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Exchange Rate Pass-Through to Inflation in Iraq: An Endogenous Structural Breaks-Based Dynamic ARDL Analysis

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Abstract: This study examines the exchange rate pass-through (ERPT) to consumer prices in Iraq using monthly data for the period 2004-2023. Understanding the effect of exchange-rate fluctuations on the inflation rate is indispensable for macroeconomic stability in an economy characterized by a fixed exchange rate regime, high import dependence, and exposure to oil-price shocks. The analysis applies a sub-sample regime-based Dynamic ARDL (DynARDL) framework, complemented by tests for nonlinear dependence and structural investigations through multiple breaks. The results across different sub-sample regimes demonstrate that inflation dynamics are more characterized by inertia than by responses to the latest exchange rate movements. The ERPT was found to be generally weak and delayed, and sub-sample regime-dependent. The long-run effects are statistically insignificant for most periods. The evidence for cointegration between exchange rates and inflation is weak, suggesting there may be no long-term stable relationship between exchange rates and inflation. Dynamic simulations demonstrate that inflation responses to exchange rate shocks are short-lived, and in some sub-sample regimes even go against standard theoretical expectations. These findings suggest that the exchange rate management alone is not sufficient to control inflation in Iraq. Effective price stability demands focusing on domestic drivers, fiscal-monetary coordination, and the ability to isolate oil-related shocks.

Keyword: Exchange rate pass-through; Inflation; Cointegration test; Regime-dependence; Dynamic ARDL model

JEL Classification: L82

1. Introduction

The economy of Iraq is heavily dependent on oil, where it accounts for over 99% of its total exports and 85% of government income (The World Bank, 2022). This total dependence made the economy prone to external shocks through oil prices volatility induced shocks. Under the managed exchange rate regime, the Central Bank of Iraq (CBI) actively maintains a fixed USD/IQD exchange rate. Although this policy helps reduce import inflation, it still limits monetary policy flexibility to counter external shocks and fiscal pressures (Shambaugh, 2004).

Inflation in Iraq is a result of complex relationships involving exchange rate movements, the money supply, oil volatility, and real economic activity (Aloui & Jammazi, 2019). These dynamics have been further complicated by structural breaks driven by political instability, global financial crises, and episodes of conflict that influence both inflation and exchange-rate pass-through (ERPT) dynamics. With Iraq's fixed exchange rate and significant import dependency, it is vital to analyze the effects of exchange rate shocks on local prices to maintain price stability in a country often impacted by fluctuations in oil prices and fiscal deficits.

Existing research typically approaches ERPT in Iraq utilizing linear models (Altaee & Al-Jafari, 2019; Essa et al., 2020; Abdallah, 2025), among others. However, linear models do not effectively analyze economic time series characterized by frequent structural shifts, which distort the underlying ERPT dynamics (Bai & Perron, 1998). Diagnostic tests such as serial correlation and heteroskedasticity are sometimes not reported in earlier work, making it difficult to assess model robustness. Furthermore, many Iraq-related macroeconomic studies employ data set samples that span over two different economic systems: the economic sanctions and the post-2003 open market system (Al-Bayati et al., 2022; Al-Dulaimi et al., 2022; Essa et al., 2020; Slow, 2025; Al-Ajrawi, 2023).

Considering all that, this study investigates the exchange rate pass-through (ERPT) to inflation in Iraq, employing monthly data from 2004 to 2023. The study makes significant contributions to the existing literature. First, it focuses on post-2003 data to ensure consistency, as this period marks a drastic transformation from a sanctioned economy to an open market system, providing a stable and unified base for the analysis. Second, the study divides the sample into separate sub-sample regimes that are influenced by major economic shifts over the years, rather than assuming the whole sample behaves uniformly. Third, the study utilizes a dynamic ARDL (DynARDL) model based on the sub-sample regime to determine the ERPT dynamics and to predict the response of the economy to the shock induced by the exchange rate.

The remainder of this paper is structured as follows: Section 2, which follows the introduction, presents a review of related literature. Section 3 provides the methodology employed, which is based on a sub-sample regime-based dynamic ARDL. Section 4 presents the empirical findings and discussion, while Section 5 concludes the paper.

2. Literature Review

2.1 ERPT in Emerging and Oil-Based Economies

The literature on ERPT in oil-dependent countries like Saudi Arabia and Russia highlights incomplete ERPT, with fixed currency regimes and subsidies, plays a significant role. Habib & Kalamova (2007) report very low ERPT in Saudi Arabia (0.06 after 2 quarters) due to oil pricing in USD and subsidies, while contrasting with the much higher estimates in Russia (0.30–0.55 long-run elasticity). Carrière-Swallow et al. (2016) conclude that the average ERPT is 39% over 2 years in emerging markets with little monetary credibility, while it is 13% in advanced economies, where the latter is also heightened by counter-cyclical fiscal policy. In Iraq-focused studies, Al-Jafari & Altaee (2019) employed ARDL to demonstrate that a 1% increment in the exchange rate leads to a drop in inflation by -0.85%, together with a 34% error correction speed, while parallel market premiums cause stronger pass-through in the context of dollarization and dependence on imports. The pass-through characteristics of oil exporters indicate that, in the case of a fixed peg, the short-run effects are muted, while volatility responses are heightened; for example, Kamati (2018) states that a 1% decrease in the price of oil leads to a 10.9% increase in exchange rate volatility in Russia. Ben Cheikh & Rault (2016) and Balcılar et al. (2020) point out the non-linearities, with pass-through being higher during booms or large depreciations, which is significant in the context of Iraq's oil shocks and interventions by the Central Bank of Iraq.

2.2 ARDL and DynARDL Methodological Applications

ARDL models are very suitable for use in the case of ERPT analysis for the mixed I(0)/I(1) series in developing countries. Al-Bayati et al. (2022) employed ARDL cointegration to find that a 1% uptick in Iraq's unofficial exchange rate causes GDP to grow by 5.785%, while a 1% rise in the official rate causes a contraction of 7.666%. Abdulmuhsen Asaad (2021) has also applied the ARDL methodology to the case of Iraq's COVID era and related oil prices, exchange rates, and inflation. The studies managed structural breaks but did not address dynamic shock persistence.

DynARDL is an extension of the ARDL method that incorporates impulse response simulations, making it appropriate for non-stationary data with regime changes. Jordan and Philips (2018) pioneered the use of DynARDL for policy simulations, and they managed to seize the short/long-run asymmetries that are usually missing in static ARDL. Because DynARDL allows impulse response simulations for different lag structures, it is suitable for a framework where the economy is divided into sub-samples or regimes. There are very few applications of this method in Iraq; Khudhair and Ghadeer (2023) show that oil price fluctuations under fixed rates result in reserve depletion, but linear models fail to grasp the lagged dynamics.

2.3 Methodological Gaps Addressed by DynARDL

Caselli & Roitman (2016) have primarily utilized the conventional ARDL/ECM method, overlooking how regime-dependent dynamics vary across Iraq's intervals of disruption from 2006 to 2020. Linear models on their own cannot simulate shock persistence or impulse responses, leading to an underestimation of the nonlinearity of the ERPT in oil-pegged economies. Iraq's related studies have not employed the DynARDL method to investigate the relationship between inflation and exchange rates during break periods. Our research employs DynARDL on monthly data covering 2004–2023 and divides the data into six regimes to surpass previous limitations, notably by assessing lagged pass-through and stability, which were not addressed in earlier ARDL research.

3. Methods

The main focus of this study is to analyze the impact of ERPT on consumer prices in Iraq. ER is an important shock variable in an economy dependent on oil exports to provide its foreign currency and imports to meet consumption needs. Furthermore, economic transformations and external shocks enhance the significance of the ER-inflation relationship.

3.1 Data

The study incorporates monthly time-series data ranging from 2004m1 to 2023m12. Monthly data is preferred since ERPT effects are short to medium-term and require high frequency. The data series consists of 240 observations. It was acquired from the CBI online statistical bureau (CBI, n.d.). The primary variables are:

Consumer Price Index (CPI): the retail price indicator used to measure the rate of inflation.

Nominal Exchange Rate (ER): the nominal USD/IQD rate, monitored by the Central Bank of Iraq to maintain stability. It serves as a factor that influences imported inflation significantly.

The variables were transformed into natural logs to stabilize variance and express the results as elasticities. The dataset is limited to post-2003 data to ensure consistency with a single economic system and avoid distortions from the sanctions-era economy.

3.2 Model Specification

This study primarily focuses on assessing how ERPT impacts Iraq's consumer price index through the ER pathway. The structural equation of the base model is:

$$CPI_t = f(ER_t) \quad (1)$$

To reflect the ratios and mitigate the effect of variances, the model utilizes a log-linear format:

$$\ln CPI_t=\beta_0+\beta_1 \ln ER_t+e_t \quad (2)$$

To account for effects that occur with a temporal lag, the estimation of independent and dependent variables is performed using an ARDL (Autoregressive Distributed Lag) model.

$$\ln CPI_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \ln CPI_{t-i} + \sum_{j=0}^{q_1} \beta_{1j} \ln ER_{t-j} + e_t \quad (3)$$

Inflation can be affected by its own previous values, known as autoregressive or memory effects, and macroeconomic variables through lagged terms may also contribute to this influence. Thus, this method aids in the separation of the short-term and long-term relationships.

The model is then converted into an Error Correction Model (ECM) to simultaneously get an estimate for both dimensions and to conduct a cointegration analysis:

$$\Delta \ln CPI_t = \alpha_0 + \beta_0 \ln CPI_{t-1} + \beta_1 \ln ER_{t-1} + \sum_{i=1}^{p_1} \alpha_{1,i} \Delta \ln CPI_{t-i} + \sum_{j=0}^{q_1} \theta_{1,j} \Delta \ln ER_{t-j} + e_t \quad (4)$$

The long-time equilibrium connection can be illustrated by means of the error correction term (ECT), which signifies the extent of the deviation from equilibrium and the rate of return to equilibrium:

$$ECT_{t-1} = \ln CPI_{t-1} - \phi_1 \ln ER_{t-1}$$

The equation can be rewritten as follows:

$$\Delta \ln CPI_t = \alpha_0 + \lambda ECT_{t-1} + \sum_{i=1}^{p_1} \alpha_{1,i} \Delta \ln CPI_{t-i} + \sum_{j=0}^{q_1} \theta_{1,j} \Delta \ln ER_{t-j} + e_t \quad (5)$$

A significantly negative λ value confirms the existence of a long-run co-integration relationship and also informs about the speed of inflation contraction to its equilibrium path following a shock. A more compact expression can be given as follows:

$$\Delta \ln CPI_t = \alpha_0 + \lambda ECT_{t-1} + \text{short-run dynamics} + e_t \quad (6)$$

This research chooses the ARDL method, which is capable of including variables with different integration orders, I(0) and I(1), without the need to run a cointegration test among all variables first (Pesaran et al., 2001). Its ability to handle different types of data makes it very fitting for Iraq's macroeconomic data, where the variables like CPI and ER have different stationarity properties.

According to Jordan and Philips (2018), the dynamic ARDL (DynARDL) simulation techniques are effectively used to assess the influence of independent variable shocks on the dependent variable over both short-term and long-term periods. The simulations provide dynamic multipliers and impulse responses, helping the readers to understand the timing, persistence, and strength of pass-through effects in Iraq's ever-changing macroeconomic and policy environment easily.

3.3 Data Transformation and Construction

The CPI series required harmonization before estimation because the raw data consisted of multiple CPI series constructed under different base-year conventions, which made direct concatenation inappropriate for time-series analysis. In order to resolve these problems, the CPI was adjusted to a common base year and chain-linked. The method of retropolation was first elected as it helps to maintain the historical growth patterns; however, it was turned down after the results during the overlapping periods conflicted with the official IMF yearly inflation values used for control purposes. In contrast, a geometric splicing procedure was used. This approach preserves the multiplicative growth features, allows for smooth changes over base-year modifications, and maintains the short-term dynamics. The final CPI series closely matches the IMF inflation data, providing external validation. The employed procedure avoids distorting the data which can impact dynamic estimation by dealing with level inconsistencies without altering growth rates or volatility. This is of great importance for ARDL and DynARDL models in particular since they are very sensitive to data discontinuities.

4.1 Pre-Estimation Diagnostic Tests

4.1.1 The BDS test for lnCPI and lnER

Following (Broock et al., 1996), the Brock-Dechert-Scheinkman (BDS) test was applied. As shown in Table 1, the BDS statistics range from 20.44 to 33.18 for lnCPI and from 38.80 to 50.91 for lnER, with p-values effectively zero ($p < 0.001$) across all neighborhood sizes (0.5-2.5 standard deviations) and embedding dimensions ($m = 2$-3). Therefore, we rejected the IID (Independent and Identically Distributed) hypothesis for both series, indicating strong nonlinear dependence and justifying the use of a nonlinear ARDL framework and dynamic simulations to analyze the inflation-exchange rate relationship.

Table 1. *BDS test for nonlinear dependence in lnCPI and lnER*

Variable	n (adj.)	ε Range (sd)	m Range	BDS Stat Range	p-value	IID
lnCPI	238	0.5 - 2.5	2 - 3	20.44 - 33.18	0.000***	Rejected
lnER	238	0.5 - 2.5	2 - 3	38.80 - 50.91	0.000***	Rejected

Notes: *The null hypothesis is IID. All p-values are effectively 0 (p < 0.001).*

4.1.2 Structural Breaks

Following Bai & Perron (1998), a Bai & Perron test for structural break detection was employed. A supF of (184.48) confirmed that indeed structural breaks exist, and five structural breaks around 2006m12, 2011m11, 2014m11, 2017m11, and 2020m11 have been identified in total. The identified structural breaks disrupt the stability and continuity of the regression relationship, which necessitates dividing the full sample into six distinct sub-sample regimes to accurately capture the different economic conditions and dynamics present during each period.

Table 2. *Structural Break Regimes and Their Macroeconomic Context in Iraq (2004-2023)*

Regime	Start	End	Obs	Percentage	Era Characteristics
1	2004m1	2006m12	36	15.00	Political instabilities (U.S. invasion, insurgency, sectarian war), CBI Rebuilding.
2	2007m1	2011m11	59	24.58	2008 financial crisis and the consequent oil price crash, Political instabilities
3	2011m12	2014m1	36	15.00	Increased government expenditures, high oil prices
4	2014m12	2017m11	36	15.00	ISIS conflict, 2014-16 Oil Price Collapse (World Bank, 2018)
5	2017m12	2020m11	36	15.00	COVID-19 pandemic and the Russia–Saudi Arabia oil price war (Kellogg, 2020)
6	2020m12	2023m12	37	15.42	Local currency devaluation, volatile oil prices, and excessive government expenditure

4.2 Descriptive Statistics

Table 3. *Statistical description of variables*

Regime	Var.	Mean	Std. Dev.	Min	Max	Skew	Kurt	JB	P-Value
1	lnCPI	3.807	0.324	3.313	4.422	0.228	1.881	5.40	0.067*
	lnER	7.288	0.013	7.238	7.305	-2.135	7.636	21.63	0.000***
2	lnCPI	4.492	0.035	4.417	4.564	0.182	2.243	2.82	0.244
	lnER	7.082	0.029	7.065	7.173	1.526	4.175	15.95	0.0003***
3	lnCPI	4.622	0.020	4.572	4.664	-0.313	2.628	0.81	0.666
	lnER	7.061	0.000	7.061	7.064	4.514	22.648	45.93	0.000***
4	lnCPI	4.651	0.009	4.639	4.677	1.213	3.879	9.04	0.010*
	lnER	7.070	0.006	7.061	7.077	-0.674	1.500	18.82	0.000***
5	lnCPI	4.650	0.005	4.642	4.662	0.349	2.540	1.10	0.578
	lnER	7.075	0.000	7.075	7.077	1.927	4.825	16.02	0.000***
6	lnCPI	4.758	0.041	4.681	4.814	-0.188	1.775	7.42	0.024**
	lnER	7.244	0.050	7.170	7.279	-0.773	1.621	14.42	0.000***

Note: *Significance levels: * 10%, ** 5%, *** 1%*

We started by generating monthly dummies. Then we ran a regression of dummies, one regime at a time, to check for significant months. All of the generated dummies for the 6 regimes were insignificant indicating no seasonality in the data. The descriptive statistics from Table 3, Figure1 and 2 reveal that the inflation curve is upward, the volatility is low, and almost symmetrically distributed in most regimes. The rising pattern suggests that inflation persistence, possibly resulting from external economic shocks or internal policy decisions, requires careful analysis to understand its impact on the broader economy. The Jarque-Bera test result indicates that lnCPI is generally normally distributed, apart from mild deviations in regimes 1 and 4. Conversely, the exchange rate data showed significant deviation from normality across all regimes and tests performed. The non-normality of exchange rates that has been detected may be attributed to the structural disturbances and the changing nature of the regime that are impacting Iraq's economy, for example, the central bank's strict control of the peg; thus, it is necessary to use non-normal and asymmetric behavior modeling techniques in the exchange rate-inflation analysis.

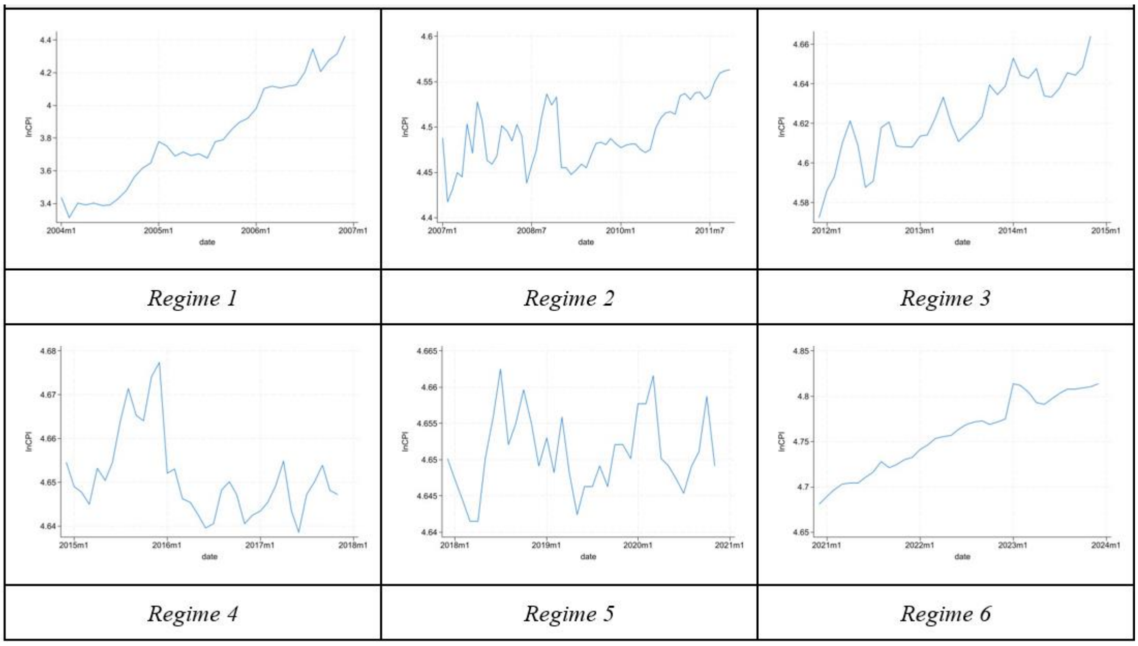


Figure 1. *lnCPI Time Plots*

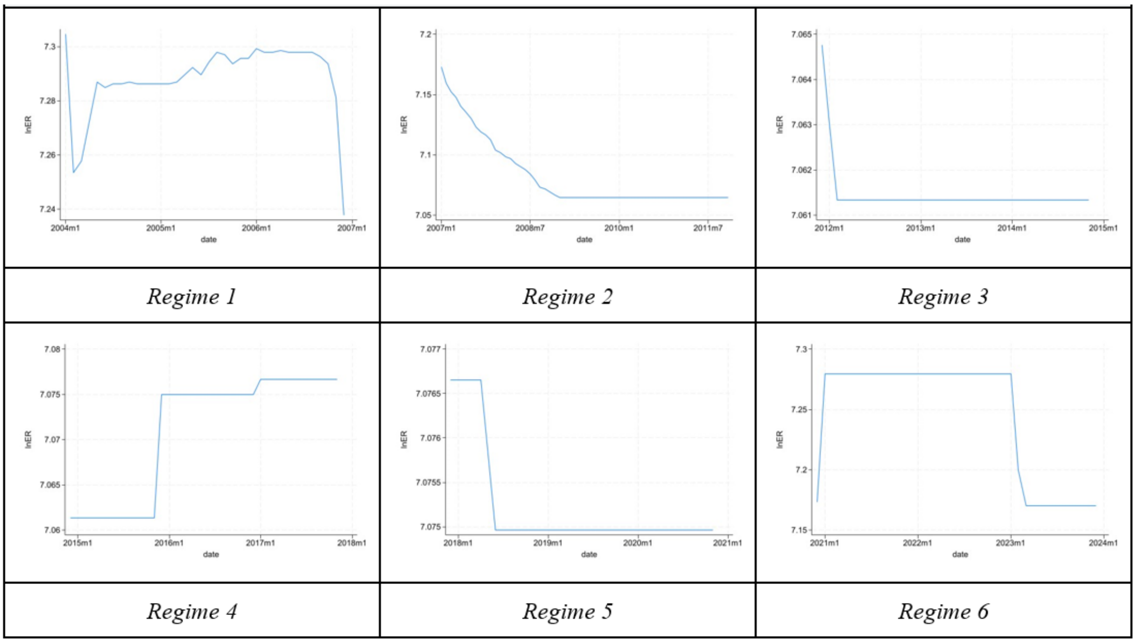


Figure 2. *lnER Time Plots*

4.3 DynARDL Estimation Steps

4.3.1 Unit Root Test (UNR)

Table 4. *ADF & PP Unit Root Test Results*

		ADF				**PP**			
		Intercept		**Trend + Intercept**		**Intercept**		**Trend + Intercept**	
Regime	**Variables**	**P-val**	**t-St**	**P-val**	**t-St**	**P-val**	**t-St**	**P-val**	**t-St**
1 CPI I(1) ER I(1)	lnCPI	0.985	0.514	0.047**	-3.436	0.993	0.905	0.041**	-3.487
	ΔlnCPI	0.000***	-7.475	0.000***	-7.448	0.000***	-7.609	0.000***	-7.596
	lnER	0.356	-1.850	0.780	-1.631	0.130	-2.444	0.321	-2.514

		ADF				**PP**			
		Intercept		**Trend + Intercept**		**Intercept**		**Trend + Intercept**	
Regime	**Variables**	**P-val**	**t-St**	**P-val**	**t-St**	**P-val**	**t-St**	**P-val**	**t-St**
	ΔlnER	0.000***	-5.350	0.000***	-6.060	0.000***	-5.425	0.000***	-4.297
2 CPI I(0) ER I(0)	lnCPI	0.058*	-2.803	0.020**	-3.733	0.062**	-2.772	0.014**	-3.846
	lnER	0.000***	-9.203	0.000***	-8.418	0.000***	-7.837	0.000***	-6.876
3 CPI I(1) ER I(0)	lnCPI	0.281	-2.014	0.019**	-3.753	0.305	-1.959	0.026**	-3.654
	ΔlnCPI	0.000***	-4.917	0.0004***	-4.850	0.0001***	-4.779	0.0007***	-4.683
	lnER	0.000***	-5.516	0.001***	-4.603	0.000***	-6.836	0.000***	-5.633
4 CPI I(1) ER I(1)	lnCPI	0.136	-2.422	0.336	-2.485	0.113	-2.510	0.274	-2.612
	ΔlnCPI	0.000***	-6.681	0.000***	-6.572	0.000***	-6.793	0.000***	-6.679
	lnER	0.652	-1.249	0.715	-1.778	0.661	-1.230	0.655	-1.899
	ΔlnER	0.000***	-6.044	0.000***	-5.987	0.000***	-6.049	0.000***	-5.992
5 CPI I(0) ER I(1)	lnCPI	0.011**	-3.391	0.060*	-3.341	0.011**	-3.405	0.057*	-3.361
	ΔlnCPI	0.000***	-7.118	0.000***	-6.996	0.000***	-7.303	0.000***	-7.166
	lnER	0.170	-2.306	0.831	-1.494	0.194	-2.236	0.772	-1.649

		ADF				PP			
		Intercept		Trend + Intercept		Intercept		Trend + Intercept	
Regime	**Variables**	**P-val**	**t-St**	**P-val**	**t-St**	**P-val**	**t-St**	**P-val**	**t-St**
	ΔlnER	0.000***	-3.499	0.024**	-3.671	0.011**	-3.408	0.036**	-3.531
6 CPI I(1) ER I(0)	lnCPI	0.117	-2.491	0.003***	-4.328	0.094*	-2.595	0.003***	-4.323
	ΔlnCPI	0.000***	-6.416	0.000***	-6.765	0.000***	-6.440	0.000***	-6.864
	lnER	0.038**	-2.965	0.000***	-6.422	0.028**	-3.078	0.000***	-5.481

Note: *Significance levels: * 10%, ** 5%, *** 1%*

2 UNR tests were employed: the ADF (Dickey and Fuller, 1979) and the PP test (Phillips and Perron, 1988). The results as listed in Table 4 indicate that regimes 1 and 4 consist of I(1), regime 2 variables are both I(0), and the rest are a combination of I(0) and I(1). The UNR reveals that variables across regimes are all I(0) or I(1), but not I(2). According to Pesaran et al. (2001), the ARDL methodology requires the series to be integrated of order zero or one to be suitable for cointegration analysis. The results of the two tests ensure the ARDL model can effectively capture the long-run equilibrium relationships between the variables.

4.3.2 ARDL Estimation

Table 5: *ARDL Estimation ECT and Long Run Results*

Regime	ARDL	Obs	R-Squared	ECT (ADJ)	SE (ECT)	PV (ECT)	LR	PV (LR)	SE (LR)
1	(1,4)	32	0.267	-0.196	0.0830	0.026**	38.518	0.000***	9.174
2	(1,2)	59	0.330	-0.211	0.089	0.021**	-0.295	0.655	0.657

Regime	ARDL	Obs	R-Squared	ECT (ADJ)	SE (ECT)	PV (ECT)	LR	PV (LR)	SE (LR)
3	(3,0)	36	0.314	-0.131	0.085	0.133	1.333	0.954	22.898
4	(1,2)	36	0.457	-0.316	0.147	0.040**	-0.912	0.044**	0.433
5	*Estimation failed due to collinearity*								
6	(4,0)	37	0.322	-0.105	0.038	0.010***	-0.206	0.47	0.279

Note: *Significance levels: * 10%, ** 5%, *** 1%*

From Table 5 ARDL Estimation ECT and Long Run Results we can note that the ECT is negative and significant in regimes 1, 2, 4, and 6, suggesting an opportunity for cointegration. Regime 3 is insignificant, meaning the long-run relationship is weak. Regime 5 failed due to multicollinearity; multiple lag combinations were tested, including manual and automatic lag selection, with no positive result. The long-run results are generally not significant; however, regimes 1 and 4 stand out as they exert significant pass-through.

Table 6. *ARDL Estimation Short Run Results*

Regime	ARDL	SR	Coefficient	SE	PV
1	(1,4)	ΔlnER	-11.972	4.937	0.023**
		ΔlnER_{t-1}	-2.867	3.785	0.456
		ΔlnER_{t-2}	-3.855	2.981	0.208
		ΔlnER_{t-3}	-2.890	1.791	0.119
2	(1,2)	ΔlnER	-1.773	0.473	0.000***
		ΔlnER_{t-1}	1.337	0.432	0.003***

Regime	ARDL	SR	Coefficient	SE	PV
3	(3,0)	$\Delta lnCPI$	0.228	0.155	0.151
		$\Delta lnCPI_{t-1}$	-0.442	0.155	0.008^{***}
4	(1,2)	$\Delta lnER$	0.865	0.495	0.090^{*}
		$\Delta lnER_{t-1}$	-1.121	0.517	0.038^{**}
6	(4,0)	$\Delta lnCPI$	-0.094	0.148	0.529
		$\Delta lnCPI_{t-1}$	-0.150	0.145	0.309
		$\Delta lnCPI_{t-2}$	-0.365	0.145	0.017^{**}

Note: Significance levels: * 10%, ** 5%, *** 1%

In Table 6: ARDL Estimation Short Run Results the only significant term of lnER of the regime 1 is the contemporaneous coefficient which is negative and huge in magnitude. During that sub-sample regime 1 period, the Central Bank of Iraq had a very restricted capability to implement any intervention measures with efficiency as it was still in the reconstruction phase. The rapid response is probably a result of the slow pace of the CBI, which is understandable considering that it was in the reconstruction stage and its abilities were limited. The unusually huge negative coefficient could be a result of demand collapse. When in regime 2, both contemporaneous and lagged lnER are highly significant at 1%. However, the contemporaneous change is negative while the lagged change is positive. This could be the result of the consumers behavior, by postponing consumption amid uncertainty which reduces aggregate demand and affect the inflation. Then the held-up demand is released. Additionally in Regime 3, with the model ARDL(3,0), ER was excluded from the SR estimation, indicating that inflation was propelled internally. ER movements had no impact on the inflation in this period, which could be translated as a muted ERPT or effective policy insulation in a period of strong price inertia. The lagged inflation term is significant and negative. This could indicate the response time for the implemented monetary policy or demand exhaustion. Furthermroe in Regime 4, the pass-through happens in two phases: the contemporaneous is a weak positive effect, while the lagged effect is strong negative. During this period, importers and retailers adjusted prices gradually, with a sign of demand contraction as the lagged coefficient suggesting a retraction that exceeds the contemporaneous positive effect. Finally, in regime 6, the ER had no effect, and the price was driven by internal factors and persistence, and was negative again indicating delayed monetary police response or demand degradation.

4.3.3. Bounds Test

Table 7. *Bounds Test Results*

Regime	F-Statistic	T-Statistic	Conclusion
1	2.800	-2.362	Accept H_0 of no level relationship / no cointegration
2	2.900	-2.374	Accept H_0 of no level relationship / no cointegration
3	1.848	-1.542	Accept H_0 of no level relationship / no cointegration
4	2.382	-2.141	Accept H_0 of no level relationship / no cointegration
5	-	-	-
6	4.591*	-2.761*	inconclusive at the 10% level[1]

[1] I(0)4.04<**F = 4.591**< I(1)4.78 → inconclusive

I(0)-2.57>**t=-2.761**>I(1)-2.91 → inconclusive

Note: *Critical values (0.1-0.01) from Pesaran, Shin, and Smith (2001), Case 3.*

Table 7, Bounds Test Results affirm that for regimes 1 to 4, the F-statistics fall below the lower-bound critical values (I(0)), indicating no statistical evidence to reject the null hypothesis of no long-run relationship between lnCPI and lnER. Therefore, cointegration is not supported in these regimes. For regime 6, both F and t statistics lie just within the lower (I(0)) and upper (I(1)) critical bounds at the 10% significance level. Hence, the test yielded an inconclusive result on whether the presence of cointegration is present or not (Philips, 2018). However, the highly significant ECT coefficient (p-value

≈ 1%) in regime 6 offered additional evidence supporting the long-run equilibrium relationship between lnCPI and lnER. So, despite the inconclusive bounds test, a significant ECT signaled that cointegration likely exists in regime 6.

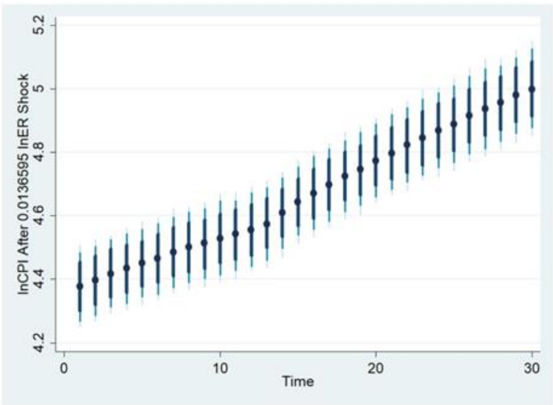
4.3.4. Dynardl

Table 8. *Summary of Dynamic ARDL Model Estimates (Selected Lags and Shock Values)*

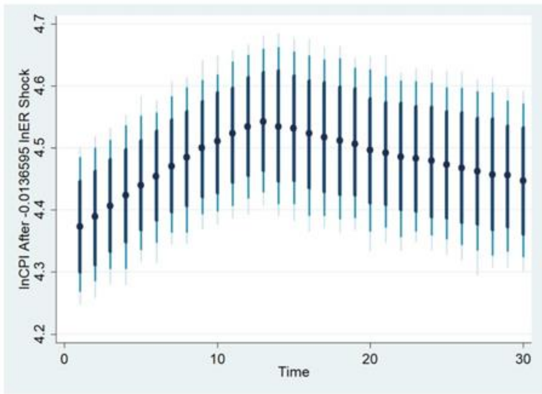
Regime	Model	Obs	Shock Value	R - squared	Variable	Coefficients	P Value
1	1,4	32	0.0137	0.965	$lnCPI_{t-1}$	0.971	0.000***
					$lnER_{t-4}$	1.346	0.305
2	1,2	57	0.029	0.647	$lnCPI_{t-1}$	0.795	0.000***
					$lnER_{t-2}$	-0.015	0.881
3	3,0	33	0.00063	0.390	$lnCPI_{t-3}$	0.571	0.000***
4	1,2	34	0.00692	0.622	$lnCPI_{t-1}$	0.566	0.000***
					$lnER_{t-2}$	-0.419	0.047**
6	4,0	33	0.05075	0.889	$lnCPI_{t-4}$	0.870	0.000***

Note: Significance levels: * 10%, ** 5%, *** 1%

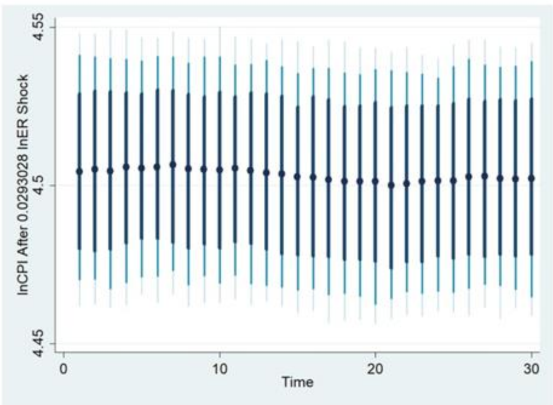
From Table 8: Summary of Dynamic ARDL Model Estimates (Selected Lags and Shock Values) we note that the lnCPIt-1 is positive and highly significant in all estimated models. This indicates a strong, persistent inflation rate that shows inertia. The lnER shocks on lnCPI are insignificant at the contemporaneous level. The analysis detects significant influence through the lagged term (lnERt-2) in regime 4, only with a negative significant coefficient (-0.419, $p < 0.05$) at (0.047) suggesting a negative delayed pass-through effect. This implies that ER movements do not raise the inflationary pressure immediately, but rather gradually over extended periods. Model fit varies among regimes; some yield high adjusted R^2 values (~0.39 to ~0.96), showing the different dynamics captured by each set. Meanwhile, lag lengths differ even more, suggesting that the pass-through dynamics from the exchange rate to inflation could be different across time regimes, and that underscores the value of a flexible approach in modeling.



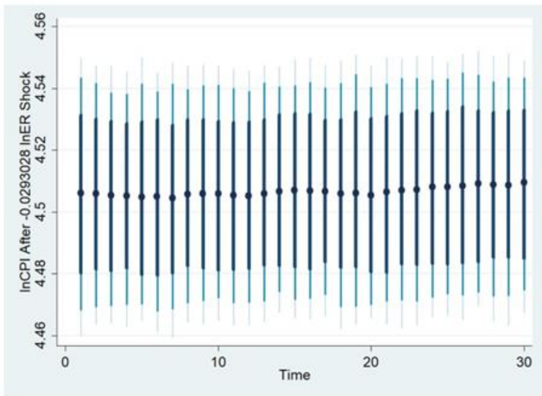
Regime 1 CPI response to a Positive ER shock



Regime 1 CPI response to a Negative ER shock

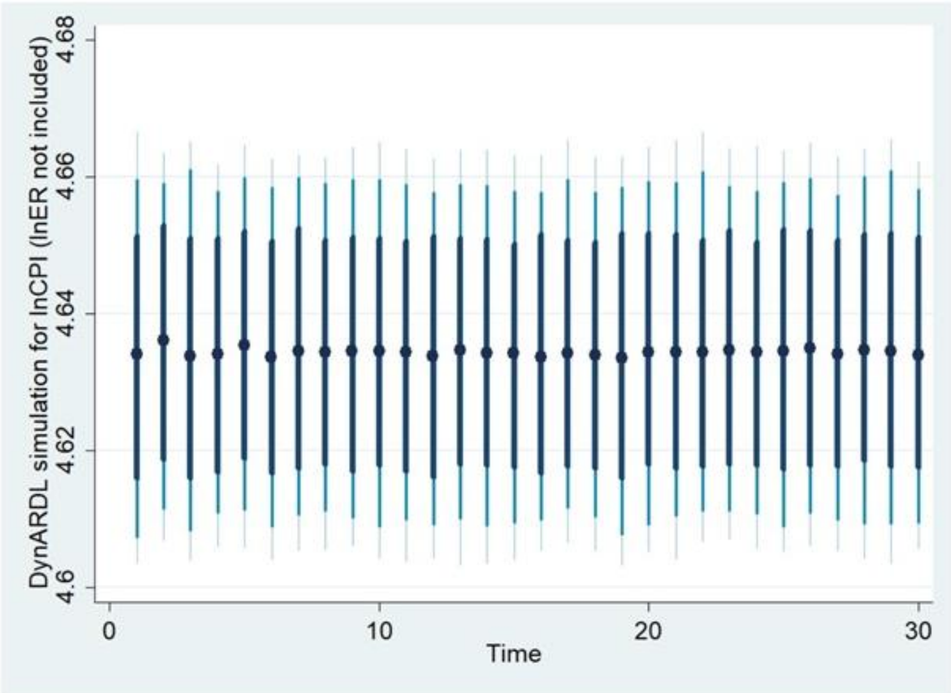


Regime 2 CPI response to a Positive ER shock

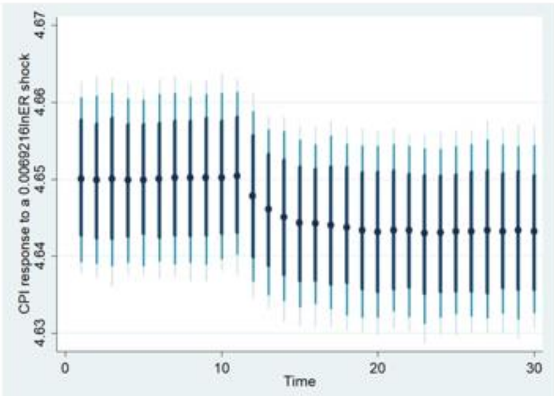


Regime 2 CPI response to a Negative ER shock

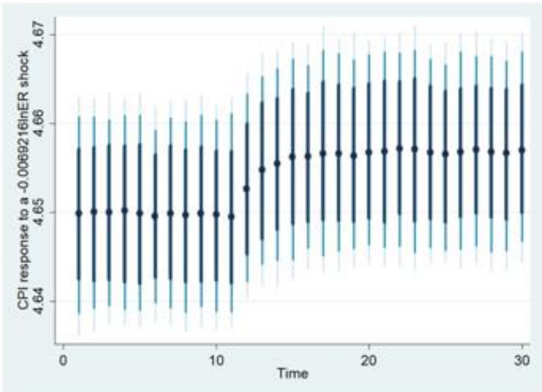
Figure 3a. *DynARDL IFRs*



Regime 3 Dynamic Estimation (No ER Shock)

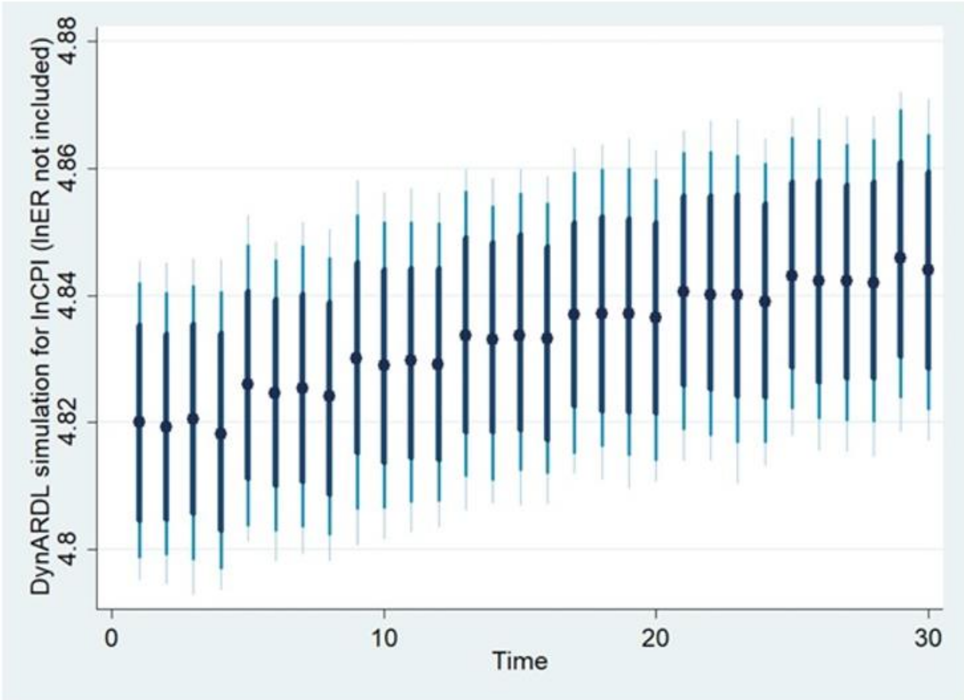


Regime 4 CPI response to a Positive ER shock



Regime 4 CPI response to a Negative ER shock

Figure 3b. *DynARDL IFRs*



Regime 6 Dynamic Estimation (No ER Shock)

Figure 3c. *DynARDL IFRs*

The graphical impulse response functions from the dynamic ARDL as illustrated in Figure 3: DynARDL IFRs models illustrate the timing and magnitude of inflation responses to exchange rate shocks. For instance, in regime 1, the graphs show a gradual and consistent inflation response to both positive and negative ER shocks after four periods, suggesting a delayed but persistent impact. These visual insights are valuable even when the explanatory variable's coefficient is insignificant, as they reveal underlying dynamics not captured by the coefficients alone. In regime 1, the graph shows that a positive or negative shock to ER leads to a gradual and consistent inflation response after 4 periods. Next in regime 2, the response is negligible and easily dismissed. The effect is indistinguishable until 11 months later, when the curve has noticeably shifted. While in regime 3, the curve is mostly stable; notably, ER is not involved in the regression, as there is hardly any movement around the sample. Furthermore regime 4 shows a more dynamic response. A delayed response commences at t2 (2 months after the shock is applied) and lasts through t3 to t5, although with slowing speed. The shock dissipates after that, and the curve flattens back again. However, the response is in the opposite direction of the ER shock, which contradicts the core of ERPT theory. This inverse movement may indicate regime-specific frictions such as pricing rigidities, policy interventions, or temporary insulation from import-cost pressures during that regime. Finally, regime 6 is mostly stable. ER is not involved, and there is hardly any movement around the sample.

4.3.5. Validation

Table 9. *Validation Tests Results*

Table 9: Validation Tests Results			
Regime	**Autocorrelation BG 4 lags1**	**Heteroskedasticity BP test**	**Normality Skewness - Kurtosis3**
1	Passed	0.0696[3]	Failed
2	Passed	0.4610	Failed
3	Passed	0.3013	Failed
4	passed[2]	0.8060	Failed
6	Passed	0.1011	Failed

[1] Regime 4 passed with borderline lag1 = 0.068 lag4 = 0.085 both > 0.05

[2] Borderline but passed since 0.0696 > 0.05

[3] Normality not required for ARDL

In Table 9: Validation Tests Results across all regimes, no significant heteroskedasticity was detected by the Breusch-Pagan/Cook-Weisberg test. Regimes 1 and 6 show marginal results ($p \approx 0.07$-0.10), but they still exceed the 5% significance level, so the null hypothesis of constant variance cannot be rejected. The normality (Skewness - Kurtosis) tests all failed to meet the significance threshold. The non-normality issue is persistent in time series data, especially across ER and inflation data sets. Since normality is not required by the ARDL framework, we can proceed as long as residual diagnostics (serial correlation, heteroskedasticity, and stability tests) do not indicate major violations.

5. Conclusion

We examined the exchange rate pass-through (ERPT) to consumer prices in Iraq from 2004 to 2023 using a regime-based Dynamic ARDL framework. This approach revealed nonlinear dependence and multiple structural breaks, justifying the division of the sample into six regimes to capture time-varying dynamics that linear full-sample models miss.

The study reveals three primary conclusions. First, the results indicate strong inflation persistence regardless of the regime. The persistent positivity and significance of lagged inflation terms indicate that price dynamics are predominantly governed by inertia, with less impact from changes in the exchange rate. Second, ERPT is generally weak, delayed, and regime-dependent. Long-term pass-through effects show no statistical significance across multiple regimes; nonetheless, short-term effects, where applicable, exhibit considerable differences in both timing and scale. In several periods, changes in the exchange rate have had little or no impact on inflation, indicating that internal factors play a dominant role. Third, there is limited evidence supporting cointegration. The bounds test findings mostly do not favor a stable long-run link between the exchange rate and inflation, with just a single regime showing signs of slow adjustment rather than a robust equilibrium. Dynamic ARDL simulations reinforce these findings by showing that inflation responses to exchange rate shocks are typically delayed and short-lived, possibly due to structural economic frictions and policy interventions. In some regimes, responses even move contrary to the expected outcomes outlined in economic theory, which highlights specific frictions within regimes and distinct structural conditions.

From a policy perspective, the results indicate that exchange rate management alone is insufficient for controlling inflation in Iraq. While a fixed exchange rate may dampen immediate imported inflation, ongoing increases in consumer prices highlight the importance of specific domestic factors, including government spending habits and public expectations of inflation. For the Central Bank of Iraq, this underscores the need for closer fiscal-monetary coordination, particularly during oil price downturns, to avoid procyclical pressures that reinforce inflation inertia. Strengthening buffers and maintaining clear policy communication are likely to be more effective for price stability than reliance on exchange rate stability alone.

The study's limitations include the use of regime-specific estimators, which restricts the generalizability of the results to broader contexts, potentially limiting the applicability of the findings to other economic environments. Additionally, the analysis focuses solely on the official exchange rate, excluding the parallel rate, which may affect the comprehensiveness of the findings. Future studies may modify this framework to adopt parallel exchange rates, and researchers may allow for non-linear, possibly time-varying analysis of oil prices and major fiscal variables. Despite its limitations, the study consistently finds that ERPT in Iraq is weak and heavily influenced by inflation inertia, highlighting the need for regime-aware policy in oil-dependent economies.

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