Policy Research Journal
ISSN (E): 3006-7030 ISSN (P) : 3006-7022 Volume 4, Issue 4, 2026

TRANSMISSION OF OIL PRICE SHOCKS TO PAKISTAN'S MONEY MARKET: AN INTERTEMPORAL ANALYSIS USING ERROR-CORRECTION MODEL AND IMPULSE RESPONSE FUNCTIONS

Bilal Aftab[1], Rubina Ilyas[2], Hidayat Ullah Khan[*3]

[1,2]*Pakistan Institute of Development Economics (PIDE)*
[*3]*Department of Economics, National University of Modern Languages (NUML), Islamabad*

[*3]hidayat.ullah@numl.edu.pk

DOI: http://doi.org/10.5281/zenodo.19724105

Keywords
Oil price shocks; Money market; Error-correction model; Impulse response functions; Pakistan

Article History
Received: 17 March 2026
Accepted: 05 April 2026
Published: 21 April 2026

Corresponding Author: *
Hidayat Ullah Khan

Abstract
The Iran-US war and the subsequent blocking of the Strait of Hormuz have triggered a severe energy crisis, driving global oil prices above $100 per barrel. For Pakistan, this is not merely a price shock but a structural policy bind. This study employs an error-correction model to quantify the money market's adjustment following the February-March 2026 disruption. Impulse response functions show that a unitary inflation shock reduces real demand for both M1 and M2, with the effect peaking after three months and dissipating after one year for M1 and after 1.5 years for M2. The oil shock arrives just as the SBP was poised to ease policy, forcing a conventional monetary dilemma. The key takeaway is that the money market requires a prolonged adjustment process. In the short term, the SBP should preposition liquidity facilities to manage the three-month peak inflation window while maintaining a tight liquidity stance through OMOs for the next 6-9 months to counter rupee depreciation and rising import costs. Over the medium term, formalizing a Hormuz contingency corridor for the policy rate would anchor expectations by signaling that rates will stay elevated until the speed of adjustment for M2 shows structural improvement. In the long term, using FX swaps instead of outright spot purchases can help build reserves without accelerating the contraction of M1, allowing for a smoother adjustment path.

1. Introduction

Amid any negative price shock, the pertinent focus of the State Bank of Pakistan's (SBP) monetary policies is to stabilize the prices (Ahmad et al., 2025). The synchronization of oil price shocks with high inflation is evident from previous global crises (Demirer et al., 2020). A severe energy crisis has been caused by the Iran-US war that heightened in March 2026 (Al-Rashi & Benali, 2026). The international prices of crude oil increased to over $100 per barrel after the Strait of Hormuz was blocked (Faria, 2026), through which about 20 percent of world oil is controlled (Ulrichsen & Krane, 2026). The Russia-Ukraine war showed Pakistan's macroeconomic vulnerability to energy prices. Back then, the impact on Pakistan was due to an indirect oil price spike across the globe. Now, with the Middle East as the battleground, the threat to the economy is via a constrained energy supply. The latter could disrupt the entire energy system, as Pakistan relies heavily on the 33-kilometer Hormuz for its energy imports. Pakistan imports over 85% of its crude oil via the Strait of Hormuz (Rashid et al., 2026).

The energy shock travels through Pakistan's economy in simultaneous waves. First, the price bind: global oil prices surge drives inflation. Every $10 rise in Brent crude adds 0.5–0.6% points to Pakistan's CPI (Kimani, 2026). JP Morgan Chase has modelled Brent at $120 per barrel under sustained disruption, enough to add 6-7 percentage points to consumer prices and erase two years of painful IMF-mandated disinflation in a single quarter (Kirimani, 2026a). Second, and structurally more hazardous, the policy bind. Pakistan's petroleum import bill was $11.3 billion in FY2025, roughly 20% of total imports (Shah et al., 2025). With global oil at $120 per barrel and the added cost of rerouting premiums, that bill could exceed $15 billion on an annualized basis (Kimani, 2026). This would widen the current account deficit, weaken the rupee, and raise the cost of every subsequent energy import, creating a self-reinforcing spiral.

The impact of oil price shocks on the macroeconomic and financial systems has been well studied in the literature since the pioneering work of James D. Hamilton (1983), who showed that oil price increases act as an adverse supply side shock that raise costs of production, reduce output, and lead to inflation. Later studies have refined this result by separating different kinds of oil price shocks. Specifically, Lutz Kilian (2009) found that oil price changes induced by global demand and supply shocks as well as oil price volatility have different effects on key macro variables and the responses of inflation and monetary policy. This is an important distinction for understanding transmission mechanisms in open economies where external shocks are filtered through domestic policy regimes. In the same manner, Katircioglu et al. (2015) find that the increasing oil prices has an upward pressure on interest rates as the monetary authorities react to the inflationary threat. These reactions have immediate consequences on money markets where short-term rates are quick to respond to changes in policy stance and liquidity situation. Furthermore, Kilian (2009) argues that central banks may confuse the type of oil shocks and react in a way that increases the macroeconomic volatility rather than dampen it.

The connection between oil price shocks and financial markets, particularly money markets, has been extensively reported. Apergis and Miller (2009) provide evidence that financial asset prices are also affected by a structural oil market shock, while Filis et al. (2011) report strong dynamic correlations between oil prices and financial markets, driven mainly by inflation expectations and risk reallocation. In the scope of short-term financial market, there is evidence that volatility of oil prices impacts on interbank rates, treasury yields and conditions of liquidity by way of portfolio rebalancing, expectations of monetary tightening, among other factors. Narayan and Narayan (2010), drawing on evidence from the emerging markets, stress that oil price shocks are a source of increased financial market volatility, particularly so for those countries with a less developed financial system. In a similar vein, Arouri et al. (2012), demonstrate that oil price shocks are strongly transmitted to financial markets, boosting uncertainty and influencing short-run borrowing rates.

Oil price shocks also play a more substantial, but still asymmetric, role in the real output growth rates of oil-exporting and oil-importing developing countries. Malik (2010) analyzes the impact of oil price shocks on the economy of Pakistan and concludes that the oil price shocks significantly and persistently affect the output leading to higher inflation and worsening of external account. These are usually propagated through the exchange rate channel as the effects of the higher oil import bills on the demand for foreign currency cause depreciation and add to upward pressure on prices (Kandil & Mirazaie, 2005). Research utilizing VAR and cointegration methodologies uniformly identifies the adjustment of the money supply, interest rates, and financial market conditions to oil price shocks, seeing more dramatic reactions among short-term interest rates compared to long-term rates (Ngobeni & Dagume, 2026; Daboh et al., 2024; Fernandez, 2015).

In Pakistan's context, the theoretical studies indicate a two-way complex relationship between oil price shocks and monetary and financial aggregates. Malik (2010) also reveals a long-run association between oil prices, output and inflation and proposes oil price shocks as the key determinant in the macroeconomic performance.

Furthermore, some results with Pakistani data suggest that surges in oil prices cause inflationary pressure, necessitating monetary tightening by the State Bank of Pakistan resulting in higher interbank rates and draining the liquidity from the banking sector (Ahmad et al., 2025). These forces are compounded by the exchange rate channel, where surging oil prices also deplete foreign reserves and induce currency depreciation, which itself feeds inflation (Iqbal & Raza, 2018).

1.1 Oil Price Shocks and Monetary Transmission

There are three channels that transmit oil price shocks to domestic prices (Razmi et al., 2016). First, the inflation channel: oil price shocks drives up headline inflation by directly increasing the cost of energy products and indirectly increasing the manufacturing and transport costs i.e., the supply chain pressures. This often pushes the SBP to tighten monetary policy despite slow economic growth. In turn, the second channel is the liquidity channel whereby the inflation-induced economic downturn reduces liquidity in the financial sector. However, the liquidity effects are asymmetric: an increase in oil price can lead to better liquidity conditions as well. In any case, policy coordination is necessary to maintain price stability. Lastly, there is the expectations channel. An oil shock alters the inflation expectations of both firms and households, prompting the SBP to adjust policy rates to counter any second-round effects.

Being a net oil importer, an exogenous output of global oil prices brings about a substantial and enduring inflationary pressure, causing the domestic currency, PKR to depreciate. This is the major vehicle by which oil shocks are transmitted to the money market in Pakistan (Iqbal & Raza, 2018). In turn, exchange rate shocks have a significant impact on the narrow money (M1) and interest rates. The demand for broad money (M2), amid an oil market shock, results in asymmetrical responses (Jones & Leiby, 1996). Further, oil shock impacts can stimulate the demand for local currency cash balances as agents restructure portfolios in the face of uncertainty.

2. Theoretical Framework

The variables that constitute the money demand function as well as defining the demand for money has gained considerable attention in both the distant past and recent past. Money demand is a broad concept which means defining it from angle cannot be justified. The literature evidence from time series does not accept the view of incorporating anything more than currency in circulation and demand deposits to attain a stable money demand function (Meltzer, 1963).

The Quantity Theory of Money (QTM) explains that money supply and money demand determine price. In simple terms, an increased change in price is inflation. Inflation affects the nominal interest rate via the fisher effect (Fisher, 1907). And the nominal interest rate affects money demand. This paper is backed by the economic theory (Friedman, 1956) that there is a positive relationship between real money demand and real income. On the other hand, there is a negative relationship between real money demand and inflation & nominal interest rates. In line with the theory, this analysis is based on the following assumptions: one, the rate at which the money is circulated from one hand to another is not constant. Two, inflation is not a complete monetary phenomenon. Three, supply of money is exogenous. Four, real money demand is stable.

3. Data and Methodology

The data has been taken for a time-period of around 10 years from quarter 3 of 2016 to quarter 1 of 2026 from the State Bank of Pakistan's (SBP) database.

Table 1 Variables Description and Data Sources

Variable	Indicator	Source	Frequency	Seasonal Adjustment
Demand for Money, *M1*	Real M1 (currency in circulation + demand deposits)	SBP	Quarterly	Yes
Demand for Money, *M2*	Real M2 (M1+ time deposits	SBP	Quarterly	Yes
Real Income, *Y*	Real GDP	SBP	Quarterly	Yes
Nominal Interest Rate, *R*	Three-month T-Bill rates	SBP	Quarterly	Yes
Inflation Rate, π	ΔConsumer Price Index, CPI	SBP	Quarterly	Yes

All the variables are adjusted seasonally i.e., a statistical method for removing the seasonal component of a time series that exhibits a seasonal pattern, for the purpose of data smoothing (Maravall, 2001). Seasonally adjusted data provides a clearer view of trends and cyclical data that would otherwise be overshadowed by the seasonal differences. The influences make it difficult to see underlying changes in the data. Statisticians use seasonal adjustment to control these influences. Controlling of seasonal influences allows measurement of real term changes; short- and long-term patterns of growth or decline; and turning points.

3.1 Chow Approach

Table 2 Test for Structural Break

Wald Test for Structural Break: Known Break Date	
No. of observations	38
Sample	2016q4 – 2026q1
Break Date	2021q4
H0	No structural break
chi2 (4)	3.8356
Prob > chi2	0.4287
Exogeneous variables	GDP, Interest Rate, & Inflation
Coefficients included in test	GDP, Interest Rate, Inflation, & Constant

At 5% significance level, it is concluded that there is no structural break in the data. Hence, Augmented Dicky-Fuller (ADF) test for unit root is applicable. Table 3 summarizes the ADF tests at both level and first difference, respectively.

Table 3 Augmented Dicky-Fuller Test for Unit Root

Variable	ADF	CV	Decision	Lags	Trend
Level					
M1	0.064	-2.964	Unit Root	0	Yes
M2	0.070	-2.964	Unit Root	0	Yes
R	-1.327	-2.964	Unit Root	0	No
Y	-1.079	-2.964	Unit Root	0	Yes

Variable	ADF	CV	Decision	Lags	Trend
π	-1.416	-2.964	Unit Root	0	Yes
First Difference					
M1	-8.619	-2.966	Stationary	0	No
M2	-10.127	-2.966	Stationary	0	No
R	-3.936	-2.966	Stationary	0	No
Y	-8.101	-2.966	Stationary	0	No
π	-4.818	-2.966	Stationary	0	No

At level, for all the variables, the absolute ADF value is less than the absolute critical value at 5% significance level. Hence, it is deduced that all the data series are non-stationary at level. This implies the need to take first differences. In turn, at first difference, for all the five variables, the absolute ADF value is greater than the absolute critical value at 5% significance level. Hence, it is concluded that all the data series are now stationary at first difference.

3.2 Model Specification

$$\frac{M^d}{P} = f(y, r, \pi)$$

where M^d denotes nominal money demand, P price level, y real income, r nominal interest rate, and π inflation rate (Friedman, 1956). In step 1, the long-run OLS equation is estimated for both M1 and M2, respectively:

$$\Delta log\left(\frac{M^d}{P}\right)_t = \alpha + \beta_1 \Delta log y_t + \beta_2 \Delta r_t + \beta_3 \Delta log \pi_t + u_t$$

In turn, the error-correction model is estimated in step 2 for both M1 and M2, respectively:

$$\Delta log\left(\frac{M^d}{P}\right)_t = \alpha_0 + \alpha_1 \Delta log\left(\frac{M^d}{P}\right)_{t-1} + \beta_1 \Delta log y_t + \beta_2 \Delta log y_{t-1} + \beta_3 \Delta r_t + \beta_4 \Delta r_{t-1} + \beta_5 \Delta log \pi_t + \beta_6 \Delta log \pi_{t-1} + \gamma \varepsilon_{t-1} + u_t$$

3.3 Post-VAR Estimation

Table 4 Johansen Co-Integration Test

Maximum Rank	Trace Statistic	Parms	5 % CV
0	16.4236	8	12.53
1	2.9171*	11	3.84
2		12	

H_0 = There is no Co-integration.
H_1 = There is Co-integration.
Thus, at I (1) there is a Co-integration (Long Run Relationship). Considering the trace test statistics i.e., the rank is 2; hence at Rank 2 and onwards, there is no co-integration detected.

4. Results

4.1 Money Market Adjustment Process

The oil shock diminishes reserve money (M0) as the SBP withdraws liquidity to protect the domestic currency. Post-shock, to compute the speed of adjustment i.e., the time taken for Pakistan's money market to converge back to equilibrium level, this analysis employs the error-correction model (ECM). The disequilibrium term of the model reflects the speed of adjustment, γ.

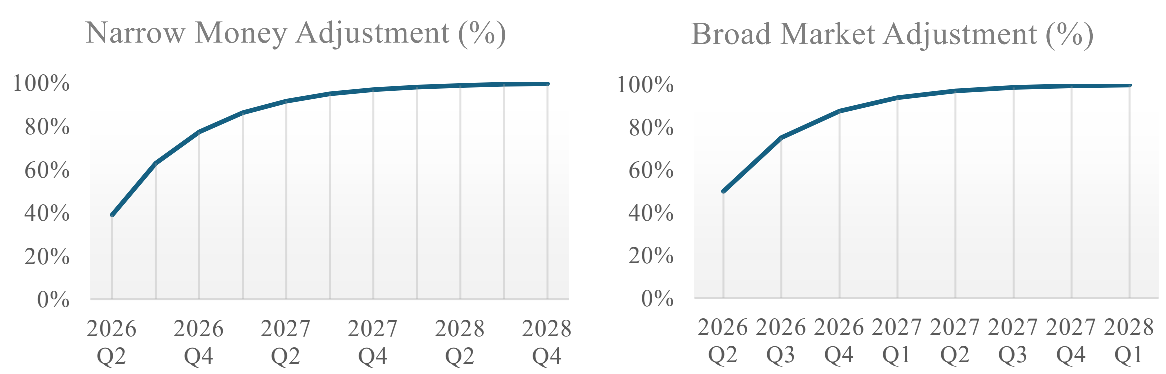
Table 5 Post-Oil Shock Speed of Adjustment for M1 and M2

Variable	γ	SE	t	P > |t|
ε_{t-1} (M1)	-.3899194	.1809428	-2.15	0.040
ε_{t-1} (M2)	-.4987932	.1657173	-3.01	0.005

Note: ε_{t-1} is the disequilibrium term

For M1, the speed of adjustment is around 39% per quarter after the oil shock disruption in February-March 2026. At this rate, the narrow money is expected to adjust back to equilibrium level by the end of 2028. On the other hand, the speed of adjustment for M2 is around 50% per quarter after the oil price shock. At this rate, the broad money is expected to adjust back to equilibrium level by the start of 2028. Thus, the money market requires an adjustment process by the SBP.

Figure 1 Post-Oil Shock Adjustment Period for M1 and M2

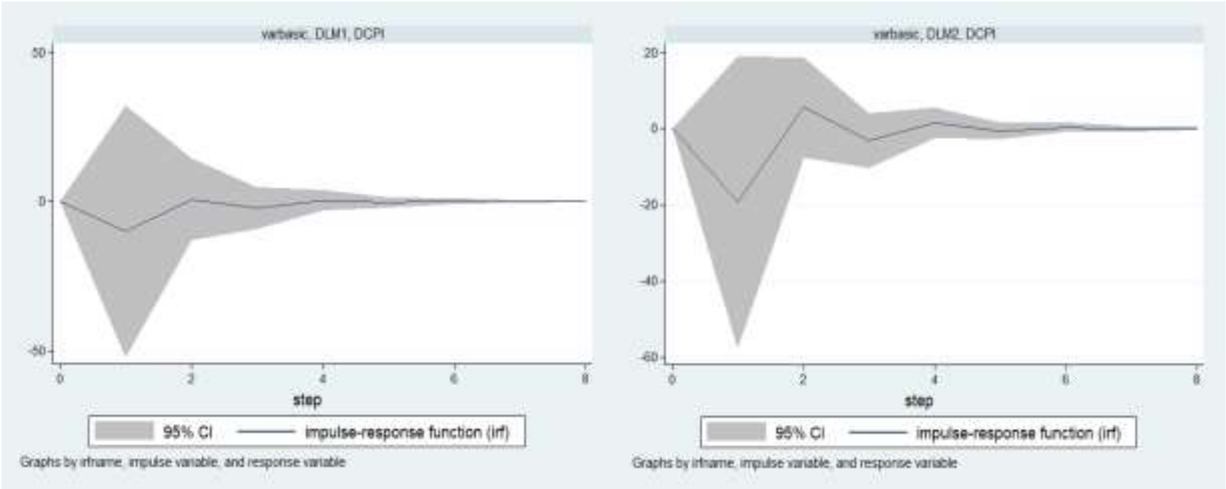


Source: Authors' calculations using SBP data

4.2 Impulse Response Functions

A one-unit change in global oil prices, in the long term, translates into persistent inflationary effects. The war-induced inflationary push is likely to cause demonetization. It would first shrink the broad money (M2) in real terms before an increase in nominal terms, which is in line with the previously observed asymmetries (Warburton, 2022).

Figure 2 Inflation-Induced Impulse Response Functions for M1 and M2



Source: Authors' computing using SBP data

A unitary shock in the inflation rate significantly reduces the real demand for narrow money (M1). The decrease peaks after 3 months. After 1 year, the effect dissipates. Similarly, a unitary shock in the inflation rate considerably reduces the real demand for broad money (M2). Like in the case of M1, the decrease peaks after 3 months. After 1.5 years, the effect dissipates. This implies that the purchasing power of individuals is likely to fall until May 2026 with the effect of the oil shock induced inflation dissipating in the first quarter of 2027 for M1 and the third quarter of 2027 for M2.

5.Monetary Policy Implications

The revived inflationary pressures come as an unpleasant surprise since the SBP was on the verge of shifting to monetary easing after long period of tightening. The plateau of the policy rate in the second half of 2025 was a reaction of the central bank to the inflationary pressures, despite an increase in M2. In FY2024-25, the SBP bought more than $8 billion from the local interbank market to replace the reserves, which went up to about $14.5 billion in June 2025. Enhancing external buffers, this intervention at the same time sucked liquidity out of the money market, providing countervailing forces on M1 and more extensive aggregates i.e., in line with Modigliani (1944).

The current oil shock presents a conventional dilemma of the monetary policy. The high levels of liquidity injections with Open Market Operations (OMOs), coupled with the anticipated fuel price increases, can force the SBP to increase the rates or withdraw liquidity to stabilize inflation expectation. The policy implications are very high. The recent oil shock makes the job for SBP difficult during a period of weak recovery. In the short-term, the SBP must strike a balance between the liquidity supply and the exchange rates stability. Over the long term, the idea of entrenching inflation expectations due to the consistent rise in oil prices may lead to the necessity of long-term high interest rates that can choke out the private credit. The fact that SBP agreed to stop the further reduction of the rate, even with the ongoing monetary expansion, demonstrates that oil shocks literally redefine the monetary policy paths of the emerging economies like Pakistan.

For the SBP, here are some policy recommendations based on the analysis done:

- **Target the 3-Month Peak Inflation Window:** The SBP should pre-position liquidity facilities for banks to manage this specific window (April to June 2026), ensuring that a temporary cash crunch does not trigger a banking sector liquidity crisis while still maintaining overall monetary tightness to stabilize inflation expectations.

- **Maintain a Tight Liquidity Stance for 6-9 Months**: The SBP must resist the urge for premature monetary easing. It is imperative that OMOs are conducted to actively absorb liquidity for at least the next three quarters (until October to December 2026) to counter the self-reinforcing spiral of rupee depreciation and import costs.
- **Formalize a Hormuz Contingency Corridor for the Policy Rate**: Instead of ad-hoc adjustments, define a new operational corridor that explicitly incorporates a premium for the $15 billion import bill scenario. This would anchor expectations by signaling that rates will remain higher until the speed of adjustment for M2 (currently around 50% per quarter) shows a structural improvement.
- **Use FX Swaps to Shield Narrow Money (M1)**: Since the M1 is expected to adjust slower than M2, the SBP should employ long-term foreign exchange swaps rather than outright spot purchases. This would allow the SBP to build reserves without accelerating the contraction of M1, giving narrow money a longer runway to adjust without overshooting.

6.Conclusion

The paper concludes that the March 2026 oil price shock forces a prolonged adjustment in Pakistan's money market, with narrow money (M1) recovering by late 2028 and broad money (M2) by early 2028. Inflation impulse responses peak after three months and dissipate within one to one-and-a-half years, creating a critical near-term policy window. To navigate the dilemma between inflation and growth, the State Bank of Pakistan should pre-position liquidity facilities, maintain tight liquidity for 6–9 months, formalize a Hormuz contingency corridor for the policy rate, and use FX swaps to protect narrow money. These measures can anchor expectations and smooth the adjustment path without exacerbating currency or credit pressures.

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