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INFLATION DETERMINANTS AND POLICY MEASURES: EMPIRICAL ANALYSIS FOR PAKISTAN

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ABSTRACT

Appropriate economic choices are very much dependent on stability of prices. It will bring certainty regarding purchasing power of the money. This research uses Johenson cointegration approach covering time duration from 1980 to 2018. The empirical estimates of this study shows that in long run all explanatory variables (unemployment, government consumption expenditures, unit price of imports, interest rate and money supply) have momentous influence in accelerating inflation in Pakistan. The findings show that decrease in unemployment and increase in unit value of imports will enhance inflation in long run. Due to the decrease in the government consumption expenditure there will be low investment, low production, and increased aggregate demand associated with high inflation. There exists positive relation between interest rate and inflation. The increase in money supply enhances inflation. Lagged value of error correction model is significant having appropriate sign. Furthermore, this study uses Granger Causality test to check the existence of uni or bi directional relationship among highlighted variables.

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INTRODUCTION

The abrupt changes in prices are considered as inflation. Upsurge in prices is the root cause of vagueness regarding impending productivity of investment decisions. It becomes the cause of conventional investment inferences rather than the advanced professional decisions. It will, eventually, generate slow economic evolution along with worse financial conditions. The main intention of every economy is to attain anticipated targets of growth and price stability yearly settled by the respective authority. Prime objective of this strategy is to control prices. Every country uses the instrument of price stability to the achieve sustainability. Steadiness in prices boosts the welfare of poor individuals. Besides this, cost of inflation has seemed in commercial area through useless investment, unsuitable production choices, increased taxes along with

wasteful resource allocation in diverse various zones. Therefore, to achieve smooth sustainable progress stable prices are nominated as core criterion in various economies. There is a need to analyze various factors influencing price stability. Extraordinary and unforeseen changes in prices depress value of indications impending over market forces. It will generate insecurity for buyers and sellers. They will become hesitant to make future plans. It will effect firm productive decisions.

The firms will contract their dynamic perceptions. They will use their means in handling price instability threats rather than concentrating on maximum resource utilization. All this will lead towards various economic and social problems such as unemployment, poverty, interest rate fluctuations, the exchange rate depreciations, currency devaluation, increase in the government consumption expenditures, high imports and low exports. Therefore, it becomes need of time to conduct such research which will highlight major instruments of price instability in Pakistan with reference to current scenario. Present research analyzes the present scenario of inflation in Pakistan and explores its different determinants. The trends of inflation in Pakistan are present in figure 1. In this connection, graph portrays inflation in Pakistan does not remained stable from a long time. So it is very necessary to empirically analyze relation of inflation and some crucial determinants like rate of interest, supply of money, unemployment, consumption expenditures of government and unit value of the imports with reference to Pakistan. In this linking, th current research will help to overcome inflation by providing some required policy suggestions.

According to existing literature imported commodities are expensive and causing momentous price instability in the country (Aslam & Munir; 2005). Moinuddin (2007) highlighted the fact that demands for money remained unsteady so, in Pakistan aggregate monetary targeting is not suitable. Zubaria, et al. (2011) explained cooperation of both fiscal and monetary policies is required to get smooth and stable economic growth. Dua and Goel (2021) investigate the relationship between expected inflation and fiscal and monetary determinants. Osorio, Rubio, and Mora (2022) highlights the significance of inflation expectations in the economies that use an inflation targeting policy that is required to cater to the situation as per desired standards. Central banks put more emphasis on handling price instability to bring steadiness of economic growth. To achieve goal of sustainable development central bank needs cooperation from rule assembling organizations, especially fiscal authorities. The main contribution of this research is that it uses such instrumental variables which portray both fiscal and monetary policies. The variables of interest rate and money supply are key tools of the monetary policy in handling inflation.

Besides this government consumption expenditure depicts role of fiscal policy in controlling inflation. This study chooses unemployment and imports as the controlled variables. It uses the appropriate empirical techniques to determine the vital role of all these important variables in controlling inflation in Pakistan. Its results will help to suggest the most significant factor to bring price stability in Pakistan. It will formulate forceful policy implications for the country. This research uses Johenson cointegration approach to investigate the association among the dependent and independent variables. Furthermore, test of Granger Causality shows nature of cause and affect between proposed determinants. Test of Granger Causality carries excessive importance in research. It explains whether the nature of relationship among dependent and independent variables is uni-directional/bidirectional. In this connection, the use of these both techniques made this research more worthwhile to provide policy implications for Pakistan to

overcome the inflation in current scenario. In this linking, therefore, present research will be a contribution in existing literature by providing policy to handle problem of price instability in Pakistan.

Research Objective

The current research purposes to consider the connotation between inflation, unemployment, government consumption expenditures, unit price of imports, interest rate and money supply with reference to Pakistan's economy during 1980-2018. Therefore, particular objectives are following:

1. To analyze long run and short run association among the inflation, unemployment, government consumption expenditures, unit price of imports, interest rate and money supply.
2. To analyze existing causation between all the variables under consideration in present study.
3. To formulate the policy options for Pakistan to combat with the price instability issue.

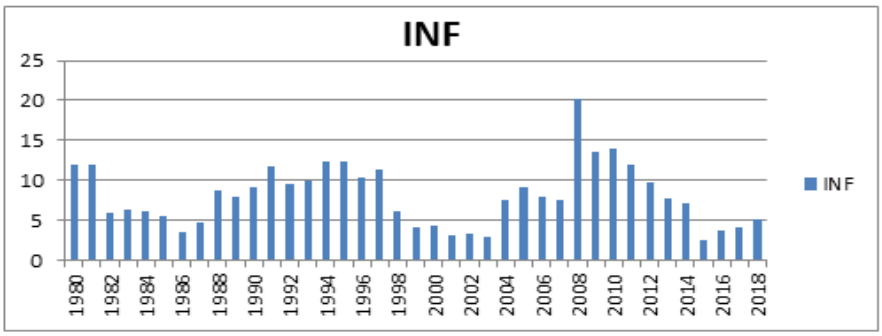
Reearch Hypothesis

H0: There exists no long-run association among inflation rate, unemployment, government consumption expenditures and unit price of imports, interest rate and money supply.

H1: There exists the long-run relation between the inflation, unemployment, government consumption expenditures, the unit price of imports, interest rate and money supply.

Figure 1

Inflation Trends in Pakistan



REVIEW OF LITERATURE

The variability of prices is hot topic of research for the various developed as for as developing economies. Excessive literature is available regarding this burning issue. This is very essential to investigate present scenario of the inflation by using tremendous instrumental factors and employing latest research techniques. Siddiqui and Akhtar (1999) analyzed prices of imported goods along with nominal factors are responsible for the fluctuations in price level. The authors found no significant relationship among internal price level and rate of the exchange. This study does not provide evidence about relation among imports and inflation. Hassan and Hussain (2005) indicated that as compared to empirical approach the current monetary aggregate is explained more on functional basis. The authors suggest that new monetary aggregate should include various saving schemes and some new deposits such as non-bank financial institutions. Aslam and Munir (2006) analyzed the influence of inflation targeting on Pakistan's economy.

Rise in import price is main reason of inflation besides inefficiency of monetary policies. Idrees and Saleem (2006) explore the relationship amid inflation and fiscal indicators with reference to Pakistan.

The authors used annual data having the period 1973-2003. They used technique of Johansen cointegration. The results of this study conclude that movements of inflation were explained by fiscal indicators both in short and long run. In a nut shell authors consider role of fiscal sector is prominent in controlling inflation in Pakistan. Moinuddin (2007) asserted that owing to fundamental and rapid structural changes in the financial system, Pakistan's money demand function remained unstable during 1974-2006. He suggested demand for money is not stable so choice of monetary policy is not suitable with reference to Pakistan. Hassan (2008) analyzed empirically that in Pakistan some important economic variables such as inflation and output growth change in response to unexpected variations in monetary strategy. Arshad and Afzal (2008) have analyzed strength of clear versions of purchasing power parity for Pakistan. The authors have used quarterly data covering time period from 1982Q2-2005Q4. Results of this analysis indicate that to attain stable evenness role of price of foreign commodities and exchange rate is very crucial. Coefficient of error correction model indicates that adjustment process is very slow. Felipe (2009) examines that how varied interest rates and inflation rate relate to each other.

The author used different measures of inflation first one is known as Wholesale Price Index (WPI) and the other one is Price Of Domestic Commodities i.e. CPI. Furthermore, the author used three different interest rates such as policy rate settled by central bank, short-term interest rate which is known as call money rate and 6-month Treasury bill rates. The study explains that when quarterly data is used the six month Treasury bill rate affects WPI in the short run and CPI during long-run. Two interest rates i.e. policy rate of the Central bank and six-month Treasury bill rate causes the two price indices. Zaman (2011) confirms that Phillips curve approach is applicable in developing countries like Pakistan covering the time period 1980-20018. They use Non-parametric estimates of the NAIRU. They found a long run causal inverse relationship among inflation and unemployment. Zubaria et al. (2011) explained the impact of two important policies i.e. fiscal and monetary on country's economic growth. The cooperation of both policies is required to get smooth and stable economic growth. Saira and Sadia (2013) explored the association among gold, stock prices and inflation with reference to Pakistan. Findings of study indicate that gold prices play potential role to determine inflation in Pakistan.

Ahmed et al. (2014) analyzed the number of variables to explore their long-run and short-run impact on inflation in Pakistan. They suggested that role of exchange rate was most significant. Asghar (2015) used monthly data from January 2000 to December 2014. They used ARDL approach to investigate how world oil prices influence internal price instability in Pakistan. Ali et al. (2015) analyzed that exchange rate fluctuations lead toward inflation. Okafor et al. (2016) found relationship between unemployment and inflation from 1989-2019. They conclude that output targeting is efficient than monetary targeting to handle inflation and unemployment in Pakistan. Peter et al. (2018) used Structural Vector Auto regression model. They found a negative, significant and persistent relation amid prices and government spending fluctuations. Ahmed et al. (2018) use monthly data from July 2001 to June 2017. They found that Granger Causality and Toda Yama moto Causality does not found any causal relationship amid import, export and inflation in Pakistan. Han and Sinah (2018) found that rise in supply of money

accelerate price instability. Dua and Goel (2021) investigate the relationship between expected inflation, output gap, money supply, exchange rate, fiscal deficit, interest rate and oil and food prices.

They confirm the long run association among inflation and its determinants. Iqbal et al. (2021) analyzed the link between energy inflation and various control variables such as board money, taxes, oil prices, energy import, and GDP. The study explains that an increase in demand for energy in economic activities in developing countries indicates an energy demand hence infers energy inflation. To achieve goal of sustainable development central bank needs support from rule assembling organizations, especially fiscal authorities. The results of this analysis indicate that to achieve stable equilibrium the role of price of foreign commodities and exchange rate is very crucial. Their research suggests that government of Pakistan must focus on the role of these factors to control inflation and to attain sustainable economic growth. Barreto et al. (2022) made a systematic literature review regarding inflation expectations, its determinants, and their implications for policy making in Latin America. The analysis depicts the significance of inflation expectations in the economies that use an inflation targeting policy. The research provides support that there is link between inflation expectations and other sectors of the economy.

Theoretical Background

Less volatility in price level is the basic purpose of monetary authority in every economy. There are many variables which play significant role in controlling inflation. Various instrumental factors like supply of money, rate of interest, consumption expenditures of government, unit price of imports and unemployment play their crucial role in stabilizing inflation. The present study investigates behavior of above mentioned important variables in accumulating inflation in Pakistan. The current study explains how varied variables behave in controlling persistent rise in inflation rate. Furthermore, this study suggests most appropriate policy variable to bring stability in prices to achieve stable economic growth. The relationship between unemployment and inflation has been explained through Philips curve theory. In this connection, there exists negative relation between these two variables. Thus, as increase in prices leads toward more investment from producer side. The demand for labor increases and unemployment goes down. Production cost will increase due to costly foreign import items. Hence, it accelerates cost-push inflation.

It becomes easy for firms to generate new investment at the low interest rate. An increase in consumption and investment is associated with high aggregate demand. The study explains that an increase in demand for energy in economic activities in developing countries indicates an energy demand hence implies energy inflation. Increase in aggregate demand leads to more resource utilization. If the increase in aggregate demand continued after the full employment level it takes towards high inflation. Monetarists believe fluctuations about supply of money take toward variations of price level. It shows that there exist cause and effect relation amid rate of inflation and supply of money. Expansionary fiscal policy increases government expenditure causing instability in prices. We can explain above discussion by using given flow chart. Above flow chart explains expansionary fiscal and monetary policies increase government expenditures and money supply respectively. This enhances aggregate demand and put upward pressure on inflation.

RESEARCH METHODOLOGY

This study investigates the impact of some policy variables (interest rate, money supply and government consumption expenditures) and some controlled variables (unemployment, unit value of imports) on inflation in Pakistan. We use Johenson Cointegration approach to measure short and long run association between discussed factors. Data is time series. Its frequency is annual from 1980 to 2018. WDI is the data source for this research. In this connection, the logarithmic data transformation of all variables converts the coefficients into elasticities and makes their interpretation easy. In this regard, the following model has been formulated to estimate. This research checks nature of causality among variables by applying Granger Causality test.

Description of Variables

Inflation (LNINF): This study uses log of inflation as an explained variable and same variable has been used in former researches by Ahmed et al. (2018), Peter et al. (2018) and Ali et al. (2015).

Unemployment (LNUN):This research uses log of total unemployment, as percent of total labor force (national estimate) to observe its influence on inflation. Same variable of unemployment has been used in earlier researches by Zaman (2011), Okafor et al. (2016). In this study we analyze that according to Phillips curve theory there exists negative relation among inflation and unemployment.

Import (LNIMP): This study uses log of import as an explanatory variable and same variable has been used in former researches by Siddiqui and Akhtar (1999), Aslam and Munir (2006), Ahmed et al. (2018).

Government consumption expenditures (LNGCE): Study uses log of government consumption expenditures as an explanatory variable and same variable has been used in former researches by Idrees and Saleem (2006), Zubaria et al. (2011).

Interest rate (LNIR): This study uses log of interest rate as an explanatory variable and same variable has been used in former researches by Felipe (2009), Aslam and Munir (2006) .

Money supply (LNMS): This study uses log of money supply as an explanatory variable and same variable has been used in former researches by Han and Sinah (2018), Sinah (2018).

$$LNINF = \beta_1 + \beta_2\, LNUN + \beta_3\, LNIMP + \beta_4\, LNGCE + \beta_5\, LNIR + \beta_6\, LNMS + \varepsilon t \text{ ----- (1)}$$

The detail of the all variables is given in table 1 while εt is error term at time period t.

Table 1

Variable's Transformation

Variable Names	V-Representation	V-Transformation	Data Source	Sample Period
Inflation	LNINF	LN [GDP Deflator (2006=100)]	WDI	1980-2018
Unemployment	LNUN	LN [UN total Unemployment, as percent of total labor force (national estimate)]	WDI	1980-2018
Imports	LNIMP	LN [Import unit value index (2000 = 100)]	WDI	1980-2018
Government consumption expenditures	LNGCE	LN [General government final consumption expenditure (% of GDP)]	WDI	1980-2018

Interest rate	LNIR	LN[Discount rate as a proxy of interest rate]	WDI	1980-2018
Money supply	LNMS	LN [Broad money % of GDP]	WDI	1980-2018

Source: Prepared by the author

RESULTS OF STUDY

Empirical estimations along with their elucidation are given. To check normality of all variables we analyze probability value of Jarque-Bera Test along with other descriptive variables discussed in table 2.

Table 2

Descriptive Statistics

	LNINF	LNUN	LNIMP	LNGCE	LNIR	LNRM2
Mean	3.980312	1.105477	4.800413	2.403874	2.322120	3.166038
Median	3.922251	1.388791	4.553877	2.398179	2.302585	3.177361
Maximum	5.574491	2.057963	5.593911	2.820480	2.995732	4.057967
Minimum	2.348249	-0.922057	4.189655	2.051660	1.323088	2.187035
Std. Dev.	1.055571	0.862773	0.464248	0.178422	0.325679	0.520555
Skewness	0.077064	-1.156655	0.651758	0.107001	-0.495427	-0.267508
Kurtosis	1.668307	3.120382	1.824125	2.912765	4.298953	2.126239
Jarque-Bera	2.920389	8.719582	5.007983	0.086786	4.337239	1.705763
Probability	0.232191	0.012781	0.081758	0.957535	0.114335	0.426185
Sum	155.2322	43.11362	187.2161	93.75107	90.56269	123.4755
Sum SD	42.34078	28.28635	8.190004	1.209707	4.030531	10.29716
Observations	39	39	39	39	39	39

Source: Prepared by the author

To check the normality of data this study uses Jarque-Bera test. Probability value of natural log of inflation, unemployment, imports, interest rate and money supply is insignificant depicting that variables are normal distribution. To check whether explanatory variables are inter correlated or not we estimate matrix of the variance inflation factor. Its estimated outcomes are in table below.

Table 3

Matrix of Variance Inflation Factor

	LNINF	LNUN	LNIMP	LNGCE	LNIR	LNRM2
LNINF	-	-	-	-	-	-
LNUN	1.130414	-	-	-	-	-
LNIMP	7.207346	1.326054	-	-	-	-
LNGCE	1.206878	1.003838	1.091516	-	-	-
LNIR	1.105371	1.023164	1.138102	1.009184	-	-
LNRM2	14.64374	1.089769	3.780695	1.115404	1.086786	-

Source: Prepared by the author

VIF estimates displayed in above table portrays that there is no multicollinearity in independent variables. As VIF (LNINF, LNUN) = 1.130414, VIF (LNINF, LNIMP) = 7.207346, VIF (LNINF, LNGCE) = 1.206878, VIF (LNINF, LNIR) = 1.105371, VIF (LNUN, LNIMP) =1.326054 etc. is less than 10 this confirms fact that there is no interdependence between explanatory variables. The decision to apply appropriate estimation technique is very essential for appropriate findings. Various tests such as Dickey-Fuller, ADF, Phillip-Perron, KPSS, NG Perron are available which guide about stationarity of factors. Based upon results of these tests selection of appropriate technique (ordinary least square method or cointegration technique) is possible. This research uses ADF and PP tests. Table 4 displays outcomes related to all variables for both at level I(0) & at I(1).

Table 4
Unit Root Test

ADF test at level				ADF test at first difference			
Variables	t-test	p value	Decision	Variables	t-test	p value	Decision
LNINF	-0.344047	0.9086	Non stationary	dLNINF	-4.7595	0.0004	Stationary
LNUN	-1.9072	0.3256	Non stationary	dLNUN	-5.722	0.0000	Stationary
LNIMP	0.136585	0.9645	Non stationary	dLNIMP	-5.882	0.0000	Stationary
LNGCE	-1.48177	0.5319	Non stationary	dLNGCE	-5.305	0.0001	Stationary
LNIR	-0.0209	0.9507	Non stationary	dLNIR	-4.578	0.0008	Stationary
LNMS	-0.80598	0.8060	Non stationary	dLNMS	-5.148	0.0001	Stationary
	Phillip- Perron Test at level			Phillip- Perron Test at first difference			
Variables	t-test	p value	Decision	Variables	t-test	p value	Decision
LNINF	-0.33968	0.9093	Non stationary	dLNINF	-4.9003	0.0003	Stationary
LNUN	-2.09201	0.2488	Non stationary	dLNUN	-5.7221	0.0000	Stationary
LNIMP	0.187109	0.9682	Non stationary	dLNIMP	-5.8813	0.0000	Stationary
LNGCE	-1.64392	0.4509	Non stationary	dLNGCE	-5.2770	0.0001	Stationary
LNIR	-0.96574	0.7556	Non stationary	dLNIR	-4.8088	0.0004	Stationary
LNMS	-1.55536	0.4951	Non stationary	dLNMS	-5.1472	0.0001	Stationary

Source: Estimated by authors.

Above table indicates that all variables given in current research are non-stationary at level but the dependent (LNINF) and all independent variables (LNUM, LNIMP, LNGCE, LNIR, LNMS) become stationary at first difference. These results provide a support to apply Johensen and Juselius technique of cointegration. Next we will move to the selection of appropriate lag length criterion. Table 5 explains the estimated lag the length selection based on some pre specified criteria's.

Table 5
Lag Length Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
1	245.7540	436.4046*	5.04e-13	-11.31967*	-9.472226*	-10.67486
2	271.2159	32.53469	1.08e-12	-10.73422	-7.303259	-9.536721
3	317.2592	43.48530*	1.02e-12*	-11.29218*	-6.277699*	-9.541989*

* Indicates Lag Order Selected by Criterion Calculated Using E Views 9

Table 5 depicts lag order 3 is selected by most criteria for this estimation and the decision is made on AIC criterion as this criterion shows minimum value (-11.29218) between all others.

On the basis of unit root test and lag length criteria cointegration test we will next determine Multivariate co-integration test which is further divided into trace and maximum Eigen value tests.

Table 6
Multi Co-Integration Approach

Trace Test				
H0	H1	Trace Test	CV at 5% SL	CV at 1% SL
r = 0**	r = 1	213.3889	95.75366	104.9615
r ≤ 1**	r = 2	134.6049	69.81889	77.81884
r ≤ 2**	r = 3	83.02940	47.85613	54.68150
r ≤ 3**	r = 4	47.14003	29.79707	35.45817
r ≤ 4	r = 5	14.96949	15.49471	19.93711
r ≤ 5	r = 6	0.621279	3.841466	6.634897
Maximum Eigenvalue Test				
H0	H1	ME Statistic	CV at 5% SL	CV at 1% SL
r = 0**	r = 1	78.78403	40.07757	45.86900
r ≤ 1**	r = 2	51.57546	33.87687	39.37013
r ≤ 2**	r = 3	35.88937	27.58434	32.71527
r ≤ 3**	r = 4	32.17054	21.13162	25.86121
r ≤ 4*	r = 5	14.34821	14.26460	18.52001
r ≤ 5	r = 6	0.621279	3.841466	6.634897

Source: Estimated by author.

Note: At 10 % trace test indicates 4 and Max-eigenvalue test also indicates 4 cointegrating eqn(s). At 5 % Trace test indicates 4 and Max-eigenvalue test indicates 5 cointegrating eqn(s).

Table 6 explains null hypothesis indicates nil cointegrating vectors i.e. r = 0 against the H1 of at least one cointegrating vector at 1 percent level of significance is recognized with reference to both employed tests (CV of Trace test: 213.3889>104.9615 & maximum eigenvalue test: 78.78403 > 45.86900). By summarizing the above table at 1 percent level of significance both tests show four cointegrating eq. While at 5 % level of significance trace test shows four cointegrating equations & maximum eigenvalue test shows five cointegrating equations. Results indicate that long run cointegration exists amid inflation and its determinants i.e. (LNUM, LNIMP, LNGCE, LNIR, & LNMS). Now we will estimate impact of explanatory variables on inflation in long and short run periods. Based on multivariate Johenson technique long-run normalized coefficients are given in table 7.

Table 7
Based on Johansen Approach Long-run Normalized Coefficients

Dependent Variable: LNINF(-1)				
Independent Variables	Coefficients	S.E.	T- Ratio	Decision
LNUN(-1)	-0.090460	(0.01403)	[-6.44806]	Significant
LNIMP(-1)	0.738620	(0.04126)	[17.9007]	Significant
LNGCE(-1)	-0.818628	(0.03273)	[-25.0121]	Significant
LNIR(-1)	0.118100	(0.03491)	[3.38346]	Significant
LNMS(-1)	1.256525	(0.03288)	[38.2194]	Significant

C	1.743327	-

Source: Estimated by author.

The empirical estimates of table 7 shows that lagged values of LNUN and LNGCE have negative and significant impact on lagged value of the LNINF in long run in Pakistan. Lagged values of LNIMP, LNIR & LNMS have direct and substantial effect on lagged value of LNINF. Coefficient of lagged value of LNUN is -0.090460 which shows that by increasing LNUN by one percent it will significantly decrease LNINF (-1) by 0.090460 percent. These outcomes are in line with I. G. Okafor et al. (2016) and Khalid Zaman et.al. (2011). Coefficient of lagged value of LNIMP is found to be 0.738620 and significant in long run in Pakistan and explains that due to 1 % rise in lagged value of LNIMP there will be 0.738620 % rise in lagged value of LNINF in Pakistan. These findings are similar to Ahmed et al. (2018). Moreover the coefficient of lagged value of LNGCE shows that 1 % rise in lagged value of LNGCE will decrease value of DV LNINF (-1) by 0.818628 percent.

Findings of Song Han and Casey B. Mulligan (2008) support our results. Due to one percent increase in LNIR (-1) there will be 0.118100 percent increase in LNINF (-1). These findings are similar to Edirisinghe et al. (2015). Besides this 1 % upsurge in value of LNMS (-1) causes to the increase lagged value of LNINF by 1.256525 percent. These outcomes are similar to Sinah (2018). The relative impact of natural log of lagged value of money supply is found to be more than relative contribution of lagged values of LNUN, LNIMP, LNGDPPC and LNIR respectively in long-run in Pakistan. Lindiwe (2017) found that there exists direct relation among interest rate and inflation. They used descriptive statistic to analyze the quarterly data from 2010-2014. After explaining long run normalized coefficients further we will explain based on Johansen multivariate cointegration technique adjusted short run coefficients. Which are given below in table 8.

Table 8

Based on Johansen Approach Adjusted Short-run Coefficients

Independent Variables	Coefficients	S.E.	T- Ratios
ΔLNUN(-1)	0.025376	(0.01690)	[1.50117]
ΔLNUN(-2)	0.034154*	(0.01611)	[2.11965]
ΔLNUN(-3)	0.043397*	(0.02144)	[2.02380]
ΔLNIMP(-1)	-0.147775	(0.10943)	[-1.35038]
ΔLNIMP(-2)	-0.001491	(0.08381)	[-0.01779]
ΔLNIMP(-3)	0.059176	(0.07562)	[0.78256]
ΔLNGCE(-1)	-0.035224	(0.11566)	[-0.30456]
ΔLNGCE(-2)	-0.013818	(0.08217)	[-0.16816]
ΔLNIR(-1)	0.047775	(0.06994)	[0.68310]
ΔLNIR(-2)	-0.102691	(0.05779)	[-1.77695]
ΔLNIR(-3)	0.022264	(0.05660)	[0.39338]
ΔLNMS(-1)	-0.836283*	(0.23323)	[-3.58560]
ΔLNMS(-2)	-0.466587	(0.24492)	[-1.90508]
ΔLNMS(-3)	-0.536757*	(0.25761)	[-2.08357]
C	0.326580*	(0.08088)	[4.03788]
ECTt-1	-0.549581*	(0.13136)	[-4.18380]

Source: Estimated by author.

Above table 8 explains that in short run the coefficients of second and third lagged values of ΔLNUN are positive and significant. It depicts that due to 1 % rise in ΔLNUN (-2) there will be 0.034154 % rise in ΔLNINF in Pakistan. 1 % rise in ΔLNUN (-3) leads to 0.043397% increase in ΔLNINF in short run. Findings are contradicting to Zaman (2011). The coefficient of ΔLNGCE (-3) is inverse and substantial. It explains that due to the 1 % rise in ΔLNGCE (-3) there will be 1.173926% decrease in dependent variable. Findings are in contrast with Bashir et al. (2011). Coefficient of ΔLMMS (-3) is negative and substantial in short run. It depicts that one percent increase in ΔLNMS (-3) will leads to 0.536757% decrease in ΔLNINF in Pakistan. These results are in line with Ndjokou (2011) and contradicted to Han and Sinah (2018). Besides this the remaining variables having different lags are insignificant in short run. Coefficient of constant term is positive and significant. Coefficient of lagged value of ECM has negative sign and large in short run. Its coefficient value i.e. -0.549581 explains that disequilibrium which is generated due to short run disequilibrium resulted from any macroeconomic disturbance will be detached 54.96 percent each year, economy will converge to stability in 1.8196 years. After explaining adjusted short run and normalized long run coefficients next discussion will be on outcomes of diagnostic tests to examine the conformation of our empirical findings. These are given in 9the table.

Table 9
Diagnostic Tests

VEC Residual Serial Correlation:	For lag 1	For lag 2	For lag 3
(LM Test)	22.71952(0.9584)	33.55318(0.5855)	44.13733(0.1655)
VEC Residual Normality Tests: Joint Jarque-Bera Test		18.29449 (0.1070)	
VEC Residual Heteroskedasticity Tests: Joint chi-square Test		7.458199 (0.2805)	
Stability Test		AR- ROOT GRAPH	

Above table displays results of LM Test, Joint Jarque-Bera Test, Joint chi-square Test, Stability Test: AR root test, correspondingly. Probability values of all tests are insignificant. It shows that model follows normal distribution. In model there were no issues of serial correlation and hetroscedasticity. Graph of AR root test shows that all estimated coefficients are structurally stable over time. Thus, in nut shell it is concluded that the estimated model of this research is appropriate.

Causality Test

The granger Causality test has been applied to judge cause and effect relation between the instrumental factors. To conduct test bivariate VAR has been estimated. We will explain it in given way. Similarly, in Table 10 granger causality test has been employed to analyze causality among factors in given research. Uni-directional causation exists from LNUN to inflation rate, from inflation towards imports, from money supply towards inflation, from imports to interest rate, from money supply to imports and from interest rate to money supply. Inflation and rate of interest both are causing each other. In this connection, these results are similar to Humera et. al (2020) to results. Hence trend of causation between variables also supports findings of study.

$$\Delta LNINF_t = \sum_{i=1}^{n} \beta_{1i}\, \Delta LNINF_{t-1} + \sum_{i=1}^{n} \beta_{2i}\, \Delta LNUN_{t-1} + \sum_{i=1}^{n} \beta_{3i}\, \Delta LNIMP_{t-1} + \sum_{i=1}^{n} \beta_{4i}\, \Delta LNGCE_{t-1} + \sum_{i=1}^{n} \beta_{5i}\, \Delta LNIR_{t-1} + \sum_{i=1}^{n} \beta_{6i}\, \Delta LNMS_{t-1} + \varepsilon_{it} \quad \text{_____(2)}$$

$$\Delta LNUN_t = \sum_{i=1}^{n} \beta_{1i}\, \Delta LNINF_{t-1} + \sum_{i=1}^{n} \beta_{2i}\, \Delta LNUN_{t-1} + \sum_{i=1}^{n} \beta_{3i}\, \Delta LNIMP_{t-1} + \sum_{i=1}^{n} \beta_{4i}\, \Delta LNGCE_{t-1} + \sum_{i=1}^{n} \beta_{5i}\, \Delta LNIR_{t-1} + \sum_{i=1}^{n} \beta_{6i}\, \Delta LNMS_{t-1} + \varepsilon_{it} \text{_____(3)}$$

$$\Delta LNIMP_t = \sum_{i=1}^{n} \beta_{1i}\, \Delta LNINF_{t-1} + \sum_{i=1}^{n} \beta_{2i}\, \Delta LNUN_{t-1} + \sum_{i=1}^{n} \beta_{3i}\, \Delta LNIMP_{t-1} + \sum_{i=1}^{n} \beta_{4i}\, \Delta LNGCE_{t-1} + \sum_{i=1}^{n} \beta_{5i}\, \Delta LNIR_{t-1} + \sum_{i=1}^{n} \beta_{6i}\, \Delta LNMS_{t-1} + \varepsilon_{it} \text{_____(4)}$$

$$\Delta LNGCE_t = \sum_{i=1}^{n} \beta_{1i}\, \Delta LNINF_{t-1} + \sum_{i=1}^{n} \beta_{2i}\, \Delta LNUN_{t-1} + \sum_{i=1}^{n} \beta_{3i}\, \Delta LNIMP_{t-1} + \sum_{i=1}^{n} \beta_{4i}\, \Delta LNGCE_{t-1} + \sum_{i=1}^{n} \beta_{5i}\, \Delta LNIR_{t-1} + \sum_{i=1}^{n} \beta_{6i}\, \Delta LNMS_{t-1} + \varepsilon_{it} \text{_____(5)}$$

$$\Delta LNIR_t = \sum_{i=1}^{n} \beta_{1i}\, \Delta LNINF_{t-1} + \sum_{i=1}^{n} \beta_{2i}\, \Delta LNUN_{t-1} + \sum_{i=1}^{n} \beta_{3i}\, \Delta LNIMP_{t-1} + \sum_{i=1}^{n} \beta_{4i}\, \Delta LNGCE_{t-1} + \sum_{i=1}^{n} \beta_{5i}\, \Delta LNIR_{t-1} + \sum_{i=1}^{n} \beta_{6i}\, \Delta LNMS_{t-1} + \varepsilon_{it} \text{_____(6)}$$

$$\Delta LNMS_t = \sum_{i=1}^{n} \beta_{1i}\, \Delta LNINF_{t-1} + \sum_{i=1}^{n} \beta_{2i}\, \Delta LNUN_{t-1} + \sum_{i=1}^{n} \beta_{3i}\, \Delta LNIMP_{t-1} + \sum_{i=1}^{n} \beta_{4i}\, \Delta LNGCE_{t-1} + \sum_{i=1}^{n} \beta_{5i}\, \Delta LNIR_{t-1} + \sum_{i=1}^{n} \beta_{6i}\, \Delta LNMS_{t-1} + \varepsilon_{it} \text{_____(7)}$$

Table 10
Pair Wise Granger Causality Test

H0	F-Statistic	Prob.
LNUN does not Granger Cause LNINF	3.35847	0.0754*
LNINF does not Granger Cause LNUN	0.06325	0.8029
LNIMP does not Granger Cause LNINF	0.00478	0.9453
LNINF does not Granger Cause LNIMP	4.07448	0.0512**
LNGCE does not Granger Cause LNINF	0.17572	0.6776
LNINF does not Granger Cause LNGCE	0.64437	0.4276

LNID does not Granger Cause LNINF	9.88892	0.0034***
LNINF does not Granger Cause LNID	3.94796	0.0548**
LNRM2 does not Granger Cause LNINF	5.93088	0.0201***
LNINF does not Granger Cause LNRM2	2.80225	0.1030
LNIMP does not Granger Cause LNUN	0.04206	0.8387
LNUN does not Granger Cause LNIMP	1.01558	0.3205
LNGCE does not Granger Cause LNUN	2.07907	0.1582
LNUN does not Granger Cause LNGCE	0.05905	0.8094
LNID does not Granger Cause LNUN	0.16222	0.6896
LNUN does not Granger Cause LNID	0.34015	0.5635
LNRM2 does not Granger Cause LNUN	0.40523	0.5285
LNUN does not Granger Cause LNRM2	1.32390	0.2577
LNGCE does not Granger Cause LNIMP	0.77378	0.3851
LNIMP does not Granger Cause LNGCE	0.01898	0.8912
LNID does not Granger Cause LNIMP	1.24492	0.2721
LNIMP does not Granger Cause LNID	3.50859	0.0694*
LNRM2 does not Granger Cause LNIMP	4.14190	0.0495**
LNIMP does not Granger Cause LNRM2	0.47650	0.4946
LNID does not Granger Cause LNGCE	1.21143	0.2786
LNGCE does not Granger Cause LNID	0.78770	0.3809
LNRM2 does not Granger Cause LNGCE	0.77420	0.3849
LNGCE does not Granger Cause LNRM2	0.00152	0.9691
LNRM2 does not Granger Cause LNID	1.56697	0.2189
LNID does not Granger Cause LNRM2	11.5084	0.0017***

Source: Author's own contribution

Lag 1 included based on SIC, *, **, ***indicate rejection of Null Hypothesis at10%, 5% and 1% level of significance respectively.

DISCUSSION

To achieve smooth sustainable progress stable prices are nominated as core criterion in various economies. The purpose of this research is to analyze various factors influencing price stability. This research uses Johanson's cointegration approach covering the time duration from 1980 to 2018. Study uses Granger Causality test to check existence of uni/bi-directional relationship among highlighted variables. Findings show that a decrease in unemployment and an increase in the unit value of imports will enhance inflation in long run. Due to a decrease in government consumption expenditure, there will be low investment, low production and increased aggregate demand associated with high inflation. There exists positive relationship between interest rate and inflation. The increase in the money supply enhances inflation. Lagged value of the error correction model is significant having an appropriate sign. Use of many other vital variables may also be possible. Use of any other econometric technique may be used for future research. The study's limitations are that it concentrates on a single economy so new researchers may conduct regional research related to price instability. Main contribution of this research is that it uses instrumental variables which portray both fiscal and monetary policies. It uses suitable empirical techniques to determine the role of all these important variables in controlling inflation in Pakistan. Its results will help to suggest most significant factor to bring the price stability to Pakistan.

CONCLUSION

Current research uses some monetary and fiscal policy instruments such as the interest rate, money supply and government consumption expenditures along with other controlled variables to analyze their impact on inflation in Pakistan. This research uses Johenson cointegration approach to estimate short and long run relation between inflation and its major determinants. Besides this, to judge nature of causality among variables Granger Causality test has been used. The empirical estimates of this study shows that in the long run all explanatory variables have significant effect on inflation in Pakistan. Increase in inflation lead to decrease unemployment. This finding is in line with Philips curve theory. In this connection, the coefficient of unit value of imports is positive and significant. It explains that increase in unit value of the mports will enhance inflation in long run. Coefficient of government consumption expenditure is significant having negative sign. It depicts that due to decrease in government consumption expenditure there will be low investment, low production, and increased aggregate demand associated with high inflation. The coefficient of interest rate has significant and positive coefficient. It shows that there exists positive relation between interest rate and inflation. Thus, the coefficient of money supply is significant and positive. It explains that increase in money supply enhances inflation.

The lagged value of ECM is substantial having appropriate sign. Coefficient of ECM indicates that in the long run the economy may converge to equilibrium path. The outcomes of Granger Causality test indicate that all other variables except interest rate have uni directional relation with inflation. The results confirm the bidirectional relation among interest rate and inflation. Therefore, the main instrument to handle inflation in Pakistan is supposed to be interest rate. The policy implications for this study are that to overcome the issue of inflation it is required to control money supply, government consumption expenditures and interest rate fluctuations. In this linking, there is need to handle inflation to control unemployment in long run. The unit value of import is positively correlated with the inflation. By reducing imports and producing import's substitutes the issue of price instability can be resolved in Pakistan. The limitations of the study are that firstly it concentrate on a single economy so new researcher may conduct regional research related to price instability. Secondly, use of many other important variables may also be possible. Thirdly, any other econometric technique may also be used for the future research.

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