his study applied statistical Johansen's cointegration test and technique, so they found that currency devaluations were expansionary in the Philippines and Thailand while contractionary in Indonesia and Malaysia. Panel data used for the investigation of currency devaluation and
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aggregate output or expansion of output for this study Christopoulos (2006) took 11 Asian countries from period 1960 to 1990. His result suggested that there is expansionary output of majority of Asian countries due to currency devaluation in long run and as a panel as a whole. This finding regrets recent studies, which conducted that there is no influence of currency devaluation in output. De Silva & Zhu (2004) investigated and considered the case of Sri Lanka and applied the VAR (vector autoregressive) technique. In the study, they used quarterly data from the period 1976 to 1998, their result show that currency devaluation improved the trade balance but had a contractionary impact on the Sri Lankan economy.
Cheng (2019) worked on a paper about currency devaluation and trade balance on US Economy with services trade. He revisits the effectiveness of currency devaluation which is a policy tool to improve trade balance by estimating exchange rate elasticities with services trade between United State and rest of the countries in the world. he took quarterly disaggregated data from 1999 to 2015, used ARDL model. He found in the results that currency devaluation on individual services trade largely depend on the nature of the services because some services are insensitive such as insurance services and charges of intellectual property. He also found that currency devaluation raises export services trade and decrease import services trade in the long run. not in the short run. Most important some individual services trades are insensitive to exchange rate changes. Most categories of service trades areincome inelastic and economic growth play a vital role and determining the imports and exports services of trade. There is contradiction between currency devaluation and output growth in case of developing countries. Pakistan is one of developing country for this purpose we used two different econometric model of cointegration to verified that whether devaluation can improve economic growth, foreign exchange market and decrease outflow or not. Researcher suggests that in the beginning of currency, devaluation economy have high inflation in short run, but in the long run the economic growth improve and it increase domestic production which increased demand for currency in the foreign market and gains currency value.
3. METHODOLOGY
To study the relationship between currency devaluation and economic growth in case of Pakistan based on the following variables such as, Interest rate, inflation, exchange rate, gross capital formation and gross domestic product. The secondary yearly time series data taken from World Development Indicator (WDI) or data bank. from the period of 1990 to 2018 to find out the main objective of the study. The time series data involved 29 observations and we applied econometric and statistical package of E Views 10. This Econometric package (E Views) helps to provide accurate and unbiased results while using on time series data. Using different econometric techniques to achieved core objectives of study. Equation (1) used first proposed model ARDL approach to established short run and log run relation among variables through co-integration test, while equation (2) used second proposed model for Johansen Co-integration and vector error correction model. The ARDL approach applied on variables where some variables are stationary on level I (0) and some are stationary on first difference I (1). As argue by Quatara (2004) that Augmented Dickey Fuller test confirmed the application of ARDL could use, if none of the variables is stationary on I (2) second difference. ARDL
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model contains the lagged value of the dependent variable, the current and lagged value of the regressed as explanatory variables.

The generalized form of ARDL specification is (p, q1, q2, q3, q4).

$$\Delta GD_t = \sum_{i=1}^{p} \beta_i \Delta GD_{t-i} + \sum_{i=0}^{q_1} \alpha_i \Delta INF_{t-i} + \sum_{i=0}^{q_2} \delta_i \Delta INT_{t-i} + \sum_{i=0}^{q_3} \theta_i \Delta EXR_{t-i} + \sum_{i=0}^{q_4} \gamma_i \Delta GCF_{t-i} + \varepsilon_t$$

Eq.1 is the first proposed equation for this study that represent ARDL Co-integration where ΔLGDPt, ΔLINTt, ΔLINFt, ΔLEXRt, and ΔLGCFt denote changes in natural lag of Gross domestic product, Interest rate, Inflation rate, Exchange rate and Gross capital formation respectively. $\alpha 0$ is intercept, k is the lag operator, and εt is the error term or white noise, error term. Moreover, $\beta 1$, φi, δi, γi, θi 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 Johansen Co-integration equation through Vector Error Correction Model that form as,

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{p-1} \beta_i \Delta Y_{t-i} + \sum_{i=1}^{p-1} \delta_i \Delta X_{t-i} + \varphi z + \varepsilon_t \qquad (3)$$

Equation.3 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 matrix of the coefficients of the model. $\varphi = (n \times r)$ represent matrix of the Error Correction coefficients and r denoted the number of co-integrating association relationships between the variables, so we can say that $0 < r < n$. φ denoted by the adjustment of parameter or speed of adjustment. $z = (n \times r)$ is the matrix of r co-integrating vectors, so that $0 < r < n$. it represents the long- run relationship between the variables.

3.1. Augmented Dicky Fuller (ADF)

This test is the advanced and prefer from of Augmented Dicky (AD). Researcher mostly rectifies some errors from (AD) test. we focused and preferred Augmented Dicky Fuller (ADF) test. It eliminates autocorrelation from residuals and adds some extra lagged term 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. Nanth & Cavanaugh (1997). The Augmented Dicky Fuller test equation will be written and express below:

$$\Delta Y_t = \delta_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + \varepsilon_t \qquad (3)$$

In equation (3) Δ is the change that means it is the first difference operator, εt is the error term and ρ is the lag operator, and t is the time subscript. For the ADF test the null hypothesis suggest unit root and the alternative suggest not unit root exist meaning that the series is stationary. If the null hypothesis accepted, it means that the series is non- stationary if the null hypothesis rejected the series have no unit root the data is stationary. The decision will take the ADF critical value and the T statistic or p value if the T statistic or p value is greater than ADF critical value we accepted null hypothesis it means the data is non-stationary.

3.2. Error correction model & Vector error correction model

It is important to do analysis on error correction model when there is co-integration amongst the variable in ARDL approach because co-integration only show long run relation while error correction model show us the short run relationship between the variables. The error term should be negative and significant. Negative value can determine how much time takes this short run shocks to adjust in the long run. Mathematical form of error correction model is,

$$\Delta GD_t = \sum_{i=1}^{p} \beta_i \Delta GD_{t-i} + \sum_{i=0}^{q_1} \alpha_i \Delta INF_{t-i} + \sum_{i=0}^{q_2} \delta_i \Delta INT_{t-i} + \sum_{i=0}^{q_3} \theta_i \Delta EXR_{t-i} + \sum_{i=0}^{q_4} \gamma_i \Delta GCF_{t-i} + \varepsilon_t \qquad (4)$$

In equation (4) represents error correction (ECM), where ECT denoted error correction term and λ is the coefficient of error term, which should be negative and significant.

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

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{p-1} \beta_i \Delta Y_{t-i} + \sum_{i=1}^{p-1} \delta_i \Delta X_{t-i} + \varphi z + \varepsilon_t \qquad (3)$$

$$Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t \qquad (2a)$$

$$Z_{t-1} = ECT_{t-1} = Y_{t-1} - \beta_0 - \beta_1 X_{t-1} \qquad (5)$$

Equation (5) represents vector error correction (VECM), where ECT denoted error correction term and the coefficient of error term should be negative and significant. While, equation (2a) $Y_t = \beta 0 + \beta 1X1$ is the long run co-integration between the two variables and $\beta 1$ and δi is the parameter that how x and y are reacts in the long run equilibrium, we applied the model more than two variables. The result discussed in the below chapter 4.

4. EMPIRICAL FINDINGS & RESULT DISCUSSION

4.1. Augmented Dicky Fuller Test

In time series data it must to check the existence of unit root if there is unit root then the series will be not integrated and will not be stationary, it led to the spurious regression, so it is necessary to make the data stationary or to make all variables stationary, which are used in the model for estimations. To test every individual variable is stationary because it needs to ensure that all variables are integrated. Indeed, unit root test is a test to verify the stationarity of variables. For the stationarity of the variable, we used Augmented Dicky Fuller test (ADF) (1979) to test for unit root amongst the variables. Therefore, we performed unit root test for levels and first difference.

Table 1. Unit root test

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, LNINF has not exist unit root, we rejected null hypothesis the p value 0.0092, 0.0019, 0.0139 respectively is less than critical value 0.05 or 5% on level. While LNEXR, LNGCF, and their p value are, 0.0070 and 0.0205 on first difference are less than significant level of 5%. When the variables are becomes stationary and co- integrated with different order such as I (0) and I (1) then used ARDL model, however before ARDL model we need to specify the lag length selection for the best ARDL model specification.

4.2. Lag length selection criterion

Table 2 used VAR lag selection criteria, where the dependent variable is Gross domestic product (GDP) and c is a constant term while Interest (INT), Inflation (INF), Exchange rate (EXR) and Gross capital formation (GCF) are independent variables. It is clearly showing in the below Table 4.3 that by all information criterion says that second (2) lag is best for ARDL approach.

Table 2. Optimal lag length criterion for ARDL model Lag

FPE	AIC	SC	HQ

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4.3. Co-integration bound test

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

Table 3. Bound test

F-Bound Test	Null Hypothesis: No levels relationship			
Test Statistics	Value	Signif.	I(0)	I(1)
F-Statistics	23.74264	10%	3.03	4.06
K	4	5%	3.47	4.57

4.4. Error correction model

In Table 4 present the Error Correction Model (ECM) or the long run model through Ordinary Least Square (OLS) method. Exchange rate with both first and second lag have positive relation with GDP, meaning that if 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. Interest rate also have positive relation in the second lag its value is 0.001049 if 1% change occur in the interest it will increase Gross Domestic Product (GDP) at 0.001049 percent. However, in the first lag the relation is negative which means inverse relation of GDP with interest rate. The Inflation coefficient value is 0.002873 in the first lag which means the relation have a positive relation with Gross Domestic Product (GDP) and with second lag the value become negative (-0.015670). Inflation variable in the first lag is positive while in the second lag, it shows negative relation its means that if currency devalue then inflation will rise and if there is 1 percent change in inflation there be -0.015670 percent decrease in the Gross Domestic product meanings lower will be economic growth.

The most important term is Error correction term (ECT (-1)) the coefficient must be negative and significant at 5%. In table 4 it is negative but not statistically significant, which means that there is no convergence from short run changes or shocks toward long run equilibrium.

LNGDP (-1)	1.365775	0.326843	4.155802	0.0253
LNGDP (-2)	-0.457045	0.333306	-1.371249	0.2639

Table 4. Error correction model through OLS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
0	0.011346	-1.651804	-1.402371	-1.603210
1	0.000250	-5.476727	-5.178007	-5.418413
C	2.490808	0.562486	4.428217	0.0214
2	0.000249*	-9.52749E*	-9.147891*	-9.459576*
LNINT (-1)	-0.044706	0.012808	-3.490595	0.0397

In the above Table 2 FPE (Final Prediction 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 ARDL model. In this study, the outcomes are integrated with different integration it

means some variables are integrate on level and some variable are integrated on first difference Therefore, we decided to run the

LNINF (-1)	0.002873	0.010463	0.274562	0.8015
LNINF (-2)	-0.015670	0.009475	-1.653884	0.1967
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
LNINT (-2)	0.001049	0.013058	0.080349	0.9410

The error correction term ECT (1) shows negative that satisfied one condition but not significant. However, we conducted others diagnostic test to look its normality LM.

LNEXR there will be decline 0.26 and 0.59 % respectively in LNGDP.

Table 6. Vector Error Correction Estimates Serial correlation and Heteroskedasticity. Before going to diagnostic tests, we want to check the second proposed model of the study that is cointegrating equation of Johansen model, which is representing the long run. All variables must cointegrated in order I (1) for Johansen cointegration.

4.5. Johansen co-integration test

In the below Table 5 Shows the result of Johansen cointegration, in which the null hypothesis is clear rejected because of the trace statistic value 78.23 for none, is greater than critical value of 0.05 or 5 %, which is 69.818 and the p value is also significant. All the other value of trace statistic is less than critical value so we cannot reject null hypothesis for that cases except at none. Here we compared the critical value 0.05 with trace statistic value. If the trace statistic value greater than its critical value we reject the null hypothesis. cointegration test through ARDL approach with lag 2 and see the Bound cointegration test.

We can also follow the p value if the p value is less than 5 % of level means it is significant. we reject null hypothesis and accept alternative. but here in thismodel we only compared trace and maxi Eigen value with

Cointegrating Eq:	CointEq1	Error Correction:	CointEq1
LNGDP (-1)	1.000000	D(LNGDP)	-0.018449
LNINT (-1)	-0.034168		(0.03707)
	(0.03964)		[-0.49770]
	[-0.57876]		
LNINF (-1)	0.264772	D(LNINT)	3.218995
	(0.05072)		(1.11117)
	[5.21899]		[2.89694]
LNEXR (-1)	0.594706		
	(0.44083)	D(LNINF)	-2.583617
	[1.34924]		(0.65160)
LNGCF (-1)	-1.710408		[-3.79054]
	(0.16558)		
	[-9.12173]		
C	7.236002	D(LNEXR)	0.294816
			(0.11665)
			[2.52662]
		D(LNGCF)	0.114485
			(0.12544)
			[0.91267]

Its critical value of 0.05. If the trace test or maxi-eigen value comes greater than its critical value, we reject null hypothesis but here we just take trace test.

In this case we can reject null hypothesis for the trace statistic at none value and can says that there are only one cointegration its means that there is association amongst all independent variable with dependent in the long run.

In the above Table 6 indicates the coefficient of coinEq1 or ECT (error correction term) with LNGDP and LNINF are negative but only LNINF is statistically significant that indicating that there is convergence from short run dynamics towards long run equilibrium. The adjustment coefficient is 2.5 percent towards long run equilibrium in case of disequilibrium situation. While in case of LNINT, LNEXR and LNGCF the adjustment coefficients are positive that means one of the ECT

Condition is not satisfied again. Therefore, we can say that both proposed model suggested there is no positive relationship between currency devaluation and economic growth in Pakistan. Nevertheless, we conducted diagnostics to make sure the model stability and normality.

We rejected the null hypothesis in the above Table 5 it means there is long run co-integration between variables in the model. Now we will apply Vector error correction model to find out the short run and long run equilibrium convergence in the model.

Table 5. Unrestricted co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.** b
None *	0.679807	78.23793	69.81889	0.0091 b
At most 1	0.599065	47.46950	47.85613	0.0541 ca
At most 2	0.478518	22.81267	29.79707	0.2554 te

4.6. Vector error correction model

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

LNGDP = 0.034168 LNINT - 0.264752 LNINF - 0.594706
LNEXR – 1.510408 LNGCF. (6)

In Equation 6 our targeted variable is LNGDP, it means that if there is one percent change in the LNINT and LNGCF there will increase 0.03 and 1.51 % respectively in LNGDP. While, 1 percent change in the LNINF.

4.7. Basic diagnostics tests

We perform the basic diagnostic test it included LM serial correlation or Autocorrelation, Heteroskedasticity and normality to see the model have stability and accuracy.

4.7.1. Autocorrelation

The serial correlation or Autocorrelation shows in the below Table 7 that error term or residual of the model are not correlated.

Meaning variables current value and past value have no relation. The model is not suffering from serial correlation.

In the above Table 7 shows the OLS Auto correlation problem, serial correlation test, which shows there is no relation of 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 is (0.6027) is greater than critical value of 5 % level. Therefore, we cannot reject the null hypothesis because null hypothesis says that this model has no serial correlation, we accept null hypothesis because of probability value is greater than 5 %.

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

4.7.2. Heteroskedasticity

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

In Table 8 it showed the null hypothesis is accepted because observe R squared statistic corresponding probability value is 0.729 and F statistics which is greater than or more than 5%. Its means residual is not heteroskedasticity it also means that residual is homoscedastic, which is desirable. Now our model is free of heteroskedasticity. In the above Table 8 it is clearly show that we cannot reject null hypothesis because the observed r square and the F statistical probability (0.9415) value is greater than critical value of 5 % level.

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 Mi
Scaled explained SS	0.441063	Prob. Chi-Square (11)	1.0000 Os

4.7.3. Normality of the model

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

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

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

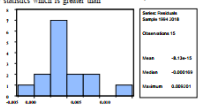


Fig 1. Residual distribution for the normality test.

In Fig.1 its clearly indicate about the normality of the model as we can see from Jarque Bera test the probability value is 0.310445 which is greater than critical value of 5 % level of significant. Therefore, we will accept null hypothesis that say the residuals are normally distributed.

We cannot reject null hypothesis because Jarque Bera probability value is greater than critical value of 5 % level.

5. CONCLUSION, DISCUSSION & RECOMMENDATIONS

The study objective was to look on updated data that how currency devaluation can effect economic growth ofPakistan. For this purpose, we took secondary data from World Development Indicator (WDI) the yearly data contains 29 observation from 1990 to 2018. And took core economic indicators such as GDP, Inflation, Exchange rate, Interest rate and Gross capital formation. This study run these five variables on econometrics techniques to find out the outcomes of currency devaluation on economic growth of Pakistan, while used ARDL, ECM, Johansen cointegration and VECM model. We found that there is no positive and significantly relation between currency evaluation and economic growth in case of Pakistan. This statement also supported by Cheng KM. (2019), Getnah Iret Ayele (2019), Mohammad Nawaz, Ejaz Ghani 2016), and Abdul Sattar et al. (2015). Mohsen Bahmani-Oskooee, S. Chomisengphet and M. Kandil (2014). In addition, for the stability of the model we performed diagnostics test. We found no serial correlation no heteroskedasticity and model residual is normally distributed. With some results, we realized that currency devaluation as a tool policy to improve economic growth but it isnot a good policy for economic growth in case of Pakistan. Because it is a blind fact that without industrialization the economic growth cannot improves, the authority needs tolook these economic indicators particular exchange rate because it is crucial to operate in a right way.

Pakistan operated a managed floating exchange rate system from 1982 to 1998. During the Benazir and Nawaz regimes (1988-1998), the trade deficit and current account deficit were 4.7 % and 5.8 % of GDP, respectively. From 1998 to 2000, the country's political situation was unstable, and the West imposed sanctioned for Pakistan due to nuclear 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 1950s, the rupee depreciated by 20 %. In addition, the 1958 agreement with the IMF supported by conditions such as devaluation, import liberalization and tariff reduction. During the period when Pakistan's exchange rate was still undervalued (1966-93), GDP growth reached a record high of 5.4 %. The higher external debt growth during this period may have been due to the World Bank and International Monetary Fund (IMF) lending programs. The continued impact 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 set a target of 6 %- to 7 %, growth by 2018, but only achieved 4.14 % growth in 2014-15. Eventually, we found that weak currency

hurts GDP growth, while strong currency adds to growth.

Policy recommendations

Under the findings and results of the study suggest that currency devaluation is not good policy for the economic growth of Pakistan, because Pakistan only exports raw materials and some agriculture products, while imports heavy machineries, and all those raw materials which are need to our industries are imported. Secondly, Pakistan is facing energy crises such as electricity, gas and petroleum that are the backbone for production. To make Pakistan economy sustainable, the authority should look closer on the economic indicators and make Industrial economic policy and economic growth related policy have to wisely applied and allow the industrial sector to play its effective role in the boosting of economic growth in Pakistan.

If we look to the countries that are economical stable, they focus on industrial reforms and Information&Technology sectors. The authority should adopt policy for industrialization, instead of currency devaluation because our industrial sector has a potential to improve, the authority should also need to create easy and friendly environment for foreigner business investors. In addition, allow currency freely to depreciate through market force and efficient money market system, official's devaluation should be discouraged. The government policy makers can pay more attention on these factors to formulate a trade policy, to generate a faster and better economic development.

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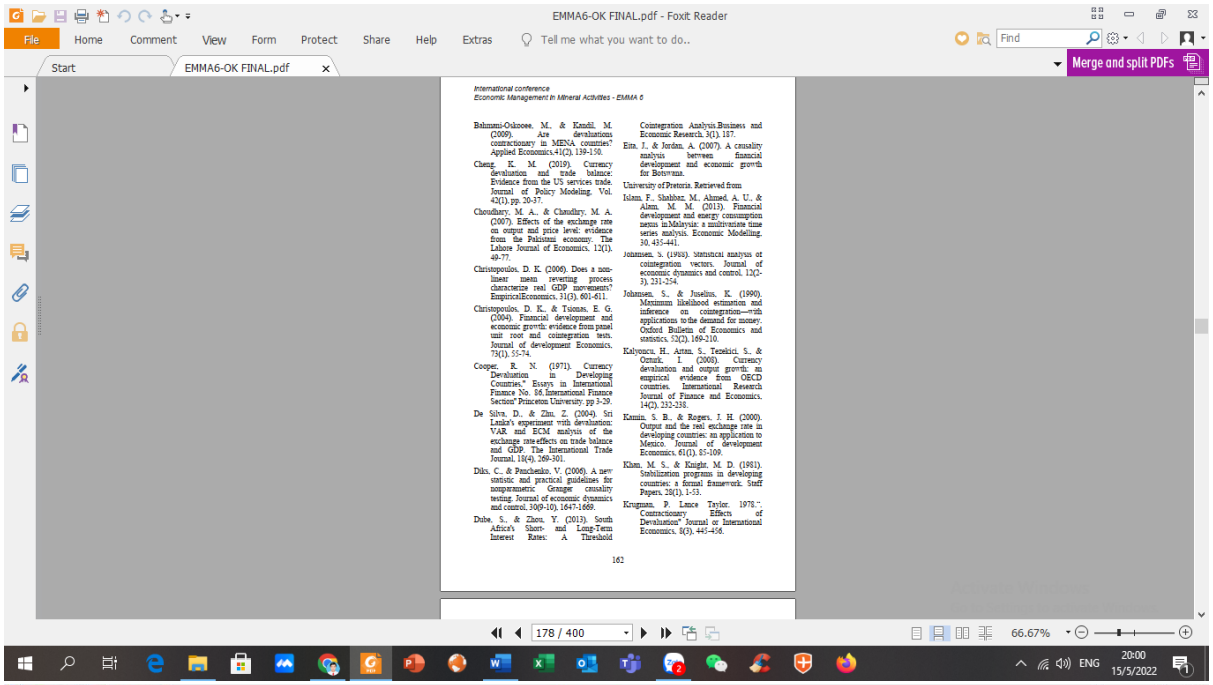
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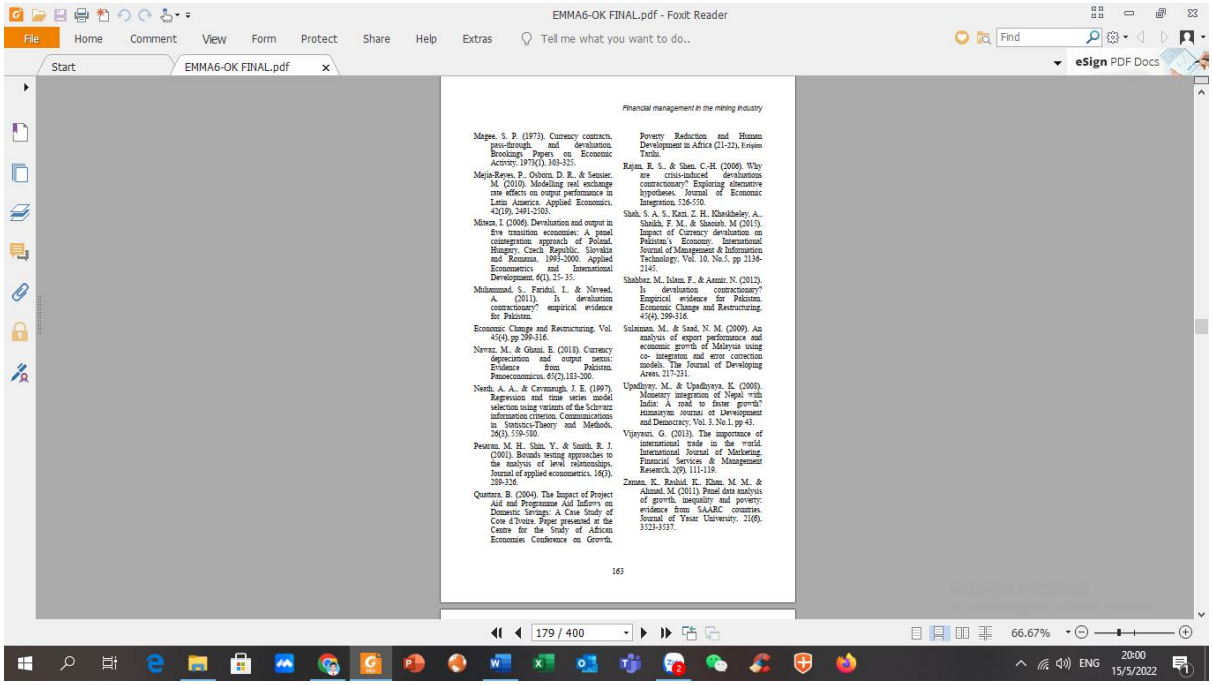
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