

# Variation in General Price Level in Pakistan: A Recent Evidence by Using ARDL Approach (1974-2016)

Sadam Hussain<sup>1</sup>

Center for Industrial and Business Organization, Dongbei University of Finance and Economics, Dalian, Liaoning Province, China

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## Abstract

The main purpose of this study to investigate the impact of the bank rate, budget deficit, FDI and money supply  $M_2$  on inflation in the case of Pakistan applying the ARDL model using yearly data from 1974-2016. The Experimental evidence highlight that there is a unique and stable relationship among dependent variable inflation and other different explanatory variables, bank rate, budget deficit, Foreign investment, GDP, Exchange rate and trade openness. After analysis, the result of ARDL indicates that bank rate, exchange rate, and GDP have a negative impact on inflation in the long-run co-efficient. On the other hand, budget deficit, FDI, Money supply  $M_2$  and trade openness have a positive impact on inflation. These two tests CUSUM and CUSUMSQ shed light on validates and stability of coefficients in this approach.

**Keywords:** Inflation, Bank rate, Foreign investment, Budget Deficit,  $M_2$ , GDP, Exchange Rate, Trade openness, ARDL.

**JEL Classification:** E2, E5

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## Introduction

The inflation variable is the most important agent of the macroeconomic. Every government of the world uses it for economic stability. In the social-economic field,

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<sup>1</sup>Corresponding author's email: [sadam\\_2iqbal@yahoo.com](mailto:sadam_2iqbal@yahoo.com)

inflation is a consistent increase in the general value (McNown and Wallace 1989) dimension of products and services in an economy over some undefined time period (Titman 1982). From an economic point of view when the general cost level up, every unit of paper money purchases fewer products and services units (Karras 1993). Much of the time, inflation reflects a decrease in the acquiring influence per unit money (Culbertson 1975); it is the loss of genuine esteem, as a solitary dollar can buy fewer products. The inflation is a marvel which implies that our cash can't buy as much amount of a product as it could have acquired previously. The dependent variable inflation relies upon the free market activity, which are the reasons for inflation. Increase the general price level of the commodity and enterprises, because of the changes market of the goods. According to Keynesian point of view, inflation has three main types, 1st is the demand-pull inflation (Emmanuel et al. 2019, Ribeiro et al. 2019, Jorda et al. 2019), 2nd is the cost pull inflation and the 3rd is built inflation (Adegbite 2019). Prior to the autonomy of Pakistan in Asia, numerous individuals are lived respectively including Muslims, Hindus, Sikhs and many minorities of other (Wallace 1986).

At the point, when Asia (Bharat) was separated into two sections, Pakistan country and India country, numerous Muslims people moved from Hindustan to Pakistan country to secure their religion, Islam (Ahmed 2002, Ambedkar and Pritchett 1946). The critical economic condition was even under the least favorable conditions because of the restricted allotment of assets through various buyers made up the substantial cabinet. The limited assets were accessible in the Pakistan region (Sengupta 2014). The scarcely any enterprises were available in Pakistan country. Around then less growth of economy implied high inflation. The Population growth of Pakistan country was quick from 30 million out of 1947 to more than 130 million of every 1996. The annual inflation ratio was about 3% in 1960. The normal growth rate of the economy of Pakistan country at the season of autonomy was higher than the normal growth rate of the world economy around then.

In yearly average real GDP growth ratio was 6.8% during 1960, 4.8% during 1970 and 6.5% during 1980. Yearly average growth ratio tumbled to 4.6% during 1990 with altogether bring down the growth rate in the second 50% of that decade. During the year 1960, Pakistan's country was viewed as a good example of a growth economy-level on the planet, and there was much acclaim for the economic growth of Pakistan country on the planet. The Karachi city of Pakistan country was the capital and was viewed as a good economy example around the entire district (Khan 1970). The numerous nations chose to select the economy of Pakistan arranging system and one of them, replicated the "Five Year Plan" of South Korea. The economic growth ratio was found the middle value 5.82% at the period of time from 1958-1969 (27 October to 25 March). Assembling growth rate was 8.51% higher in Pakistan around then when contrasted with the earlier years. The Pakistan country was the main who got a vehicle industry, cement industries and some other overwhelming assembling enterprises around then. The Tax duty gathering was under 10% of GDP. The EBVC (1959) and Tax duty impetuses actuated new business visionaries, industrialists and exporters. Extra vouchers turned out to be a chance to win net exchange for imports of mechanical apparatus and raw materials.

Because of financial misusing and especially fiscally untrustworthy economic approaches, brought about a substantial increment in the nation's open obligation and in

slower development rate in 1990. The two wars were battled with India's country. The 1st war was fought in 1965 on the Kashmir issue between two countries (Gartenstein-Ross 2010, Malik 1996). The 2nd war started in 1971 about the detachment of East Pakistan (Malik 1996). Therefore, Bangladesh and Pakistan isolated and the procedure of growth of the economy were influenced on a substantial scale. The partition of East Pakistan from East Pakistan (Burki 1988) conveyed the financial condition near subsidence (Baxter 2018). Because of the strategy of deregulation period in the time of 1980, the state of the Pakistan economy enhanced a bit of bringing about an inflow of Foreign inward investment and settlements. The nationalization of the businesses can be partitioned into two eras (Stern 2001).

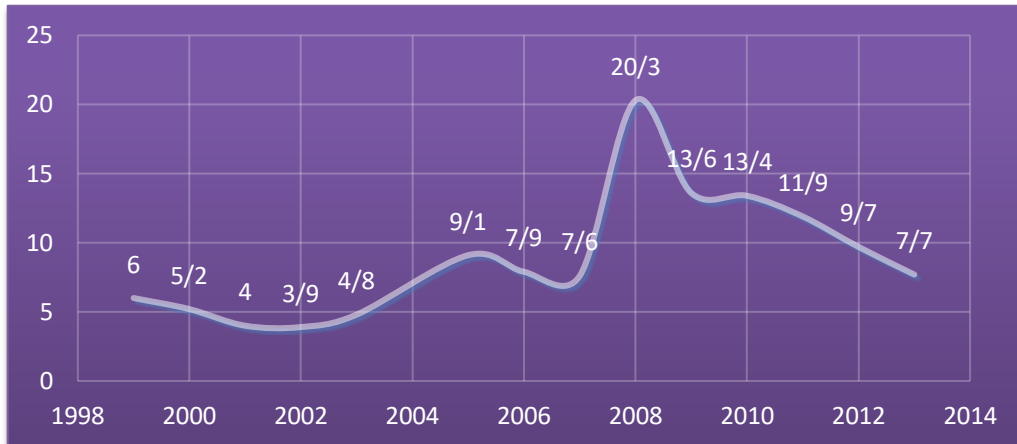
The first time began when Pakistan People Party came into power (Baxter 1971). Z.A. Bhutto attempted to bring the economic issues of the nation under the express' own control and attempted to give control of the physical money to the corporate first class. The first stage was entirely unexpected from the second period because of its thought processes and effects. The second period began in 1974. The principal stage was a high point which included systems inspired by ideological powers. At the point when Bhutto came into power in the time of 1974-1976, he guaranteed to lessen the job of arranging commission and political chiefs. The ratio of corruption expanded, and the lawmakers utilized general society riches to build the economy riches power.

In the period of Zia ul Haq Govt, economic welfare supported, both at a residential and universal level. The Tarbela dam was finished in his period of Govt (Khanna 2002). The Rural development, manure ventures and concrete enterprises were given significance by Bhutto, monetarily. The Wages of the specialists expanded which helped in the positive development of the economy (Rizvi and Khan 2001). The settlements from remote nations made a commitment of 10% to the GDP in Bhutto Govt.

In Zia Ul Haq's period, the United States helped the Afghan Mujahidin's through Pakistan which raise the development rate of the economy (Stern 2000, Haqqani 2004). Zia exceedingly focused on available monetary approaches (Chawla 2001). In the period 1990 with the assistance of economy progression and decentralization, the chain of expansion has been broken. Around then the economy transcended from subsidence however just incidentally. The development of the economy was not lasting the same number of plans were turned somewhere near the PPP government.

Show the inflation rate in this graph 1<sup>st</sup> are appeared in the time period from 1999 to 2014, In 1999 the inflation ratio was 6% and in 2000 the inflation rate goes to decline at 5.2%, after declining it reached 4% in 2001. Govt's wasteful financial policies, the Inflation rate was reached 9.1% in 2005. With the same series would happen in growth shape in these next three years (2008, 2010, 2011). At the 2013-year Pakistan got a loan to value which is 6.6\$ billion from IMF for the sack of to recoup the BOP condition. At that point heading of the growth was to move in a great way because of high settlements, increment in shopper uses and decrease in oil price value. The state of national output was a move to down 3.59%. from 2012-2013. In the business area, numerous progressions were happening to ascend in FDI \$10 billion however it not out of the ordinary that it will be cross the \$15 billion in the mid of 2014 which is best for Pakistan. Creator likewise Highlight with graphically beneath.

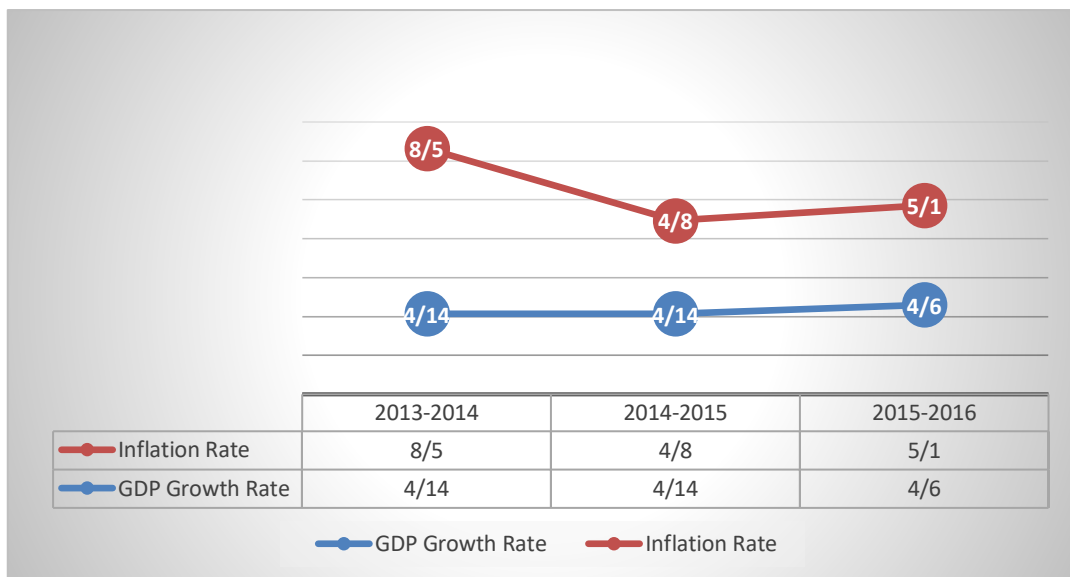
Graph 1. Inflation rate 1999-2013



Source: WDI

In 2<sup>nd</sup> graph show with a table that in 2008 the inflation rate was 25.3% which was a decline in 2014 by 13%. The situation of budget deficit reduced to 3% of GDP while foreign assets are in the best position in the year 2014.

Graph 2. GDP & inflation in %



Source: WDI

In the fiscal year of 2013 to 2014 GDP rate is 4.14% while the rate of inflation is 8.5%. In 2015 4.14% is gross domestic product and inflation is 4.8%. 2016 fiscal year GDP is 4.5% which is projected, and the inflation rate is 5.1%.

This study explores the short and long-run relation between macroeconomic variables and inflation. The objective of this study to explore the macroeconomic variables effected on inflation. In this case study, the result indicates that inflation increase positively moves downward on the behalf of growing bank rate. Furthermore, on account of money supply

which might be positively or negatively however in our examination, it is sure when money supply expands then rate of inflation likewise rise, and when money supply go to descending position then inflation rate additionally fall, total national output is adversely identified with the expansion when GDP grows up then inflation rate will be decrease and when GDP in descending position then rate of inflation will be rise, foreign investment is a positive association with expansion when foreign investment builds then rate of inflation increments. At the point when net exchange rate changes at that point there will be an extraordinary change in the inflation rate. The exchange open has a positive association with inflation.

The further section of this study is: 2<sup>nd</sup> section explore to previous study discussion, 3<sup>rd</sup> section highlight to data, methodology and econometrics tools process. 4<sup>th</sup> section is estimation and result. the last section of this paper is the conclusion.

## Literature Review

Inflation is the main variable of the world economy, it is presented in every country. The inflation rate is different in different countries of the global word. According to different study, the inflation rate is high in developing economy as compared to developed economy. These factors variation of in general price level (inflation) include the  $M_2$ , exchange rate, consumer price index, domestic credit, price level, GDP, etc.

Afridi and Qadir (1984) examined dual-sector inflation in the case of Pakistan country using time series data for analyzing. For data analysis author used statistical descriptive approaches. It demonstrated the significance of standard deviation in the financial investigation not just as a certainty level on an expectation, yet in addition as an essential logical instrument. As indicated by financial record the economy has been disaggregated into two divisions which made two lists of the commodity. 1st they had recorded 16 wares which could be considered as "fundamental nourishment" which were created in the horticulture sector growing from the land. 2nd they had recorded 28 items which comprised of modern items, mechanical crude materials, and money edit from the agrarian part for land growing. They had utilized two wellsprings of information with the end goal of investigation. The CSO value lists of discount costs base year (1969-70) for the assurance of the inflation rate of individual products were recorded for the two parts. The "input-yield" tables were additionally aggregated at the PIDE with the motivation behind demonstrating loads of items against an absolute load of their individual divisions. The inflation variables were demonstrated by a lack in supply and an abundance sought after, in each monetary period of the country.

On the other hand, Afridi et al. (1983) examined Dual Sector Inflation in Pakistan. The information was related to time arrangement data. In this analysis, the author used correctional techniques that were used with the Statistical Descriptive approach. Factors utilized included wheat, maize, bajra, meat, angle, hardware, transport, synthetic compounds, composts, sugarcane, cotton, and cowhide. In this time-series data used 103 factors were incorporated into an econometric model for the time of 1959-60 to 1978-79 for Pakistan economy. The model recommended that inflation in Pakistan had generally been a local marvel and was likewise influenced by outside components. Also, another hand, Afridi et al. (1984) analyzed the impacts of double area expansion crosswise over

different salary levels in Pakistan. That information was related to time arrangement information. The authors studied the distinctive salary levels and furthermore researched the inclinations. The investigation investigated that the general population confronting negative expansion considers it to be a consolation to spare more.

Ahmed et al. (1999) data investigated that show the impact of the exchange rate with inflation dynamic in time series data used from 1882-1996. These researchers used the level of price of dimension produce commodities, GDP and money supply which signified by P, Y and M. The examination presumed that (PPP) buying power equality held for the minor changes in the value level and conversion scale. It was reasoned that at the given world costs the expansion rate was evened out with the rate at which the inflation ratio devalued. Obtaining Power Parity (PPP) recommendation did not have an impact in the short run. Transitory stuns by unique reactions enabled the framework to change step by step to recover the equality in a relative sense.

Bokil et al. (2006) investigate the inflation forecasting in the case of Pakistan country which used in the article annually time series data from 1975-200. Used four variables show in signified shape like CPI, V, M, and GDP. The growth of the economy of the country was explored by the PC (Phillips curve) underused the econometrics technique of VAR. Khan et al. (2006) Study the time series data used in phased January 1998-2005 on monthly baes for investigation and estimation of inflation in the case of Pakistan country. The technique used VAR and Cointegration for analysis. Technique and model were determined and included normal fiscal variables (cash supply, credit), trade term and the cost for the sustenance of the neighboring elements of the wheat supply. The inflation rate began to quicken in late 2003. Amid the emergency in the time series data of 1998-1999 inflation dipped under 5% by 2000 and stayed stable in 2003. The investigation established that in the short run wheat bolster cost affected the inflation while fiscal components were the primary reasons for expansion. Their examination demonstrated that financial components assumed an overwhelming job in expansion and influenced inflation by a slack of around multi-year. In the short run, changes in wheat bolster costs affected expansion yet not over the long haul.

Khan et al. (2010) investigate inflation in the case of Pakistan's country. That which time series data 1971-1972 to 2005-2006 and used econometrics OLS technique was used for that purpose. Used 4 economic indicators for the determination of dependent variable inflation such as independent variables CPI, SPI, WPI & GDP are including. While on the other hand, economical deficit, interchange rate, wheat support prices, yearly interest rate, the charge of annual imports, annual prices of sugarcane, rice, wheat, cotton and money stock were explanatory variables. These variables were used to explain variations in Dependent variables respectively. Hussain et al. (2019) By using ARDL econometrics tools, investigate that inflation has negative impact on economic growth in log run and FDI have positive impact on economic growth which both time period short and long run in case of Pakistan country. Another article, Hussain et al. (2020) investigate that FDI have positive impact on economic growth by using panel data evidence from Pakistan.

Khan et al. (2011) talked about Political Instability and inflation with used money supply in the case of Pakistan country. Here the data was used time series from 1951-2007 for econometric estimation techniques also used include OLS. The examination

contended that the economy with feeble organizations and political insecurity did not have an effective expense framework that expanded their help on seigniorage. The examination contended that the above lines of thinking maybe valid for remarkable expansion countries, yet not for low and tolerably high inflation nations. The rate of inflation indicator was available to start to finish in the time of 1951 to 2007, which was 6.99%. They reasoned that blend of forecasts of solid type of FTPL and speculations of PEMP were progressively proper in legitimizing a connection between political unsteadiness and expansion in a low or tolerably inflation struck nation like Pakistan.

Ullah et al. (2013) examined the money related changeability, yield and inflation in the case of Pakistan. Data are used in the shape of the time series. The article utilized the M2 and GDP and inflation in their work with basic factual methodology. That information identified with time-series data. The investigation investigated that when there are sudden changes in cash supply then it would be unequivocally connected to yield and Inflation in Pakistan.

Rizvi et al. (2012) studied the components of expansion in the Pakistan economy by an Empirical examination. That data related to the time arrangement data and utilized the timespan of the information from 1980-81 to 2007-08. Basic SLS and SPSS were utilized for the investigation of the information in that needy variable was expansion and independent factors were total national output, import costs, government coordinate expenses, send out costs, government landing. At the point when there was expanded in import costs then it implied that expanded at the expense of the conclusive item. At that point, costs would raise a thus expansion rate would be high. Fare cause expansion in the economy because of the expanded interest and furthermore expanded in costs. In any case, in the matter of Pakistan, it was stopped inverse. The examination inferred that GDP, IMP, charges and government landing were solid implantation. The expansion could be control by the ceaseless development in GDP. Moreover, the government may be chopped down consumptions. At the point when previously mentioned variables would be controlled in best estate then we would have the capacity to put inflation under compelling control.

Yasmin et al. (2013) inspected the cash source, régime getting and inflation relationship in Pakistan country. That data was the time arrangement data in monthly shape from January 2008 to February 2013 for research used econometric techniques of VAR and Causality analysis for time series data. Their test grades depended on the fully modified ordinary least square. The examination proposed that administration loaning and the money supply was a solid effect on value ascends because of long keep running for Pakistan country. The paper inferred that bidirectional causality happens among inflation and supply of money. Bidirectional causality among government acquiring and expansion additionally because of government getting and cash supply.

Ijaz et al. (2014) examined the audio effects of terms of exchange and hazardous nature of expansion in Pakistan. The examination rehearsed yearly time series data from 1972 to 2012 and to connect with the GMM system. Any instability on the TOT restricted result on the financial development because of increment in unconventionality raise chance, which frustrated the speculation by made venture unsuccessful. While the flimsiness of TOT ascends in developing states like Pakistan were exchanges of products comprised of

the essential merchandise with modified costs. Good impact on expansion under a confined conversion scale when raise in TOT led to ostensible and genuine swapping scale appreciation. The information in the time of the 1970's indicated greater instability in TOT when contrasted with the inflation. Because of an expansion in the estimation of fares TOT was enhanced in the year (FY) 1974. In any case, in the (FY) 1975, the condition was inverse, and TOT diminished. Be that as it may, in the time of 1980 blended pattern was finished with the TOT expanded and diminished.

Saleem et al. (2015) examined the raw petroleum cost and inflation in Pakistan in yearly data. That information related to the time arrangement information. The investigation decided on the nearness and quality of relationships amidst the raw petroleum costs and expansion. The examination additionally investigated the impacts of unrefined petroleum cost on GDP deflator. They utilized time arrangement information from the time of 1979-2012. With the end goal of estimation, they utilized the system of Johansen Co-joining for short-run and long-run outcomes. The investigation utilized factors, for example, costs of oil, FDI, premium, aberrant assessments and unemployment. The article inferred that expansion in cash supply, raw petroleum costs, conversion scale, the loan fee and roundabout duties quickened inflation while then again expanded in genuine earned household item led to diminished when all is said in done value level in the short run and long run. The exploration's outcomes demonstrated that supply of cash, costs of unrefined petroleum, rate of trade, and term of premium and charges of the roundabout was the beneficial outcome, while genuine GDP kept the negative effect on inflation.

## Data and Methodology

### *Data*

The time-series data is collected in yearly form from WDI and Handbook of the statistic over the time period 1974-2016. In this study inflation variable is dependent and other variables are treated independently. It is the main point of research work when we gather useful and accurate data then our results are very accurate. Data provide information about the past trend of any country and this converts from one format to another. There is a benefit, data is accumulated from various sources and recorded in the computer for processing to producing information.

The methodology is a process in which we solve the research problems in a systematic manner. It consists of theoretical and logical points. Researchers have adopted a series of logical steps. The methodology is the key that supports the size of the sample, data collection, sampling methods, designing instrument for collecting data, recording analysis and an interpretation of data.

Model Specification:

*Inflation = f( Bank Rate, Budget Deficit,  
Foreign Direct Investment, Money Supply,*

*Gross Domestic Product, Exchange raate, Trade Openness) (1)*



We explain our equation as follows;

$$\text{Inf} = f(\text{BR}, \text{BD}, \text{FDI}, \text{M}_2, \text{GDP}, \text{EXR}, \text{TO}) \quad (2)$$

Econometrics Model:

$$\text{Inf}_t = \beta_0 + \beta_1 \text{BR}_t + \beta_2 \text{BD}_t + \beta_3 \text{FDI}_t + \beta_4 \text{M}_{2t} + \beta_5 \text{GDP}_t + \beta_6 \text{TO}_t + \mu_t \quad (3)$$

ARDL Model:

$$\begin{aligned} \Delta \text{Inf}_t = & \beta_0 + \sum_{i=1}^{n_1} \beta_{1i} \Delta \text{Inf}_{t-1} + \sum_{i=1}^{n_2} \beta_{2i} \Delta \text{BR}_{t-1} + \sum_{i=1}^{n_3} \beta_{3i} \Delta \text{BD}_{t-1} + \sum_{i=1}^{n_4} \beta_{4i} \Delta \text{FDI}_{t-1} \\ & + \sum_{i=1}^{n_5} \beta_{5i} \Delta \text{M}_{2t-1} + \sum_{i=1}^{n_6} \beta_{6i} \Delta \text{GDP}_{t-1} + \sum_{i=1}^{n_7} \beta_{7i} \Delta \text{EXR}_{t-1} \\ & + \sum_{i=1}^{n_8} \beta_{8i} \Delta \text{TO}_{t-1} + \delta_0 \text{Inf}_{t-1} + \delta_1 \text{BR}_{t-1} + \delta_2 \text{BD}_{t-1} + \delta_3 \text{FDI}_{t-1} \\ & + \delta_4 \text{M}_{2t-1} + \delta_5 \text{GDP}_{t-1} + \delta_6 \text{EXR}_{t-1} + \delta_7 \text{TO}_{t-1} + \varepsilon_t \end{aligned}$$

In this equation, Inf represents the inflation rate,  $\beta_0$  is constant,  $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$  highlight to parameters,  $\Delta$  show to change, t is time series, the BR bank rate, BD shows the budget deficit, FDI is used for foreign direct investment,  $M_2$  for the money supply, GDP present the gross domestic product, EXR for the exchange rate and TO for trade openness. Inflation is the dependent variable which depends on variables such as bank rate, budget deficit, foreign direct investment, money supply, gross domestic product, exchange rate, and open trade. The analysis finds out that bank rate, GDP and exr have a negative relationship with inflation on the other hand bd, FDI,  $m_2$  are positively related.

Table 2. Description of Variables

Variables symbol	Variable	Description of Variables	Sign Expect	Source
Dependent Variable				
<b>Inf</b>	Inflation	The inflation variable shows the general price increment of good and services increase in one-year limited time period		
Independent Variables				
<b>BR</b>	Bank	A foundation formally by the administration which pays loan cost, credits, Accept Deposits, clear checks, responds as a center budgetary exchange and offers financial administrations to claim clients. Business	Negative	

		banks get from the bank and fix the loan interest.		
FDI	Foreign investment	Foreign investment is an interest in a business by a Investors come from another nation for which the outside financial Investors has authority over the organization bought. The Organization of OECD characterizes control as owning 10% or a greater amount of the business.	Positive	WDI
BD	Budget Deficit	The Budget Deficit is the expansion of capital record shortage and income account shortfall. At the point when consumptions of the administration surpass its all-out income, it results in income account shortfall.	Positive	
M2	Money Supply	The money supply (M2) is a complete load of cash streaming in an economy. It is utilizing for investigation and help the arrangement producer and furthermore business analysts for expanding and diminishing the cash supply factor. This estimation is extremely noteworthy effects on the business cycle and furthermore on the economy	Positive	
GDP	Economic Growth	Economic growth is the total of the market esteems, or costs, of every single last great and administration created in an economy amid a one-year time period. GDP per capita is the total national output separated by the midyear population.	Negative	
ER	Exchange rate	When two or more countries exchange their goods and commodities and also currency interchange between them. The exchange rate either fixed or floating. Due to market demand and supply, the exchange rate is calculated by the central bank.	Negative	
TRO	Trade Openness	When trading starts then market opens financial security at some price which is different from the previous price. Trade open has a positive relationship with inflation. When trade open increase than inflation level also rises.	Positive	

Mostly data is collected from the World Development Indicator and Some part of the data is

*Procedure of Estimation: Procedure of estimation has following steps.*

### Stationarity of Data

We check the stationarity of all variables; some variables are stationary at first difference and some at the level. Which is showing the stationarity of data?

### Augmented Dicky Fuller Test (ADFT)

To examine the stationarity of the data, Dickey and Fuller (1981) proposed a test based on the presence of unit root generally which is known as the Augmented Dickey-Fuller (ADF) test. For this test, we conclude that all selected variables such as inflation rate, bank, budget deficit, foreign direct investment, money supply, gross domestic product, exchange rate and trade openness are stationary at the level and 1<sup>st</sup> difference. Discussing our first variable which is dependent variable inflation, is significant at Level's Intercept, Trend & Intercept but not at none which is also not necessary because if the variable satisfies at least two of these conditions then we can say that our variable is significant. At 1% level of significance, 5% level of significance and 10% level of significance, the result we can be expressed as I (0) which shows the significance at Level. Our next independent variables such as bank and BD (budget deficit) are also significant at the level which can also be judged by simply noticing the values of Intercept, Trend & Intercept and None. The result is as I (1) which means that the variables are significant at level. However, the other independent variables such as FDI (foreign direct investment) and M<sub>2</sub> (money supply) are significant at 1<sup>st</sup> difference. The result is as I (1) which means that the variables are significant at the 1<sup>st</sup> difference. Further variables are GDP (gross domestic product), Exr (Exchange rate) and TO are showing the stationarity at Trend, Trend & Intercept. Which concluded that I (1).

### Auto-Regressive Distributed Lagged Model (ARDL)

The econometrics equation can be expressed as follows. It is a technique for estimating the long run and short-run relationship between variables.

### Estimates of Long-run relationship between Variables

At the ARDL approach, we consider the long-run cointegration between the variables. And from this table, we show that the coefficient of Bank is negative, and its value is -0.038245 which is statistically significant. The coefficient of the Bank implies that a 1% increase in bank rate will reduce inflation. It is significant as shown by its P-value i.e 0.0008. Negative sign shows that when bank rate decreases then the inflation rate will increase this shows the negative relationship between bank and inflation. In such a situation, the government should opt the fiscal policy and as well as monetary policy

In this table, the R-squared is 0.873719, which shows that our model is more favorable. This value predicted that 87% of changes independent variable are being explained by the independent variables in our model. The value of the Durbin-Watson Stat is 1.962657, which is close to the 2 indicating the absence of autocorrelation. Further, the value of

Prob (F-statistics) is 0.00001, which shows that all variables are more significant at 1 and 2 lags.

### Estimates of Short-run Relationship between Variables

The short-run co-integration is used to describe the Coefficient, Std. Error, t-statistics and the Prob in the short-run. In this table, the last value is CointEq (-1) which also satisfied in our terms that are negative and the probability is less than 0.05 in our model it is 0.0000. This data is evaluated from short-run cointegration. The table also shows the short-run relationship of inflation in Pakistan, which is based on the selected ARDL model (1, 0, 0, 2, 1, 2, 2, 0). The results show that FDI and M<sub>2</sub> have a negative relationship with the Inf. But the other variables such as Bank, BD and FDI, EXR, GDP, and TO has a positive relationship with the Inf.

### Estimates of Bound Test

The calculated value of F-statistics is 4.01 and is significant at 1%, 5%, and 10%. From the given result we concluded the value of F-statistics is 10.21511 that is greater than all the critical values either they are Lower Critical Bound (LCB) or Upper Critical Bound (UCB) at the 10%, 5% and 1% respectively. The value of F-statistics shows that it lies in all the values of the lower and upper bound. The further given values of R-squared shows that our model is 87% accurate with our selected model and Adjusted R-square is also close to the R-squared which also represents the model correction. Also, there is a point to be noted in the Bound test, our null hypothesis is that: there is no long-run relationship that exists within the model and our value of the Bound test satisfies the null hypothesis. In this table, the R-squared is 0.8774448, which shows that 88% variation independent variable is explained by the variations in the independent variables in our model. In this, the value of the Durbin-Watson Stat is 2.382957, which is 2 and this shows the absence of autocorrelation in our model.

Table 3: Unit Root Test for Stationarity At Level and at First Difference (ADF Test)

Variables	At Level			1 <sup>st</sup> Difference			Result
	Intercept	Intercept & trend	None	Intercept	Intercept & Trend	None	
Inf	-4.4736 * ** ***	-4.4161 * ** ****	-1.1107	—	—	—	I(0)
Bank	—	—	—	-5.5019 * ** ***	-5.6919* ** ***	-5.5872 * ** ****	I(1)
BD	—	—	—	-7.1706 * ** ***	-7.3291 * ** ****	-7.1849 * ** ****	I(1)
FDI	—	—	—	-4.9346 * ** ***	-5.7165 * ** ****	-4.1251 * ** ****	I(1)
M2	—	—	—	-6.7859 * ** ***	-6.7170 * ** ****	-6.8877 * ** ****	I(1)
GDP	—	—	—	-4.8552 * ** ***	-5.3632 * ** ****	- 3.7604* ** ****	I(1)



EXR	—	—	—	-4.3697 * ** ***	-4.2714 * ** ***	-2.7451 * ** ***	I(1)
TO	—	—	—	-4.0439 * ** ***	-5.0605 * ** ***	-5.1178 * ** ***	I(1)

Where \* shows the significance at 1% level, \*\* shows at 5% level, \*\*\* shows at 10% level.  
 Source: Author's calculated with the help of EViews 9.5

ADF test with level and 1<sup>st</sup> difference: In discussed in our analysis that there is no need for applying unit root test on data in ARDL approach, but on the other hand we want to confirm that the data we selected and the variables in it are not lie in 2<sup>nd</sup> Difference i.e. I(2).

In this above table all, we concluded the stationarity of our selected variables which are as follows: inflation rate, bank rate, budget deficit, and foreign direct investment, the supply of money (M2), gross domestic product, exchange rate, and trade openness. To fulfill our task, we used the Unit Root Test in which we selected an augmented dickey fuller test (ADF). From our above result, we can clearly see the stationarity of our selected variables on Level and on First Difference.

Discussing our first variable which also dependent variable is the Inflation rate, is significant at Level's Intercept, Trend & Intercept but not at none which is also not necessary because if the variable satisfies at least two of these conditions then we can say that our variable is significant. At 1% level of significance respectively 5%, 10% level and the result can be expressed as I (0) which shows the significance of variable at Level. This shows that our selected variable is significant at all the levels of stationarity which gives us the best estimation of our selected variable. Our next variable that is the independent variable (Bank) is significant at the First Difference which can be judged by simply noticing the values of Intercept, Trend & Intercept and also at none. The result is as I (1) which means that the variable is significant at 1<sup>st</sup> difference. Likewise, BD, FDI, M<sub>2</sub>, Exr, GDP and To are significant at 1<sup>st</sup> difference.

Table 4. Bound Test

F-Statistics	4.01	
Critical Value	LCB	UCB
10%	1.92	2.89
5%	2.17	3.21
1%	2.73	3.9

R-Squared = 0.8774	Prob (F-statisytics) =
0.000001	
Adjusted R-squared = 0.7888	Durbin-Watsonstat = 2.3829
Akaike info criterion = -1.0211	Schwarz criterion = -0.3316
Hannan-Quinn criterion = -0.7758	F-Statistic = 10.2151

Source: Author's calculated with the help of EViews 9.5

The next step is co-integration test to check out the connection between our selected variables, such as Inf, Bank, BD, FDI, M<sub>2</sub>, GDP, EXR, and TO by implying Bound Test technique on it.

The result indicate that the value of F-statistics is 4.01 that is greater than all the critical values either they are lower critical bound (LCB) or upper critical bound (UCB). Respectively the critical

values are 10%, 5%, and 1%. The value of F-statistics shows that it lies in all the values of the lower and upper bound. The further given values of R-squared shows that our model is 87% accurate with our selected model and Adjusted R-square is also close to the R-squared which also represents the model correction is good. The value of 10.215 and its probability is less than 0.000001 which shows that our model is correct that the value lies within the 0.00% level. The value of Akaike is also the smallest value from all other the included observations that are obtained by the ARDL approach. Likewise, the value of the Schwarz criterion is also the smallest value of all included 40 observations. Also, there is a point to be noted that in this observation of Bound test our null hypothesis is that: there is no long-run relationship that exists within the model and our value of the Bound test satisfies the null hypothesis.

Table 5: Long run Co-integration

Variables	Coefficient	Std.Error	t-Statistics
Bank	-0.0382 0.0008	0.0099	-3.8748
BD	0.0271 0.0480	0.0129	2.0943
FDI	0.1749 0.0066	0.0583	2.9991
M2	1.1876 0.2608	1.0289	1.1543
GDP	-0.0013 0.0000	0.0003	-5.0548
EXR	0.2504 0.0767	0.1349	1.8572
TO	1.2415 0.2356	1.0181	1.21937
C	-0.7877 0.6257	1.5921	-0.4948

Table 6: R-Squared values

R-Squared = 0.8738	Adjusted R-squared = 0.7876
Prob(F-statistic) = 0.000001	Durbin-Watson stat = 1.9626

Source: Author's calculated with the help of EViews 9.5

Here is the long-run co-integration of our described independent variables that are used in our model respectively. Most of the variables have a probability that is less 0.05%, which shows that most of the variables have a high effect on our dependent variable. Except for two that are M2 and To which are not less than 0.05%.

Table 7: Short Run Estimates of Model

Variables	Coefficient	Std. Error	t-statistic	Prob
D(BANK)	0.0458	0.0115	-3.9688	0.0007
D(BD)	0.0223	0.0134	1.6629	0.1105
D(FDI)	-0.0753	0.0443	-1.7013	0.1030
D(FDI(-1))	-0.2440	0.0597	-4.0851	0.0005
D(M2)	-1.1147	0.7966	-1.3993	0.1757
D(GDP)	0.0045	0.0004	10.1802	0.0000
D(GDP(-1))	0.0029	0.0007	3.7424	0.0011
D(EXR)	2.6249	0.7521	3.4899	0.0021
D(EXR(-1))	3.2515	0.9108	3.5699	0.0017
D(TO)	0.7343	0.8252	0.8898	0.3832
CintEq(-1)	-0.9979	0.1186	-8.4134	0.0000

Source: Author's calculated with the help of EViews 9.5

The short-run co-integration is used to exhibit the coefficient, Std. Error, t-statistics and the prob. Of the independent variables. The last value is for CointEq(-1) which also satisfied our terms that is this value of coefficient must be negative and the probability must be less than 0.05. this data is evaluated for the short-run and can be expressed as given above.

Stability Test: The stability test is the two types that are following.

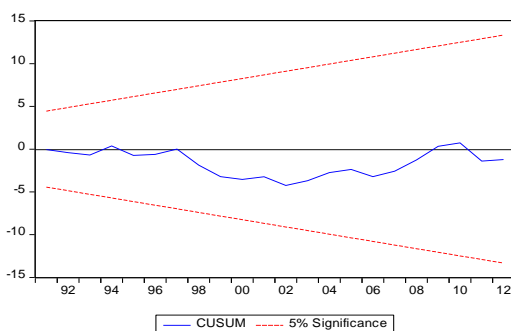


Figure 4: CUSUM Stability Test

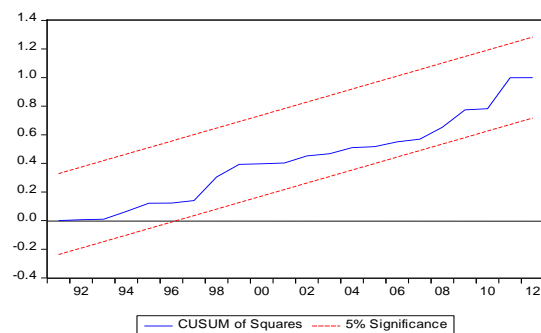


Figure 5: CUSUM SRRT(Square Recursive Residuals Test)

In CUSUM Square Test, this shows that our estimation of variables is stable. In the blue line of deviation show, different trends and increasing falling under the red line cross the boundary of the red line and not touched.

## Conclusion

The inflation variable is the most important agent of the macroeconomic. Every government of the world uses it for economic stability. By utilizing the method of ARDL approach which demonstrates the significant aftereffect of the factors and furthermore checks the stationary or non-stationary. This study utilizes the yearly data from 1974-2016. Inflation increase positively moves downward due to increasing bank rate. Furthermore, when government consumption exceeds budget deficit shortfall increment or decline then it is decidedly identified with the inflation and result in rising or fall in inflation individually. Look-like previous statement, on account of money supply which might be positively or negatively however in our examination it is sure when money supply expands then rate of inflation likewise rise, and when money supply go to descending position then inflation rate additionally fall, total national output is adversely identified with the expansion when GDP grows up then inflation rate will be decrease and when GDP in descending position then rate of inflation will be rise, foreign investment is a positive association with expansion when foreign investment builds then rate of inflation increments. At the point when net exchange rate changes at that point there will be an extraordinary change in the inflation rate. The exchange open has a positive association with inflation.

Money related approach ought to be move successfully in three driving ways. By Federal Reserve, the rate of intrigue is increment which is the main term. To make cash, banks obtain cash from the legislature and loan it at a more prominent rate. Banks are incremented their rate because of ascending in loan fees by the government holds. The second technique is, in the volume of cash banks are legitimately permitting to keep an eye to cover pulls back and to build hold necessities. Banks need to hold more cash, at that point, the loan little amount to the purchaser. The decrease in spending is the result that banks are less to loan then purchasers obtain less. The third route is to pass strategies that actuate to deduct the cash supply by straightforwardly and in a roundabout way decline the cash supply.

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