An Empirical Analysis of Exports, Imports and Inflation: A Case of Pakistan

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Abstract
The study examines the impact of imports and exports on inflation in Pakistan, over the period of 1986 to 2020. Various methodological techniques such as the Unit Root test, and Co-integration Test have resulted in the application of the VAR Model. The study revealed that imports significantly affect inflation. However, the study further revealed that inflation and imports were insignificant to exports. Based on empirical results, the study proposed that the policymaker should re-examine the threshold level of imports to reduce inflation.

Keywords*: Inflation, Exports, Imports, Pakistan.*

1. Introduction

Inflation is a permanent increase in generally accepted indices of price because of which the cost-of-living increase to a great extent and the public feel comparatively poor than before. The permanent and constant rise in prices is termed as inflation. Studies discussed that it is a complex economic phenomenon, consisting of "*Demand Pull Inflation*" and *Cost-Push inflation.* Inflation can be in aggregate form for things means goods as well as services and it is technically called *Demand Pull Inflation*. It can also be *Cost-Push inflation* which discusses the rise in the cost of inputs to production that are the basic inputs. It is such complex economic phenomenon that it is after so many years is the center of attention of Central Banks of the whole world, the focus of the macroeconomists and policymakers. Besides Central Banks, Macroeconomists, it is also a center point of the Public.

Further, globalization has made the doors open for the international trade-exports and Imports. Globalization took played a significant role in the production processes as well as in the consumption decisions. Where there is open economy situation, the demand of goods and services bring inflation and where there is closed economy situation, the exports and imports bring inflation. According to the study of Dexter *et al.*, (2005), the domestic inflation can directly influenced by Imports and it can also influence the completion indirectly by importing the goods. Similarly, the inflation can also be influenced by exports.

This study aims to explore the effects of exports and imports of goods and services on inflation in the context of Pakistan's economy. The main objective of the study is to find out the relationship between inflation, exports, and imports in the context of Pakistan's economy and to determine the degree of relatedness among the variables. Moreover, this study tries to answer the following research questions.a) Do Inflation rate affects exports and imports? b) Do exports and imports affect inflation? Furthermore, the rest of the study is designed as, Segment 2 discussed Literature review, Portion 3 discussed methodology, Section 4 analyzed empirical results and finally, Section 5 conclude the study.

2. Literature Review

Different studies are conducted to explore the determinants of the inflation, relationship between inflation and exports and imports. Many schools of thought of the economist have put forth their hypotheses and views regarding what causes inflation. Inflation was believed to be caused by either a rise in overall demand (also known as demand-pull inflation) or a fall in overall supply throughout the Keynesian era (also known as cost-push inflation). Economists at the time considered fiscal policy as a crucial tool for limiting inflation. The Phillips Curve idea (Phillips, 1954) expresses a trade-off between employment and inflation. In a similar vein, Lipsey (1960), Samuelson and Solow (1960), among others, significantly altered this model. According to this concept, there is a negative relationship between inflation and unemployment. However, the quantity theory of money model favoured an exact proportionality between the money supply and inflation. This theory emphasises the crucial part that monetary policy plays in keeping inflation under control. Several studies have looked at the possible reasons why inflation might occur in developed and developing nations alike. Exchange rate depreciation and quicker money growth are the typical factors associated with the fiscal disparity that are driving inflation in developing countries, according to Liviatan and Piterman (1986), Sergent and Wallace (1981), and Montiel (1989).

Furthermore, several empirical research studied attempts to investigate the nexus between imports, exports and inflation. For instance, Ulke and Ergun (2011) empirically analyzed the relationship between import and inflation in Turkey, during 1995 to 2010. The study employed various econometric techniques and identified the presence of co-integration between import and inflation in long-run and in short-run.Ahmad (2018) explored the association between import, export, and inflation in Pakistan from the year of 2001 to 2017. This study revealed asignificant short-run relationship by using the ECM-Error Correction Model and the long-term relationship by using Johansen co- integration. The study resulted that a 1% increase in exports resulted 0.63% increase in inflation and a 1% increase in imports resulted 0.57% increase in inflation in the long run. The study also resulted those monthly changes in exports and imports bring changes in the monthly inflation. Similar results were found by Muktadir-Al-Mukit (2015) while investigating the relationship between exports, imports, and inflation in case of Bangladesh's economy. The methods used were Variance Decomposition, co- integration and ECM-Error Correction Models. The results revealed that in the long run, a 1% increase in Imports contributed a 3.2 percent increase in the inflation and exports contributed 1.9 percent decrease in Inflation rate. This study also resulted that exports have the highest shock impact on inflation as compared to imports.

According to Gylfason (1997), high inflation is associated with low exports. His study resulted that the exporters of primary goods have more inflation than the exporters of manufacturers. Purusal (2018) Studied the outcome of foreign direct investment, crude oil price &inflation upon exports in Indonesia. This study used Panel data model and the method which is implemented was Fixed Effect Model with the Generalized Least Square. The study resulted that foreign direct investment as well as crude oil price both had positive as well as significant effect on the exports. The result also revealed that inflation has negative and significant relationship with exports. Further, Khan et al., (2010) conducted the study in the context of Pakistan on inflation and exports and imports by using a time series data from 1970 to 2007. This study resulted that government borrowings, import, private sector borrowing, wheat support price, exchange rate, real demand, taxes and last year's CPI significantly contribute to inflation in the case of Pakistan. The current reviews the important nexus between inflation, exports and imports in the context of Pakistan to explore that whether the relationship still exists or not?

3. Research Methodology

The study used time series data about the Pakistan's exports, imports, and inflation from 1986 to 2020 (almost 35 years). The data for inflation, exports and imports are taken from the World Bank. Further, Inflation is used as the dependent variable for which Consumer Price Index (CPI) is used as the proxy. The two independent variables (import and export) are measured as exports of goods and Services and imports of goods and services (in millions PKR).

Furthermore, to analyze the relationship between the variables, we firstly used the Unit root in the data to check whether the data is Stationary or non-stationary. After checking stationarity, the study needs to examine the long run relationship among the variables for which we employed Johnsons Co-integration test and VAR Model.

3.1. Model of the Study

Based on the above discussion, the empirical model of the study can be shows as follows.

Inflation= f (Exports and Imports)

$$INF_t = \beta_0 + \beta_1 EXP_t + \beta_2 IMP_t + \mathcal{E}_t$$

Where.,

INF = Inflation Consumer Price Index (CPI) (in percentage)
EXP= The Exports ofServices andGoods (in million PKR)
IMP = The Imports of Services andGoods (in million PKR)
$\mathcal{E}_t$= Error Term
β_0= Intercept
andβ_1, and $\beta_2$are the coefficients of explanatory variables.

4. Results and Discussion

To check the stationarity of the variables, we used *Augmented Dickey-Fuller Test Statistic* at 5% level of significance, the result shows that Inflation, export and import data is Stationary at the first difference. As the data is stationary on first difference so we will check the long run significance by using the Johnsons Co-integration test, according to the results trace value (20.25603) is less than critical value (35.19275), (7.342603) and 20.26184 and (1.400645)

and 9.164546, therefore, we have to accept null hypotheses that is there is no co-integration in these variables. It can be said there is no co-integration equation.

Table 1. Trace value and Critical value of Johnson Co-integration Test;

Trace Statistic	Critical Value
20.25603	35.19275
7.342603	20.26184
1.400645	9.164546

According to the criteria, if the data is stationary at 1st difference and it is not co-integrated, then we will use OLS/VAR model, but that data has to be 1st difference.

4.1. VAR Model

The following equations are multivariate Vector Autoregressivemodels used for calculation:

- $INF_t = \alpha + \sum_{j=1}^{k} \alpha_j EXP_{t-j} + \sum_{j=1}^{k} \beta_j IMP_{t-j} + \sum_{j=1}^{k} \lambda_p INF_{t-1} + \mu_{1t}$
- $EXP_t = \alpha' + \sum_{j=1}^{k} \chi_j INF_{t-j} + \sum_{j=1}^{k} \delta_j IMP_{t-j} + \sum_{j=1}^{k} \eta_j EXP_{t-1} + \mu_{2t}$
- $IMP_t = \alpha' + \sum_{j=1}^{k} \chi_j INF_{t-j} + \sum_{j=1}^{k} \delta_j EXP_{t-j} + \sum_{j=1}^{k} \eta_j IMP_{t-1} + \mu_{3t}$

Each of equation above was predicted separately,on the specification, $\mu_{it,}$ μ_{2t} and μ_{3t} are the random error term, that are assumed no longer to be correlated throughout time.

Table 2: Vector Autoregression Estimates

	CPI_INFLATION	EXPORTS	IMPORTS
CPI_INFLATION(-1)	0.252056	0.524091	-0.596543
	(0.20855)	(0.36516)	(0.26993)
	[1.20861]	[1.43525]	[-2.20999]
CPI_INFLATION(-2)	0.159805	-0.386859	0.402503

	(0.19926)	(0.34888)	(0.25790)
	[0.80201]	[-1.10885]	[1.56070]
EXPORTS(-1)	0.094384	1.064261	-0.143180
	(0.11819)	(0.20695)	(0.15298)
	[0.79856]	[5.14271]	[-0.93596]
EXPORTS(-2)	-0.122036	-0.284651	0.329089
	(0.12156)	(0.21285)	(0.15734)
	[-1.00388]	[-1.33733]	[2.09155]
IMPORTS(-1)	0.753888	-0.602906	1.138770
	(0.30925)	(0.54147)	(0.40026)
	[2.43781]	[-1.11346]	[2.84505]
IMPORTS(-2)	-0.287602	0.577559	0.027079
	(0.33499)	(0.58655)	(0.43359)
	[-0.85853]	[0.98467]	[0.06245]
C	-4.402548	12.82687	-14.33430

	(7.62779) [-0.57717]	(13.3557) [0.96041]	(9.87274) [-1.45191]
R-SQU	0.518255	0.736393	0.524248
Adj-R-SQU	0.407083	0.675561	0.414459

According to VAR Model, there are three variables, and all are the Dependent variables. The detail is as under;

- CPI_Inflaiton is a Dependent variable and it has six independent variables namely (1) CPI_Inflaiton (-1) LAG 1, (2) CPI_Inflaiton (-2) LAG 2, (3) Exports (-1) LAG 1, (4) Exports(-2) LAG 2, (5) Imports(-1) LAG1 and (6) Imports(-2) LAG 2 and then it has its C (Constant).
- Exports is the second Dependent variable and it has six independent variable namely (1) CPI_Inflaiton (-1) LAG 1, (2) CPI_Inflaiton (-2) LAG 2, (3) Exports (-1) LAG 1, (4) Exports(-2) LAG 2, (5) Imports(-1) LAG 1 and (6) Imports(-2) LAG 2 and then it has its C (Constant).
- Similarly, Imports is the third Dependent variable and it has six Independent variable namely (1) CPI_Inflaiton (-1) LAG 1, (2) CPI_Inflaiton (-2) LAG 2, (3) Exports (-1) LAG 1, (4) Exports(-2) LAG 2, (5) Imports (-1) LAG 1 and (6) Imports(-2) LAG 2 and then it has its C (Constant).

4.2. Coefficients of the VAR Model

From the above Table 2; there are 21 coefficients of the VAR Model, 7 coefficients for each model;

Table 3: Coefficients for CPI_Inflation

CPI_INFLATION(-1)	0.252056
CPI_INFLATION(-2)	0.159805
EXPORTS(-1)	0.094384
EXPORTS(-2)	-0.122036
IMPORTS(-1)	0.753888
IMPORTS(-2)	-0.287602
C	-4.402548

Table 4: Coefficients for Exports

CPI_INFLATION(-1)	0.524091
CPI_INFLATION(-2)	-0.386859

EXPORTS(-1)	1.064261
EXPORTS(-2)	-0.284651
IMPORTS(-1)	-0.602906
IMPORTS(-2)	0.577559
C	12.82687

Table 5: Coefficients for Imports

CPI_INFLATION(-1)	-0.596543
CPI_INFLATION(-2)	0.402503
EXPORTS(-1)	-0.143180
EXPORTS(-2)	0.329089
IMPORTS(-1)	1.138770
IMPORTS(-2)	0.027079
C	-14.33430

To check the level of significance of the independent variable, if the p-value is less than 5%, the independent variable is significant to explain the dependent variable, and if the p-value is more that 5%, it is insignificant. Now we have to find out the p-value of each independent variable.

4.3. Finding Equation for the VAR Model

CPI_INFLATION = C(1)*CPI_INFLATION(-1) + C(2)*CPI_INFLATION(-2) + C(3)*EXP(-1) + C(4)*EXP(-2) + C(5)*IMPORT(-1) + C(6)*IMPORT(-2) + C(7)

EXP= C(8)*CPI_INFLATION(-1) + C(9)*CPI_INFLATION(-2) + C(10)*EXP(-1) + C(11)*EXP(-2) + C12)*IMPORT(-1) + C(13)*IMPORT(-2) + C(14)

IMPORT = C(15)*CPI_INFLATION(-1) + C(16)*CPI_INFLATION(-2) + C(17)*EXP(-1) + C(18)*EXP(-2) + C(19)*IMPORT(-1) + C(20)*IMPORT(-2) + C(21)

Table 6: Finding p-value for VAR Model

	Coefficients	Sd.Er	t-Stat	P-value
C.(1)	0.252056	0.208551	1.208607	0.2305
C.(2)	0.159805	0.199256	0.802011	0.4250
C.(3)	0.094384	0.118192	0.798564	0.4270
C.(4)	-0.122036	0.121565	-1.003882	0.3185
C.(5)	0.753888	0.309248	2.437810	0.0171
C.(6)	-0.287602	0.334993	-0.858531	0.3932
C.(7)	-4.402548	7.627791	-0.577172	0.5655
C.(8)	0.524091	0.365156	1.435253	0.1552
C.(9)	-0.386859	0.348882	-1.108854	0.2709
C.(10)	1.064261	0.206946	5.142711	0.0000
C.(11)	-0.284651	0.212850	-1.337332	0.1850
C.(12)	-0.602906	0.541470	-1.113462	0.2689

C.(13)	0.577559	0.586548	0.984675	0.3278
C.(14)	12.82687	13.35568	0.960406	0.3398
C.(15)	-0.596543	0.269929	-2.209994	0.0300
C.(16)	0.402503	0.257899	1.560698	0.1226
C.(17)	-0.143180	0.152978	-0.935955	0.3522
C.(18)	0.329089	0.157342	2.091550	0.0397
C.(19)	1.138770	0.400263	2.845051	0.0057
C.(20)	0.027079	0.433586	0.062454	0.9504
C.(21)	-14.33430	9.872737	-1.451907	0.1505

4.4. Individual effect

Now we can explain which independent variable is significant and which one is insignificant. **For Equation#1 or Model#1,**

CPI_INFLATION = C(1)*CPI_INFLATION(-1) + C(2)*CPI_INFLATION(-2) + C(3)*EXP(-1) + C(4)*EXP(-2) + C(5)*IMP(-1) + C(6)*IMP(-2) + C(7)

Here, C (1) to C (7) p-values are;

Table 7: Individual Effect

p-value	Level of significance
0.2305	C(1) Insignificant as it is more than 5%.
0.4250	C(2) Insignificant as it is more than 5%.
0.4270	C(3) Insignificant as it is more than 5%.
0.3185	C(4) Insignificant as it is more than 5%.
0.0171	C(5) Significant as it is less than 5%.
0.3932	C(6) Insignificant as it is more than 5%.
0.5655	C(7) Insignificant as it is more than 5%.

For Equation#2 or Model#2,

Here, C (8) to C (14) p-values are;

EXP= C(8) *CPI_INFLATION(-1) + C(9)*CPI_INFLATION(-2) + C(10)*EXP(-1) + C(11)*EXP(-2) + C(12)*IMPORT (-1) + C(13)*IMPORT (-2) + C(14)

p-value	Level of significance
0.1552	C(8) Insignificant as it is more than 5%.
0.2709	C(9) Insignificant as it is more than 5%.
0.0000	C(10) Significant as it is more than 5%.
0.1850	C(11) Insignificant as it is more than 5%.
0.2689	C(12) Significant as it is less than 5%.
0.3278	C(13) Insignificant as it is more than 5%.
0.3398	C(14) Insignificant as it is more than 5%.

For Equation#3 or Model#3,

IMP = C(15)*CPI_INFLATION(-1) + C(16)*CPI_INFLATION(-2) + C(17)*EXP(-1) + C(18)*EXP(-2) + C(19)*IMP(-1) + C(20)*IMP(-2) + C(21)

Here, C (15) to C(21) p-values are;
Table 8: Individual Effect

p-value	Level of significance
0.0300	C(8) Significant as it is more than 5%.
0.1226	C(9) Insignificant as it is more than 5%.
0.3522	C(10) Significant as it is more than 5%.
0.0397	C(11) Significant as it is more than 5%.
0.0057	C(12) Significant as it is less than 5%.
0.9504	C(13) Insignificant as it is more than 5%.
0.1505	C(14) Insignificant as it is more than 5%.

4.5. Joint effect

Now we will check the joint effect of the independent variables on the dependent variables here we conduct Wald Test.

Checking C (1) and C (2)
Table 9: results of joint effect

Wald-Test:			
T.Stat	Val	D.f	Prob.
Chi-squ	3.975499	2	0.1370

The value is 0.1370 which is equal to 13.7% and it is more than 5% significance level and so that means these two independent variables (CPI_INFLATION lag 1 and CPI_INFLATION lag 2) cannot jointly affect the Dependent variable (CPI_INFLATION).

Checking C (3) and C (4)
Table 10 results of joint effect

Wald-Test:			
T.Stat	Val	D.f	Prob.
Chi-squ	1.017029	2	0.6014

The value is 0.6014 which is equal to 60 % and it is more than 5% significance level and so that means these two independent variables (EXPORT Lag 1 and EXPORT Lag 2) cannot jointly affect the Dependent variable (CPI_Inflation).

Checking C (5) and C (6)
Table 11: results of joint effect

Wald-Test:

T.Stat	Val	D.f	Prob.
Chi-squ	7.224521	2	0.0270

The value is 0.0270 which is equal to 2.7 % and it is less than 5% significance level and so that means these two independent variables (IMPORTS Lag 1 and IMPORTS Lag 2) can jointly affect the Dependent variable (CPI_Inflation).

Checking C (8) and C (9)
Table 12: results of joint effect

Wald-Test:			
T.Stat	Val	D.f	Prob.
Chi-squ	2.283556	2	0.3193

The value is 0.3193 which is equal to 31.93 % and it is more than 5% significance level and so that means these two independent variables (CPI_Inflation Lag 1 and CPI_Inflation Lag 2) cannot jointly affect the Dependent variable (EXPORTS).

Checking C (10) and C (11)
Table 13: results of joint effect

Wald-Test:			
T.Stat	Val	D.f	Prob.
Chi-squ	58.53407	2	0.0000

The value is 0.0000 which is equal to 0 % and it is less than 5% significance level and so that means these two independent variables (EXPORTS Lag 1 and EXPORTS Lag 2) can jointly affect the Dependent variable (EXPORTS).

Checking C (12) and C (13)
Table 14: results of joint effect

Wald-Test:			
T.Stat	Val	D.f	Prob.
Chi-squ	1.329981	2	0.5143

The value is 0.5143 which is equal to 51.43 % and it is more than 5% significance level and so that means these two independent variables (IMPORTS Lag 1 and IMPORTS Lag 2) cannot jointly affect the Dependent variable (EXPORTS).

Checking C (15) and C (16)
Table 15: results of joint effect

Wald-Test:			
T.Stat	Val	D.f	Prob.

Chi-squ	5.198159	2	0.0743

The value is 0.0743 which is equal to 7.4 % and it is more than 5% significance level and so that means these two independent variables (CPI_Inflation Lag 1 and CPI_Inflation Lag 2) cannot jointly affect the Dependent variable (IMPORTS).

Checking C (17) and C (18)

Table 16: results of joint effect

Wald-Test:			
T.Stat	Val	D.f	Prob.
Chi-squ	6.831283	2	0.0329

The value is 0.0329 which is equal to 3.29 % and it is less than 5% significance level and so that means these two independent variables (EXPORTS Lag 1 and EXPORTS Lag 2) can jointly affect the Dependent variable (IMPORTS).

Checking C (19) and C (20)

Table 17: results of joint effect

Wald-Test:			
T.Stat	Val	D.f	Prob.
Chi-squ	15.87548	2	0.0004

The value is 0.0004 which is equal to 0 % and it is less than 5% significance level and so that means these two independent variables (IMPORTS Lag 1 and IMPORTS Lag 2) can jointly affect the Dependent variable (IMPORTS).

5. Conclusion and Recommendations

In the context of the Pakistani economy, this research study has made an effort to investigate the relationship between inflation and imports and exports. We have used a yearly data set of imports, exports, and inflation for the period from July 1986 to June 2020 for this research. From the results analysis, the study concludes the following

- CPI_Inflation Lag1, CPI_Inflation Lag 2, Exports Lag 1, Exports Lag 2, Imports Lag 2 were insignificant to the dependent variable CPI_Inflation. They were affecting weakly the CPI_Inflation.
- Imports Lag 1 was affecting CPI_Inflation significantly. There was strong relationship between Imports Lag 1 and CPI_Inflation.
- CPI_Inflation Lag1, CPI_Inflation Lag 2, Exports Lag2, Imports Lag 2 were insignificant to Exports. They were not affecting Exports strongly and there was weak relationship between Exports and CPI_Inflation Lag1, CPI_Inflation Lag 2, Exports Lag2, Imports Lag 2.
- Exports Lag1, Imports Lag 1 are significant to Exports. They were affecting Exports strongly and there was strong or significant relationship between Exports and Exports Lag1, Imports Lag 1.

- CPI_Inflation Lag2 and Imports Lag2 were insignificant to Imports. They were affecting weakly the Imports.
- CPI_Inflation Lag1, Exports Lag1, Exports Lag2 and Imports Lag1 were affecting strongly Imports. They were affecting Imports strongly and there was strong or significant relationship between Imports and CPI_Inflation Lag1, Exports Lag1, Exports Lag2 and Imports Lag1.

The main conclusion is that;

a) Imports affecting Significantly CPI_inflation.
b) CPI_inflation 1, 2, Imports 2 were insignificant to Exports.
c) CPI_Inflation Lag1, Exports Lag1, Exports Lag2 and Imports Lag1 were affecting strongly Imports.

5.1. Recommendations

In order to implement steady economic growth, anti-inflationary policies should be developed in light of imports and exports, and this is where the study's findings will be useful. The results of this study are a real reflection of Pakistan's economic situation because they showed that exports are the primary cause of inflation, despite Pakistan's ironic exports actually dropping during the past few years.

Moreover, based on the above analysis and conclusion it is recommended to; As we have found that imports affecting inflation significantly, so the policy makers should focus on imports. Further, in line with Ahmed et al. (2018) the study recommends that it is essential to take real steps to increase Pakistan's exports, and the government should create a competitive environment and offer incentives to the local sector so that it may produce value-added goods at competitive rates for global markets. The government should also eliminate pointless export taxes and tariffs and offer enticing incentives to foreign businesses to make local investments. Textiles, fisheries, agricultural products, mining, medicines, and sporting goods all have enormous potential; as a result, the government should support these businesses and create a business-friendly climate for global markets.

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