

Monetary Policy, Oil Rents, Exchange Rate and Consumer Prices Nexus: A Case Study of Pakistan

Iftikhar Ahmad¹, Arifa Saeed², Muhammad Mudassar Naushahi³ and Javed Iqbal⁴

<https://doi.org/10.62345/jads.2024.13.2.7>

Abstract

This research examines the effects of monetary policy in the form of nominal money supply, economic growth, exchange rate, and oil rents on domestic prices for Pakistan's economy. By taking an annual data series, this research reports evidence of mixed integrated order of the data series. The estimates of the ARDL bounds test suggest that consumer prices have a long-run cointegrating relation with its factors. The findings also highlight that the money supply supports the causality thesis, indicating that when the money supply stretches, it accelerates domestic prices. Moreover, it is also exposed that domestic output, exchange rates, and oil rents have significant and appreciating effects on consumer prices in both time spans. These results are robust to the diagnostics used in this research ensuring the reliability of the results. Based on these results, money supply and exchange rate should be controlled by the policymakers in such a way that it should not allow domestic prices to rise. Moreover, an attempt should be made via which increase in domestic out, and oil rents should remain greater than the increase in prices.

Keywords: Consumer Prices, Money Supply, Economic Growth, Exchange Rate, Oil Rents.

Introduction

The debate on the causes of inflation is continuing. This is a macroeconomic challenge which is a serious worry for the economists and policymakers of the world. The situation whereby prices, in general, increase constantly over time refers to inflation. This raises living costs; it hampers the purchasing capacity of people, it triggers the production cost, and above all, resources shift from the society too few in this case. The money supply leads to Inflation, Inflation highlighted by the Classical school of thought. At the same time, Keynes and his followers referred to the expansion of aggregate demand as a reason for inflation and it remained a monetary aspect during all time, according to Friedman. The role of monetary policy in the form of money supply can influence the level of prices in the economy. The empirical literature postulates that an increase in the quantity of money has significantly stimulating effects on the price level. Mishkin (2007) reported their findings for the US that higher money supply gives rise to domestic prices and hence leads to inflation. Similar findings were reported by Stylianou et al. (2024) for Pakistan.

¹Assistant Professor, Hailey College of Banking and Finance, University of the Punjab, Lahore, Pakistan. Email: iftikhar@puhcbf.edu.pk

²Assistant Professor; Department of Economics and Finance, Greenwich University, Karachi. Email: arfasaheed@gmail.com

³PhD Scholar; Department of Economics and Quantitative Methods, Dr. Hasan Murad School of Management (HSM), University of Management and Technology, Lahore. Email: Economistnaushahi18@gmail.com

⁴Lecturer; Department of Statistics, Virtual University of Pakistan. Email: javediqbal@vu.edu.pk



Besides money supply, we have to come to the notion that economic growth is another important driver that helps in stimulating domestic prices and, therefore, inflation in any economy. Expanding output growth suggests increasing employment and incomes in the country, leading to a rise in buying power, and hence, it pushes up the aggregate demand. This further suggests an increase in domestic prices or inflation in the country. Roncaglia et al. (2018) suggested similar results in their study. Another important driver is the exchange rate. This increasing value suggests the depreciation of domestic currency against the international currency like the dollar. The reduction in the value of domestic currency diminishes the buying power due to an increase in the prices of goods and services. This, in fact, reveals a positive response of inflation to the depreciation of domestic currency against the dollar.

The advocates like Gola et al. (2023) and Mukhtarov et al. (2019) reported similar results in their research. After this, the expansion in oil rents asserts that oil prices will expand which further would enhance the cost of production. This will fuel inflation in the country. Similar findings were suggested by Blinder (1982). Besides this, oil rents when increasing in any society, then it also expands the wealth of the people. The increase in assets in the wealth statement posits an increasing size of cash in the hands of people. This will again push up the aggregate demand which in turn will increase the prices or will lead to inflation. This expansionary demand side impact was highlighted by Keynes (1936) in his book. Based on this discussion, this research is organized to investigate the role of monetary policy in the form of nominal money supply, economic growth, oil rents, and exchange rates on consumer prices for the Pakistani economy. This research will add value to the literature as it provides recent insights on the suggested indicators for Pakistan.

The rest of the study will be organized by uncovering the findings of many scholars on a similar topic in the next section. The third section will present a data and model-related discussion. Results and discussion will be shared in section four. The last section will highlight the concluding remarks and policy implications.

Literature Review

In research, we found Uddin and Ullah (2024), who highlighted an insignificant but negative impact of money supply on inflation in the case of Pakistan. The determinants of inflation were explored by Stylianou et al. (2024) for Pakistan's economy. They reported significantly increasing effects of money supply on inflation. In another document researched by Hashem (2024), the exchange rate was found to reduce short-term imported inflation in Iraq. The causing link between inflation and its factors was inquired by Khan et al. (2023). They disclosed one-way causing effect from money supply and oil prices to inflation and two-way causing effect was witnessed between inflation and manufacturing in Pakistan. The study also suggested that the exchange rate was caused by inflation. The variations in economic performance due to many macroeconomic factors were inquired by Hanif et al. (2020); Alharthi and Hanif (2020); Huang et al. (2020); Wang et al. (2022) and Hanif et al. (2014). Later on, we find Hanif (2018), who explored the causes of carbon emissions, while the causes of private savings were inquired by Hanif and Gago-de Santos (2017). The changes in factor productivity were highlighted by Nazli et al. (2018).

The contribution of Gola et al. (2023) also presented the role of the supply of money and the rate of exchange in finding the changing behavior of inflation. They provided evidence of the increasing behavior of inflation towards the expansion of the money supply and exchange rate in Pakistan. After this, we came across another study conducted by Iqbal et al. (2022), who

highlighted that the quantity of money was escalating inflation, whereas the exchange rate was reducing it for Pakistan's economy. Besides this, the contribution of Islam also explored the influence of human development, money supply, and exchange rates on inflation and suggested that both money supply and exchange rates stimulate inflation in South Asian economies. The impact of petrol prices and exchange rates on inflation was captured by Qasim et al. (2021) for Pakistan's economy. They confirmed that inflation was increasing due to an increase in petrol prices, but it was decreasing due to an increase in the exchange rate. In another study, Mukhtarov et al. (2019) reported the relationship between inflation, exchange rate, and prices of oil. Their empirical results provided evidence of significantly encouraging effects of the prices of oil and the rate of exchange for inflation in Azerbaijan. After this research, we saw the study of Sultana et al. (2019), who reported causing association between money supply and inflation. They reported a two-way association between money supply and inflation over a longer period in the Bangladeshi case. Later on, we found Roncaglia et al. (2018) research in which they explored the determining factors of inflation and reported that it is per capita national income that helped in reducing inflation in 65-panel countries. The exchange rate and economic growth increased while government revenue left decreasing effects on inflation in Pakistan (Ellahi, 2017). After this, we found Kahssay's (2017) contribution in which they provided evidence of the significantly stimulating role of economic growth for the inflation of the Ethiopian economy. Afterward, Uddin et al. (2014) also explored the role of different macroeconomic factors on inflation, and their findings suggested that economic growth had significant and encouraging effects on inflation in Bangladesh. After this section, the data and methodology discussion is presented in the next section.

Data, Variable and Methodology

The study's data is collected from the database of the World Bank (2024) for the indicators considered in this research. The data covers a sample range from 1972 to 2022. The data of the variables like an index of consumer prices, nominal money supply, economic growth, official exchange rate, and oil rents is sourced from the database of the World Bank. For facilitating our analysis, the data series is converted into natural log form. This research suggests the below-presented function in order to fetch empirical findings:

$$\ln P_t = f (\ln NM_t, \ln EG_t, \ln ER_t, \ln OR_t)$$

Whereas;

Table 1: Names of the variables & their demonstration

| Name of the Variable | Demonstration | Source of the Data |
|------------------------|---------------|--------------------|
| Consumer Price Index | $\ln P_t$ | World Bank (2024) |
| Nominal Money Supply | $\ln NM_t$ | World Bank (2024) |
| Economic Growth | $\ln EG_t$ | World Bank (2024) |
| Official Exchange Rate | $\ln ER_t$ | World Bank (2024) |
| Oil Rents | $\ln OR_t$ | World Bank (2024) |

The summary of basic stats will be presented for sharing the overview of the selected factors in the beginning. The unit root status will be inquired by considering augmented Dickey Fuller (1981) unit root test. ADF test provides efficient results in case data has large number of observations. The null hypothesis suggests presence of unit root will be accepted if the test turns to be insignificant. The findings of this test will facilitate us to utilize any appropriate cointegration technique to find out long run equilibrium between consumer prices and its factors. This research will apply the method proposed by Pesaran et al. (2001) to report the results of long run equilibrium. This technique is most ideal if the data series report mixed integrated order. Later on, we will find out and report long and short-term elasticities for the selected ARDL model. To see if the estimated coefficients are reliable, we will apply diagnostic tests. This will provide cross-verification of the results. Lastly, we will utilize stability test in the form of CUSUM and CUSUM square graph. This will allow us to conclude whether the estimated results for the present research are stable during the selected period or not? In case if the results are stable; then both graphs will remain within their critical values. After this, we will move to policy recommendations if the results are robust to all the diagnostic tests. The successive section will be providing the empirical results and their argumentation and it is presented as below:

Results and Discussion

The findings followed by their explanations are presented in this section. We have started this section from presenting the summary and the discussion of basic stats. From the results we may examine that mean value in the form natural log of all the variables are presented. The mean value of economic growth in natural log form is witnessed as highest while the mean value of oil rents in natural log form is witnessed as minimal. After this, normality status of the variables is checked through the significance or insignificance of JB-test. Nominal money supply and oil rents do not follow the traits of normal distribution because JB-test appears to be significant therefore, accepting the alternate hypothesis that series are not normally distributed. The remaining three factors are normally distributed because JB-test is witnessed as insignificant. The results are shared in below provided table 2:

Table 2: Descriptive Stats

| Variables | Average | S.Deviation | J.B.-Test | P.Value | Size |
|------------|---------|-------------|-----------|---------|------|
| $\ln P_t$ | 3.5006 | 1.1977 | 2.5441 | 0.2803 | 51 |
| $\ln NM_t$ | 3.7596 | 0.1400 | 6.4330 | 0.0401 | 51 |
| $\ln EG_t$ | 11.5711 | 0.2856 | 1.9406 | 0.3790 | 51 |
| $\ln ER_t$ | 3.5831 | 0.9558 | 3.6748 | 0.1592 | 51 |
| $\ln OR_t$ | -0.3960 | 0.8240 | 16.0641 | 0.0003 | 51 |

The outcomes of stationarity test are presented in table 3 which reveal that ADF test is significant in case nominal money supply at level specification and this indicate that nominal money supply is I (0) variable when it is tested at zero difference. This concludes that it is a stationary variable at level specification. Other than this, for all variables, ADF test is found to be insignificant when we have tested these at zero difference. Therefore, all the remaining

variables are non-stationary data series at level specification. This further indicates that all these data series are I (1). This means that these all data series other have become stationary data series at first difference specification. Hence this allows us to conclude that data series provide mixed order of integration. Therefore, we are going to utilize bounds testing approach to cointegration for obtaining longer-term cointegrating relation between consumer prices and its factors in case of Pakistan economy. The results are presented as below:

Table 3: Augmented Dickey Fuller Unit Root Test

| At Level | | | At First Difference | | |
|------------|---------|---------|---------------------|---------|---------|
| Variables | t-Test | P-Value | Variables | t-Test | P-Value |
| $\ln P_t$ | 0.4447 | 0.9829 | $\Delta \ln P_t$ | -4.0713 | 0.0025 |
| $\ln NM_t$ | -3.2887 | 0.0208 | $\Delta \ln NM_t$ | -6.4108 | 0.0000 |
| $\ln EG_t$ | -0.2998 | 0.9172 | $\Delta \ln EG_t$ | -3.9793 | 0.0033 |
| $\ln ER_t$ | 1.0942 | 0.9969 | $\Delta \ln ER_t$ | -4.2790 | 0.0014 |
| $\ln OR_t$ | -2.4880 | 0.1245 | $\Delta \ln OR_t$ | -6.0543 | 0.0000 |

The results presented in the previous table 3 exposed a mixed integrated order of the data series. So, we have applied bounds test and provided results in the table 4 which indicate that the F-stats = 4.24 which is greater than the 10-percent upper critical bound value = 3.8006. Also the W-stats = 21.2001 and it is also witnessed as greater than the 10-percent upper critical value = 19.0032. This indicate that the null hypothesis of no cointegration is rejected and we are accepting the alternate hypothesis which signifies that consumer prices and its factors have long run cointegrating relation with each other. The results of ARDL table further reveal that the diagnostic stats including heteroskedasticity-testing constant variance of error term, normality-testing normality of errors, functional form-testing model specification and serial correlation-testing significant correlation between two or more observations of error term are witnessed as insignificant. This helps us to share that this study does not have any heteroskedasticity and model misspecification issues. It is also found that errors are normally distributed and there is no serial correlation issue. The results are presented in the below table 4:

Table 4: ARDL Bounds Testing Approach

| Estimated Model | $\ln P_t = f(\ln NM_t, \ln EG_t, \ln ER_t, \ln OR_t)$ | | | |
|---|---|------------|-----------------------------|------------|
| Lag Length of the Model | (2, 1, 0, 0, 0) | | | |
| F-test | 4.2400** | | | |
| W-test | 21.2001** | | | |
| Significance Level | Tabulated Values for F-Test | | Tabulated Values for W-Test | |
| | 5 percent | 10 percent | 5 percent | 10 percent |
| Lower Critical Bounds | 3.1247 | 2.6166 | 15.6235 | 13.0830 |
| Upper Critical Bounds | 4.4409 | 3.8006 | 22.2045 | 19.0032 |
| Testing for Diagnostics | | | | |
| Serial Correlation | 0.9579 [0.328] | | | |
| Functional Form | 1.1627 [0.281] | | | |
| Normality | 3.2986 [0.192] | | | |
| Heteroscedasticity | 0.0430 [0.836] | | | |
| Note: ** (*) shows 5 (10) percent significance level. The information shared square braces the p. values. | | | | |

With the above reported findings, now we move forward to report the coefficients of long term for Autoregressive Distributed Lag (ARDL) model in the below shared table 5:

Table 5: Coefficients for Long Run

| D.V = $\ln P_t$ | | | | |
|-----------------------------------|-------------------|-------------------|--------------------|--------------|
| Indicators | Indicators | Indicators | t-Statistic | Prob. |
| $\ln NM_t$ | 0.7091 | 0.3872 | 1.8315 | 0.0743 |
| $\ln EG_t$ | 0.2069 | 0.0854 | 2.4219 | 0.0199 |
| $\ln ER_t$ | 0.6349 | 0.2145 | 2.9599 | 0.0051 |
| $\ln OR_t$ | 0.1093 | 0.0605 | 1.8050 | 0.0784 |
| C | -25.0599 | 8.4445 | -2.9676 | 0.0050 |

The long-term effects of nominal money supply; economic growth, exchange rate and oil rents on consumer prices are shared in the above table. Money supply shows positive but statistically significant effect on consumer prices confirming the causality thesis that money supply lead hike consumer prices in the country. One percent increase in money supply lead to increase consumer prices by 0.7091 percent. The economic growth; exchange rate and oil rents have positive and statistically significant influence on consumer prices. More production raises incomes of the people and through higher incomes, aggregate demand increases. This further stimulates consumer prices in the country. The increase in exchange rate shows depreciation of domestic currency against international currency leading to reduce buying power of locals. Hence, it leads to hike consumables prices locally. The higher oil rents also indicate higher earnings leading to rise purchasing ability of the households. This further exhibits them to stretch their expenditures on goods and services. Hence domestic prices will increase due to expansion in aggregate demand. One percent increase in economic growth, exchange rate and oil rents significantly stimulate domestic prices by 0.2069%; 0.6349% and 0.1093% respectively. Among all these factors of consumer prices, we have found money supply as the most strong factor influencing domestic prices in Pakistan. After this, short run coefficients are presented in the following table 6:

Table 6: Coefficients for Short Run

| D.V = $\Delta \ln P_t$ | | | | |
|--|--------------------|-----------------------|--------------------|-----------------|
| Indicators | Coefficient | Standard Error | t-Statistic | P. Value |
| $\Delta \ln P_{t-1}$ | 0.5222 | 0.1061 | 4.9224 | 0.0000 |
| $\Delta \ln NM_t$ | -0.0597 | 0.0533 | -1.1189 | 0.2697 |
| $\Delta \ln EG_t$ | 0.0245 | 0.0097 | 2.5172 | 0.0158 |
| $\Delta \ln ER_t$ | 0.0751 | 0.0389 | 1.9292 | 0.0607 |
| $\Delta \ln OR_t$ | 0.0129 | 0.0062 | 2.1029 | 0.0417 |

| | | | | |
|--------------------------------|---------|--------|---------|---------|
| ecm_{t-1} | -0.1183 | 0.0341 | -3.4652 | 0.0013 |
| Diagnostic Tests | | | | |
| R^2 after Adjustment | | | | 0.6246 |
| Testing Overall Model (F.Test) | | | | 14.4779 |
| P. Value | | | | 0.0000 |
| Durbin Watson Test | | | | 2.0419 |

The short run effects of the factors of domestic prices are presented in the above Table which show that consumer prices followed by its one period lagged term, economic growth, exchange rate and oil rents are significantly expanding domestic prices. This shows that one percent increase in one period lagged prices, economic growth, exchange rate and oil rents significantly elevating domestic prices by 0.5222 percent, 0.0245 percent, 0.0751 percent and 0.0129 percent respectively. The results of economic growth, exchange rate and oil rents are similar to long-term effects. After this, we have witnessed that money supply is leaving insignificant effects on domestic prices in the short run. The speed of adjustment term is witnessed as negative and significant which is confirming the validity of convergence hypothesis for this study. Moreover, the proposed model will require almost 8.5 years to attain long term equilibrium point again. After this, we are going to present stability graphs which are presented as below:

Figure 1: Cumulative Sum of recursive residuals

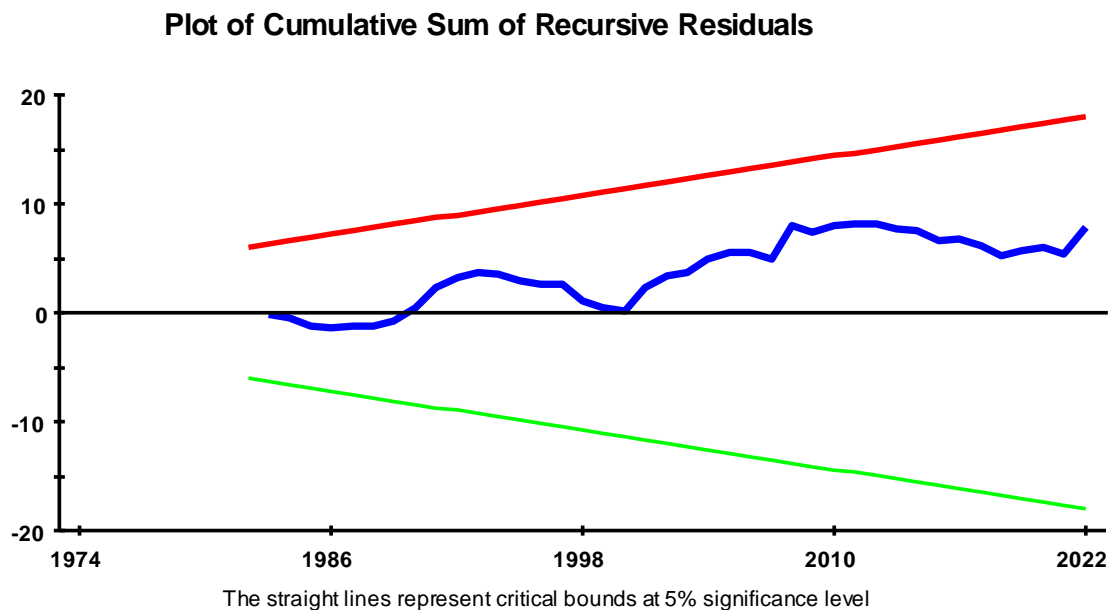
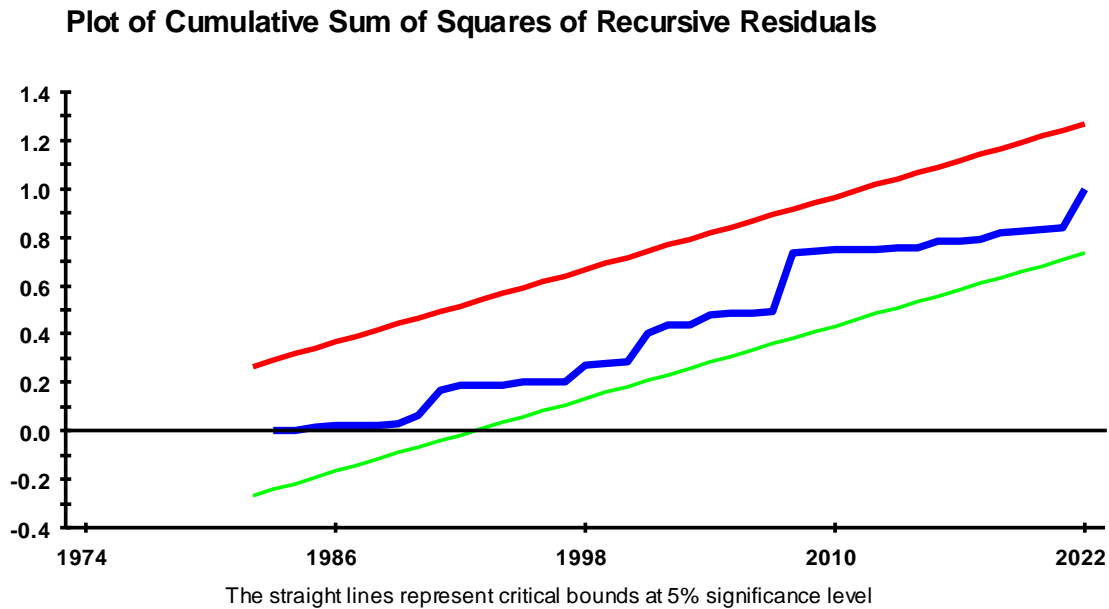


Figure 2: Cumulative sum of square of recursive residuals

The above presented graphical representation of CUSUM and CUSUM square suggest that the calculated blue solid line is found within its corresponding critical values in both graphs indicating that mean and variance of error term of the proposed model of this research are stable. Therefore, there is no evidence found of structural instability. Hence, the calculated results for the selected period of our proposed model are stable.

Conclusion

This study is designed to investigate the role of monetary policy in the form of nominal money supply; oil rents, exchange rates and economic growth on domestic prices for the case of Pakistan's economy. This research uses ADF unit root test and findings confirm the mixed integrated order of the data series. ARDL bounds test is used for finding long run equilibrium between domestic prices and its factors and results validate the evidence of long run cointegrating relation. After this, results also suggest that money supply has significant and increasing effects on domestic prices confirming the causality hypothesis for Pakistan. The results further expose that economic growth; exchange rate and oil rents have statistical significant and boosting effects on consumer prices in long and short run in Pakistan. These findings are cross-verified by diagnostic tests suggesting reliability of the results.

This research suggests that increase in exchange rate and increase in money supply may be regulated in such a way that it should not boost consumer prices. Besides this, increase in oil rents and domestic production is also good for the economy but regulators may see that increase in these indicators must remain greater than the increase in prices so that gain in increase must remain greater than the cost in the form of increase in prices.

References

- Alharthi, M., & Hanif, I. (2020). Impact of blue economy factors on economic growth in the SAARC countries. *Maritime Business Review*, 5(3), 253-269. <https://doi.org/10.1108/MABR-01-2020-0006>
- Blinder, A. S. (1982). The Anatomy of Double-Digit Inflation in the 1970s. In *Inflation: Causes and Effects*, edited by Robert E. Hall, 261–82. Chicago: University of Chicago Press.
- Dickey, D. A., & Fuller, W. A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica*, 49(4), 1057-1072.
- Ellahi, N. (2017). The Determinants of Inflation in Pakistan: An Econometric Analysis. *The Romanian Economic Journal*, 20(64), 2-12.
- Gola, A. A., Qamri, G. M., Panhyar, A., Khan, Q. R., & Ali, I. (2023). Analysing the Role of Money Supply on Inflation: A case Study of Pakistan. *iRASD Journal of Economics*, 5(4), 1162-1176.
- Hanif, I. (2018). Impact of economic growth, nonrenewable and renewable energy consumption, and urbanization on carbon emissions in Sub-Saharan Africa. *Environmental Science and Pollution Research*, 25(15), 15057-15067. <https://doi.org/10.1007/s11356-018-1753-4>
- Hanif, I., Chaudhry, I. S., & Wallace, S. (2014). Fiscal autonomy and economic growth nexus: Empirical evidence from Pakistan. *Pakistan Journal of Social Sciences*, 34(2), 767-780.
- Hanif, I., & Gago-de Santos, P. (2017). Impact of fiscal decentralization on private savings in a developing country: Some empirical evidence for the case of Pakistan. *Journal of South Asian Development*, 12(3), 259-285. <https://doi.org/10.1177/0260107917735403>
- Hanif, I., Wallace, S., & Gago-de-Santos, P. (2020). Economic growth by means of fiscal decentralization: an empirical study for federal developing countries. *SAGE Open*, 10(4), 2158244020968088. <https://doi.org/10.1177/2158244020968088>
- Hashem, H. A. S. (2024). Measuring the Impact of Exchange Rate Changes on Imported Inflation in Iraq. *World Economics and Finance Bulletin*, 32, 166-179.
- Huang, Y., Raza, S. M. F., Hanif, I., Alharthi, M., Abbas, Q., & Zain-ul-Abidin, S. (2020). The role of forest resources, mineral resources, and oil extraction in economic progress of developing Asian economies. *Resources Policy*, 69, 101878. <https://doi.org/10.1016/j.resourpol.2020.101878>
- Iqbal, M. A., Nadim, N., & Akbar, Z. (2022). Determinants of Recent Inflation in Pakistan and its Relation with Economic Growth: An Econometric Analysis. *Pakistan Journal of Humanities and Social Sciences*, 10(1), 345-353.
- Islam, M. S. (2022). Impact of socioeconomic development on inflation in South Asia: evidence from panel cointegration analysis. *Applied Economic Analysis*, 30(88), 38-51.
- Kahssay, T. (2017). Determinants of inflation in Ethiopia: A time-series analysis. *Journal of Economics and Sustainable Development*, 8(19), 1-6.
- Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*. Macmillan and Company.
- Khan, A., Khan, A., & Ullah, I. (2023). Exploring Macroeconomic Determinants of Inflation in Pakistan; Fresh Insights from Vector Autoregressive Analysis. *Journal of Economic Sciences*, 2(2), 127-138.

- Mishkin, F. S. (2007). *The Economics of Money, Banking, and Financial Markets*. Pearson Education.
- Mukhtarov, S., Mammadov, J., & Ahmadov, F. (2019). The Impact of Oil Prices on Inflation: The case of Azerbaijan. *International Journal of Energy Economics and Policy*, 9(4), 97-102.
- Nazli, A., Siddiqui, R., & Hanif, I. (2018). Trade reforms and productivity growth in manufacturing industries of Pakistan. *Review of Economics and Development Studies*, 4(2), 199-207.
- Pesaran MH, Richard J, Shin Y (2001) Bounds Testing Approaches to the Analysis of Level Relationships. *J Appl Econom* 16(3): 289-326.
- Qasim, T. B., Ali, H., Baig, A., & Khakwani, M. S. (2021). Impact of exchange rate and oil prices on inflation in Pakistan. *Review of Economics and Development Studies*, 7(2), 177-185.
- Roncaglia de Carvalho, A., Ribeiro, R. S., & Marques, A. M. (2018). Economic development and inflation: a theoretical and empirical analysis. *International Review of Applied Economics*, 32(4), 546-565.
- Sultana, N., Koli, R., & Firoj, M. (2019). Causal relationship of Money Supply and Inflation: A Study of Bangladesh. *Asian Economic and Financial Review*, 9(1), 42-51.
- Stylianou, T., Nasir, R., & Waqas, M. (2024). The relationship between money supply and inflation in Pakistan. *Plos one*, 19(3), 1-13, Article # e0301257. <https://doi.org/10.1371/journal.pone.0301257>
- Uddin, I., & Ullah, R. (2024). The Nexus Amongst the Interest Rate, Inflation and Economic Growth in Pakistan: Evidence from Simultaneous Equation Modeling. *Economic Alternatives*, 1, 45-58.
- Uddin, S., Chowdhury, N. M., & Hossain, M. A. (2014). Determinants of inflation in Bangladesh: An econometric investigation. *Journal of World Economic Research*, 3(6), 83-94.
- Wang, J., Hassan, M. S., Alharthi, M., Arshed, N., Hanif, I., & Saeed, M. I. (2022). Inspecting non-linear behavior of aggregated and disaggregated renewable and non-renewable energy consumption on GDP per capita in Pakistan. *Energy Strategy Reviews*, 39, 100772. <https://doi.org/10.1016/j.esr.2021.100772>
- World Bank (2024). *World Development Indicators*. World Bank, Washington, D.C.