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Macroeconomic Impacts of Global Oil and Commodity Price Shocks on the Economy of Pakistan

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ABSTRACT

The effects of oil and commodity price shocks on Pakistan's real exchange rate, inflation rate, government spending, money market rate, and industrial output are examined using monthly data from 2000-2017. Using the vector autoregressive (VAR) paradigm, we do an empirical investigation. Impulse response functions and generalized prediction variance decompositions are used to analyze the effect that fluctuations in oil and commodities prices have on Pakistan's economy. When the world oil price (LWOP) causes shock in the global oil market, the real exchange rate (LRER) shows a negative impulse response function. As a result of the rising cost of crude oil throughout the globe, inflation has been on the rise. Industrial output falls, the real exchange rate rises, and interest rates and inflation go up as a result of shocks. Despite increased industrial production, commodities prices have seen repercussions. Pakistan's interest rate follows shocks by rising for a prolonged period, much as the money market rate (MMR)or interest rate. After oil and commodity price shocks, governments tend to increase their spending. The real effective exchange rate is the primary source of economic volatility, as shown by generalized impulse response functions. Pakistan's economy has been hit hard by the shocks, especially the aftershocks in the currency rate. A depreciating currency rate is being seen in Pakistan. The real effective exchange rate is the main cause of fluctuations in the economy, as demonstrated by tools called generalized impulse response functions.

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1. Introduction

The recent surge in the prices of oil and other commodities has caused considerable macroeconomic volatility, leading to concerns among policymakers worldwide. This trend has also impacted Pakistan's economy.

World oil is a significant source of energy that is widely used in the industrial, transportation, and domestic sectors. Because of this, it is seen as a vital and significant aspect in the nation's economic development. The Middle East is the largest source of crude oil in the world, and Asia is thought to consume the most of it. Fluctuations in oil prices influence not only current economic activity but also offer foresight into future stability and its implications. If the economy can exhibit resilience and strategically adapt to these oil price changes, it might not only preserve stability but could also uncover opportunities for growth and diversification. This underscores the significance of astute planning and policymaking, particularly in managing potential inflationary pressures and upholding fiscal balance. High oil prices could trigger a cascade of increased production costs, inflation, and a slowdown in economic growth, along with an escalated import bill, thus affecting the trade balance. However, these challenges can also stimulate a transition towards renewable energy sources, reducing oil dependency. Moreover, the social implications of oil price shocks, especially for low-income households, emphasize the need for robust social safety nets. Hence, future stability hinges on Pakistan's capacity to navigate these economic shocks and evolve its energy consumption habits (Odhiambo, 2020). The ongoing and high volatility of the oil price has an impact on a number of other variables, including the country's GDP, import costs, and inflation, in addition to the economy.

Macroeconomic stability in emerging economies like Pakistan is threatened by fluctuations in oil prices in several ways. To begin, most sectors rely heavily on petroleum, and when the price of oil rises owing to higher production costs, industrial output naturally falls. Second, a change in the terms of commerce caused by a higher oil price would cause a redistribution of wealth from oil-importing to oil-exporting nations. Countries that have to import oil face direct consequences due to the increase in oil prices, which negatively impacts their economy.

An increase in oil prices is expected to lead to greater core inflation and production costs, but the exact magnitude of these effects is contingent on a variety of variables. Most previous studies have been conducted with developed economies in mind. Limited data exist on the effects of fluctuating oil prices on emerging nations, particularly in regards to the correlation between these factors and inflation. Thus far, there has been no significant effort to empirically investigate the impact of oil prices on inflation in Pakistan. Malik (2016) Strong fluctuation in international crude oil prices have major consequences for inflation rates in Pakistan due to the country's practically consistent energy intensity over the past four decades and energy reliance of roughly 33%.

Between 2000 and 2017, Pakistan's budgetary expenditures were monitored on a monthly basis. Most existing studies on this subject have been conducted within the context of developed economies. Specifically, these studies often examine the relationship between oil price volatility, inflation, growth, and the exchange rate. Macroeconomic factors' responses to shocks in the global oil price and global commodities price are poorly understood. Too far, there has been little to no attempt to conduct a rigorous empirical study of the impact of oil and commodity prices on Pakistan's macroeconomic indicators. It is expected that the effect of deficit spending would be positive on inflation rate as the government turns to monetization of its fiscal imbalance, which is expanding due to increase in oil and commodity prices. The actual rate of inflation and other macroeconomic indicators will also be positively affected by the public's optimistic view of future inflation. The relationship between Pakistan's real GDP growth and oil prices from 1980 to 2012 has been analyzed (Sultan & Waqas, 2014). It is found that at the first difference, all of the variables are at rest. Therefore, the long-term and short-term interrelationships between variables are investigated using the Johnson Co-integration and error correction method. There are both short- and long-term partnerships out there. From what we can see, the rising cost of crude oil has a significant negative effect on Pakistan's agricultural GDP.

Hence, the need to look at the effects of recent fluctuations in global oil and commodity prices. Pakistan's economy is vulnerable to the ups and downs of global oil and commodities prices. The study's aim is to examine how changes in the price of oil and other commodities affect inflation, real exchange rate, industrial output, money market rate or interest rate, and public spending.

This study explores the impact of oil and commodity price shocks volatility on exchange rate fiscal balance for Pakistan's economy. Monthly data framework from 2000 to 2017. This study aims to analyze the historical trends and patterns of oil and commodity prices and their impact on the economy of Pakistan.

The paper proceeds as follows. Section 2 reviews literature. The methodology of this is described in section 3. I describe the data and variables in section 4. Section 5 presents the empirical results from monthly data estimation. And section 6 provides the conclusion and recommendation of the study.

2. Literature review

In the study Adekoya and Faraz (2021), the researchers investigate the impact of different macroeconomic variables on the level and trend of food prices in Iran over a thirty-year period from 1986 to 2017. The study intends to analyze the role played by various economic factors in determining the changes in food prices in Iran over this period. They used the NARDL method to examine the unequal effects of food price fluctuations across time. The variables of effective exchange rate and per capita income are examined. It was established that the variables were not stationary by use of the Augmented-Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. As the results of the OND-test showed, long-run correlations and co-integration between the variables were not to be ruled out. The model estimates also revealed that the amount of liquid assets, the price of crude oil, and the level of disposable income all had a considerable impact on food prices over the long term, in addition to the short-term impacts of the effective exchange rate. The outcome shows that both increases and decreases in the effective exchange rate and per capita income may result in roughly equivalent shifts in food costs. Moreover, the key macroeconomic elements have a significant association with one another.

Alom, Ward, and Hu (2013) the impact of shocks in food and energy prices on a specific group of countries in Asia and the Pacific. The study finds that countries with limited resources, such as Korea and Taiwan, which rely heavily on manufacturing, are greatly affected by changes in the global oil price. In contrast, Australia and New Zealand, which are oil-poor nations with diverse natural resources not related to oil, are not impacted by oil price changes. Additionally, oil-poor countries that prioritize international financial services, like Singapore and Hong Kong, experience minimal effects from increases in oil prices**.** Additionally, some emerging countries—in this example, India—with minor oil reserves are unaffected by changes in oil prices, but other similar countries—like Thailand—with greater natural resource abundance is more severely affected. India, Korea, and Thailand have only marginally been impacted by increased food costs in terms of price shocks. Overall, a nation's economic characteristics determine how international oil and food costs impact its economy. Furceri, Loungani, Simon, and Wachter (2016) investigates the impact of global food price fluctuations on inflation rates in a variety of countries. They found that these shifts have major consequences for industrialized economies from 1960 to the current day. After a year, a 10% rise in global food inflation is expected to have the largest effect on domestic inflation in advanced economies, peaking at about 0.5 percentage points, according to the baseline estimate. However, they also found that the impact has weakened and is not as potent as it once was. The year when food prices rose internationally was the year that impact peaked at around 0.25 percent of a cent; the next year, it had essentially little effect on local inflation. This trend has persisted since the 1980s. Various factors could be contributing to this trend, such as the absence of significant food shocks in the 1980s and 1990s; the decreasing proportion of food in consumption baskets; other structural changes in economies, like increased wage flexibility that prevents a wage-price spiral; and most notably, enhanced credibility of monetary policy that can offset unexpected inflation spikes due to elements like supply-side shocks or trade disputes Using a second data set consisting of monthly CPI data for a large number of advanced and emerging nations, they found that developing countries were hit harder by these more recent global food price shocks than advanced economies were. They also demonstrate that inflation expectations in developed countries are more firmly established than in emerging economies, which may mitigate the effects of a sudden increase in inflation caused by shocks to global food prices. Qayyum (2011) The purpose of this research was to examine the impact of oil price volatility on several macroeconomic indicators. The standard Garchmode (analyzing time series data) was used. The discrepancies in the effect of the oil price shock on conditional volatility are not uncovered by the estimate results of the GJR model. The conditional variance (GARCH01) of the GJR model was used as the price shock measure in the VAR model in this investigation. "This study examines the impact of oil price volatility on various economic indicators, including GDP growth, inflation, unemployment, the trade deficit, and private consumption, within the framework of conditional variance."

The results of the estimations using VAR and impulse responses showed that the oil price shock significantly impacted unemployment in a negative way. Majumder, Raghavan, and Vespignani (2022) demonstrates that commodity price volatility negatively affects government fiscal balance, especially in nations that rely on the export of commodities. "The study found that for each one standard deviation increase in commodity price volatility, the fiscal balance as a percentage of GDP decreased by approximately 0.04 units. The authors also examined the relationship between real interest rates and the correlation between government spending and commodity price fluctuations. The empirical results suggest that a lower real interest rate may help alleviate the negative impacts of commodity price volatility on the fiscal balance. This suggests that a flexible monetary policy, assuming sticky pricing, may be effective in reducing the adverse effects of commodity price volatility on the budget balance." This proposed research could bridge these gaps by delivering a more comprehensive analysis of the combined effects of oil and commodity price shocks, examining both the direct impacts on Pakistan's economy and the effectiveness of potential policy responses.

3. Methodology & Model

The analysis utilizes time series data to estimate world commodities and oil prices, with quarterly dente method observations covering the period from 2000 to 2017. We make use of Structural Vector Autoregressive (VAR) modeling approach.it has better empirical fit and allows identifying structural shocks with respect to economic theory. The variables considered in the analysis include LWOP (world oil prices), LWCP (world commodity prices), MMR (money market rate) as a monetary policy instrument, LIPI (industrial production index), LRER (real exchange rate), INFL (inflation rate), and LG-EXP (government expenditure as a proxy for economic growth). All data used in the study was sourced from WDI.

3.1. Vector Autoregression Model, Data and description of the Variables

VAR model can be applied in reduced and structural form. A reduced form of VAR model uses each variable as a function of its own lagged value and lagged value of all other variables used in the model as endogenous variables. Stock and Watson (2016) have shown in their study that VAR is one of the most flexible models used for multivariate time series analysis. VAR is multivariate extension of univariate time series analysis which can be used for 2 or more dependent variables. The VAR methodology has been used widely in literature to identify the impact of infrastructure by Yuwono, Mustajab, and Arsyad (2010) & Hossain, Rahman, and RAJİB (2013). Asmah (2013) has used the VAR methodology for a time series data analysis to show real exchange rate fluctuations in Ghana. Kimmel, Berlin, Strom, and Laskey (1995) has used the VAR methodology and interpreted the VAR parameters by using impulse response functions and variance decompositions in order to show the influence of infrastructure on productivity in Netherlands.

The basic p lag VAR (VAR(p)) model can be of the following form;

$$x_t = \pi_0 + \pi_1 x_{t-1} + \pi_2 x_{t-2} + \cdots + \pi_p x_{t-p} + \varepsilon_t \quad (1)$$

Where t = 1, 2,. T

y_t denotes vector of endogenous time series variables.

If there are independent variables in the model the model is known as VAR(x) X denotes the independent variables. As VAR is a short run time series model which requires the assumption of the data to be stationary. A data is said to be stationary if its means and variance are independent of time (Guajarati & Baser).

The structural VAR model with lag order p is represented as:

$$X(t) = A1 * X(t-1) + A2 * X(t-2) + A3 * X(t-3) + A4 * X(t-4) + \varepsilon(t) \quad (2)$$

Reduced-Form VAR and Error Terms:

The reduced-form VAR is obtained by pre-multiplying the structural VAR with matrix A. The reduced-form equation is:

$$X(t) = At * X(t-1) + A2 * X(t-2) + A3 * X(t-3) + A4 * X(t-4) + u(t) \quad (3)$$

Where u(t) is the vector of reduced-form error terms.
Relating Structural and Reduced-Form Models:

The relationship between the structural VAR model and the reduced-form VAR model is given by:

$$u(t) = A\hat{}(-1) * B * \varepsilon(t) \quad (4)$$

The results of the analysis can provide insight into how these variables affect each other over time. For example, the model may reveal that changes in commodity prices have a significant impact on exchange rates, which in turn affect inflation rates. Similarly, changes in government expenditure may have an impact on commodity prices, which can in turn affect exchange rates.

Figure 1 in the figure LWCP, MMR, LRER, LG-EXP, INFL, LIPL & MMR shows the money market rate or monetary policy tools or interest rate. LG-EXP (government expenditure) INFL (inflation rate) LIPI (industrial product rat which show the real GDP (proxy for economic growth) we have used monthly data to (2000-2017) these variables show high seasonal variation that's why we have adjusted seasonally variate to come our seasonality there are adjusted all variables included world commodity price, world oil price real exchange rate, government expenditure, inflation rate, industrial products. However, the LIPI and LG-EXP there don't have much seasonal fluctuation.

4. Empirical Results

4.1. Unit Root Test

Table 1 employs the augmented Dickey-Fuller (ADF) test to assess the stationary characteristics of the variables under consideration. The unit root test is employed to determine the presence of a steady pattern in each variable. The data is characterized by an integration order of zero, and its stationary status is deemed significant if the test result attains statistical significance, thereby allowing rejection of the null hypothesis.

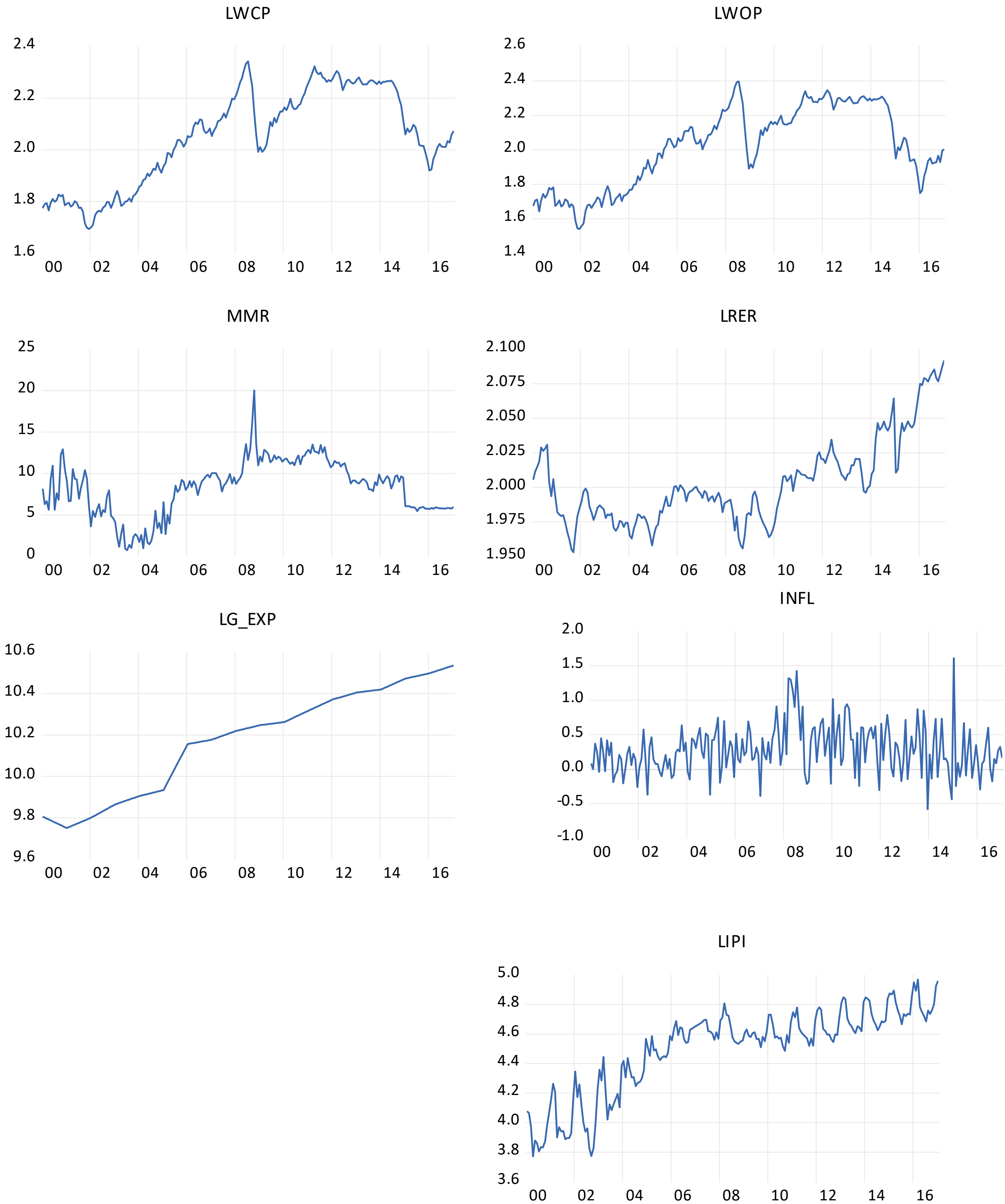

Figure 1: Graphs of the Variables

The outcomes of the unit root test presented above reveal that solely the variable LIPI exhibits trend stationarity at the first difference, while the remaining variables demonstrate no statistically significant trend. A comprehensive examination in Table 4.1 indicates that all variables are integrated of order 1(1) except for inflation. Inflation, uniquely, is integrated of order 1(0), signifying that its meaning is stationary at level (0), in contrast to the other variables, which are stationary at the first difference due to their integration order of 1(1).

Table 1
Unit Root (ADF) Test

Variables	Trend	Lag	t-Statistic	Prob.*	I()
LWOP	NO	0	-10.619	0.000	I(1)
LWCP	NO	0	-9.476	0.000	I(1)
LIPI	Yes	11	-5.740	0.000	I(1)
MMR	NO	2	-12.742	0.000	I(1)
LG_EXP	NO	0	-3.347	0.014	I(1)
LRER	NO	1	-11.370	0.000	I(1)
INFL	No	2	-5.792	0.000	I(0)

4.2. Optimal Lag Length

In the realm of economics, a lag denotes the temporal lapse between the occurrence of a change in one variable (Y) and its subsequent influence on another variable (X). Excessive delays can engender complications such as multicollinearity, serial correlation in error terms, and misspecification errors, leading to a diminution in degrees of freedom. In the context of yearly data, the prevalence of delays is generally circumscribed. It is advisable to maintain an interval ranging from 1 to 8 quarters between the initial and subsequent data sets. Furthermore, when confronted with monthly data and a satisfactory volume of observations, scholars may consider utilizing 6, 12, or 24 delays.

Table 2
Optimal Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	797.9518	NA	7.68e-13	-8.029967	-7.913305	-7.982742
1	2497.696	3261.438	4.05e-20	-24.78879	-23.85549	-24.41098
2	**2720.986**	**412.5768**	**6.91e-21***	**-26.55823***	**24.80830***	**-25.84985***
3	2760.283	69.81760	7.66e-21	-26.45973	-23.89316	-25.42076
4	2813.648	91.01843*	7.39e-21	-26.50404	-23.12084	-25.1345
5	2841.160	44.96840	9.32e-21	-26.28589	-22.08605	-24.58576
6	2876.150	54.70455	1.10e-20	-26.14365	-21.12718	-24.11295
7	2909.367	49.57374	1.33e-20	-25.98342	-20.15032	-23.62214
8	2942.154	46.60037	1.63e-20	-25.81882	-19.16908	-23.12696

* Indicates lag order selected by the criterion HQ: Hannan-Quinn information criterion

An elementary resolution entails the utilization of criteria such as the Akaike or Schwarz, where the model selection is determined by the lowest values of the output, primarily distributed across lags 1 and 2, with a predominant concentration observed at lag 2. In this context, the AIC criterion, exhibiting the lowest value (currently -2655823), is favored as it signifies the optimal model. Consequently, it can be inferred that the most suitable criterion for this model is the AIC, and the optimal lag length to be employed with this model is identified as 2.

Table 3 delineates the results of forecast error variance decomposition. The examination of macroeconomic variables reveals that the industrial price index and inflation exhibit only marginal sensitivity to the LWCP money market rate, resulting in a limited contribution to the variance of these variables. Subsequently, after a 24-month period, the primary driver of variance in the variables is identified as LWOP, constituting 51.01% of the variance, followed by LG-EXP with an effect of 32.68%, and INFL with a corresponding effect of 1.49% on the industrial price index (LIPI). Within the initial 6 months, LIPI exhibits 89.6% self-induced variance, while LWCP contributes moderately at 4.67%, along with additional influences from other macroeconomic variables such as the Real Exchange Rate (LRER) and government expenditure at 1.87% and 2.25%, respectively. Subsequent 12-month and 24-month periods continue to underscore the substantial influence of LIPI itself, alongside other significant contributors such as LG-EXP.

Table 3

Forecast Error Variance Decomposition

Variance Decomposition of LWOP:								
Period	**S.E.**	**LWOP**	**LWCP**	**LIPI**	**MMR**	**LG_EXP**	**LRER**	**INFL**
6	0.101248	74.34015	18.48821	4.267892	0.824341	0.370075	0.562595	1.146738
12	0.136215	61.08695	26.37443	8.865220	0.745392	0.938144	0.469188	1.520675
18	0.152255	57.69325	27.41156	10.50915	0.706509	1.683067	0.440147	1.556315
24	0.161487	56.02053	27.24303	11.39312	0.710248	2.490757	0.587801	1.554514
Variance Decomposition of LWCP:								
6	0.068609	63.94454	30.03453	3.986902	0.370147	0.266636	0.231933	1.165313
12	0.095108	54.79248	34.18133	8.124224	0.307673	0.921680	0.222002	1.450612
18	0.108113	52.40475	33.72632	9.918365	0.305793	1.920199	0.238239	1.486334
24	0.115947	51.01198	32.68570	10.98783	0.344904	3.064101	0.410563	1.494933
Variance Decomposition of LIPI:								
6	0.126558	0.732063	4.670443	89.55677	0.216199	1.871265	2.257455	0.695804
12	0.138472	1.345870	4.791421	77.28760	0.677835	7.330584	7.978646	0.588047
18	0.146820	1.625731	4.400184	70.17829	1.205655	12.70019	9.313165	0.576785
24	0.153704	1.880106	4.017779	65.29891	1.615583	16.93396	9.644280	0.609382
Variance Decomposition of MMR:								
6	2.241814	6.615195	1.463817	5.800415	82.91143	0.031591	0.964400	2.213150
12	2.636935	14.55462	9.234552	4.476822	69.12371	0.027113	0.888859	1.694320
18	2.906008	19.92666	14.87324	4.621794	58.27708	0.022387	0.839976	1.438862
24	3.081875	23.06547	17.70690	5.063413	52.04282	0.020271	0.756819	1.344307
Variance Decomposition of LD_EXP:								
6	0.013615	0.032161	0.568425	1.684151	1.715424	94.68154	0.414408	0.903889
12	0.029535	0.011230	0.348285	4.533226	2.518703	91.22072	0.167522	1.200318
18	0.044297	0.020194	0.333886	6.367215	3.222977	88.04242	0.797603	1.215704
24	0.057411	0.113316	0.324168	7.642689	3.764147	85.03486	1.933647	1.187173
Variance Decomposition of LRER:								
6	0.016619	6.687407	2.561898	0.724342	2.107607	1.416457	86.19334	0.308954
12	0.020617	17.94944	5.368193	1.558915	1.413885	3.645452	69.82640	0.237710
18	0.023014	24.01032	8.936457	2.155633	1.166790	5.823701	57.71321	0.193894
24	0.024608	26.47855	11.38569	2.284524	1.115554	7.943955	50.61806	0.173659
Variance Decomposition of INFL:								
6	0.356939	4.261568	4.236617	3.984750	2.171054	0.140704	2.304107	82.90120
12	0.363037	5.560002	5.219945	4.260918	2.154382	0.198065	2.444243	80.16244
18	0.366354	6.422979	5.651977	4.388010	2.121376	0.207168	2.480002	78.72849
24	0.368382	6.933879	5.939339	4.474677	2.098847	0.207107	2.474239	77.87191

The variance decomposition of the money market rate or monetary policy instrument (MMR) reveals that, within the first 6 months, MMR is primarily influenced by itself at 82.91%, with minor contributions from world oil price (LWOP) at 6.61%, industrial price index (LIPI) at 5.8%, and world commodity price (LWCP) at 1.46%. Over an 18-month duration, the self-influence of MMR diminishes to 58.27%, with a heightened impact from world oil price at 19.92%. After 24 months, MMR exhibits a substantial self-influence of 52.04%, accompanied by additional contributions from LWOP, LIPI, INFL, and LWCP.

The variance decomposition of the logarithm of government expenditure (LG-EXP). Over the initial 6 months, LG-EXP demonstrates predominant self-induced variance at 94.68%, with minor influences from LIPI and MMR. The subsequent 12-month and 24-month periods continue to highlight LG-EXP's pronounced self-influence, while other macroeconomic variables such as INFL and LRER contribute proportionately.

The variance decomposition of the real exchange rate (LRER). Initially, LRER exhibits significant self-induced variance at 86.19% within the first 6 months, with minor contributions from LWOP, LIPI, MMR, and LG-EXP. Over an 18-month and 24-month duration, LRER's self-influence diminishes to 57.71% and 50.61%, respectively, with heightened contributions from world oil price, world commodity price, industrial price index, and LG-EXP.

The variance decomposition of inflation rate (INFL) is discussed. Over the initial 6 months, INFL is predominantly influenced by itself at 82.90%, with minor contributions from oil price variation (LWOP), world commodity price (LWCP), industrial price index (LIPI), MMR, and LRER. Subsequent 12-month, 18-month, and 24-month analyses reveal diminishing self-influence of INFL, with significant contributions from various macroeconomic variables, emphasizing the intricate interplay of factors influencing inflation.

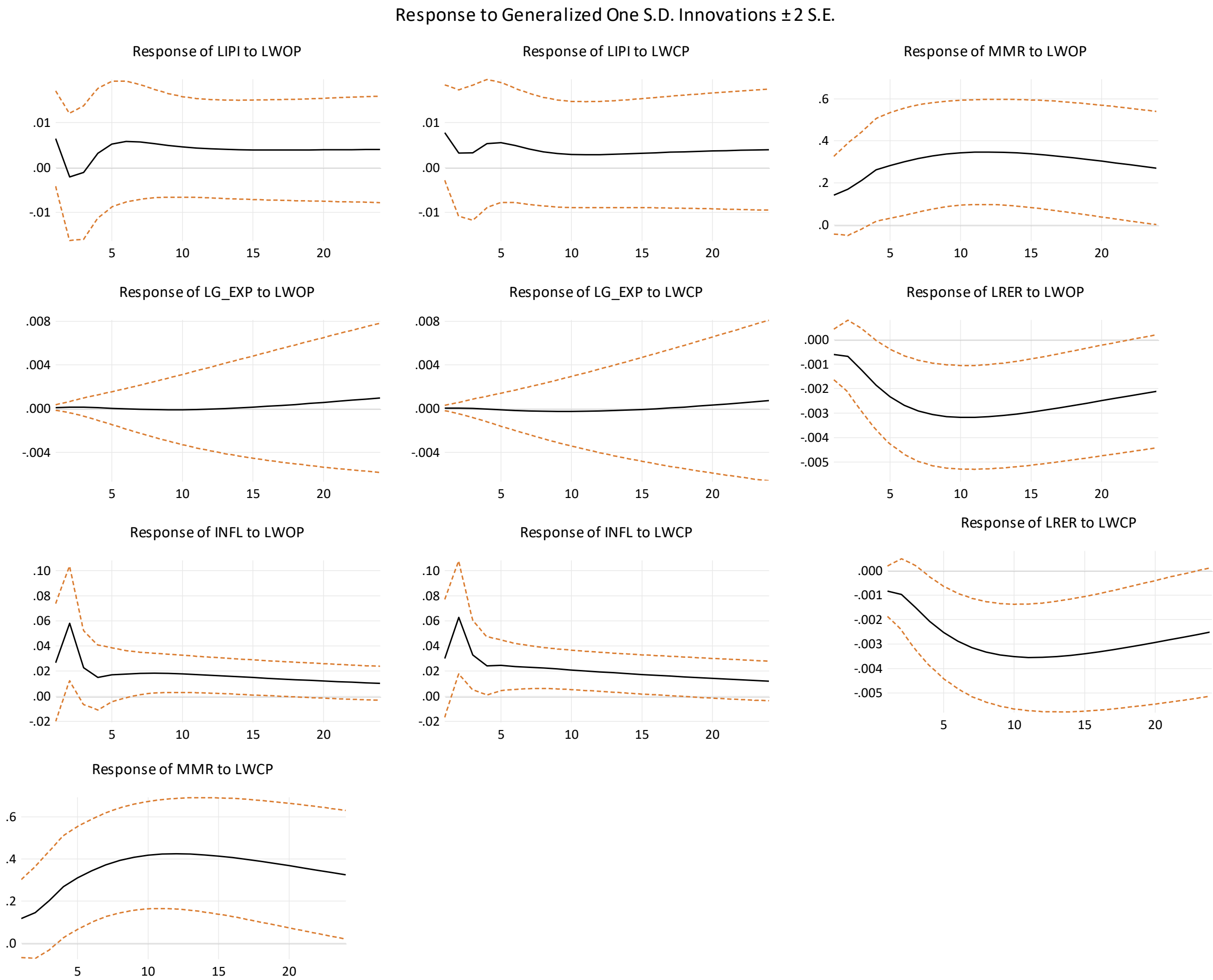

Figure 2: Analysis impulse Rapson function (IRF)

Figure 2 presents the outcomes derived from the impulse response function (IRF), which illustrates the reaction of variables concerning alterations in other variables or their own fluctuations. The horizontal axis denotes the number of months following the occurrence of a shock, while the vertical axis indicates the response value. The study investigates the responses of LIPI, LRER, LG-EXP, and MMR to changes in LWOP and LWCP.

The initial graph reveals that a surge in world oil prices, as represented by LWOP, leads to a contractionary impact on LIPI during the initial three months, causing a decline in industrial output. However, LIPI experiences subsequent recovery between the fifth and eighth months, reaching equilibrium between the eighth and twentieth months. Notably, any form of reaction, whether positive or adverse, leaves a lasting imprint on LIPI. The second graph demonstrates the contractive effect of LWOP on LIPI during the fifth month, while LWCP induces an expansionary effect between the fifth and sixth months.

The shock in world commodity prices also affects LG-EXP, albeit at a gradual pace with an upward trajectory. Additionally, the exchange rate undergoes an impact, initiating at the 01 line, sharply decreasing, and transitioning to the negative side. Post the 20th period, a gradual upward movement is observed. LRER, influenced by the world oil price shock, exhibits a negative response, leading to a ten-month depreciation in the exchange rate. The figure illustrates a subsequent gradual recovery after the initial ten months, signifying a prolonged impact on Pakistan's exchange rate. Oil price volatility shock also influences inflation, manifesting an increase as world oil prices rise. After the fourth period, a positive response in inflation is evident, followed by a tendency to reach an equilibrium point in the fifth period. From the sixth to the 20th period, LWOP induces fluctuations in inflation with a substantial amplitude, affirming that high world oil prices contribute to increased inflation. This stabilizing effect persists beyond the fifth month.

Moreover, the LWCP shock affects inflation, commencing at the 02 line and progressively intensifying before stabilizing after the 10th month. The increase in world commodity prices results in a depreciation of the exchange rate for 16 months, with a gradual return to equilibrium after the 17th month. The world commodity price shock also impacts the money market rate (MMR), causing an increase in Pakistan's interest rate for an extended duration. The shock initiates from zero and ascends to the positive side until the 20th period, highlighting the robust response of Pakistan's monetary policy to fluctuations in world commodity prices. Ultimately, the findings underscore the association between high oil and commodity prices, inflation, and the consequential impact on the money market rate.

Table 4
VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: LWOP				**Dependent variable: LWCP**			
Excluded	**Chi-sq**	**df**	**Prob.**	**Excluded**	**Chi-sq**	**df**	**Prob.**
LWCP	**19.92124**	**2**	**0.0000**	**LWOP**	**12.37155**	**2**	**0.0021**
LIPI	3.998265	2	0.1355	LIPI	3.596208	2	0.1656
MMR	1.327730	2	0.5149	MMR	0.605174	2	0.7389
LG_EXP	6.471437	2	0.0393	LG_EXP	4.302868	2	0.1163
LRER	6.052892	2	0.0485	LRER	3.140874	2	0.2080
INFL	0.944008	2	0.6238	INFL	1.265746	2	0.5311
Dependent variable: LIPI				Dependent variable: MMR			
LWOP	**11.60055**	**2**	**0.0030**	LWOP	0.652921	2	0.7215
LWCP	**10.06420**	**2**	**0.0065**	LWCP	0.999403	2	0.6067
MMR	0.266036	2	0.8754	LIPI	0.327121	2	0.8491
LG_EXP	**20.09844**	**2**	**0.0000**	LG_EXP	1.251744	2	0.5348
LRER	5.023215	2	0.0811	LRER	2.752998	2	0.2525
INFL	**7.142421**	**2**	**0.0281**	INFL	4.060780	2	0.1313
Dependent variable: LG_EXP				Dependent variable: LRER			
LWOP	0.119310	2	0.9421	LWOP	1.404086	2	0.4956
LWCP	0.162827	2	0.9218	LWCP	0.598901	2	0.7412
LIPI	2.993704	2	0.2238	LIPI	0.436938	2	0.8037
MMR	1.938604	2	0.3793	MMR	1.537062	2	0.4637
LRER	2.748189	2	0.2531	**LG_EXP**	**7.082780**	**2**	**0.0290**
INFL	1.850519	2	0.3964	INFL	0.659575	2	0.7191
Dependent variable: INFL							
LWOP	0.815934	2	0.6650				
LWCP	2.416543	2	0.2987				
LIPI	1.638963	2	0.4407				
MMR	3.588041	2	0.1663				
LG_EXP	3.196055	2	0.2023				
LRER	0.726662	2	0.6954				

LWOP Granger-Causality Test:

Table 4 indicates that LG-EXP and LRER have p-values below 0.005 in relation to LWOP. However, as these variables are endogenous, their influence on LWOP is limited. The primary influence on LWOP is attributed to LWCP, making the impacts of LG-EXP and LRER less significant. It is crucial to note that causality determination requires consideration of significance levels, magnitude, and direction of the relationship.

LWCP Granger-Causality Test:

The Granger-causality test reveals a significant relationship between LWOP and LWCP, suggesting predictive causality between the two variables. The past values of LWOP can forecast LWCP, indicating a substantial and reciprocal influence between them.

LIPI Granger-Causality Test:

Among LWOP, LWCP, MMR, LG-EXP, LRER, and INFL, only MMR and LRER do not reject the null hypothesis, signifying no causality relationship with LIPI. Conversely, LWOP, LWCP, LG-EXP, and INFL exhibit a causal relationship with LIPI, as their past values predict LIPI. The significance level ($p\text{-value} < 0.05$) underscores the meaningfulness of these relationships.

MMR Granger-Causality Test:

The Granger-causality test on LWOP, LWCP, LIPI, LG-EXP, LRER, and INFL indicates no causality relationship with MMR. Past values of these variables cannot predict MMR, emphasizing the absence of a causal connection.

LG-EXP Granger-Causality Test:

The Granger-causality test on LWOP, LWCP, LIPI, LRER, and INFL concludes that there is no causality relationship with LG-EXP. Past values of these variables do not predict LG-EXP, indicating an absence of causal influence.

LRER Granger-Causality Test:

Results suggest a significant relationship only between LRER and LG-EXP, with a p-value less than 0.05. Other variables (LWOP, LWCP, LIPI, MMR, and INFL) do not reject the null hypothesis, indicating no causal impact on LRER.

INFL Granger-Causality Test:

The Granger-causality test on LWOP, LWCP, LIPI, LG-EXP, and LRER reveals no causality relationship with INFL. Past values of these variables cannot predict INFL, implying an absence of a causal connection.

5. Conclusions & Recommendations

This research investigates the impact of global oil and commodity price shocks on key macroeconomic indicators in Pakistan, including inflation, industrial output, government spending, the real exchange rate (RER), and the money market rate (MMR). The study covers the period from 2000 to 2017, utilizing SVAR analysis to examine the immediate effects of abrupt changes in oil and commodity prices on the economy.

The empirical findings reveal a noteworthy positive correlation between rising oil prices and global increases in currency rates and interest rates. Specifically, the study examines the effects of food price shocks on RER, inflation, and GDP as indicators of economic health.

The impulse response analysis indicates that an elevation in global oil and commodity prices leads to a strengthening of the Pakistani currency alongside an increase in inflation. The research underscores the significance of oil and commodity price shocks as primary drivers of macroeconomic changes, surpassing the indirect effects of monetary policy and government spending. Inflation and currency value in Pakistan are notably influenced by escalating oil costs.

The study employs unit root tests to determine the integration order (I(0)) for variables, revealing that, except for inflation, all variables remain at rest. Variance decomposition analysis attributes 74% of the variation in global oil prices (LWOP) to internal factors and 18% to global commodity prices (LWCP). The relationship between LWOP and LWCP indicates mutual influence, with LWOP affected by LWCP by 63%, and vice versa by 30%, extending to 54.7% and 34.18%, respectively, after 24 months.

While the industrial price index (LIPI) experiences primary fluctuations from internal factors, global commodity prices (LWCP) and other macroeconomic factors contribute modestly. External factors predominantly influence variations in the money market rate (MMR) and government spending (LG-EXP), while oil price changes impact the real effective exchange rate (LRER).

The research underscores the volatility of Pakistan's real effective exchange rate, attributing it to external shocks causing supply and demand disruptions. The study's impulsive response analysis emphasizes the impact of oil and commodity price shocks on the Pakistani rupee's appreciation and concurrent inflation rise.

In conclusion, this study provides empirical evidence that global oil and commodity price shocks significantly influence key macroeconomic variables in Pakistan, underscoring the importance of considering these shocks when evaluating economic interventions and potential implications for the country's trade balance and inflation dynamics.

In Pakistan, the central bank responds dynamically to fluctuations in the international economic landscape, with particular attention to the substantial impact of oscillations in oil and commodity prices on both inflation and the real exchange rate. Recent volatility in these prices has presented formidable challenges to Pakistan's economy. Effective policies in the country should demonstrate resilience in the face of external shocks. A more profound understanding of such shocks could enhance policymaking in Pakistan, particularly concerning currency rate stability.

The recent upheavals in global oil and commodities markets have significantly impacted Pakistan's economy, notably affecting its currency rate and inflation dynamics. Therefore, it is imperative for the Pakistani government to formulate and implement a comprehensive, efficient, and effective fiscal and monetary strategy. Such a strategy should be accompanied by a roadmap for the country's long-term economic growth, with the objective of mitigating the adverse effects of external price shocks and ensuring sustained stability in key economic indicators.

Authors Contribution

Bilqees: write the introduction and literature review.
Nadia Ayyub: interpreted the results and reported conclusion.
Mukamil Shah: write the methodology and analysis.

Conflict of Interests/Disclosures

The authors declared no potential conflicts of interest w.r.t the research, authorship and/or publication of this article.

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