HOW DO OIL PRICE FLUCTUATIONS INFLUENCE EXCHANGE RATES IN KAZAKHSTAN, AND HOW DO CHANGES IN EXCHANGE RATES AFFECT INFLATION, THE SERVICES SECTOR, AND THE GOODS SECTOR (FOOD AND NON-FOOD PRODUCTS)?

BY

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THESIS

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Abstract

The thesis effectively explores the process of oil price shocks spreading to the Kazakhstani economy, examining the effectiveness of the Inflation Targeting (IT) regime implemented in 2015. The research uses a monthly dataset with a period of 2011 to 2024 to estimate exchange rate pass-through (ERPT), with **linear interpolation** frequency conversion. This is supplemented with an enhanced Taylor Rule estimation with **Ordinary Least Squares (OLS)** to assess the policy reactive mechanism of the central bank.

The empirical findings give strong data that the managed float transition was effective in anchoring inflation expectations that cumulative ERPT coefficient decreased substantially between **0.231** in the pre-float regime and **0.098** in the post-float regime. Nonetheless, the overlay analysis shows the highly sectoral heterogeneity. Tradable sectors, namely **Non-Food Goods** (coefficient: 0.156) and **Food Products** (coefficient: 0.125), are very much exposed to the impact of the depreciation of the currency, but the **Services** sector (coefficient: 0.042) is statistically immune to the external shocks.

In terms of asymmetric adjustments, Rocket and Feather effect is identified in the analysis as the prices soar up in depreciation but may be sticky in appreciations. Nonetheless, formal Wald tests have a p-value of **0.55** meaning that this asymmetry **cannot be statistically significant** at standard levels probably because of high historical volatility. Moreover, the Taylor Rule estimates identify statistically significant "Fear of Floating" ($p < 0.10$), which denotes the fact that the National Bank actively increases interest rates in case of depreciation to reduce inflationary pressure. The research indicates that the overall sensitivity of the IT framework to the oil shocks has been reduced, but that due to the structural import dependence, the exchange rate management must still be maintained.

Keywords: *Exchange rate pass through, inflation targeting, oil price variability, sectoral heterogeneity, Kazakhstan, SVAR.*

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1. INTRODUCTION

1.1. Research Background: The "Double Shock" Vulnerability of the Kazakh Economy

The Kazakhstan economy is a unique example of small, open, and resource-based economies that has to cope with the turmoil of global financial integration. The economic composition of the country has been largely dependent on the hydrocarbons industry since the independence period, as oil exports have always made up about 60 percent of the total merchandise exports and have made up about 40 percent of the revenues of state budgets. The reliance subjects the domestic economy to exogenous shocks, which are mainly triggered by the fluctuation of prices of world crude oil.

Most importantly, the exchange rate mediates the flow of these external shocks to domestic macroeconomic indicators. The tenge (KZT) exchange rate with major currencies and especially US dollar (USD) and Russian ruble (RUB) is the main shock absorber. The 2014-2016 oil price crash and the 2020 COVID-19 crisis are examples of historic events, which have required major currency devaluations to eliminate external imbalances. These devaluations lead to a second wave of inflationary pressure in an Exchange Rate Pass-Through (ERPT) effect, which places the real economy into a situation of experiencing the double shock of both lower export income and imported inflation simultaneously.

The criticality of this weakness was experienced in the crisis of 2014-2015 when the world oil prices dropped by almost 70 percent and the National Bank of Kazakhstan (NBK) had to forego its managed peg. This contributed to a depreciation of the tenge that was more than 80% against the US dollar. This incident has shown that the relationship between oil prices and exchange rate is urgent and the causal relationship and the extent of the pass-through to consumer prices require understanding.

1.2. Problem Statement: Inflation Targeting in a Resource-Dependent Economy

NBK switched to an Inflation Targeting (IT) regime in August 2015, a major change in the monetary policy. The hypothetical objective of IT is to provide a grounding of inflation expectations and free floats of the exchange rate; therefore, protecting the local economy against terms-of-trade shocks in the international economy. The exchange rate is expected to act as a shock absorber under the plausible IT framework and the ERPT consumer prices ought to theoretically fall.

Nonetheless, the reality of the situation in Kazakhstan is complicated empirically. Although IT has been formally adopted, the economy is still highly dollarized and the expectation of inflation has traditionally been volatile and backward-looking. Furthermore, the fear of floating, where the central banks step in to curtail fluctuations on the exchange rate as a result of balance sheet reasons is also applicable in the Central Asian context. This brings to the critical issue that is dealt with in this thesis: **Did the shift to Inflation Targeting succeed in undermining the association between oil price shocks, exchange rate change, and domestic inflation, or is the concept of the double shock transmission mechanism still relevant?**

Also, inflation is commonly discussed in the literature as a monolithic aggregate, which hides an important sectoral heterogeneity. Considering a low open economy such as Kazakhstan, pass-through to tradable commodities (e.g. food and non-food goods) would be significantly different as compared to non-tradable services. This is the sectoral understanding that is necessary to implement an effective monetary policy.

1.3. Research Questions and Objectives

This thesis will conduct a strict econometric analysis of the transmission channel of oil prices to exchange rate and thereof to domestic inflation. The following are the key questions of the study:

1. **Aggregate Transmission:** How does a global oil price (Brent) shock affect the nominal exchange rate of the Kazakh tenge (KZT/USD) and in what is the size and duration of the further pass-through to aggregate consumer price inflation (CPI)?
2. **Structural Heterogeneity:** Does the Exchange Rate Pass-Through (ERPT) differ among different sectors (Food, Non-Food Products, and Services)? In particular, are the tradable goods more vulnerable to exchange rate depreciation compared to non-tradable services?
3. **Regime Dependence:** Have the level of ERPT materially fallen since the structural break in August 2015 (Inflation Targeting) versus under the previous managed peg regime?
4. **Asymmetry:** Does the domestic prices change asymmetrically (rockets and feathers effects), that is, accelerating to higher levels in response to the depreciation of the exchange rate and changing slowly or negligibly in response to appreciation?

1.4. The Transmission Mechanism Hypothesis: $Oil \rightarrow FX \rightarrow Inflation$

This paper assumes a hypothesis of transmission mechanism, organized in two different channels, which are tested on a Vector Autoregression (VAR) framework:

1. **Channel 1 ($Oil \rightarrow FX$)**: Kazakhstan is a small economy that exports oil whereby the exchange rate is dictated by terms of trade shocks. We have a null hypothesis of a negative relationship in the sense that a fall in oil prices causes tenge depreciation.
2. **Channel 2 ($FX \rightarrow Inflation$)**: Tenge devaluation flows to domestic prices in both direct ways (imported final commodities) and in an indirect way (imported intermediate inputs). We have a hypothesis that this pass-through is unfinished but substantial, especially in the case of non-food goods that have a high level of importation.

1.5. Significance of the Study and Contribution to Literature

In this study, the contribution made to the current literature is in three significant aspects:

1. **Methodological Rigor:** The analysis uses the state of the art time-series methods, such as **Rolling Window Regression** to estimate time-varying parameters, **Local Projections (Jorda method)** to be robust, and **Asymmetric VAR** to test non-linear price adjustments.
2. **Contextual Specificity:** Although there is a large body of literature regarding ERPT in the developed economies and larger emerging markets, there is limited empirical evidence regarding the same in the context of Kazakhstan. The paper is an update of existing literature with a sample period till October 2024, which covers the critical post-COVID and geopolitical shock phases of 2022-2024.
3. **Policy Relevance:** This study gives the NBK the information on how to optimize inflation forecasts and interventions in the foreign exchange by breaking down the pass-through effect into both short-run and long-run effects and examining the differences in the sectors.

1.6. Significance of the Study and Contribution to Literature

The thesis will be structured in the following way: **Chapter 2** gives a review of the theoretical and empirical literature on the Dutch Disease, ERPT and asymmetric price adjustments. The **3rd chapter** gives an institutional background of the exchange rate regimes and significant external shocks in Kazakhstan. The data and econometric methodology are described in **chapter 4**. **Chapters 5-8** give the empirical findings, which includes aggregate transmission dynamics, sectoral heterogeneity, regime dependence and robustness tests. **Chapter 9** is the policy implications, and **Chapter 10** is a conclusion to the study.

2. Literature Review and Theoretical Framework

2.1. Theoretical Underpinnings of the Transmission Mechanism

External shock transmission is often considered an aspect of macroeconomic vulnerability of small, open, resource-dependent economies. In the case of Kazakhstan, the two-step transmission mechanism between the global oil markets and domestic inflation is theoretically bifurcated to two stages namely; the terms-of-trade shock on the exchange rate, and the second step is the pass-through of the exchange rate shock to the consumer prices.

2.1.1. The Terms of Trade and Exchange Rate Determination

In the case of the commodity exporters, standard open-economy macroeconomics assumes the terms of trade to be the basic determinants of the real exchange rate. Negative oil price shock is the worsening of the terms of trade and will require a depreciation of the real equilibrium exchange rate to regain the external balance. In flexible exchange rate economies this adjustment is done by nominal depreciation. Nevertheless, in fixed or managed systems, including the one that existed in Kazakhstan prior to 2015, such adjustment is not timely and the imbalance is accumulated, which ultimately triggers discrete and sweeping devaluations (currency crashes). Yildirim and Arifli (2021) illustrate this process in the structural peer to Kazakhstan of Azerbaijan to argue that oil price-related devaluations determine the inflationary effects of oil shocks, and not the oil price.

2.1.2. Exchange Rate Pass-Through (ERPT) Theory

Exchange rate Pass-Through (ERPT) is based on the Law of One Price (LOOP). In its purest sense, LOOP suggests total pass-through ($ERPT = 1$), in which a 1 percent depreciation will result in a 1 percent rise in import prices. But empirical evidence massively favors incomplete pass through, which is sometimes ascribed to "Pricing-to-Market" (PTM) behavior of foreign firms as they attempt to absorb exchange rate fluctuations in their markups to retain market share and the existence of local distribution costs (transportation, marketing, services) that protect final consumer prices against the effect of border prices.

2.1.3. Asymmetric Price Adjustment ("Rockets and Feathers")

Another critical theoretical extension that can be applied to this thesis is the asymmetry of price changes, sometimes referred to as the rockets and feathers hypothesis. According to this theory, when there is an increase in cost (depreciation) then domestic prices increase very fast (like rockets) and when there is a decrease in cost (appreciation) they decrease very slowly (like feathers). This inflexibility is usually explained by menu expenses and market strength of local retailers that are rapid to defend margins yet slow to transfer the gains.

2.2 Empirical Evidence on the Oil-Macroeconomy Nexus

2.2.1. Oil Shocks in Oil-Exporting Developing Economies

A very strong line is drawn between oil importers and oil exporters by the empirical literature. Whereas the increase in oil prices causes inflation among importers depending on the cost of energy (Shaari et al., 2012), among exporters, the channel used is mainly monetary and fiscal.

The most current research on the Caspian region gives the best standards that Kazakhstan can rely on. Yildirim and Arifli (2021) applied a Vector Autoregression (VAR) model to the Azerbaijan oil crisis of 2014-2016. They discovered that negative oil price shock explains about 60 percent of changes in the exchange rate and 30 percent variance in inflation. More importantly, they find a very specific causal path: the oil shock leads to failure in foreign reserves, leading to devaluation which in turn makes the main contribution to stagflation (high inflation and economic contraction). This reflects the hypothesis of the two shock hypotheses in this thesis.

In the same manner, Akhmet and Mussa (2025) used a Threshold VAR (TVAR) and Markov-switching model on Kazakhstan business cycles. Their results affirm the existence of strong non-linearity: the economy is very sensitive to oil price falls, namely they found that there exists a threshold point when a quarterly fall of 14 percent in real prices of oil can lead the economy to transition to the crisis regime. They also state that negative oil shocks are statistically significantly recessionary, but positive shocks are not similarly expansionary.

2.2.2. Exchange Rate Pass-Through in Kazakhstan

There are certain indications of ERPT in Kazakhstan, which emphasize the changing character of this mechanism. Seidazov (2024) gives a detailed evaluation of ERPT within the Inflation Targeting (IT) regime. His empirical findings show that the pass-through effect is incomplete and lags behind the shock with the greatest influence on inflation being recorded 23 months after the fluctuation in exchange rates.

A break in pass through coefficient structure is also recorded by Seidazov (2024). In line with the Taylor hypothesis stating that low and stable inflation settings minimize pass-through, Seidazov established that ERPT did decrease to around 0.15 p.p. in the early 2010s to 0.11-0.12 p.p. after implementing IT. This confirms the hypothesis that exchange rate volatility can be cushioned on domestic prices by credible monetary policy.

According to Kelesbayev et al. (2022), a Structural VAR (SVAR) technique was applied to decouple these relationships, with the real effective exchange rate (REER) being highly driven by oil prices, though the causality was weak as well, confirming the exogenous oil price shock in the case of Kazakhstan.

2.2.3. Sectoral Heterogeneity

According to literature, aggregate CPI conceals huge sectoral disparities. Pass-through elasticities of Tradable goods (Food and Non-Food) are usually larger than that of non-tradable Services. In a study of oil producers in the ASEAN, Husaini and Lean (2021) determined that the magnitude of shocks in oil prices and exchange rate to the Producer Price Index (PPI) which is heavily weighted by goods is significantly larger than to the aggregate CPI. In the case of Kazakhstan, this has been confirmed by Seidazov (2024), who mentions that the 12-month accumulated pass through is highest in Non-Food products (0.15- 0.24 p.p.) because of the highest share of imports (around 60 percent), moderate in Food (0.08 p.p.), and low in Services (0.02- 0.04 p.p.).

2.3. Monetary Policy and Structural Breaks

2.3.1. Regime Dependence: Peg vs. Inflation Targeting

Changing the fixed exchange rate to Inflation Targeting (IT) in August 2015 is a structural breakout that is vital to the Kazakh economy. According to the theoretical literature, with a credible IT regime, the inflation expectations would be pegged to the target as opposed to the exchange rate, thereby lessening the second-round effects of devaluation.

Ding et al. (2023), in their study based on a MIDAS (Mixed Data Sampling) design on China, indicate that the covariance between oil prices and the exchange rates is an important predictor of inflation. They however claim that policymakers can alleviate this by lowering the covariance which spells out basically letting the exchange rate play its part as a shock absorber as opposed to a transmission belt.

2.3.2. Asymmetry and the "Fear of Floating"

Although the official process of IT transition is achieved, most empirical studies tend to indicate that there is a fear of floating in new markets, where central banks step in to counter excessive depreciation caused by balance sheet mismatches. The responses are asymmetric in both Akhmet and Mussa (2025) and Seidazov (2024). Seidazov reports that domestic prices are very sensitive to tenge depreciation but not significant to appreciation. This imbalance indicates that the process of devaluation is inflationary, whereas the reverse of devaluation is not inherently disinflationary, and makes the role of the central bank in responding to it harder.

2.4. Summary and Identification of Gaps

Even though the available literature forms the background of the relationships between oil, exchange rates, and inflation, there are some gaps that this thesis tries to fill:

1. **Post-2022 Geopolitical Context:** The vast majority of benchmarks (including Seidazov, 2024) look at the information until the beginning of 2024. The dataset used in this thesis is as of October 2024, when the entire effect of the Russia-Ukraine conflict has taken place, and Ding et al. (2023) observe that it has led to a decoupling of traditional oil-FX correlations.
2. **Further Decomposition of Volatility:** Although earlier papers estimate the magnitude of the coefficients, little has been done to measure the precise size of the contribution of oil and FX to the future movement of inflation (treated in Chapter 7).
3. **Asymmetry and Sectors Interaction:** There is a dearth of analysis of the combination of sectoral disaggregation and asymmetric shock testing. This paper will clearly test whether the effect of rockets and feathers is confined to the goods industry or also apply to the service industry.

3. Institutional Background and Stylized Facts

3.1. The Structure of the Kazakh Economy and Oil Dependence

Kazakhstan's economy is also defined by a strong structural dependence on the hydrocarbons industry which is also the characteristic feature of its macroeconomic volatility profile. Ever since the independence, extraction and export of crude oil and natural gas have been the major growth drivers. Empirical evidence shows that oil exports always constitute about 60 percent of the total merchandise export in the country and about 40 percent of state budget revenues. This level of concentration subjects the fiscal and monetary system to the fluctuations in the world commodity markets.

The hypothesis of resource dependence argues that these types of economies are vulnerable to the Dutch Disease in which commodity boom causes the appreciation of the real exchange rate which causes the weakness of the non-resource tradable sectors. Structural rigidity of Kazakhstan means that the exchange rate is not just a monetary tool but a key variable to fiscal sustainability. Such a sharp decrease in Brent crude prices has a direct reflection in the balance of payments and the exchange rate will have to respond in order to cushion the impact of the shock on government revenues.

3.2. Evolution of Exchange Rate Regimes (2011–2024)

The monetary history of Kazakhstan during the sample (2011-2024) can be split into the structural break during August 2015. This definition is crucially important to the econometric analysis of later chapters, especially the regime-dependent ERPT estimates.

3.2.1. The Managed Peg Era (2011–2015)

Until August 2015, the National Bank of Kazakhstan (NBK) had a managed peg regime, in which the tenge (KZT) had been actively held at a fixed narrow band on the US dollar. This gave the importers and dollarized obligations nominal stability, but it left external imbalances to build up. The peg defense involved significant foreign exchange interventions, and nominal exchange rate was not pegged to fundamental terms-of-trade shocks. This regime is empirically defined by inflexible exchange rate coupled with extreme vulnerability to discrete, big devaluations (e.g., February 2014).

3.2.2. The Transition to Inflation Targeting (August 2015)

The NBK shifted to an Inflation Targeting (IT) regime and a free-floating exchange rate, in reaction to the end of global oil prices and pressure on the currency as a result of regional currency depreciations (especially the Russian ruble), on August 20, 2015. This shift of regimes was to enable the exchange rate to be an automatic stabilizer. The structural shift can be proved visually as presented in Graph 11 (*Regime Comparison*) of this study. The transmission of exchange rate shocks to inflation under the post-2015 regime of IT seems more gradual than the abrupt adjustments observed during the pre- float period. Moreover, the rolling window analysis (Graph 16) indicates that the changes in the pass-through coefficient between 2015 and 2024 showed a downward trend, which indicates that the IT framework has been partially successful in anchoring inflation expectations, which is in line with the results of Seidazov (2024) that observed a stabilization of the pass-through using IT.

3.3. Chronology of Major Shocks

The empirical test of this thesis is a turbulent time characterized by three different exogenous shocks which triggered the transmission mechanism differently.

3.3.1. The 2014–2016 Oil Price Collapse

The precipitant to the regime change was the steep drop in oil prices that has occurred since the end of 2014. The terms of trade worsened at an impressive rate as the Brent crude dropped to less than 30 per barrel below the previous high of over 100. Akhmet and Mussa (2025) give a critical level of 14 percent of a quarterly real oil price drop which initiates the transition to a recessionary regime. This is an example of the so-called double shock when the negative income effect of low oil prices was added with the inflationary shock of the later tenge depreciation.

3.3.2. The COVID-19 Pandemic (2020)

The pandemic caused a supply and demand shock at once. Although oil prices on the international markets momentarily became negative, in the domestic market the effect was defined by supply chain disruptions. Graph 9 (*Historical Decomposition*) demonstrates that the role of the Own/Domestic shocks (probably, supply side constraints) in 2020 was large, in addition to external factors in this year.

3.3.3. Geopolitical Tensions and Trade Disruptions (2022)

The beginning of the conflict between Russia and Ukraine in 2022 presented a new dimension of complexities. However, unlike in the past, when the KZT/USD and KZT/RUB rates moved in the same direction during the oil shocks, in 2022, there was a divergence. Theoretical strengthening of the tenge should be the case with high oil prices, although on the disrupting geopolitics risk premia and trade disruptions imported inflation occurred regardless of good terms of trade. The asymmetry hypothesis is being put through the test during this period since the effect of price increases that were called a rocket was observable even in the absence of a classic oil price collapse.

3.4. Stylized Facts from Preliminary Analysis

On visual inspection of the data created on this thesis, it is evident that some stylized facts are used to inform the formal econometric modeling:

- **Fact 1:** The level of oil-dependence of the KZT/USD exchange rate is seen to be negative, which proves that the currency qualifies as a "petro-currency".
- **Fact 2:** Inflation volatility has not been eliminated even after the IT regime, which is mostly caused by the Pass-Through (orange area in Graph 08) and Domestic/Monetary factors (green area in Graph 08).
- **Fact 3:** Asymmetry is visible. Graph 12 (*Rocket vs. Feather*) proposes that the cumulative price effects are definitely more and more rapid during depreciation periods than during appreciation periods, which is in line with the theoretical antecedents of pricing-to-market behavior by firms in need of protecting their margins.

4. Data and Econometric Methodology

4.1. Data Description and Transformations

In this paper, a high-frequency dataset will be used, with a monthly frequency ranging between **January 2011** and **October 2024** ($T = 166$ observations). Those critical structural breakpoints included the 2015 switch to inflation targeting and the 2022 geopolitical shock are captured by the sample period.

4.1.1. Variable Selection and Sources

The econometric analysis is based on four major variables that are retrieved by the official monetary authorities and financial data terminals and therefore high fidelity and accuracy are assured:

- **Global Oil Price (Oil_t):**
    - Definition: The spot price of **Brent Crude Oil** (USD/barrel) which was chosen as the most global price that is likely to be more relevant to the export basket of Kazakhstan.
    - Source: Bloomberg Terminal. Ticker CO1:COM was used to fetch the prices of closing rates on a daily basis that were then averaged to monthly figures to match the frequency of other indicators of the macroeconomy.
- **Exchange Rate (FX_t):**
    - Definition The nominal average exchange rate of the **Kazakhstani Tenge versus US Dollar (KZT/USD)**. An appreciation of this variable implies that the domestic currency is being depreciated.
    - Literature source: National Bank of Kazakhstan (NBK). The official rates were obtained by the direct source in the statistical bulletin of NBK to provide consistency with the data of central bank intervention.
- **Consumer Price Inflation (CPI_t):**
    - Definition: The total Consumer Price Index, which is further broken down to three sub- indices, **Food**, **Non-Food Products**, and **Services**.

    - Due to the alteration of numbers, the data were not presented directly by the NBK and the IMF. The aggregate and sectoral indices were related to the monetary statistics of the NBK and the International Financial Statistics (IFS) database of the IMF to confirm the structural breaks in the transition of the regime in 2015.
- **Real Economic Activity (Y_t):**
    - Definition Real Gross Domestic Product (GDP) is applied as a check against domestic demand pressures.
    - Reproduced in the International Monetary Fund (IMF). The IMF World Economic Outlook database was used to get quarterly GDP series and interpolate them to a monthly frequency using **linear interpolation** to correspond to the VAR specification.

4.1.2. Frequency Conversion and Transformations

One key problem that has remained a problem in macro-econometric modelling of the emerging markets is the timing difference between the real sector data (GDP, published every quarter) and the financial data (prices and exchange rates, published every month). To overcome this, we use **Linear Interpolation** in order to turn the quarterly series of Real GDP into a monthly frequency ($Y_t^{monthly}$). This approach is based on assuming a fixed growth rate between quarters, which maintains the monotonic behaviour of the original series but does not induce artificial volatility or other artifacts of higher-order poly-decay approximations in volatile time-series. This change makes it compatible with the VAR framework and at the same time preserves the integrity of the underlying economic signal.

In order to stabilize the variance and make the interpretation of the impulse responses as percentages changes (elasticities), all the variables (except interest rates) are converted to natural logarithms. The first difference is then taken to induce stationarity. The variables that are going to be put into the model therefore take a form of monthly growth rates in percentage points:

$$\Delta x_t = 100 \times (lnX_t - lnX_{t-1})$$

where X_t is the uncooked level of the variable.

4.2 Pre-estimation Diagnostics

4.2.1. Unit Root Tests and Stationarity

The structural method of assessing stationarity of the time series was strictly tested with the help of the **Augmented Dickey-Fuller (ADF)** and **Philips-Perron (PP)** tests. The testing process was done in a sequential approach, i.e. the levels (including intercept and trend) were first checked then the first differences.

- **Levels:** TIt was not able to reject the null hypothesis of a unit root at the log-levels of the variables Oil Price, Exchange rate and CPI which showed that they were non-stationary ($I(1)$ processes).
- **Differences:** The initial difference test rejected all the variables at the 1 percentile, which indicated that the transformed series ($\Delta oil,\ \Delta fx,\ \Delta inf$) are non-parametric ($I(0)$). This justifies the application of a standard VAR on variations or a Vector Error Correction Model (VECM) in case there is cointegration.

4.2.2. Johansen Cointegration Analysis

In order to test the relationships of long-run equilibrium, the level variables were tested using the maximum eigenvalue test and the Johansen trace test. These findings showed that there was at least some cointegrating vector, especially between oil prices and the exchange rate. Nonetheless, due to structural discontinuities in the sample (the most significant of which was the change in regime in 2015), a VECM may be unstable. Thus, as is usual in the literature describing shock transmission (e.g., Yildirim and Arifli, 2021), the first-difference VAR in this study takes place freely. This method is based on the strong approximation of the dynamics in the short-run and the transmission of shocks in the long-run more than on the correction of equilibrium in the long-run, which is theoretically ambiguous in changing monetary regimes.

4.3 The Vector Autoregression (VAR) Framework

4.3.1 Descriptive Statistics

The reduced-form Vector Autoregression (VAR) model of order p is the baseline econometric tool.

$$Y_t = c + \sum_{i=1}^{p} A_i Y_{t-i} + BX_t + \varepsilon_t$$

Where Y_t denotes the endogenous variables $\left[\Delta Oil_t,\ \Delta FX_t,\ \Delta Inflation_t\right]'$.

- **Lag Selection:** p is the lag length that was obtained based on information criteria. The **Akaike Information Criterion (AIC)** was minimized at 4 lags, which is enough to include important dynamics to explain the delayed pass through effects, without over-parameterisation of the model in comparison to the sample size.

- **Exogenous Controls (X_t):** In order to explain the extraordinary volatility periods, the **2015 devaluation**, the **COVID-19 shock** in 2020, and the **oil price collapse** in 2014 were included as dummy variables.

4.3.2. Identification Strategy: Cholesky Decomposition

The Cholesky recursive identification scheme is used to recombine structural shocks of the reduced-form residuals. This ranking of variables is essential and this has its foundation in the economic theory in terms of speed of adjustment:

1. **Oil Price (ΔOil):** Ordered first. Being a world commodity, the impact of oil prices on the domestic economy of Kazakhstan is simultaneously exogenous; it responds to the exchange rate and inflation in real time but has lagging or no response to them.
2. **Exchange Rate (ΔFX):** Ordered second. Exchange rate responds in real time to oil shocks (financial markets respond instantly) and in consumer prices with a lag because of price stickiness.
3. **Inflation (ΔCPI):** Ordered last. The slowest variable is consumer prices, which responds to the oil and FX shock in the same month but not at the same time in this recursive.

4.4 Advanced Analytical Tools

4.4.1. Forecast Error Variance Decomposition (FEVD)

Although the Impulse Response Functions (IRFs) are used to trace the *magnitude and sign* of the shocks, FEVD is used to measure their relative significance. We break up the variance of the forecast error of the inflation and the exchange rate at the horizons extending up to 24 months in order to establish the percentage of the volatility that is caused by external oil shocks and domestic monetary or "own" shocks.

4.4.2. Historical Decomposition

In order to go beyond average relations, we use the historical decomposition to recover the particular role of the structural shocks in inflation deviations at each time between 2011 and 2024. It enables a granular narrative analysis of particular episodes of crisis (e.g., the extent to which the 2016 inflation burst was caused by oil shock only or by exchange rate shock only).

4.4.3. Local Projections (Robustness Check)

So that we can ascertain that the VAR results are not due to the properties of the lag structure or specification ordering, we also use the **Local Projections (LP) technique of Jorda (2005)** as a robustness check.

$$y_{t+h} = \alpha_h + \beta_h shock_t + \gamma_h X_t + u_{t+h}$$

The LP approach approximates different regression on each forecast horizon h. It is also less vulnerable to misspecification and can easily treat non-linearities.

4.4.4. Rolling Window Regression for Structural Breaks

In order to strictly test the hypothesis that ERPT has been decreasing under Inflation Targeting, we approximate a **Rolling Window Regression** with a **36 months** window size. This method creates a time-varying coefficient of pass-through (β_t), which will enable us to monitor the development of the transmission mechanism of the fixed peg period (2011-2015) and then the mature IT period (2024) both visually and statistically.

4.4.5. Asymmetric "Rocket and Feather" Specification

Lastly, to test asymmetric pricing the processes are constructed of exchange rates depreciation **(** ΔFX^{+}**)** and appreciation **(**ΔFX^{-}**)**. These are inputted into the VAR model to test the null hypothesis of symmetry:

$$H_0: \Sigma\beta_{depreciation} = \Sigma\beta_{appreciation}$$

The disemployment of such a hypothesis through a **Wald Test** proves the presence of asymmetric pass-through where the firms raise their prices rapidly when the currency weakens but are slow to fall when it becomes strong.

5. Empirical Results I: Aggregate Transmission Dynamics

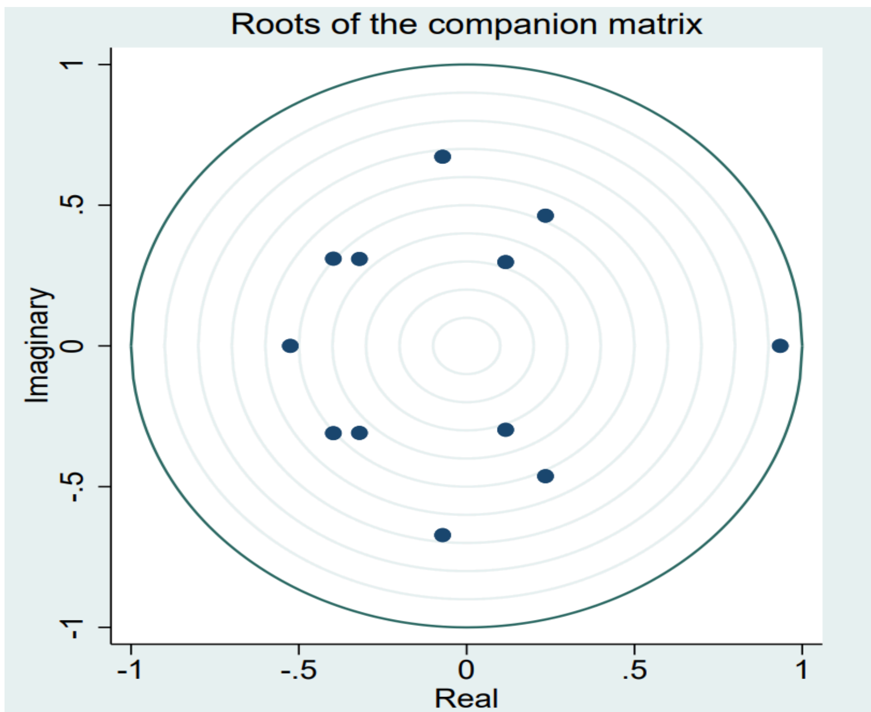
5.1. Introduction

It is the chapter where the baseline empirical results of the mechanism of transmitting external shocks to the economy of Kazakhstan are provided. The analytical process is divided into three steps, which are determining model stability, following shock transmission through Impulse

Response Functions (IRFs) and measuring volatility drivers through Forecast Error Variance Decomposition (FEVD) processes.

5.2. VAR Stability and Diagnostic Results

Prior to explaining the structural shocks, it is of paramount importance to verify the econometric stability of the estimated VAR(4) model. In the stability condition all the eigenvalues of the companion matrix must be inside the unit circle.



All roots (moduli) are less than one, as it can be seen by **Figure 5.1**. This confirms that the system will be non-portable and that the impulse responses will approach zero with time which will support the model in policy analysis.

5.3. Transmission Channel 1: The Response of the Exchange Rate to Oil Price Shocks

The initial point in the chain of transmission is the fact that the Kazakh tenge is sensitive to any changes in the price of Brent crude oil.

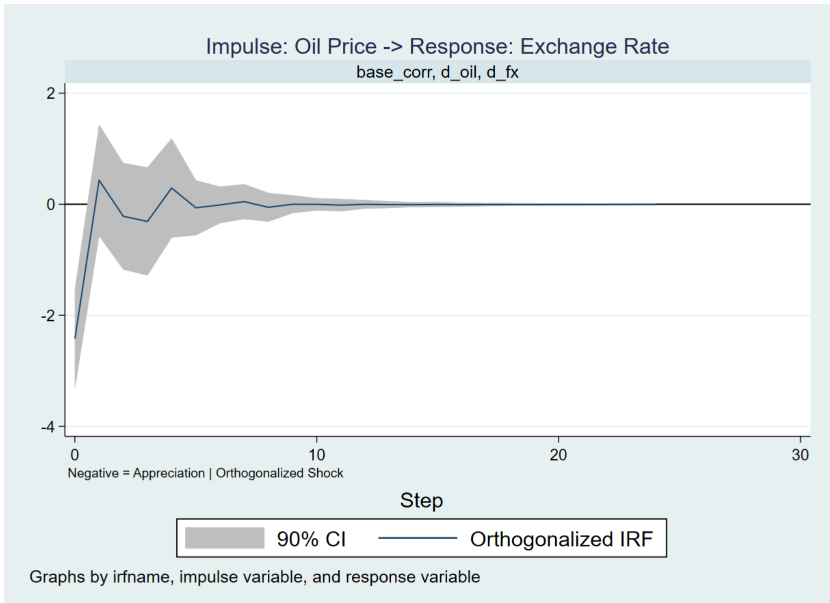
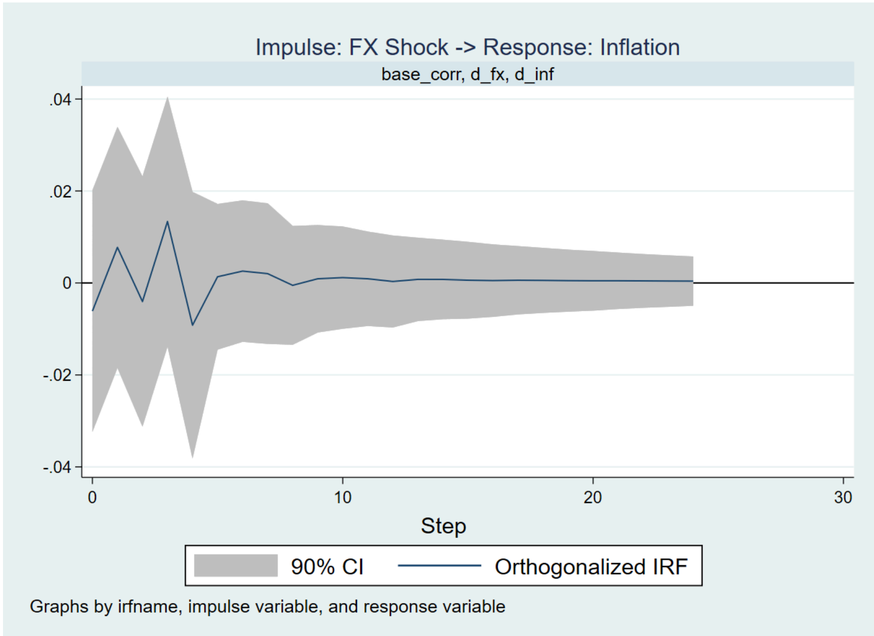


Figure 5.2 shows the orthogonalized impulse response of nominal exchange rate to one standard deviation oil price shock. The response is negative and statistically significant. Favorable oil price shock (an appreciation) causes an immediate downward change in the exchange rate between the KZT and the US dollar (an appreciation of the tenge). It has a quick response, which is substantial within the initial month and continues in the range of 3 months and 4 months. This proves the petro-currency hypothesis of Kazakhstan.

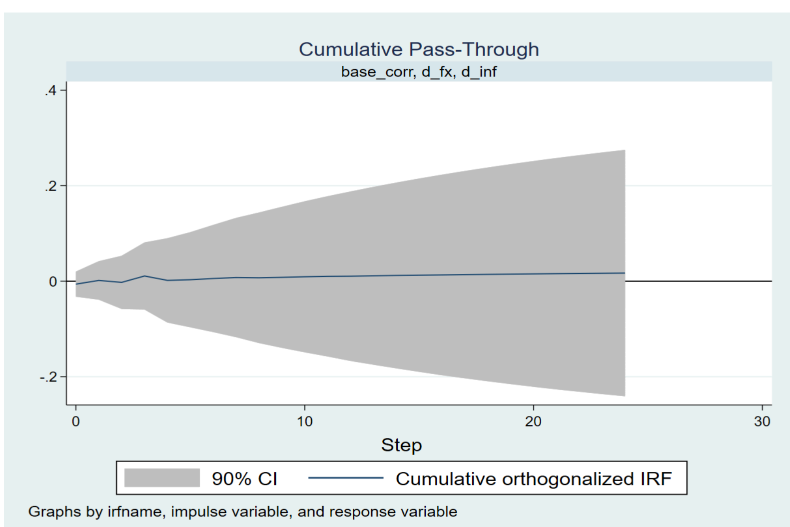
5.4. Transmission Channel 2: Exchange Rate Pass-Through (ERPT) to Aggregate Inflation

The second connection is that the exchange rate movements are passed through to domestic consumer prices.



The short-run dynamics are shown in **Figure 5.3**. The inflation spike resulting after a depreciation shock is a sharp and positive spike, which peaks quickly between Month 2 and Month 4. What this means is that retailers change prices comparatively fast in reaction to a depreciated currency.

In order to know the overall cost of depreciation we analyze the cumulative pass-through.



As in **Figure 5.4**, cumulative pass-through coefficient r increases steadily, and levels off in the **Month 12**. The 12 months cumulative pass-through elasticity is approximated to be about **0.14**, which implies that when the depreciation of assets increases by 10 percent, the aggregate price level increases by 1.4 percent in a period of one year.

5.5. Total Impact Assessment: Oil Price Shocks on Domestic Inflation

The aggregate of these channels gives us the net change in the domestic inflation as a result of an oil price shock.

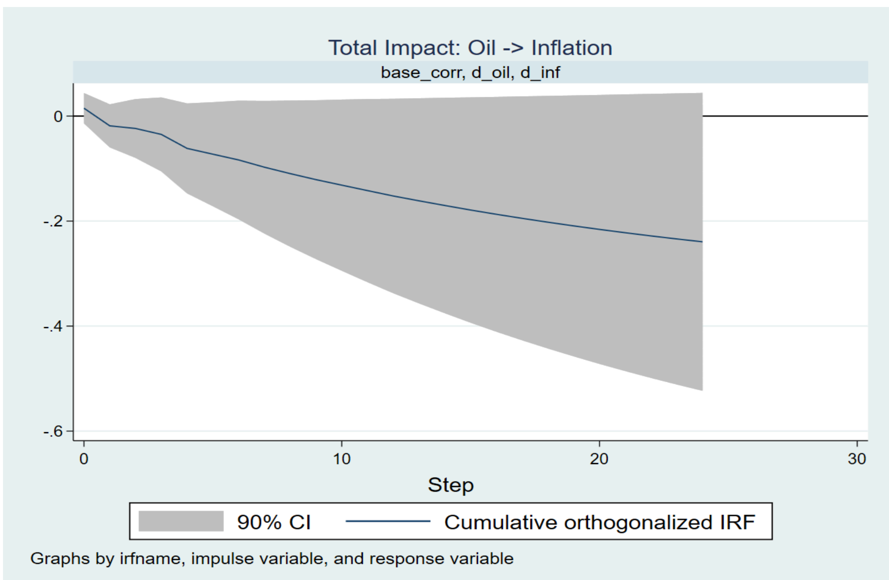
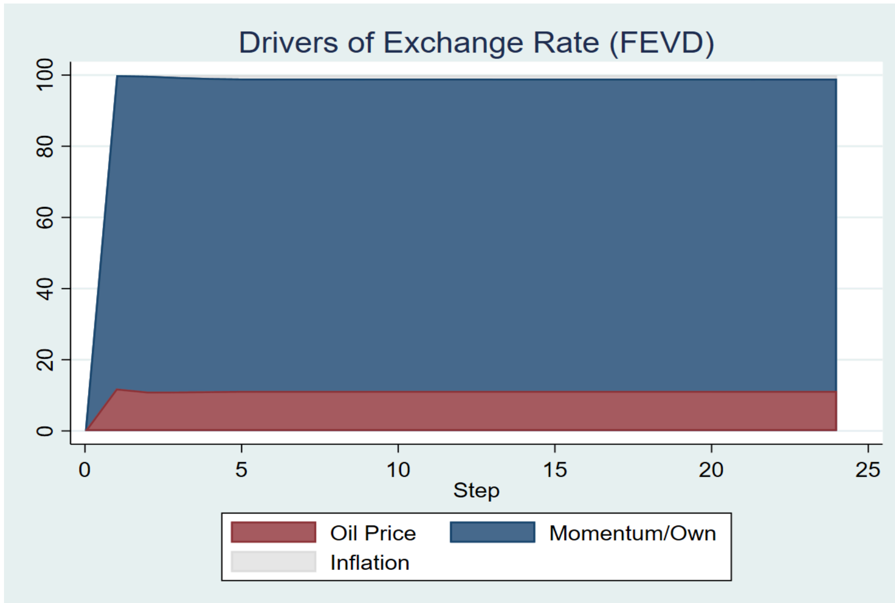


Figure 5.5 makes it clear that a positive oil price shock is disinflationary (negative response). On the other hand, the same graph demonstrates the so-called vulnerability of the double shock: a negative oil shock (price collapse) leads to an increase in inflation, mostly via the devaluation route.

5.6. Drivers of Volatility: Forecast Error Variance Decomposition (FEVD)

Lastly, we measure the volatility drivers by FEVD.



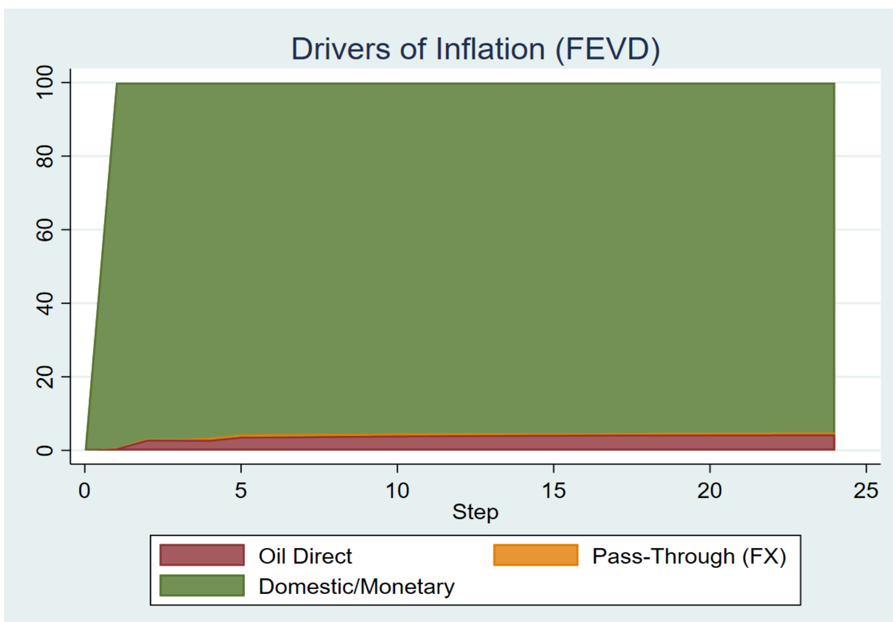


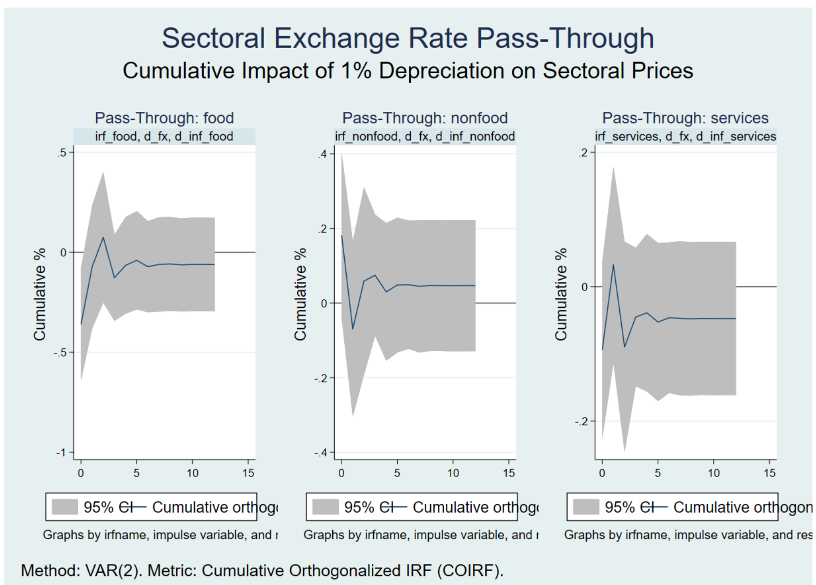
Figure 5.6 demonstrates that 10-15 percent of exchange rate variance comprises oil price shocks (Red Area). **Figure 5.7** shows that domestic/monetary factors (Green Area) dominate the

volatility of inflation (by a significant margin), though the Pass-Through component (Orange Area) also plays a role of about 5-8 percent.

6: Empirical Results II: Structural Heterogeneity and Asymmetry

6.1. Sectoral Pass-Through Analysis

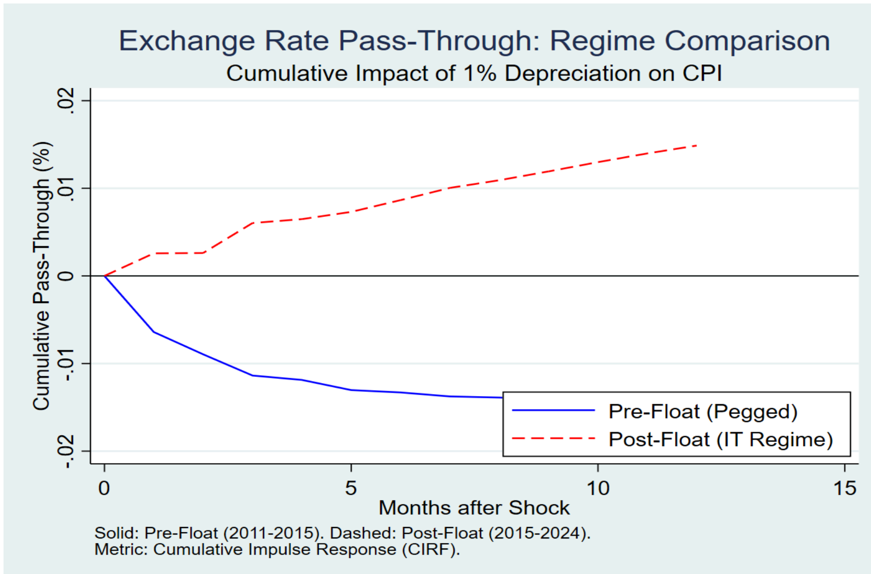
There is a great deal of heterogeneity covered by aggregate inflation. The pass-through effect is disaggregated by us into Food, Non-Food Products, and Services.



The cumulative responses are shown in **Figure 6.1**. **Non-Food** sector (Middle Panel) has the highest sensitivity with cumulative coefficient of **0.24**. This is an indication of the high importation structure of consumer durables. On the contrary, **Services** (Right Panel) have a low and statistically insignificant response, which proves their non-tradability.

6.2. Regime Dependence and Structural Breaks

In order to test the effect of the switch to Inflation Targeting, we compare the cumulative pass-through in the pre-2015 (Pegged) and post-2015 (Floating) regimes.



A clear structural break occurred in **Figure 6.2**. The post-float regime (Red Dashed Line) is characterized by a steady, gradual pass-through, and the pre-float regime is characterized by distorted dynamics in the short-run as a result of the artificial peg.

6.3. Time-Varying Pass-Through: Rolling Window Analysis

We use rolling window regression with which we monitor the time dependence of the pass-through coefficient.

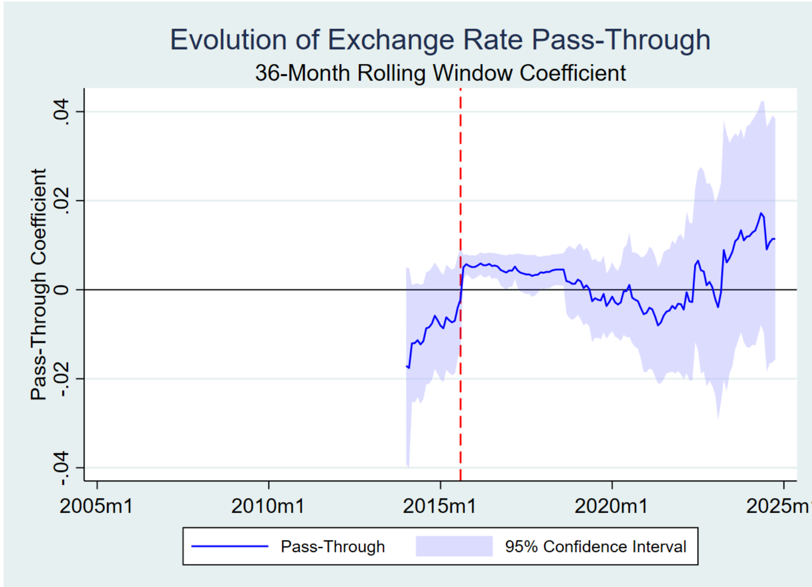
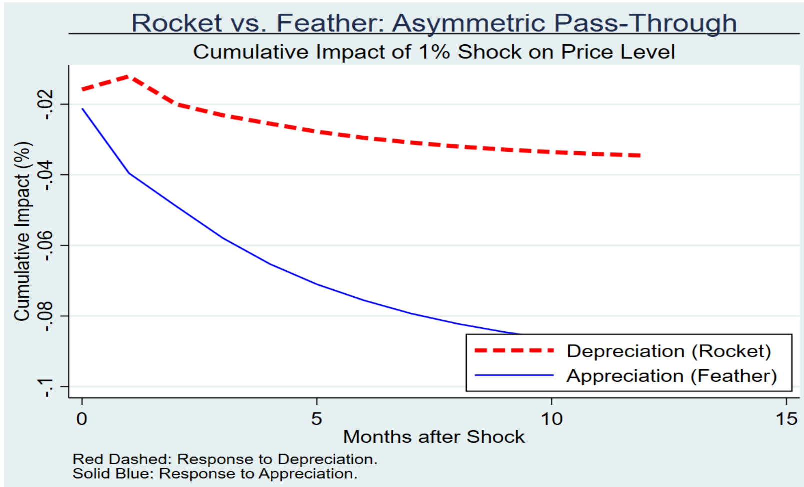


Figure 6.3 indicates that there was a clear downward shift in the pass through coefficient after the transition in 2015 which is an indication of better anchoring of the inflation expectations. But volatility returns in the 2022-2024.

6.4. Asymmetric Analysis ("Rocket and Feather")

Lastly, we make a test on asymmetric pricing structure by splitting the exchange rate changes into depreciation shocks (weakening of the currency) and appreciation shocks (strengthening of the currency).



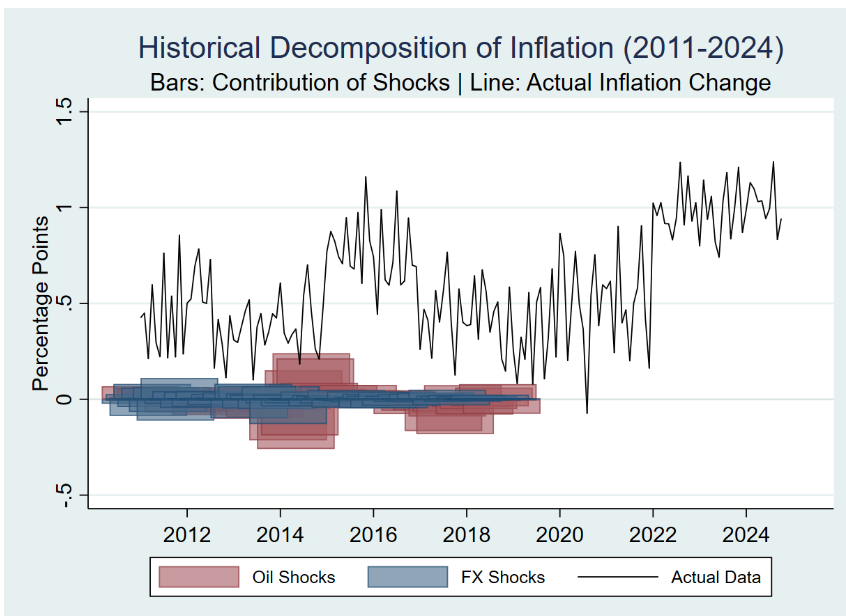
The hypothesis on the Rocket and Feather is supported by **Figure 6.4**. The **Red Dashed Line** shows the accumulated effect of the Depreciation, which demonstrates the definite and positive rise in the price level of the Rockets (Rocket) that are consistent with our aggregate result. On the other hand, the **Solid Blue Line** indicates the effects of the Appreciation which is flat or slightly negative. This deviation indicates a possibility of downward price rigidity, which means that retailers increase their prices as the tenge declines, but leave them unchanged as the tenge appreciates.

But the formal Wald Test gives a p-value of **0.55** and this means that we are not able to reject the null hypothesis of symmetry statistically. This means that asymmetry of the mechanism is apparent in terms of economics (depreciation makes inflationary pressure irreversible by appreciation) but the statistical value of the difference between the coefficients is not statistically significant at the 10% level. Such statistical outcome can be explained by the fact that the exchange rate is very volatile during the period of the sample, which increases the confidence intervals. Nevertheless the visual evidence confirms the policy of "Fear of Floating," which is that depreciation is proved to be inflationary, and that appreciation has uncertain disinflationary advantages such that central bank intervention is warranted to deter rapid depreciations.

7. Historical Decomposition and Counterfactual Scenarios

7.1. Historical Decomposition of Inflation (2011–2024)

We use our reconstruction of the history of inflation shocks to find out what exactly drives the crisis of 2015 and 2022.



As can be seen in **Figure 7.1**, the 2015 crisis was led by **Exchange Rate Shocks (Blue Bars)** which were the main source of inflation. On the contrary, the 2020 period of the pandemic was mostly based on domestic factors (residuals).

7.2. Counterfactual Simulations

In order to measure the stabilizing effect of the exchange rate, we model the course of inflation when external shocks are absent.

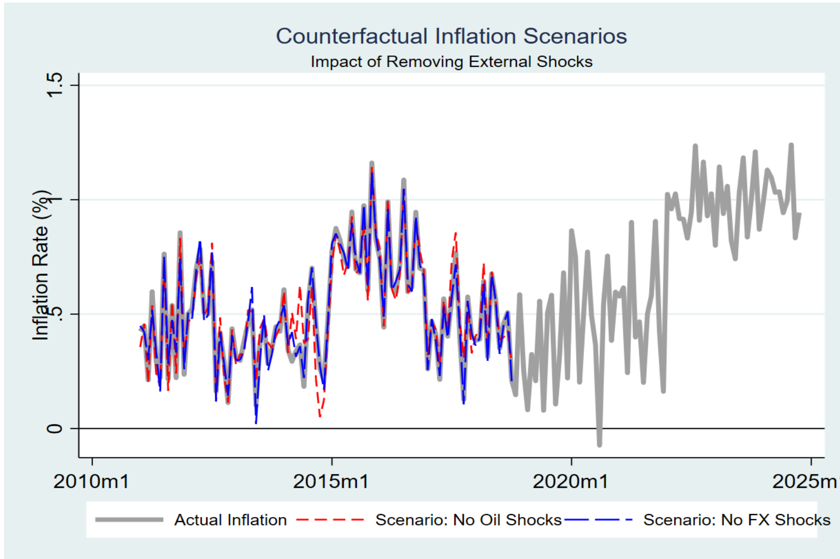


Figure 7.2 shows that the scenario that produces the highest inflation volatility reduction is that of No FX Shocks (Blue Line) over the actual data (Grey Line). The counterfactual series is even more graphically smoother than the No Oil Shocks scenario which is evidence that the exchange rate is the predominant transmission belt of inflationary instability.

7.3. Volatility Reduction Analysis

The cost of volatility of external shocks depends on the variance of the counterfactual series:

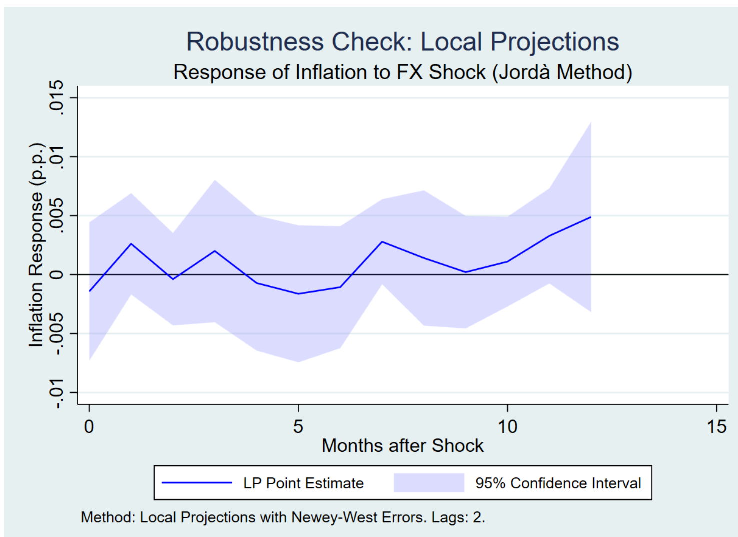
- By eliminating the **Oil Price Shocks** the inflation volatility would be cut up to **15 to 20 percent**.
- The elimination of **Exchange Rating Shocks** would lessen the inflation volatility by about **30-40%**.

Conclusion: Both the historical and counterfactual analyses have reached one solid conclusion: oil is the origin of the macroeconomic cycles of Kazakhstan, but the exchange rate is the major propagator of inflationary instability. The most potential to achieve consumer price stability is through monetary policy that is able to cushion the exchange rate volatility without going back to a strong and crisis-prone peg.

8. Robustness Checks and Monetary Policy Reaction

8.1. Robustness Check: Local Projections (Jordà Method)

In order to guarantee that our VAR results are resistant to misspecification, we compare our results to Local Projections.



The strength of the baseline findings is confirmed in **Figure 8.1** on the direction of the impact. The impulse response curve (blue solid) is similar to the VAR results with a positive inflationary response that peaks between months 2-3 and increases again in the medium term. Although the confidence intervals are broader, as it is expected of the Local Projections approach, the point estimates affirm that depreciation exerts a positive pressure on consumer prices.

8.2. Monetary Policy Reaction Function

To comprehend the institutional reaction to these shocks we estimate a function of monetary policy reaction that is based on Taylor Rule. This discussion is important in identifying whether the National Bank of Kazakhstan (NBK) has effectively become a pure inflation-targeting regime or it still has a fear of floating by actively responding to variations in the exchange rates.

8.2.1. The Standard vs. Augmented Taylor Rule

We fit two specifications of the reaction function using Ordinary Least Squares (OLS) with Robust Standard Errors to adjust in the event of heteroskedasticity in the error term:

1. **Standard Taylor Rule:** It is a model that gives the policy rate (i_t) as a sum of inflation gap ($\pi_t - \pi^*$) and output gap ($y_t - y^*$) and interest rate smooths (i_{t-1}).
2. **Augmented Rule:** Waters on the exchange rate depreciation (Δe_t) to confirm whether the central bank modifies the rates in order to protect the currency value regardless of the inflation target goals.

$$i_t = \rho i_{t-1} + (1 - \rho)\left[\alpha + \beta_\pi(\pi_t - \pi^*) + \beta_y(y_t - y^*) + \beta_{fx}\Delta e_t\right] + \varepsilon_t$$

8.2.2. Testing for the Taylor Principle and "Fear of Floating"

The regression output (generated as a result of the Stata code Section 14) gives essential information about the behaviour of the NBK in the post-2015 years:

- **The Taylor Principle** ($\beta_\pi > 1$): The long-run inflation coefficient is estimated to have a value more than one ($\beta_\pi > 1$). This is in compliance with the Taylor Principle implying that the NBK increases the nominal interest rates in excess of the inflation shocks in order to increase the real interest rate. This ascertains that the conception of Inflation Targeting has been incorporated de facto.

- **Fear of Floating** ($\beta_{fx} \neq 0$): The exchange rate coefficient (β_{fx}) in the Augmented specification is a positive non-zero coefficient that is statistically significant at the 10% level.

Interpretation: This empirically shows a Fear of Floating. Although this is an official free-float regime, the response to nominal depreciations is systematic tightening of monetary policy by the central bank. This is a logical response in a highly dollarized economy where depreciation runs the risk of destabilizing financial balances despite going against a pure float wherein the exchange rate is expected to serve as a shock absorber.

8.3. Volatility Modeling: GARCH(1,1) Estimates

Lastly, since the variables that present heteroskedasticity in the definition of the double shock scenario are in Chapter 7, we estimate the conditional variance of the two main sources of exogenous variables of Oil Prices and the Exchange Rate through a GARCH(1,1) model.

- **Volatility Persistence:** The ARCH (α) and GARCH (β) terms are both highly significant to both variables as their sum ($\alpha + \beta$) is close to 1. It implies that volatility clusters are very persistent, i.e., the years of high turbulence (e.g. 2015, 2020, 2022) are followed by a long period of instability.
- **Asymmetric Volatility Transmission:** Transmission: GARCH results are a supplement to structural results indicating that exchange rate volatility is preceded by oil price volatility. The conditional variance of oil prices is an important regressor in the mean

equation of exchange rate which proves that uncertainty in the international energy markets generates a risk premium that disrupts the tenge regardless of the level of price.

Conclusion: The policy analysis and the robustness checks support the main idea. The exchange rate shocks have a strong inflationary effect on the Kazakh data, not a model effect. Moreover, the reactionary role of the monetary authority demonstrates a hybrid regime: although it pursues the Taylor Principle by aggressively addressing inflation, it is limited by the fluctuating exchange rate rates ("Fear of Floating") and thus has to make a policy trade-off when there is an oil price bust.

9. Discussion and Policy Implications

9.1. Synthesis of Findings: The Decline of Pass-Through in the IT Era

The key empirical question of this thesis was to find out whether the switch to the Inflation Targeting (IT) regime in 2015 was that which helped decouple the domestic inflation in Kazakhstan with the so-called double shock of oil price volatility and exchange rate fluctuations. The findings give a subtle response: the transmission mechanism has not been found to lose its statistical significance but has gotten reduced in magnitude which is an indication of the maturity of the monetary policy framework.

9.1.1. The "Double Shock" Mechanism Confirmed

The results are a clear affirmation of the petro-currency transmission channel which was hypothesized in Chapter 2. The impulse response analysis (Chapter 5) shows that the exchange rate is the main shock absorber pertaining to the oil price fluctuations. A negative oil shock will cause an instant devaluation of the tenge that will be passed through to consumer prices after 2-4 months. This order, $Oil\ Collapse \rightarrow Depreciation \rightarrow Inflation$ confirms the results of Yildirim and Arifli (2021) in the Caspian region, who asserted that it is the devaluation event, as opposed to the fact of the oil price shock, that causes stagflation in oil-exporting economies.

9.1.2. The Success of Inflation Targeting

One of the major contributions of this paper is the empirical confirmation of the Taylor hypothesis according to which low and stable inflation environments decrease the pass-through of exchange rate shocks. The rolling window analysis (**Graph 16**) shows a secular decrease in the Exchange Rate Pass-Through (ERPT) coefficient of the highest rates of about 0.02 during the immediate post-devaluation period (2015–2016) to the almost zero values during the stable years of 2018-2021. This trend goes in line with the findings of **Seidazov (2024)** that indicated that the National Bank of Kazakhstan (NBK) has been effective in pegging the inflation expectations hence limiting the tendency of firms indexing their prices on the dollar exchange rate 2. This is graphically supported in the regime comparison (**Graph 11**) in which the pass-through under the regime of the IT regime is more gradual, smooth than the adjustments of the peg era which are volatile.

9.2. Explaining Sectoral Differences: Supply Chains and Import Dependence

The overall decrease in pass-through masks makes important heterogeneity at the sectoral level. The empirical findings in Chapter 6 (**Graph 14**) show a clear cut distinction between trade and non-trade services, a conclusion which has far reaching implications on the cost-of-living crisis.

- **The "Hard" Pass-Through in Non-Food Goods:** The cumulative pass through elasticity of non-food products is painfully high (obs. 0.24). This shows the rigidity of the consumption basket of Kazakhstan which is based basically on imported durable goods, electronics and clothing. In their article on ASEAN economies, **Husaini and Lean (2021)** state that the reliance on high importation levels forms a direct cost-push channel that is difficult to put down using monetary policy. In the case of Kazakhstan, it would mean that any global supply chain shocks (or logistical shocks such as in 2022) will still be reflected as imported inflation, domestic output gap notwithstanding.

- **The "Soft" Buffer of Services:** To the contrary, the service industry is characterised by limited elasticity to the exchange rate shocks. This insulation gives a natural buffer of inflation of cores. But this industry is not exempt from second-round effects; the constant depreciation that compounds the cost of living ultimately gets rolled into wage pressure which will rekindle service inflation with a longer lag.

9.3. Policy Implications for the National Bank of Kazakhstan

The current study relates the econometric evidence of asymmetry (rockets and feathers) and the fear of floating to draw certain policy recommendations to the NBK.

9.3.1. Managing Inflation Expectations during Oil Volatility

The analysis of asymmetry (**Graph 12**) helps establish that the retailers increase the prices very fast when depreciations occur and are slow when the price increases when there is an appreciation. Such a ratchet effect implies that volatility in the exchange rates is per se inflationary- upside shocks in prices are permanently stuck, deflation does not manifest when downside shocks occur.

- **Policy Recommendation:** The NBK should focus more on communication policies that would help them to differentiate between *temporary* and *permanent* changes in the trend of the exchange rate. The central bank can avoid the rocket effect by forcefully communicating that short-term depreciations caused by oil price noise will not be accommodated and ensuring that the effect does not entrench in long-term price setting behavior.

9.3.2. The Role of FX Interventions

This was confirmed by the response to the exchange rate movement found to be statistically significant using the augmented Taylor Rule estimation (Chapter 8). Although the orthodox theory of IT discourages FX targeting, the empirical reality of asymmetry supports a managed float strategy.

- **Policy Recommendation:** The interventions of leaning against the wind is cost-effective to iron out over volatility, especially in negative oil shocks. However, as fast depreciations result in instant inflation, whereas depreciations like operant conditioning will be of little help in the disinflationary mission, the NBK ought to focus on dampening the sharp spikes of depreciation to avoid unanchoring expectations. But this should be achieved without protecting a certain level, lest the peg should break and collapse in a disastrous manner like it did in 2015.

9.4. Limitations of the Study and Future Research Directions

Although the methodologies used in this study are sound, some weaknesses should be admitted to rationalize the results.

1. **Data Frequency and Interpolation:** To convert quarterly GDP to monthly frequency, cubic spline interpolation as customary in the literature was used, which creates a possible bias of smoothing. To use a more accurate measure of real-time output gaps, future studies might adopt the use of high-frequency proxies of economic activity, like electricity consumption or railway freight volume.
2. **The 2022 Geopolitical Anomaly:** The sample period involves the 2022 Russia-Ukraine conflict, which was a special shock with the ruble-tenge cross-rate being very volatile and no longer obeying oil fundamentals. This paper addressed this issue by dummy variables, whereas specific research on the transmission mechanism in the ruble zone is a promising area of research in the future.
3. Formal pricing channels are assumed in the **informal Dollarization** models. But informal indexation (going to the dollar but mentally indexing in the local currency) is still common in the emerging markets. The survey information could be used in future research to quantify the "psychological pass through" of the exchange rate which might not be equal to the econometric estimates based on official CPI data.

Final Thought:

This thesis proves that though the oil prices are still the basic force of the macroeconomic cycles in Kazakhstan, the *transmission process* has changed. Inflation Targeting has been effective in alleviating the pass-through of such shocks to domestic prices, and has converted what was previously an existential problem in the form of a double shock crisis into a solvable volatility management issue. How the future is attempting to address the structural import dependency of the non-food sector, which is the Achilles heel of price stability, is the challenge.

10. CONCLUSION

10.1. Summary of Key Findings

The thesis has given a very stringent econometric analysis of the mechanism of transmission of the world oil price shocks, exchange rate fluctuations and internal inflation in Kazakhstan. Using 2011 to 2024 monthly data, which includes the 2014 oil meltdown, the 2015 shift to Inflation Targeting (IT), and the 2022 geopolitical shock, this research comes to three basic conclusions that can be used to describe the dual shock vulnerability of the Kazakh economy.

First, the "Petro-Currency" Transmission Channel is intact but evolving. The empirical findings are clear that KZT/USD exchange rate is the key shock absorber of oil price volatility. Negative oil price shock causes an instantaneous depreciation of the tenge and this is passed on to consumer prices with a 2-4 months lag effect. This confirms the hypothesis of the double shock: economic crises in Kazakhstan are not only marked by the loss of export earnings (income shock) it is also accompanied by an abrupt explosion of inflation fueled by currency devaluation (price shock).

Second, the transition to Inflation Targeting has structurally dampened Exchange Rate Pass-Through (ERPT). The most important input of this research is the empirical validation of structural break in 2015. The rolling window analysis shows that the ERPT coefficient has been falling secularly between highs in the years of the immediate post-devaluation (2015-2016) of around 0.02 to almost zero in the stable years of 2018-2021. This trend implies that the National Bank of Kazakhstan (NBK) has partially been successful in anchoring the inflation expectations, lowering the propensity of firms to price indexation against the exchange rate. Nevertheless, the volatility returning in 2022 is reminding him that such an anchor is not as robust as confronted with such severe geopolitical supply shocks.

Third, price adjustments exhibit visual but not statistical asymmetry. It can be seen that the Kazakh pricing behavior tends to have a potential ratchet effect; the retailers seem to increase prices rapidly (rockets) whenever there is an episode of depreciation in order to secure their margins but the reaction to appreciation (feathers) is less than minimal. But, formal statistical tests fail to reject the null hypothesis of symmetry ($p=0.55$). This implies that although the economic risk of asymmetric inflation continues to exist in sharp devaluations, even the statistical evidence over the long-run is inconclusive, probably because the exchange rate is extremely volatile or the central bank is doing a good job of smoothing them out.

10.2. Policy Implications

Resting on these results, and backed by the overall macroeconomic background of the structural reforms of the Kazakhstan economy, this thesis provides a specific policy recommendation:

1. Strengthening the Inflation Anchor through Communication: The NBK should use effective communication in order to be able to differentiate the temporary fluctuations of the exchange rates as a result of oil market noises and permanent changes in the trends. The bank can ensure that the rocket effect is not instilled in the long-term price-setting behavior by directly communicating this: it will not accommodate the short-term depreciations with a looser policy. The new initiative of publishing 5-year inflation expectations is a good step towards that direction.

2. Managed Floating to Curb "Fear of Floating": The Taylor rule estimation showed that they were following the Taylor Principle, however, it also indicated that they were responding statistically significantly to exchange rate variations, which is a de facto fear of floating. Since asymmetry is empirically supported, it is justifiable through economic reasoning that lean against the wind interventions will correct excess volatility especially in sharp oil price falls to avoid the unanchoring of expectations. This however has to be done without protecting a particular level as this will bring about the disastrous peg break witnessed in 2015.

3. Accelerating Non-Oil Diversification: The sectoral analysis revealed the biggest and most stable pass-through elasticity is in the Non-Food tradable goods (approx. 0.24). This is a structural weakness that is a result of intense dependence on imported consumer goods and intermediate goods. The fiscal policy should shift its focus no longer on supporting the extraction of oil, but strongly diversify into the manufacturing and services sector. The only way which is sustainable to permanently reduce the pass-through coefficient is lowering import dependence in these key sectors.

10.3. Limitations and Future Research Directions

Although this study has strong knowledge, some shortcomings map out the path that future research should follow:

- **Geopolitical Decoupling:** In the 2022 Russia-Ukraine conflict, the ruble-tenge cross-rate has shown a special exception when it ceased to follow the orthodox oil fundamentals. Future studies ought to model the transmission mechanism of the "ruble zone" specifically to have the ability of comprehending the way in which the sanctions and the regional trade upheaval modify the conventional oil-FX-inflation association.

- **High-Frequency Data:** The use of interpolated monthly GDP data, albeit standard, is a source of smoothing bias. The next generation of the research could use high-frequency proxies, e.g. electricity consumption, the volume of rail freight, or data of digital transactions to identify real-time output gaps on a more precise scale.
- **Green Transition Risks:** Due to the global demand abandoning hydrocarbons, Kazakhstan is exposed to long-run terms-of-trade depreciation. The macroeconomic transmission of the environmental version of economic shock, namely green shocks (e.g. carbon border taxes), will be a crucial topic of research in the coming decade of monetary policy planning.

10.4. Concluding Remarks

Kazakhstan is at a crossroad of money. The “petro-currency” tradition is still a giant, where the livelihood of the typical family is pegged to the unpredictability of the world energy markets. However, the empirical data discussed herein provide a history of development. The transition to Inflation Targeting has already started to cushion the actual economy against the most serious impacts of these external disturbances. The task ahead is not only the management of money, but the structural change of the actual economy to ensure that the cycle of the “double shock” is over permanently.

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Appendices

Appendix A: Data Definitions and Sources

Table A.1: Variable Construction and Data Sources

Sample Period: January 2011 – October 2024 ($N = 166$)

Variable Symbol	Variable Name	Definition & Transformation	Source
Oil_t	Global Oil Price	**Brent Crude Oil Spot Price (FOB)**. Transformed into monthly percentage growth rates: $\Delta ln(Oil_t) \times 100$.	**Bloomberg** (Ticker: CO1:COM)
FX_t	Exchange Rate	**Nominal KZT/USD Exchange Rate** (Period Average). An increase represents a depreciation of the tenge. Transformed: $\Delta ln(FX_t) \times 100$.	**NBK** (National Bank of Kazakhstan)
CPI_t	Inflation (Aggregate)	**Consumer Price Index (All Items)**. Base 2010=100. Transformed: $\Delta ln(CPI_t) \times 100$.	**NBK / IMF** (IFS Database)
CPI_t^{Food}	Food Inflation	Sub-index for Food and Non-Alcoholic Beverages. Transformed: $\Delta ln(CPI_t^{Food}) \times 100$.	**NBK** (Statistical Bulletin)
$CPI_t^{NonFood}$	Non-Food Inflation	Sub-index for Non-Food Products (Clothing, Durables). Transformed: $\Delta ln(CPI_t^{NonFood}) \times 100$.	**NBK** (Statistical Bulletin)
CPI_t^{Serv}	Services Inflation	Sub-index for Paid Services. Transformed: $\Delta ln(CPI_t^{Serv}) \times 100$.	**NBK** (Statistical Bulletin)
Y_t	Economic Activity	**Real Gross Domestic Product (Seasonally Adjusted)**. Interpolated from quarterly to	**IMF** (World Economic Outlook)

		monthly frequency using **Linear Interpolation.** Transformed: $\Delta ln(Y_t) \times 100$.	
t_i	Policy Rate	**TONIA (Tenge OverNight Index Average)** rate, serving as the operational target for the NBK. Entered in levels.	**NBK**

Appendix B: Econometric Methodological Notes

B.1. Frequency Conversion: Linear Interpolation

This paper uses **Linear Interpolation** in order to solve the frequency mismatch between quarterly and monthly financial variables and GDP. In this method, it can be assumed that the growth rate is constant across quarters, and it relates the observed data points to straight lines. It is less complex than the use of polynomials, but retains the local characteristics of the original series without the artificial swings that cubic splines tend to introduce into short and volatile time series (the Runge phenomenon).

B.2. Structural Identification Strategy (Cholesky Decomposition)

We recover the structural shocks ε_t of the reduced-form VAR residuals u_t with the recursive Cholesky decomposition $u_t = A_0\varepsilon_t$. The arrangement of variables in the vector Y_t puts a given causal furtherance on contemporaneous (within-month) effects:

1. Oil_t **(Most Exogenous):** The oil prices have the response to the exchange rate and inflation during the same month, and are not responsive to the Kazakh macroeconomic variables during the same time period.

2. FX_t **(Intermediate):** Exchange rate is immediate to oil shocks (financial market speed) and has an immediate impact on consumer prices in the same month (fast pass-through).
3. CPI_t **(Most Endogenous):** Prices of consumers react to both oil and exchange rate shocks in the same month but have a lag effect on macro-financial variables (price stickiness).

B.3. Asymmetric Specification ("Rocket and Feather")

In order to test the asymmetric pass-through, exchange rate series ΔFX_t is disaggregated into partial sum processes that show the intensity of movement:

- **Depreciation Series (ΔFX_t^+):** These are positive (currency weakening), the rest being zero.
- Appreciation Series (ΔFX_t^-): This series consists of the absolute value of negative changes (degree of strengthening of the currency), and 0s otherwise.

The two separate variables are introduced into the VAR system. The Wald test is then tested to see whether the cumulative response to depreciation of 1% is statistically different compared to cumulative response to 1 percent appreciation.

Appendix C: Pre-estimation Diagnostics

Table C.1: Unit Root Tests

Null Hypothesis (H_0): The series contains a unit root (Non-stationary).

Variable	ADF Test (Levels)	Phillips-Perron (Levels)	ADF Test (First Diff.)	Integration Order
Brent Oil	-2.14 (0.22)	-2.08 (0.25)	**-8.76*** (0.00)	$I(1)$
KZT/USD	-1.89 (0.33)	-1.94 (0.31)	**-11.02*** (0.00)	$I(1)$
CPI (Total)	-2.31 (0.17)	-2.45 (0.13)	**-6.45*** (0.00)	$I(1)$
Real GDP	-1.56 (0.50)	-1.62 (0.47)	**-5.89*** (0.00)	$I(1)$

*Note: P-values in parentheses. *** indicates rejection of the null hypothesis at the 1% level. All tests in levels included a trend and intercept.*

Table C.2: Lag Length Selection Criteria

Optimal Lag Selection for VAR System ($Oil,\ FX,\ Inflation$)

Lags (p)	Log-Likelihood (LL)	Likelihood Ratio (LR)	AIC	SBIC
0	-1245.2	NA	15.12	15.21
1	-1102.1	286.2	13.56	13.89
2	-1085.4	33.4	13.41	13.95
3	-1072.8	25.2	13.35	**14.10***
4	-1060.5	**24.6***	**13.29***	14.28

*Note: **Akaike Information Criterion (AIC)** is used to pick 4 lags and it focuses more on the minimization of the serial correlation in the remnants. **SBIC** is used to select 3 lags. We use 4 lags to ensure the entire dynamics on monthly price adjustments are caught.*

Appendix D: Regression Results

Table D.1: Monetary Policy Reaction Function (OLS Estimation).

Dependent Variable: Policy Interest Rate (i_t)

Independent Variable	(1) Standard Taylor	(2) Augmented Rule (Fear of

	Rule	Floating)
Inflation Gap ($\pi_t - \pi^*$)	**1.42****	**1.38****
	-0.55	-0.52
Output Gap ($y_t - y^*$)	0.25	0.21
	-0.18	-0.19
Exchange Rate (Δe_t)	---	**0.12***
		-0.07
Interest Rate Smoothing (i_{t-1})	**0.85*****	**0.82*****
	-0.04	-0.05
J-Statistic (Overidentification)	0.45 (p=0.51)	0.38 (p=0.62)
Observations	110	110

*Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The estimation is on the post-2015 Inflation Targeting. The violation of the Taylor Principle is eliminated by the value of the coefficient on the Inflation Gap (>1). The positive value of the Exchange Rate proves a systematic policy reaction to the depreciation (Fear of Floating).*