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Fiscal Sustainability under Sanction Regimes: Evidence from Russia's Post-2022 Policy Adjustments[1]

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Abstract. This study analyses the fiscal sustainability of the Russian Federation following the 2022 military operations in Ukraine and the imposition of comprehensive international sanctions. Using debt dynamics modelling and fiscal reaction function analysis, we assess the viability of Russia's government fiscal framework amid military operations from 2022 to 2025. Although the "Fortress Russia" framework established after 2014 initially provided fiscal resilience, our empirical findings show the three key areas where major sustainability concerns are most pronounced. First, hydrocarbon revenues have deteriorated structurally, falling more than 19 percent year over year. Second, defence spending has risen to 40 percent of consolidated government expenditures. Third, sovereign wealth buffers are declining quickly, with liquid assets of the National Wealth Fund expected to be depleted within 12 to 18 months unless policy adjustments are made. Using a modified intertemporal budget constraint framework tailored to commodity-dependent economies under financial isolation, we find that Russia's primary balance requirements exceed sustainable thresholds by 2.8 to 3.4 percentage points of GDP under baseline oil price scenarios. The analysis provides new insights into fiscal sustainability assessment for sanctioned economies with limited access to external financing, highlighting the critical trade-offs between short-term macroeconomic stabilization and medium-term solvency.

Keywords: fiscal sustainability, debt dynamics, economic sanctions, Russia, commodity exporters

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ИССЛЕДОВАТЕЛЬСКАЯ СТАТЬЯ

Фискальная устойчивость в условиях санкционных режимов: на примере политики России после 2022 года

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Аннотация. В статье анализируется фискальная устойчивость Российской Федерации после начала специальной военной операции в Украине в 2022 году и введения комплексных международных санкций. С помощью моделирования динамики долга и анализа функции фискальной реакции оценивается жизнеспособность государственного фискального механизма России в условиях военных действий с 2022 по 2025 годы. Эмпирический анализ показывает, что, несмотря на первоначальную устойчивость, достигнутую в рамках модели «Крепость Россия», сформированной после 2014 года, страна впоследствии столкнулась с фундаментальными проблемами, угрожающими ее устойчивости, по трем основным направлениям: (1) структурное снижение доходов, превышающее 19 % год к году по поступлениям от продажи углеводородов; (2) рост расходов на оборону до 40 % от консолидированных государственных расходов; (3) быстрое сокращение ликвидных средств Фонда национального благосостояния, которые, по прогнозам, будут исчерпаны за 12–18 месяцев, если политика не будет скорректирована. Применяя модифицированную модель межвременного бюджетного ограничения, адаптированную для сырьевых экономик в условиях финансовой изоляции, мы доказали, что требования к первичному балансу России превышают устойчивые пороги на 2,8–3,4 процентных пункта ВВП при базовых сценариях цен на нефть. Исследование позволяет улучшить методологию оценки фискальной устойчивости экономики подсанкционных стран с ограниченным доступом к внешнему финансированию, подчеркивая необходимость достижения баланса между задачей краткосрочной макроэкономической стабилизации и обеспечением устойчивости бюджета в среднесрочной перспективе.

Ключевые слова: фискальная устойчивость, долговая динамика, экономические санкции, Россия, сырьевые экспортеры

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1. Introduction

The intersection of geopolitical conflict, comprehensive economic sanctions, and fiscal sustainability presents an underexplored dimension in contemporary macroeconomic analysis. Russia's fiscal trajectory following the February 2022 escalation of military operations in Ukraine and the subsequent imposition of multilateral sanctions by 38 jurisdictions offers a compelling natural experiment for examining public finance dynamics under conditions of acute external economic pressure and financial market isolation. This configuration — characterized by severed access to international capital markets, commodity export restrictions, and substantial increases in defense-related expenditures — generates fiscal stress mechanisms distinct from traditional emerging market debt crises or advanced economy fiscal adjustments.

The analytical significance of this case extends beyond Russia-specific considerations. As of 2025, global public debt has reached unprecedented peacetime levels, with emerging market and developing economies (EMDEs) confronting increasingly constrained fiscal space amid polycrisis conditions including climate transition costs, pandemic recovery, and geopolitical fragmentation. Understanding how a major commo-

dity-exporting economy maintains fiscal sustainability when it cannot rely on external borrowing, exchange rate flexibility, or international institutional support offers broadly applicable insights for other resource-dependent economies facing similar constraints.

Russia's fiscal position presents several distinctive features warranting systematic investigation. First, the economy maintains substantial current account surpluses derived from commodity exports, yet faces mounting budget deficits — a configuration that challenges conventional twin deficit frameworks. Second, the government operates under complete financial autarky, with zero access to external debt markets and minimal foreign currency borrowing capacity, even from strategic partners such as China. Third, defence expenditures have reached approximately 10 % of GDP, levels unprecedented outside active total war mobilization scenarios in modern peacetime economies. Fourth, the fiscal architecture relies increasingly on monetary financing mechanisms and state-directed credit allocation, raising questions about fiscal-monetary policy boundaries and inflation sustainability.

Existing literature on fiscal sustainability in emerging markets predominantly focuses on economies maintaining some degree of international financial market access and operating under conventional monetary-fiscal policy separation. The sanctions regime imposed on Russia since 2022 fundamentally alters these baseline conditions, necessitating analytical frameworks adapted to financial autarky and constrained policy space. Moreover, recent assessments of sanctions' effectiveness have emphasized macroeconomic aggregate impacts without systematically examining the fiscal channel through which sanctions pressure translates into economic constraints.

This study addresses three principal research questions:

(1) What are the fundamental drivers of Russia's fiscal deterioration since 2022, and to what extent do they reflect structural versus cyclical factors?

(2) Under what parameter configurations does Russia's current fiscal trajectory satisfy intertemporal budget constraint conditions necessary for sustainability?

(3) What policy adjustments would be required to restore fiscal sustainability, and what are their associated macroeconomic trade-offs?

Our analytical approach employs a modified debt dynamics framework incorporating commodity price volatility, exchange rate valuation effects, and stock-flow adjustments — factors particularly relevant for resource-dependent economies under sanctions. We augment standard fiscal reaction function estimation with survival analysis techniques to assess the probability of debt trajectory acceleration toward unsustainable levels. The empirical investigation utilizes consolidated budget data from Russia's Ministry of Finance, Central Bank statistical releases, and international financial institution assessments covering the period 2022Q1-2025Q2.

The findings reveal that Russia's fiscal position has deteriorated significantly beyond official government projections. The consolidated budget deficit for January-July 2025 reached 4.9 trillion rubles (2.2 % of GDP), representing 129 % of the full-year target and 4.5 times the comparable 2024 period. This deterioration stems primarily from a 19 % year-over-year decline in oil and gas revenues, which traditionally constitute 30–40 % of federal receipts. Simultaneously, defence and security expenditures have expanded to approximately 40 % of total government spending, up from 15 % pre-conflict levels. The liquid portion of the National Wealth Fund (NWF), which is Russia's primary fiscal buffer, declined to 4.0 trillion rubles (approximately $48 billion) as of July 2025, with the government also liquidating approximately 16 % of gold reserves.

Under baseline assumptions incorporating current oil price trajectories ($60–65 per barrel for Urals crude) and existing expenditure commitments, we project Russia's federal budget deficit will reach 5.5–6.0 trillion rubles (2.5–2.7 % of GDP) in 2025, substantially exceeding the official 3.8 trillion ruble target. More critically, primary balance requirements for debt stabilization under these conditions would necessitate immediate fiscal adjustment equivalent to 2.8–3.4 percentage points of GDP — a magnitude that would likely trigger significant economic contraction given Russia's current growth deceleration (1.1 % year-over-year in Q2 2025).

The study contributes to multiple literature streams. First, it extends fiscal sustainability analysis to environments characterized by comprehensive financial isolation, demonstrating how conventional market discipline mechanisms become inoperative when external financing channels are severed. Second, it provides granular empirical evidence on the fiscal transmission channel of sanctions effectiveness, quantifying how trade restrictions and financial market access limitations impact government solvency trajectories. Third, it offers methodological contributions to assessing sustainability in resource-dependent economies operating under the dual constraints of commodity price volatility and geopolitical isolation.

The remainder of this paper proceeds as follows. Section 2 reviews relevant theoretical frameworks and empirical literature on fiscal sustainability in emerging markets and sanctions economics. Section 3 presents the analytical framework, including the modified debt dynamics equation and fiscal reaction function specification calibrated for commodity exporters under financial autarky. Section 4 describes data sources, measurement approaches, and econometric methodology. Section 5 presents empirical results, including baseline sustainability assessments and sensitivity analyses under alternative oil price and policy scenarios. Section 6 discusses policy implications and international comparative perspectives. Section 7 concludes with considerations for future research directions.

2. Literature Review and Theoretical Framework

2.1. Fiscal Sustainability in Emerging Markets

The conceptual foundation for fiscal sustainability analysis derives from the government's intertemporal budget constraint (IBC), which stipulates that the present value of all future primary surpluses must equal or exceed the current debt stock (Blanchard, 1990; Hamilton & Flavin, 1986). Formally, the IBC can be expressed as:

$$B_t = \sum_{i=1}^{\infty} \frac{1}{\prod_{i=1}^{i}(1+r_{t+j})} PB_{t+i} + \lim_{n\to\infty} \frac{B_{t+n}}{\prod_{j=1}^{n}(1+r_{t+j})}, \quad (1)$$

where B_t represents the debt stock at time t, PB_{t+i} denotes the primary balance in period $t + i$, and r_{t+j} is the real interest rate. Sustainability requires that the transversality condition (the second term) equals zero, implying the government cannot engage in Ponzi finance indefinitely.

For emerging market economies, Escolano (2010) demonstrates that the effective interest rate on public debt frequently exceeds the nominal growth rate, a configuration termed "fiscal stress" where $r > g$. This relationship fundamentally distinguishes EMDEs from advanced economies, where negative interest-growth differentials ($r - g < 0$) have been empirically common during recent decades (Blanchard, 2019; Mehrotra & Sergeyev,

2021). When $r > g$, debt sustainability becomes more stringent, requiring positive primary balances to prevent explosive debt trajectories.

The practical implementation of sustainability assessment typically employs the standard debt dynamics equation:

$$\Delta d_t = \frac{r_t - g_t}{1 + g_t} d_{t-1} - pb_t + sfa_t, \quad (2)$$

where d_t represents the debt-to-GDP ratio, pb_t is the primary balance as a share of GDP, and sfa_t captures stock-flow adjustments — discrepancies between the change in debt stock and the recorded deficit that arise from valuation effects, asset transactions, and statistical discrepancies. For commodity-exporting economies, stock-flow adjustments can be substantial, often reflecting exchange rate movements, commodity fund operations, and contingent liability realizations (Jacobo & Jalles, 2023; Weber, 2012).

Ghosh et al. (2011) introduce the concept of "fiscal space" defined as the difference between current debt levels and a debt limit beyond which governments lose market access. Their empirical analysis covering 23 advanced economies identifies a non-linear fiscal reaction function, where primary surpluses respond positively but with declining sensitivity to debt accumulation. At sufficiently high debt levels, this response weakens, signalling proximity to fiscal limits. The fiscal reaction function takes the general form:

$$pb_t = \alpha + \beta d_{t-1} + \gamma X_t + \varepsilon_t, \quad (3)$$

where β measures the responsiveness of the primary balance to the lagged debt ratio, and X_t includes control variables such as output gaps, commodity prices, and institutional quality measures.

For resource-dependent economies specifically, the sustainability framework requires augmentation to incorporate commodity revenue volatility and sovereign wealth fund dynamics. The permanent income hypothesis suggests that commodity revenues should be smoothed through countercyclical fiscal policy, accumulating assets during price booms and drawing them down during busts (Bems & de Carvalho Filho, 2011; IMF, 2015). The modified fiscal rule for commodity exporters can be expressed as:

$$G_t = R_t + \alpha(F_{t-1}) \cdot R_t^{perm}, \quad (4)$$

where G_t represents government spending, R_t denotes non-resource revenues, R_t^{perm} is the permanent component of resource revenues, and $\alpha(F_{t-1})$ is an adjustment factor depending on the sovereign wealth fund stock.

2.2. Economic Sanctions and Fiscal Channels

The literature on economic sanctions has traditionally focused on trade disruptions, financial market access restrictions, and aggregate output effects (Hufbauer et al., 2007; Neuenkirch & Neumeier, 2015). More recent analyses examining the comprehensive sanctions regime imposed on Russia following 2022 identify multiple transmission channels: energy export constraints, technology import restrictions, financial system isolation via SWIFT exclusions, and freezing of approximately $300 billion in foreign exchange reserves (Ahn & Ludema, 2020; Chupilkin et al., 2023).

Mulder (2022) provides historical context, noting that sanctions on Russia represent the most comprehensive restrictions imposed on a major economy since the 1930s, exceeding in scope previous cases such as Iran, Iraq, or South Africa. Unlike these prece-

dents, Russia maintains status as the world's largest natural gas exporter and third-largest oil exporter, creating significant global spillover effects when sanctions target these sectors. The price cap mechanism implemented by the G7 in December 2022, limiting Russian oil exports to $ 60 per barrel, represents a novel policy instrument designed to constrain Russian revenues while maintaining global supply.

The fiscal dimension of sanctions effectiveness has received relatively little attention in the literature. Financial sanctions constrain government financing capacity through three primary mechanisms. First, they eliminate access to international capital markets, removing external borrowing as a deficit financing option (Neuenkirch & Neumeier, 2015). Second, domestic financial institutions become captive purchasers of government debt, raising domestic borrowing costs as local markets reach absorption limits, which can be seen as a form of "financial repression" (Reinhart & Sbrancia, 2015). Third, the loss of external financing access and constrained domestic debt capacity reduce governments' ability to smooth fiscal policy intertemporally, forcing procyclical adjustments (Cipriani et al., 2023).

Empirical evidence on the fiscal impacts of sanctions remains limited. Dashti-Gibson et al. (1997) find that sanctions reduce government revenues by an average of 3–4 % across historical episodes, though effects vary substantially with sanctions scope and target economy characteristics. Caruso (2003) examines fiscal consequences in Iraq during 1990–2003, documenting revenue declines exceeding 60 % and complete loss of external financing access. However, Iraq's case involved comprehensive trade embargoes, whereas contemporary Russia faces more selective sectoral sanctions while maintaining substantial commodity export capacity.

2.3. Fiscal Sustainability Under Financial Autarky

The theoretical literature on debt sustainability implicitly assumes governments retain some access to international credit markets, even during crisis periods. This assumption underpins standard sustainability indicators such as the debt-to-GDP threshold beyond which market access deteriorates (Reinhart & Rogoff, 2010) and the debt intolerance concept highlighting lower debt capacity in countries with histories of default (Reinhart et al., 2003).

Complete financial autarky — the condition where external financing becomes entirely unavailable — fundamentally alters sustainability dynamics. Under autarky, the government budget constraint reduces to:

$$G_t + i_t B_{t-1} = T_t + \Delta B_t + \Delta M_t, \quad (5)$$

where G_t represents expenditures, $i_t B_{t-1}$ is interest payments, T_t denotes tax revenues, ΔB_t is new domestic debt issuance, and ΔM_t represents monetary financing (seigniorage or central bank debt purchases).

The critical distinction under autarky concerns debt capacity constraints. With access only to domestic financial markets, debt absorption capacity is limited by domestic financial sector size and households' asset allocation preferences (Kumhof & Tanner, 2005). For Russia specifically, the domestic government bond market (OFZ bonds) had outstanding stock of approximately 18 trillion rubles ($200 billion) as of early 2025, with annual issuance capacity estimated at 3–4 trillion rubles before crowding-out effects become severe.

Monetary financing capacity depends on inflation tolerance and central bank independence. Sargent and Wallace (1981) demonstrate that fiscal dominance, where the central bank accommodates fiscal deficits through money creation, necessarily gener-

ates inflation when real money demand is relatively stable. The inflation tax revenue function exhibits a Laffer curve property: beyond some inflation rate, further money creation reduces real seigniorage as economic agents economize on real balances. For Russia, with inflation already at 8.8 % as of mid-2025, the sustainable seigniorage potential appears limited without triggering destabilizing inflation expectations.

2.4. Theoretical Predictions and Testable Hypotheses

Drawing on the frameworks reviewed above, we derive several testable hypotheses regarding Russia's fiscal sustainability trajectory:

H1: Structural Revenue Deterioration: Sanctions-induced export price discounts and volume constraints will generate persistent negative shocks to hydrocarbon revenues exceeding 15 % of baseline projections, with minimal offset from non-oil revenue enhancement.

H2: Primary Balance Requirements: Under financial autarky and baseline growth-interest rate differentials, stabilizing the debt-to-GDP ratio requires primary balances exceeding 2 % of GDP, which is substantially above current performance.

H3: Non-Linear Adjustment Dynamics: As liquid fiscal buffers (NWF assets) approach exhaustion, the fiscal reaction function will exhibit discontinuous adjustment, either through abrupt expenditure compression or acceleration of monetary financing.

H4: Asymmetric Commodity Price Response: Given structural constraints on crude oil export volumes imposed by sanctions and transportation capacity, fiscal revenues will demonstrate reduced elasticity to oil price increases relative to the pre-sanctions period.

These hypotheses guide the empirical investigation presented in subsequent sections, with particular emphasis on identifying structural breaks in fiscal reaction functions and quantifying the magnitude of sustainability gaps under alternative scenarios.

3. Analytical Framework and Methodology

3.1. Modified Debt Dynamics Equation

The standard debt accumulation equation requires several modifications to capture the specific features of Russia's fiscal situation. We develop an augmented framework incorporating: (1) explicit treatment of commodity revenue volatility, (2) sovereign wealth fund dynamics, (3) exchange rate valuation effects on foreign-currency-denominated debt, and (4) off-budget financing mechanisms. The comprehensive debt dynamics equation takes the form:

$$\Delta d_t = \alpha_t d_{t-1} - pb_t + \delta_t + \phi_t - \theta_t + sfa_t, \quad (6)$$

where: $a_t = \frac{r_t - g_t - \Pi_t}{(1+g_t)(1+\Pi_t)}$ represents the real interest-growth differential adjusted for inflation; $pb_t = \frac{R_t^{oil} + R_t^{nonoil} - G_t^{primary}}{GDP_t}$ is the primary balance decomposed into oil, non-oil revenues, and non-interest expenditures; δ_t captures exchange rate valuation effects on foreign currency debt; ϕ_t represents off-budget quasi-fiscal operations; θ_t denotes sovereign wealth fund contributions (positive) or withdrawals (negative); and sfa_t includes remaining stock-flow adjustments.

For commodity exporters, oil revenue can be expressed as:

$$R_t^{oil} = P_t^{oil} \cdot Q_t^{export} \cdot \tau_t \cdot e_t, \quad (7)$$

where P_t^{oil} is the international oil price, Q_t^{export} represents export volume, τ_t is the effective tax rate on oil production / exports, and e_t denotes the exchange rate (rubles per dollar). This specification makes explicit that sanctions can affect revenues through multiple channels: direct price discounts relative to benchmark crude ($P_t^{oil} < P_t^{Brent} - \gamma$), volume restrictions ($Q_t^{export} < Q_t^{capacity}$), and potentially exchange rate effects.

The primary balance required to stabilize the debt ratio ($\Delta d_t = 0$) becomes:

$$pb_t^{stabilizing} = \alpha_t d_{t-1} + \delta_t + \phi_t - \theta_t + sfa_t. \quad (8)$$

This formulation highlights that under positive real interest-growth differentials ($\alpha_t > 0$), increasingly large primary surpluses are required as the debt stock grows. Furthermore, if sovereign wealth fund withdrawals ($\theta_t < 0$) approach their sustainable limits, the primary balance requirements intensify absent compensating adjustments.

3.2. Fiscal Reaction Function Under Financial Autarky

To assess whether Russia's fiscal policy stance is consistent with debt stabilization, we estimate a fiscal reaction function relating the primary balance to the debt ratio and other state variables. The baseline specification follows Bohn (1998) but incorporates modifications relevant for sanctioned commodity exporters:

$$pb_t = \beta_0 + b_1 d_{t-1} + \beta_2 ogap_t + \beta_3 oil_t + \beta_4 sanctions_t + \beta_5 (d_{t-1} \cdot sanctions_t) + \varepsilon_t, \quad (9)$$

where: $ogap_t$ is the output gap; oil_t represents deviations of oil prices from trend; $sanctions_t$ is an indicator variable (or continuous sanctions intensity measure). The interaction term ($d_{t-1} \cdot sanctions_t$) allows the fiscal response to debt to differ under sanctions.

The coefficient β_1 is of primary interest — positive values indicate counter-cyclical fiscal policy responding to debt accumulation by generating higher primary surpluses. However, Ghosh et al. (2011) demonstrate that this response typically becomes non-linear at high debt levels. We extend their framework by allowing for three distinct regimes:

$$pb_t = \begin{cases} \beta_{low} d_{t-1} + X_t \gamma \ if \ d_{t-1} < d^* \\ \beta_{med} d_{t-1} + X_t \gamma \ if \ d^* \le d_{t-1} < d^{**} \\ \beta_{high} d_{t-1} + X_t \gamma \ if \ d_{t-1} \ge d^{**} \end{cases}, \quad (10)$$

where d^* and d^{**} are endogenously determined threshold values. We hypothesize that $\beta_{low} < \beta_{med} < \beta_{high}$, reflecting increasing fiscal discipline as debt ratios rise, though potentially bhigh < bmed if fiscal fatigue sets in at very high debt levels.

Under financial autarky, an additional constraint becomes binding: the domestic debt absorption capacity. Let B^{dom} represent the maximum stock of domestic debt the financial system can absorb without generating financial stability concerns. This imposes:

$$B_t^{dom} \le \overline{B}^{dom}(M2_t, REQ_t, \rho_t), \quad (11)$$

where the absorption capacity depends on broad money supply ($M2_t$), regulatory requirements (REQ_t), and risk aversion parameters (ρ_t). For Russia, we calibrate $B^{dom} \approx 0.30 \cdot GDP_b$ based on historical financial sector balance sheet capacity.

When this constraint binds, deficit financing must occur either through: (1) sovereign wealth fund drawdowns, or (2) monetary financing. The monetary financing constraint in turn depends on inflation tolerance:

$$\Delta M_t \leq n_t M_{t-1} + \Delta M_t^{demand}, \quad (12)$$

where n_t represents the maximum inflation rate policymakers will tolerate, and ΔM_t^{demand} captures increases in money demand from real economic growth.

3.3. Sustainability Indicators and Thresholds

Following Escolano (2010), we employ multiple complementary indicators to assess fiscal sustainability:

1. Debt Stabilizing Primary Balance (DSPB):

$$DSPB_t = \frac{r_t - g_t}{1 + g_t} d_{t-1}. \quad (13)$$

Sustainability requires the actual primary balance to equal or exceed DSPB over the medium term.

2. Primary Gap:

$$PG_t = pb_t - DSPB_t. \quad (14)$$

Negative primary gaps indicate unsustainable trajectories requiring fiscal adjustment.

3. Fiscal Buffer Depletion Rate: For Russia specifically, with sovereign wealth fund F_t:

$$T_{depletion} = \frac{F_t}{\left| Deficit_t - DSPB_t \cdot GDP_t \right|}. \quad (15)$$

This estimates the time until fiscal buffers exhaust under current deficit trajectories.

4. Heat Map Composite Indicator: We construct a composite sustainability risk indicator that brings together five elements: the magnitude of the primary gap, the expected timeline for buffer depletion, the interest-growth differential, revenue volatility, and debt refinancing needs.

Each component receives weights based on their predictive power for fiscal crises in comparable economies:

$$Risk_Score_t = 0.30 \cdot PG_t + 0.25 \cdot \frac{1}{T_{depletion}} + 0.20 \cdot (r_t - g_t) + 0.15 \cdot \sigma(R_t) + 0.10 \cdot Refinancing_t \quad (16)$$

Scores exceeding 0.65 indicate high sustainability risk based on calibration to emerging market crisis episodes.

3.4. Stochastic Simulation Framework

Given the inherent uncertainty in oil price projections and sanctions evolution, we employ stochastic simulation to generate probability distributions of future debt trajectories. Oil prices follow a mean-reverting process with time-varying volatility:

$$\Delta \ln(P_t^{oil}) = k(P - \ln(P_{t-1}^{oil})) + \sigma_t \varepsilon_t, \quad (17)$$

where k is the mean-reversion speed, P represents long-run equilibrium, σ_t is conditional volatility following a GARCH process, and $\varepsilon_t \sim N(0,1)$.

We calibrate k = 0.15 and P = \$ 75 per barrel for Brent crude, with Urals discount $\gamma \sim U[10,25]$ dollars per barrel to reflect sanctions-induced price differentiation uncertainty. Volatility parameters derive from historical oil price dynamics over 2000–2024, adjusted upward by 15 % to reflect heightened geopolitical uncertainty.

For each simulation path, we compute the debt trajectory $\{d_t\}_{t=2025}^{2035}$; the primary balance requirements, $\{DSPB_t\}$ — the probability of debt exceeding 80 % of GDP, and the expected time until fiscal buffers are exhausted.

Ten thousand Monte Carlo iterations generate probability distributions for these outcomes under alternative policy scenarios.

4. Data and Estimation

4.1. Data Sources and Construction

Our empirical analysis draws on multiple data sources to construct a comprehensive dataset covering Russia's fiscal position over 2014Q1–2025Q2. The primary data sources include:

Official Russian Government Statistics:

— Ministry of Finance monthly budget execution reports (revenue and expenditure by economic classification)

— Central Bank of Russia balance sheet data and monetary statistics

— Federal State Statistics Service (Rosstat) national accounts and price indices;

— Federal Treasury cash flow statements

International Financial Institutions:

— International Monetary Fund Government Finance Statistics (GFS) and International Financial Statistics (IFS)

— World Bank World Development Indicators

— Bank for International Settlements (BIS) international debt statistics

Market and Alternative Data:

— Bloomberg commodity price data (Brent crude, Urals crude, natural gas)

— Central bank foreign exchange reserves tracking (including frozen assets)

— Sovereign bond yields (OFZ domestic bonds)

— Credit default swap spreads (where available pre-sanctions)

Sanctions Tracking:

— U.S. Treasury Office of Foreign Assets Control (OFAC) sanctions lists

— European Commission sanctions database

— Atlantic Council sanctions tracking initiative

— Castellum.AI sanctions enforcement monitoring

For the post-2022 period, particular challenges arise from data reliability concerns. Russia ceased publishing certain economic statistics following sanctions imposition, and remaining official data may suffer from reporting biases. We address these limitations through several approaches:

1. Cross-validation: Where possible, we verify Russian official statistics against alternative sources, including satellite-based economic activity indicators, energy export tracking via tanker movements, and banking sector data.

2. Nowcasting: For the most recent months where official data lags, we employ nowcasting techniques using high-frequency indicators such as tax collection patterns, central bank monetary operations, and market-implied expectations.

3. Transparency adjustments: Following the methodology of Sonnenfeld et al. (2023), we adjust headline GDP and fiscal figures to account for overstatement biases identified in the post-invasion period.

4.2. Variable Construction and Definitions

Debt Measures: We use gross general government debt as the primary measure, covering federal, regional, and local obligations. For Russia, this encompasses federal government debt including OFZ bonds and other treasury securities, sub-federal debt, government-guaranteed liabilities, and, in periods of monetization, the central bank's monetary base.

External debt is converted to ruble terms using period-average exchange rates, with separate tracking of frozen foreign reserves ($ 300 billion as of 2025) which remain on government balance sheets but cannot be accessed.

Primary Balance: The primary balance is calculated as total revenues minus non-interest expenditures. For Russia, this requires adjustments for quasi-fiscal operations carried out through state-owned enterprises, the activities of off-budget funds such as the pension, medical insurance, and social insurance funds, and operations of the National Wealth Fund, including contributions and withdrawals.

Oil Price Variables: For the oil price variables, we construct several measures, including the Brent benchmark price used in international markets, the Urals price that reflects Russia's main export blend, the discount of Urals relative to Brent ($\gamma_t = P_t^{Brent} - P_t^{Urals}$), and the budget rule reference price applied in Russia's fiscal framework.

The Urals discount widened substantially post-2022, from historical levels of $ 2–4 per barrel to $ 15–25 per barrel, reflecting sanctions enforcement and transportation cost increases.

Sanctions Intensity: Sanctions intensity is measured using a composite index that incorporates the number of sanctioned entities and individuals, the share of banking sector assets subject to restrictions, technology import limitations in sectors such as semiconductors and machinery, constraints on energy export volumes, and the stringency of price cap enforcement.

The index is normalized to [0,1], with 0 representing pre-2014 baseline and 1 representing maximum observed intensity.

Output Gap: Estimated using HP-filter methodology with $\lambda = 1600$ for quarterly data. We also construct alternative output gap measures using production function approaches and multivariate filters incorporating unemployment and capacity utilization.

4.3. Summary Statistics

Table 1 presents summary statistics for key variables across three periods: pre-sanctions (2014Q1–2014Q1), moderate sanctions (2014Q2–2022Q1), and comprehensive sanctions (2022Q2–2025Q2).

Table 1 reveals several patterns. First, the primary balance deteriorated systematically across periods, shifting from small surpluses pre-2014 to deficits averaging 2.1 % of GDP under comprehensive sanctions. Second, this deterioration reflects both revenue compression (particularly oil and gas receipts declining from 13.2 % to 9.6 % of GDP) and expenditure expansion (defence and security spending doubling from 4.9 % to 9.8 % of GDP). Third, the debt-to-GDP ratio nearly doubled from 12.4 % to 24.3 %, though this remains moderate by international standards. Fourth, the interest-growth differential

Table 1

Summary Statistics

Variable	2014Q1–2014Q1	2014Q2–2022Q1	2022Q2–2025Q2
Fiscal Variables (% of GDP)			
Primary Balance	0.8 (1.2)	–0.3 (1.8)	–2.1 (1.5)
Total Revenue	35.4 (2.1)	33.8 (2.7)	32.9 (3.2)
Oil & Gas Revenue	13.2 (1.8)	11.9 (2.4)	9.6 (2.9)
Non-Oil Revenue	22.2 (1.1)	21.9 (1.3)	23.3 (1.7)
Primary Expenditure	34.6 (1.9)	34.1 (2.1)	35.0 (2.8)
Defense & Security	4.9 (0.6)	5.8 (0.9)	9.8 (1.2)
Debt-to-GDP Ratio	12.4 (2.3)	17.8 (3.1)	24.3 (4.2)
Macroeconomic Variables			
Real GDP Growth (%)	3.2 (2.1)	1.3 (2.8)	1.8 (3.2)
Inflation (%, y-o-y)	7.8 (1.3)	5.2 (2.1)	7.9 (2.8)
Nominal Interest Rate (%)	8.1 (0.9)	7.4 (2.1)	12.8 (3.7)
$r - g$ (percentage points)	2.1 (1.8)	3.4 (2.4)	5.8 (3.1)
Commodity & External			
Brent Oil Price (/bbl) | 98.4 (8.7) | 71.3 (19.2) | 81.2 (12.4) || UralsDiscount	2.8 (1.2)	3.2 (1.8)	18.7 (4.3)
Exchange Rate (RUB/USD)	34.2 (3.1)	64.8 (8.7)	91.3 (12.8)
NWF Balance (% GDP)	7.8 (1.2)	9.2 (2.1)	5.1 (1.8)
N (quarterly observations)	4	31	12

Notes: Standard deviations in parentheses. All fiscal variables expressed as percent of GDP. Oil prices in nominal USD per barrel. Exchange rate represents period average. NWF = National Wealth Fund liquid assets.

($r - g$) increased substantially to 5.8 percentage points, implying increasingly stringent primary balance requirements for debt stabilization.

The Urals discount widening to $ 18.7 per barrel represents a critical structural shift. At current export volumes of roughly 7.3 million barrels per day, this discount results in annual revenue losses of over $ 50 billion compared with Brent pricing, equivalent to about 2.5 % of GDP. The National Wealth Fund balance fell from 9.2 % to 5.1 % of GDP, with liquid assets declining even more sharply as illiquid foreign currency holdings were frozen.

4.4. Econometric Methodology

Baseline Estimation: We estimate the fiscal reaction function using panel estimation techniques with quarterly data. The baseline specification employs fixed effects to control for time-invariant country characteristics (when incorporating comparative emerging market data) and year fixed effects to absorb common time trends:

$$pb_{i,t} = \alpha_i + \lambda_t + \beta_1 d_{i,t-1} + \beta_2 ogap_{i,t} + \beta_3 oil_{i,t} = \gamma X_{i,t} + \varepsilon_{i,t}. \quad (18)$$

We employ several estimation approaches: 1. OLS with Newey-West HAC standard errors to address potential autocorrelation and heteroskedasticity 2. Two-stage least squares (2SLS) to address potential endogeneity between debt and primary balances, using lagged values and commodity prices as instruments 3. Threshold regression to identify non-linear responses following Hansen (1999).

Structural Break Testing: To formally assess whether sanctions create structural breaks in fiscal dynamics, we apply Chow tests to examine parameter stability across pre- and post-sanctions periods, Bai-Perron sequential breakpoint tests to detect multiple unknown break dates, and rolling window estimation to track changes in coefficients over time.

Stationarity and Cointegration: Standard panel unit root tests (Im-Pesaran-Shin, Levin-Lin-Chu) are employed to assess variable stationarity. For the debt-primary balance relationship specifically, we test for cointegration using the methodology of Westerlund (2007), which allows for structural breaks.

Robustness Checks: We conduct extensive robustness analysis, considering alternative debt measures such as federal debt versus general government debt, different methods for estimating the output gap, variations in control variable specifications, bootstrapped confidence intervals with 10,000 replications, and placebo tests using data from the pre-sanctions period.

5. Empirical Results

5.1. Debt Dynamics Decomposition

We begin by decomposing the observed change in Russia's debt-to-GDP ratio from 2022Q2 to 2025Q2 into component factors using the augmented debt dynamics equation. Table 2 presents this decomposition.

The decomposition reveals that the unfavourable interest-growth differential contributes the largest share (73.7 %) to debt accumulation. With nominal interest rates on government debt averaging 12.8 % while nominal GDP growth averaged 9.1 % (real growth of 1.8 % plus inflation of 7.3 %), the debt stock grows mechanically even absent primary deficits. The cumulative primary deficits contribute an additional 3.8 percentage points, representing 66.7 % of the total increase.

Exchange rate depreciation paradoxically provided modest debt relief (–1.2 pp) as the ruble weakened from approximately 60 RUB/USD to 95 RUB/USD over the period. This occurs because Russia's foreign-currency-denominated debt, while frozen and inaccessible, becomes smaller relative to ruble-denominated GDP. However, this tech-

Table 2

Debt Dynamics Decomposition, 2022Q2–2025Q2

Component	Contribution (pp of GDP)	Share of Total (%)
Initial Debt Stock (2022Q2)	18.6	—
Contributions to Change:		
Interest-Growth Differential	+4.2	73.7
Primary Balance (cumulative)	+3.8	66.7
Exchange Rate Valuation	–1.2	–21.1
NWF Drawdowns (offset)	–1.8	–31.6
Stock-Flow Adjustments	+0.7	12.3
Total Change	+5.7	100.0
Final Debt Stock (2025Q2)	24.3	—

Notes: pp = percentage points. Contributions calculated using actual quarterly data and may not sum exactly due to rounding and interaction effects. Exchange rate valuation reflects revaluation of foreign-currency debt holdings.

nical benefit is overwhelmed by the revenue losses from reduced export purchasing power.

The National Wealth Fund drawdowns totalling 1.8 % of GDP helped finance deficits without additional debt accumulation during 2022–2024. However, as of 2025Q2, liquid NWF assets have declined to approximately 5.1 % of GDP (4.0 trillion rubles or $ 48 billion), providing limited remaining buffer capacity.

5.2. Primary Balance Requirements and Sustainability Gap

Table 3 presents calculations of the debt-stabilizing primary balance (DSPB) under various scenarios, comparing required versus actual primary balances to quantify the sustainability gap.

Under baseline conditions reflecting current macroeconomic trends, Russia requires a primary balance of +0.8 % of GDP to stabilize debt at its current 24.3 % ratio. Instead, the actual primary balance stands at -2.1 % of GDP, generating a sustainability gap of 2.9 percentage points. This gap implies that absent policy adjustment, the debt-to-GDP ratio will continue rising at an accelerating pace.

The pessimistic scenario, incorporating higher interest rates (reflecting increased government financing needs and monetary tightening) and lower growth (reflecting sanctions constraints and investment deterioration), generates a DSPB requirement of 1.6 % of GDP and a sustainability gap exceeding 3.7 percentage points. Critically, even under the optimistic scenario with favourable interest-growth differentials, a gap of 2.0 percentage points remains due to the large primary deficit.

The forward projections for 2026–2027 demonstrate gap widening as debt ratios rise. By 2027, even stabilizing debt at the projected 31.4 % of GDP level would require primary surpluses of 1.6 % of GDP — a 3.7 percentage point adjustment from current deficits. This magnitude of fiscal consolidation typically generates significant output losses, potentially triggering a negative feedback loop where growth deterioration further widens the gap.

5.3. Fiscal Reaction Function Estimates

Table 4 presents estimation results for the fiscal reaction function, examining whether Russia's fiscal policy responds systematically to debt accumulation.

Table 3

Debt-Stabilizing Primary Balance Analysis

Scenario	r (%)	g (%)	$r - g$ (pp)	Current Debt (% GDP)	DSPB (% GDP)	Actual PB (% GDP)	Gap (pp)
Baseline (2025)	12.8	9.1	3.7	24.3	0.8	–2.1	–2.9
Optimistic	11.0	11.5	–0.5	24.3	–0.1	–2.1	–2.0
Pessimistic	14.5	7.2	7.3	24.3	1.6	–2.1	–3.7
High Oil Price	12.8	10.8	2.0	24.3	0.4	–0.8	–1.2
Low Oil Price	12.8	7.8	5.0	24.3	1.1	–3.2	–4.3
2026 Projection	13.2	8.4	4.8	27.8	1.2	–2.4	–3.6
2027 Projection	13.5	7.9	5.6	31.4	1.6	–2.6	–4.2

Notes: r = nominal effective interest rate on government debt; g = nominal GDP growth; pp = percentage points; DSPB = debt-stabilizing primary balance calculated as $[(r - g)/(1 + g)] \cdot$ debt ratio; Gap = actual primary balance minus DSPB. Negative gaps indicate unsustainable trajectories.

The baseline specification (Column 1) yields a positive and statistically significant coefficient on lagged debt (0.083), indicating that Russia historically responded to debt accumulation by improving primary balances — a pattern consistent with fiscal sustainability. For each percentage point increase in the debt-to-GDP ratio, the government generated primary balance improvements of 0.083 percentage points of GDP.

However, the non-linear specification (Column 2) reveals important heterogeneity. The endogenously estimated threshold of 22.4 % of GDP divides the sample into two regimes. In the low-debt regime (below 22.4 %), the fiscal response coefficient is 0.142, indicating relatively strong fiscal discipline. Above this threshold, the response coefficient falls to 0.051 and loses statistical significance, suggesting fiscal fatigue or policy constraints at higher debt levels. Russia crossed this threshold in 2024Q3, precisely when fiscal reaction weakening would prove most problematic.

The sanctions interaction specification (Column 3) provides direct evidence that comprehensive sanctions altered fiscal dynamics. The interaction term (–0.089) indicates that under sanctions, the fiscal response to debt weakened significantly. Combined with the baseline debt coefficient (0.124), the net response under sanctions is only 0.035 — economically small and barely distinguishable from zero. The sanctions dummy itself has a large

Table 4

Fiscal Reaction Function Estimation Results

Variable	(1) Baseline	(2) Non-Linear	(3) Sanctions Interaction	(4) IV Estimate
Debt Ratio (t-1)	0.083*** (0.028)	—	0.124*** (0.035)	0.091** (0.041)
Debt (t-1) × Low Regime	—	0.142*** (0.039)	—	—
Debt (t-1) × High Regime	—	0.051 (0.047)	—	—
Debt (t-1) × Sanctions	—	—	–0.089** (0.038)	—
Output Gap	0.312*** (0.067)	0.298*** (0.071)	0.305*** (0.069)	0.327*** (0.089)
Oil Price Deviation	0.041*** (0.012)	0.038*** (0.011)	0.029** (0.013)	0.043*** (0.015)
Sanctions Dummy	—	—	–1.87*** (0.42)	—
Defense Spending (% GDP)	–0.287*** (0.082)	–0.301*** (0.088)	–0.265*** (0.079)	–0.294*** (0.097)
NWF Balance (% GDP)	0.124** (0.051)	0.118** (0.054)	0.095* (0.053)	0.131** (0.062)
Observations	47	47	47	47
R-squared	0.672	0.691	0.728	0.658
Threshold (% GDP)	—	22.4*** (3.2)	—	—

Notes: Dependent variable is primary balance as % of GDP. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. Column (2) employs threshold regression with endogenously determined threshold. Column (3) includes sanctions dummy (=1 for 2022Q2 onward) and interaction term. Column (4) uses 2SLS with lagged debt and commodity prices as instruments. All specifications include year fixed effects.

negative coefficient (–1.87), capturing the approximately 1.9 percentage point deterioration in primary balances attributable directly to sanctions, holding other factors constant.

The instrumental variables estimation (Column 4) addresses potential endogeneity concerns, yielding similar coefficient magnitudes and confirming baseline results' robustness. The Kleibergen-Paap F-statistic of 24.3 comfortably exceeds conventional thresholds, indicating strong instruments.

Control variables show the expected signs. The output gap coefficient of 0.312 reflects counter-cyclical fiscal policy, with surpluses emerging during economic booms and deficits during recessions. Deviations in oil prices have a positive but modest effect on primary balances (0.041), consistent with Russia's budget rule that limits spending sensitivity to short-term price fluctuations. Defence spending strongly reduces primary balances (–0.287), a relationship that became especially significant as defence expenditures surged after 2022. The National Wealth Fund balances are positively associated with primary balances (0.124), supporting the view that the fund acts as a fiscal buffer enabling counter-cyclical policy.

5.4. Structural Break Analysis

To formally test for structural breaks in fiscal dynamics coinciding with sanctions escalation, we employ Bai-Perron sequential tests allowing for up to three breaks (see Table 5 for results).

The tests strongly reject the null hypothesis of no structural breaks, identifying 2022Q2, which coincides with the implementation of comprehensive sanctions, as the primary break date (F-statistic = 28.73, $p < 0.001$). A secondary break in 2014Q3 aligns with the initial Crimea-related sanctions, though its effects are less pronounced. No third break point is detected, indicating that a two-regime structure sufficiently captures the evolution of fiscal dynamics.

5.5. Fiscal Buffer Depletion Analysis

A critical dimension of sustainability concerns the exhaustion rate of fiscal buffers, primarily the National Wealth Fund. Table 6 projects NWF depletion timelines under alternative scenarios.

Under baseline assumptions incorporating current deficit trajectories and oil prices around $65 per barrel for Urals crude, liquid NWF assets will exhaust by October 2026. The optimistic scenario, requiring sustained Urals prices above $ 75 per barrel and successful revenue mobilization efforts, extends this timeline only to May 2027. The pessimistic scenario, combining oil prices below $55 per barrel with continued defence spending growth, accelerates depletion to July 2026.

The "With Gold Reserves" scenario recognizes that Russia has already begun monetizing international reserves, with approximately 90 tons of gold (16 % of holdings) sold

Table 5

Structural Break Test Results

Test	Break Date 1	Break Date 2	*F*-statistic	*p*-value
SupF(1)	2022Q2	—	28.73	0.001
SupF(2|1)	2022Q2	2014Q3	19.42	0.008
SupF(3|2)	2022Q2	2014Q3	8.14	0.245

Notes: Bai-Perron tests for structural breaks in fiscal reaction function. SupF(k) tests null of no breaks vs. k breaks. *SupF*(k + 1 | k) tests null of k breaks vs. k + 1 breaks. Critical values based on 15 % trimming.

Table 6

National Wealth Fund Depletion Projections

Scenario	Current NWF (trillion RUB)	Monthly Deficit (trillion RUB)	Months to Depletion	Depletion Date
Baseline	4.0	0.36	11.1	October 2026
Optimistic (High Oil)	4.0	0.22	18.2	May 2027
Pessimistic (Low Oil)	4.0	0.51	7.8	July 2026
Accelerated Defense	4.0	0.44	9.1	August 2026
With Gold Reserves	5.9	0.36	16.4	March 2027

Notes: NWF balance as of July 2025. Monthly deficit represents amount requiring NWF financing after exhausting domestic bond market absorption capacity. "With Gold Reserves" scenario includes liquidation of an additional 100 tons of monetary gold (approximately 20 % of remaining reserves) valued at 1.9 trillion rubles.

during 2024–2025. Liquidating an additional 100 tons could provide approximately 1.9 trillion rubles of financing, extending the timeline to March 2027 but at the cost of further reserve adequacy deterioration.

Critically, all scenarios project that the National Wealth Fund will be exhausted within 18 months unless fundamental policy adjustments are made. Beyond that point, the government faces three options: deeper cuts to non-defence spending, aggressive tax increases, or accelerated monetary financing through central bank debt purchases. Each option carries significant economic and political costs.

5.6. Stochastic Simulation Results

To incorporate uncertainty in key drivers, particularly oil prices and sanctions evolution, we conduct 10,000 Monte Carlo simulations of debt trajectories through 2030. Table 7 reports key statistics from the simulations.

The mean debt trajectory increases from 24.3 % of GDP in 2025 to 45.8 % by 2030 — a near-doubling within five years. However, substantial uncertainty surrounds this central estimate, with the 90th percentile reaching 66.8 % by 2030 while the 10th percen-

Table 7

Stochastic Simulation Results — Debt Trajectory Distribution

Statistic	2026	2027	2028	2029	2030
Debt-to-GDP Ratio (%)					
Mean	28.4	32.7	36.9	41.2	45.8
Median	27.8	31.9	35.8	39.6	43.7
10th Percentile	23.1	25.8	28.2	30.4	32.9
90th Percentile	35.2	41.8	49.3	57.6	66.8
Std. Deviation	4.3	6.2	8.7	11.4	14.6
Probability Metrics (%)					
P(Debt > 40 %)	8.7	23.4	42.8	58.2	69.4
P(Debt > 60 %)	0.3	2.1	8.9	18.7	28.3
P(Debt > 80 %)	0.0	0.2	1.4	5.8	12.1
P(NWF Depletion)	68.3	91.2	97.8	99.3	99.8

Notes: Simulations based on 10,000 iterations with stochastic oil prices, growth rates, and interest rates. Debt ratios represent gross general government debt. NWF depletion is defined as liquid assets falling below 1 % of GDP.

tile remains at 32.9 %. This 34 percentage point spread reflects primarily oil price uncertainty, with secondary contributions from growth and interest rate volatility.

The probability of debt exceeding 40 percent of GDP, a threshold often associated with deteriorating market access in emerging markets, increases from 8.7 percent in 2026 to 69.4 percent by 2030. While these levels remain moderate by advanced economy standards, they represent substantial increases for an economy lacking external financing access and already demonstrating fiscal rigidity.

Critically, the probability of NWF depletion reaches 68.3 % within one year and exceeds 91 % within two years. This near-certainty of buffer exhaustion represents the most binding near-term constraint, forcing imminent policy choices regardless of medium-term debt trajectory uncertainty.

5.7. Policy Scenario Analysis

To quantify the fiscal adjustment required to restore sustainability, we evaluate alternative policy scenarios through 2030. Table 8 presents results.

The status quo trajectory, absent policy intervention, generates unsustainable debt accumulation reaching 45.8 % of GDP by 2030 with NWF exhaustion by 2027. Moderate adjustment (+1.5 pp of GDP primary balance improvement) reduces the 2030 debt ratio to 38.2 % but fails to prevent NWF depletion and still leaves debt on an upward trajectory. This adjustment would reduce real GDP by an estimated 2.3 % cumulatively through fiscal multiplier effects.

Full stabilization requires a 3.2 percentage point primary balance improvement, moving from the current –2.1 % deficit to a surplus of approximately +1.1 % of GDP. This magnitude would stabilize debt around 32 % of GDP and preserve NWF assets but would generate cumulative GDP losses of 4.8 %. Such an adjustment exceeds historical precedents for voluntary fiscal consolidation in emerging markets without IMF programs, which makes its feasibility highly uncertain.

Table 8

Policy Scenario Comparison - Fiscal Adjustment Pathways

Scenario	Primary Adjustment (pp GDP)	2030 Debt Ratio (%)	NWF Status 2027	Real GDP Impact (%)	Feasibility Assessment
Status Quo	0.0	45.8	Depleted	Baseline	Unsustainable
Moderate Adjustment	+1.5	38.2	Depleted	–2.3	Low feasibility
Full Stabilization	+3.2	32.4	Maintained	–4.8	Very low feasibility
Revenue-Led	+2.0 (revenue)	35.6	Partially depleted	–2.9	Moderate feasibility
Expenditure-Led	+2.0 (expenditure)	35.6	Partially depleted	–3.8	Low feasibility
Monetization	0.0	41.2	Depleted	–1.2	High inflation risk

Notes: pp = percentage points. Primary adjustment represents improvement in structural primary balance relative to baseline. Real GDP impact is calculated using fiscal multipliers: 0.8 for spending cuts, 0.6 for tax increases. Feasibility assessment considers political economy constraints and historical adjustment magnitudes in comparable cases.

The revenue-led and expenditure-led scenarios explore different composition strategies for achieving +2.0 pp adjustment. Revenue mobilization through tax increases (VAT rate increases, personal income tax reforms, corporate tax base broadening) generates smaller GDP losses (multiplier of 0.6) but faces limits from already-elevated tax burdens and administrative capacity constraints. Reducing spending in non-defence areas faces major political economy constraints and offers little room for adjustment because defence spending now accounts for such a large share of the budget.

The monetization scenario assumes that the government makes no fiscal adjustment and instead finances its deficits through central bank purchases of government debt. By doing so, the government sidesteps the immediate consolidation cost of roughly 1.2 percent of GDP, but the inflation risks rise substantially. If 2 to 3 percent of GDP is financed in this way each year, and inflation is already at 8.8 percent, inflation is likely to move into double-digit territory, which would erode real incomes and could unsettle inflation expectations.

5.8. Comparative International Evidence

To contextualize Russia's situation, Table 9 compares fiscal sustainability indicators with other emerging markets that experienced significant external financing constraints.

Russia's situation most closely resembles Iran's experience during the 2012–2015 sanctions period, although the current sanctions on Russia are far more comprehensive. Iran achieved fiscal stabilization largely through an export recovery that followed the partial lifting of sanctions in 2015, an option that is not currently available to Russia. Argentina's case demonstrates that complete external finance loss can trigger explosive

Table 9

International Comparison — Fiscal Sustainability Under Constraints

Country	Period	Initial Debt (% GDP)	Peak Debt (% GDP)	Primary Adjustment (pp)	External Finance Access	Resolution Mechanism
Russia	2022-2025	18.6	24.3+	–2.9 (deterioration)	None	Ongoing
Brazil	2014-2016	62.3	78.4	+3.8	Limited	Fiscal consolidation
Turkey	2018-2019	28.3	35.5	+2.1	Restricted	IMF-style adjustment
Argentina	2018-2020	57.1	102.8	+0.7	None	Debt restructuring
South Africa	2019-2021	56.7	69.3	+1.4	Maintained	Gradual adjustment
Iran	2012-2015	11.2	18.7	+1.4	Sanctions-limited	Oil export recovery
Mexico	2019-2021	45.3	51.2	+2.2	Maintained	Counter-cyclical
Median (ex-Russia)	—	45.3	51.2	+1.8	—	—

Notes: Primary Adj. = cumulative change in structural primary balance as percentage points of GDP. External Access categories: None (complete autarky), Sanctions-limited (restricted but some access), Limited (severely constrained market access), Restricted (available at high spreads), Maintained (normal access). Resolution mechanism describes primary pathway to fiscal stabilization.

debt dynamics even from moderate initial levels, particularly when combined with insufficient fiscal adjustment (+0.7 pp versus the required magnitudes exceeding +5 pp).

Brazil successfully managed fiscal stress by consolidating the budget, improving the primary balance by 3.8 percentage points over two years. This was possible because the country retained market access, which made the adjustment smoother. In contrast, Venezuela illustrates a catastrophic outcome, where a sharp deterioration in the primary balance of 8.2 percentage points combined with monetary financing to trigger hyperinflation and economic collapse.

Russia currently has moderate debt levels at 24.3 percent of GDP, but its primary balances are deteriorating rapidly, with a 2.9 percentage point gap, and it has lost access to external financing. This combination places Russia on a path between Iran's managed adjustment and Argentina's debt crisis. The outcome will depend on policy choices over the next 12 to 18 months as the National Wealth Fund buffers are depleted.

6. Discussion and Policy Implications

6.1. Fundamental Constraints and Trade-Offs

The empirical analysis shows that Russia confronts an acute fiscal Russia faces a serious fiscal challenge due to three main factors. First, revenue is falling because sanctions reduce the value of commodity exports. Second, defence spending remains high, near 10 percent of GDP. Third, fiscal buffers are expected to run out within 12 to 18 months. These factors create a policy dilemma: the government cannot keep defence spending at current levels, avoid an economic slowdown, and maintain fiscal sustainability all at once.

The fiscal adjustment needed for full stabilization is 3.2 percent of GDP, which is greater than typical adjustments under normal conditions. In emerging markets, fiscal adjustments above 2 to 3 percent of GDP often carry serious political risks. Russia faces this challenge at a time when growth is already slowing, with GDP rising only 1.1 percent in 2025Q2, and policy options are limited because of sanctions.

The adjustment composition presents equally challenging trade-offs. Revenue mobilization options include VAT rate increases (from 20 % to 22–23 %), personal income tax progression elimination or rate increases (current flat 13 % rate), corporate tax increases (already raised to 25 % in 2025), and property tax enhancement. However, total government revenue already amounts to 33 percent of GDP, which is high for an emerging market. Raising revenue further would likely trigger behavioural responses, including increased tax evasion and expansion of the informal sector.

Expenditure reduction confronts rigidity in major categories. Defence and security spending approaching 40 % of the budget is politically untouchable absent conflict resolution. Social expenditures (pensions, healthcare, education) comprising another 40–45 % face demographic pressures and political sensitivity. Infrastructure and development spending, already compressed, provides limited adjustment potential. The residual categories, such as administration and subsidies, constitute only 15–20 % of spending, implying even complete elimination would generate adjustment barely exceeding 1 % of GDP.

6.2. Monetary Financing and Inflation Dynamics

Given the constraints on fiscal adjustment, monetary financing appears to be the easiest option, raising concerns similar to the Venezuela scenario. Russia's Central Bank has shown declining independence, with policy rate decisions increasingly driven by fis-

cal needs. The use of directed credit to finance the military action further blurs the line between fiscal and monetary policy.

The inflationary impact of monetary financing depends heavily on the stability of money demand. With inflation already at 8.8 percent and households' 12-month ahead expectations rising to 11.4 percent in July 2025, the economy may be approaching a point where monetary financing could accelerate inflation. The relationship between monetary growth and inflation is as follows:

$$\prod_t = \Delta m_t - \Delta y_t + \Delta v_t, \quad (19)$$

where $\prod_t$ is inflation, Δm_t is money growth, Δy_t is real output growth, and Δv_t represents velocity changes. With real growth at around 1 to 2 percent and required monetary financing of 2 to 3 percent of GDP per year, which is equivalent to roughly 15 to 20 percent money growth given Russia's M2-to-GDP ratio of 0.65, inflation would mechanically rise to 13 to 18 percent if money velocity does not decline.

Velocity usually rises during periods of high inflation, as economic agents try to reduce their real money holdings, meaning actual inflation could exceed these mechanical estimates. In addition, accelerating inflation has secondary fiscal effects, including erosion of real revenues (the Tanzi effect) and higher pressures to index social spending, which could potentially trigger a negative spiral.

6.3. Alternative Adjustment Pathways

6.3.1. Defence Spending Optimization

While total defence spending appears politically rigid, efficiency improvements could reduce fiscal pressure without compromising security objectives. International comparisons show that Russia's defence budget has become much less efficient since 2022, generating less military capability per ruble spent. Equipment losses, mobilization costs, and emergency procurement at premium prices all reduce value-for-money. Procurement reform, improved logistics, and phased mobilization approaches could potentially reduce spending requirements by 1.0–1.5 percentage points of GDP while maintaining force posture, contributing meaningfully to fiscal adjustment.

6.3.2. Revenue Administration Enhancement

Russia's tax gap, the difference between theoretical tax liability and actual collection, is estimated at 8 to 10 percent of GDP, well above the 3 to 5 percent typical in comparable economies. Improvements in digital enforcement, enhanced cross-verification systems, and lower compliance costs could raise additional revenues equivalent to 0.5 to 0.8 percent of GDP. Reintroducing a progressive personal income tax, which was abandoned in 2001 in favour of the 13 percent flat tax, could generate 0.3 to 0.5 percent of GDP if thresholds are carefully calibrated. Implementation would need careful design to avoid triggering capital flight.

6.3.3. State Enterprise Dividend Policies

Russia's extensive state-owned enterprise (SOE) sector controls assets exceeding 60 % of GDP, yet dividend contributions to the budget remain modest at approximately 0.8 % of GDP. Comparator economies with large SOE sectors (Norway, Singapore, China) extract dividend yields of 2–3 % of GDP. Enhanced dividend policies requiring SOEs to distribute 50–

60 % of profits (versus current 25–35 %) could generate additional revenues of 0.6–0.9 % of GDP. Implementation challenges include SOE profitability variation, reinvestment needs, and political resistance from enterprise management, but the fiscal potential is substantial.

6.3.4. Asset Monetization

Beyond dividend enhancement, direct asset sales could provide one-time fiscal relief. However, under sanctions conditions, asset valuations have declined substantially, and potential buyers are limited primarily to domestic actors and strategic partners (China, India). Estimated proceeds from partial privatization of major SOEs (Rosneft, Gazprom, Russian Railways) range from 2–4 % of GDP, sufficient to extend NWF buffers by 1–2 years but failing to address structural sustainability concerns. Moreover, strategic considerations may preclude selling crown jewels to foreign entities, particularly from potential rival nations.

6.4. Geopolitical Scenarios and Fiscal Implications

Fiscal sustainability trajectories depend critically on geopolitical developments affecting sanctions intensity and conflict duration. We consider three scenarios:

Scenario A: Prolonged Stalemate (Baseline, 60 % probability): Conflict continues at current intensity through 2027, sanctions remain comprehensive with no major escalation or relief. This generates the fiscal trajectories analysed in Section 5, with NWF depletion by late 2026 and debt reaching 45–50 % of GDP by 2030. Policy response likely involves gradual monetary financing acceleration, pushing inflation toward 12–15 %, with corresponding real income compression and social spending pressures.

Scenario B: Negotiated Settlement (25 % probability): Diplomatic resolution occurs by end-2026, enabling gradual sanctions relief over 2027–2029. Partial restoration of energy export markets and limited international financial access could improve primary balances by 2–3 percentage points of GDP through revenue recovery. However, reconstruction costs and reintegration expenses would partially offset gains. Net fiscal position improves modestly, stabilizing debt around 35–40 % of GDP by 2030, with inflation returning to 4–6 % range.

Scenario C: Escalation (15 % probability): Conflict intensifies, triggering additional defence spending increases to 12–15 % of GDP and further sanctions tightening (secondary sanctions on Chinese/Indian trade partners). Fiscal position deteriorates catastrophically, with deficits exceeding 8–10 % of GDP and debt approaching 70–80 % by 2030. Monetary financing becomes dominant, inflation reaches 20–30 %, triggering risk of economic crisis similar to 1998. This scenario carries substantial regime stability risks.

The weighted-average outcome across scenarios indicates that debt would stabilize at around 42 to 47 percent of GDP by 2030, with inflation settling between 10 and 13 percent. While this is economically manageable, it represents a significant decline from pre-conflict living standards and the previous fiscal position.

6.5. Methodological Limitations and Extensions

Several methodological limitations warrant acknowledgment. First, data quality concerns affect post-2022 analysis, as Russian official statistics may incorporate measurement biases. Our cross-validation approaches mitigate but cannot fully eliminate these concerns. Second, the structural break at 2022Q2 limits available post-sanctions observations, reducing statistical power for regime-specific parameter estimates. Third, forward projections rely on assumptions regarding oil prices, sanctions intensity, and policy responses that in-

corporate significant uncertainty. Fourth, the analysis focuses on federal budget dynamics with limited attention to regional and municipal fiscal positions. Sub-federal governments have experienced transfers compression as federal resources concentrate on defence, potentially creating hidden fiscal stresses not captured in consolidated measures. Fifth, quasi-fiscal operations through state banks and enterprises likely exceed our estimates, suggesting official deficits understate true public sector resource requirements.

Future research should expand the analysis in several ways. First, incorporating firm-level data could reveal how fiscal stress spreads through the economy via government payment delays, differences in tax enforcement, and the allocation of directed credit. Second, household survey data could provide insights into how different fiscal adjustment strategies affect people's incomes and living standards, which is important for evaluating their political feasibility. Third, comparative analysis with historical episodes of prolonged conflict financing (UK during Napoleonic Wars, US during Vietnam, USSR during Afghanistan) could provide insights into sustainable wartime fiscal architectures.

6.6. Policy Recommendations

Based on the empirical findings, we offer several policy recommendations for enhancing fiscal sustainability:

Immediate Priority (0–12 months): Implement emergency revenue measures aimed at raising 1.0 to 1.5 percent of GDP through improved tax administration, digital enforcement, and reforms to state-owned enterprise dividend policies. These measures offer the least disruptive way to adjust while providing time for broader structural reforms. At the same time, it is necessary to establish transparent fiscal rules to limit NWF withdrawals to specific contingencies, preventing the complete depletion of buffers.

Near-Term Measures (1–2 years): Design comprehensive fiscal consolidation strategy targeting 2.5–3.0 % of GDP adjustment over 3–4 years, balanced between revenue enhancement (60 %) and expenditure optimization (40 %). Revenue measures should prioritize administration and compliance over rate increases to minimize growth impacts. Expenditure optimization should focus on defence procurement efficiency, subsidy rationalization, and administration streamlining rather than front-line service cuts.

Medium-Term Reforms (2–5 years): Restructure fiscal architecture to enhance resilience against commodity price volatility and geopolitical shocks. This includes: (1) strengthening fiscal rules with automatic stabilizers, (2) rebuilding sovereign wealth buffers targeting 15–20 % of GDP over a decade, (3) developing domestic capital markets to enhance debt absorption capacity, and (4) improving fiscal transparency and independent oversight institutions.

Monetary-Fiscal Coordination: Establish clear boundaries for monetary financing, ideally through formal central bank independence restoration and fiscal dominance prevention mechanisms. If monetary financing remains necessary, implement explicit limits (e.g., maximum 1 % of GDP annually) and sunset provisions triggering automatic fiscal adjustment if targets are exceeded.

Contingency Planning: Develop explicit contingency frameworks for different geopolitical scenarios. For Scenario B, a negotiated settlement, plans should outline how to use sanctions relief effectively, avoiding Dutch disease from sudden revenue inflows and ensuring reconstruction financing supports key development priorities. For Scenario C, escalation, crisis management protocols are needed, including emergency taxation measures, rules for prioritizing expenditures, and mechanisms to protect social safety nets.

7. Conclusion

This study has examined fiscal sustainability in Russia following the 2022 escalation of the Ukraine conflict and implementation of comprehensive international sanctions. The analysis reveals a challenging but not yet catastrophic fiscal position, characterized by moderate debt levels (24.3 % of GDP) but rapidly deteriorating primary balances (deficit of 2.1 % of GDP generating a 2.9 percentage point sustainability gap) and approaching exhaustion of fiscal buffers within 12–18 months.

This study has yielded three key findings. First, Russia's fiscal deterioration is driven by structural factors rather than temporary cyclical pressures. These include revenue losses from sanctions on exports, defence spending rising to 40 percent of the budget, and the complete loss of access to external financing. Because these factors are structural, the need for fiscal adjustment will persist unless there is a fundamental resolution of the geopolitical situation. Second, under baseline projections, debt ratios are expected to roughly double from the current 24 percent to 45 to 50 percent of GDP by 2030, with significant risks of even worse outcomes if oil prices fall or defence spending rises further. Third, the fiscal reaction function shows structural breaks at the 2022Q2 sanctions escalation. Debt responsiveness declined from 0.142 to nearly zero under comprehensive sanctions, indicating that conventional fiscal discipline mechanisms have become ineffective.

The fiscal adjustment required for debt stabilization, 3.2 percentage points of GDP, exceeds what is typically achieved during peacetime and would result in cumulative GDP losses approaching 5 percent due to fiscal multiplier effects. This creates a fundamental policy trilemma: authorities cannot maintain defence spending, prevent economic contraction, and ensure fiscal sustainability at the same time. Resolving this trilemma will likely involve a combination of modest fiscal adjustment of 1.5 to 2.0 percentage points of GDP, gradual monetary financing that pushes inflation to 12 to 15 percent, and extended adjustment timelines depending on geopolitical developments.

Comparative international evidence provides both warning and hope. Venezuela's experience demonstrates how fiscal-monetary discipline loss can trigger economic collapse even from moderate debt levels, while Iran's case shows that commodity exporters can navigate sanctions-induced fiscal stress through selective adjustment and eventual partial sanctions relief. Russia's outcome will depend critically on policy choices over the next 12–18 months as fiscal buffers exhaust and hard trade-offs become unavoidable.

The analysis contributes to several streams of literature. From a methodological perspective, it shows that conventional fiscal sustainability frameworks need to be adapted for sanctioned economies operating under financial autarky, particularly with respect to debt absorption limits and alternative financing mechanisms. Empirically, it provides detailed evidence on how sanctions transmit through fiscal channels, quantifying the impact of commodity export restrictions and financial isolation on government solvency trajectories. Theoretically, it highlights the limitations of standard fiscal reaction function frameworks when market discipline mechanisms fail due to the complete loss of external financing.

Several avenues for future research are suggested. First, examining micro-level transmission mechanisms, such as how fiscal stress spreads through payment chains, variations in tax enforcement, and directed credit allocation, could shed light on broader economic effects beyond aggregate indicators. Second, analysing the political economy constraints on fiscal adjustment in authoritarian systems without conventional democratic accountability could improve assessments of policy feasibility. Third, develop-

ing real-time sustainability indicators using high-frequency data could provide earlier warning of deteriorating fiscal trajectories.

The Russian fiscal situation offers a critical case for understanding public finance dynamics under geopolitical conflict, comprehensive sanctions, and financial isolation. As global geopolitical fragmentation accelerates and sanctions become increasingly common policy tools, lessons from Russia's experience, including both successful adaptations and potential policy failures, will be valuable for other economies facing similar constraints. The ultimate outcome remains uncertain and dependent on future policy choices, but this analysis clarifies the constraints, quantifies the challenges, and identifies possible pathways for navigating the fiscal sustainability crisis.

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