# STRESS TESTING OF FISCAL RISK AND FUNDING PRESSURES ASSOCIATED WITH CONTINGENT LIABILITIES IN MOLDOVA

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# SUMMARY

The article develops an integrated framework for assessing fiscal risk in Moldova, focused on stress-testing the budgetary position and quantifying contingent liabilities relevant to the sustainability of public finances. The aim is to estimate the sensitivity of the deficit and public debt to macroeconomic and fiscal shocks, and to incorporate contingent risks (state guarantees, exposures associated with public enterprises, litigation, and contractual commitments) into an operational monitoring tool. The methodology combines early warning indicators for macro-fiscal and financing risks, the estimation of budgetary elasticities of revenues and expenditures with respect to macroeconomic variables, and stress scenarios (baseline/adverse/severe) used for the projection of the deficit, the financing need, and the debt path. The data come from national official sources and are harmonised for the period 2010–2024 / 2014–2024, depending on availability. The applied stress scenario reflects a compound macro-financial shock, defined by GDP contraction, an interest rate increase, and exchange rate depreciation, with cumulative effects on the budget deficit, debt service costs, and financing needs. The implications aim to integrate stress testing and the fiscal risk register into the medium-term budgetary framework and to strengthen fiscal risk reporting.


*Keywords: fiscal risk, budgetary stress test, contingent liabilities, budgetary deficit, public debt, refinancing risk, financing vulnerabilities*

# INTRODUCTION

In small, open economies, fiscal risk can erode fiscal stability, as external shocks quickly affect the tax base and budget revenues, and influence the government's financing costs and the exchange rate. In Moldova, macroeconomic volatility, structural rigidities in expenditure, and constraints on borrowing and refinancing conditions increase the likelihood of deviations from budget targets and can accelerate the accumulation of public debt.

In addition to conventional macro-fiscal risks, contingent liabilities represent a financial risk in the area of budgetary and fiscal relations with the potential to materialise, as they can transform potential obligations into actual payment obligations of the public sector. State guarantees, commitments associated with publicly owned enterprises, litigation, and commitments related to public-private partnership contracts can threaten fiscal stability by rapidly increasing financing needs and jeopardise the trajectory of public debt. However, in the current analysis, these exposures are often treated piecemeal, without explicit integration into deficit and debt stress testing.

The aim of the paper is to develop an integrated framework for assessing fiscal risk that combines stress-testing of the budgetary position with the assessment of contingent liabilities based on their potential impact on the deficit, debt, and financing needs. Stress-testing measures the sensitivity of revenues and expenditures to macroeconomic shocks, using budget elasticities to estimate deficit deviations and the implications for the public debt trajectory. At the same time, contingent liabilities are treated as potential fiscal exposures, and their materiality is expressed by an applicable measure of additional financing pressures if they materialize. Thus, the research assesses the sensitivity of budgetary revenues and expenditures to macroeconomic shocks, identifies the scenarios that produce the largest deficit deviations from targets and the strongest debt pressures, and assesses the potential contribution of contingent liabilities to financing vulnerabilities. The central hypothesis is that combined shocks - a decline in gross domestic product, an increase in interest rates and a depreciation of the exchange rate - generate nonlinear effects on the deficit and debt, and the materialisation of contingent liabilities can amplify the financing needs in periods of increased risk exposure.

The main contribution of the paper is the proposal of a fiscal risk assessment tool, designed as a unique framework that uses early warning indicators, estimates of budgetary elasticities for revenues and expenditures, stress scenarios, and a register of contingent liabilities. The application of this tool allows tracking risks transmitted to the deficit, debt, and financing needs, and provides support for the formulation of policies within the medium-term budgetary framework. The article further includes a literature review, a description of the research methodology, and the presentation of the results, accompanied by discussion.

## DEFINITION AND TAXONOMY OF FISCAL RISKS

The specialised literature distinguishes several analytical dimensions of fiscal risk, relevant for the assessment of contingent liabilities and financing pressures. These include: macroeconomic risks with an impact on public revenues and expenditures; operational budgetary risks, associated with execution and structural rigidities; public debt and financing risks, such as refinancing or exposure to interest rate fluctuations; as well as risks arising from contingent liabilities of the public sector – guarantees, state-owned enterprises, public-private partnerships and other potential obligations – the materialization of which

can directly affect the budget balance and the gross financing need. The diversity of these approaches reflects differences in focus and operationalisation, determined by each study's analytical objective. As a reference definition, this study starts from the formulation of the International Monetary Fund, according to which fiscal risk is understood as the possibility that actual budgetary results deviate from those anticipated in the budget or in official forecasts, as a result of the materialization of shocks and uncertainties that affect both fiscal flows (revenues, expenditures), as well as stock variables (public debt) and financing conditions. (IMF, 2008) This approach has two important analytical implications: (i) fiscal risk is not a singular phenomenon, but a set of interdependent risks, and (ii) robust assessment requires the explicitation of the transmission channels through which shocks are transformed into deviations in the deficit, debt and financing needs.

In this paper, fiscal risk is treated as a set of correlated risks that manifest through variations in budgetary revenues and expenditures, changes in financing conditions and the cost of debt, and the materialisation of contingent liabilities with budgetary impact. In aggregate, these risks are reflected in the budget balance, public debt and gross financing needs (IMF, n.d.). The taxonomy used in the paper distinguishes four categories of risks, relevant for fiscal stress testing and for estimating the impact on the main budgetary aggregates:

**(a) Macroeconomic risks**: variations in GDP, inflation, exchange rate and interest rates, which simultaneously affect the tax base, price-sensitive indexations/expenditures and the cost of debt service (IMF, 2008).

**(b) Budgetary risks (revenue and expenditure)**: forecast errors and budgetary elasticities different from those implicit in the baseline projection, respectively, expenditure rigidities (e.g., expenditure that is difficult to adjust in the short term), which amplify the deficit deviation in adverse periods (IMF, n.d.).

**(c) Debt and financing risks**: risks associated with the structure of the debt portfolio (maturity profile, currency share, fixed/floating interest rate) and refinancing risk, which are reflected in the increase in financing costs and the vulnerability of the gross financing requirement to market shocks (Budina and Petrie, 2013).

**(d) Contingent risks**: obligations that can become explicit debts under certain conditions (state guarantees, litigation), as well as exposures from state-owned enterprises (SOEs) and PPPs, where obligations can be explicit or implicit and can quickly migrate to the budget in adverse scenarios (IMF, 2008).

The taxonomy provides an analytical framework for linking each risk category to the mechanisms by which effects are transmitted to the budget balance and, through it, to the public debt. Macroeconomic shocks are reflected in budget execution by altering tax bases and adjusting expenditures through indexation mechanisms, thereby directly influencing the balance. Budgetary risks are captured by revenue and expenditure deviations from the baseline scenario, which are explained by expenditure rigidities and by the insufficient calibration of the parameters used in the forecast, including fiscal elasticities. Financing risks operate through the cost of debt and the conditions for access to refinancing, with implications for interest expenses and the gross financing need. In this context, contingent risks can trigger temporary adjustments to debt and financing needs when contingent obligations become actual budgetary obligations. Thus, the taxonomy establishes the transmission channels to the balance sheet, debt, and gross financing need. On this basis, fiscal stress testing operationalises scenario analysis, incorporating macroeconomic shocks and contingent liabilities into projections of fiscal variables (IMF, 2016).

## FISCAL STRESS TESTING: APPROACHES AND STANDARDS

Fiscal stress testing assesses the resilience of public finances to adverse scenarios by projecting severe, simultaneous shocks along alternative trajectories of fiscal aggregates. The exercise operationalises this analysis by projecting revenues, expenditures, and debt costs, built on explicit assumptions about macroeconomic variables and financing conditions, and by tracking the results through the budget balance, public debt, and gross financing needs. In the IMF toolkit, the Fiscal Stress Test standardises this approach by defining the shock parameters and transmission mechanisms used in projections, thereby enabling the quantification and comparison of the effects on the fiscal position across scenarios (IMF, n.d.; IMF, 2016).

In the literature, fiscal stress-testing approaches can be grouped into two analytical directions, depending on how the relationships between macroeconomic variables and budget aggregates are specified. The first direction uses semi-structural frameworks based on fiscal elasticities (or semi-elasticities), in which the responses of revenues and selected expenditure components to changes in GDP, inflation, or employment are modelled using explicit parameters, while the cost of debt is derived from assumptions about interest rates, exchange rates, and the structure of the debt portfolio (EC, 2020; IMF, 2016). A second approach uses econometric models, in which these relationships are estimated from data, providing an empirical basis for calibrating the responses of revenues, expenditures, and debt service in adverse scenarios.

From a methodological perspective, fiscal stress testing provides an operational framework for assessing the resilience of public finances to macroeconomic and financial shocks. Within the framework of fiscal

projections based on elasticities, revenues are projected using elasticities/semi-elasticities, differentiated by the main revenue categories and reported to relevant nominal bases (nominal GDP, consumption, wage bill), to capture volume and price effects simultaneously. Expenditures are treated through explicit rules for components sensitive to inflation and the economic cycle (indexation, labour market benefits), linked to assumptions regarding the degree of short-term rigidity of primary expenditures. The public debt analysis block operationalises the transmission of market shocks to the cost of financing through changes in interest rates on government securities, the exchange rate, and the structure of the debt portfolio. In this logic, changes in financing conditions are reflected in interest expenses and gross financing needs, through the debt service and refinancing channels.

The quality of the assessment is determined by the internal consistency of the scenarios and the explicit specification of the interdependencies between fiscal aggregates and financing conditions, including how shocks can occur simultaneously and amplify each other (for example, a slowdown in economic growth associated with tightening financial conditions and a depreciation of the exchange rate). A shock to interest rates is progressively reflected in the effective cost of debt through refinancing at maturity and reindexing of the variable-rate component, and foreign exchange exposure amplifies the impact by revaluing debt service and the stock of foreign-currency-denominated debt. The effects are transmitted directly to interest expenditure, the primary balance and the gross financing need. The relevance for financial risk management in the field of budgetary and fiscal relations increases when the set of scenarios includes severe adverse shocks with low probability, defined by explicit calibration criteria (historical distributions, stress episodes, standardized parameters) and oriented towards capturing the materialization of extreme risks, including jumps in the debt stock and accelerated deterioration of fiscal-budgetary sustainability indicators (IMF, 2018).

## CONTINGENT LIABILITIES: TYPES, MATERIALIZATION AND IMPACT

In this context, contingent liabilities represent potential obligations of the public sector that become actual obligations only if a triggering event occurs. In the analysis and efficient management of financial risks in the field of budgetary and fiscal relations, the relevance of contingent liabilities is determined by two interdependent parameters: the probability of activation (materialization) and the amplitude of the budgetary effect, expressed by the impact on the balance, debt and financing needs (IMF, 2008; Budina and Petrie, 2013; IMF, 2016).

The operationalisation of these parameters requires classifying exposures by the nature of the commitment that generates them, since these conditions both affect the estimation of probability and the impact on the transmission channel. A useful typology for fiscal assessment starts from the distinction between explicit and implicit contingent liabilities. Explicit contingencies derive from regulatory acts or contracts and typically include state guarantees, indemnification clauses or contingent payments in contracts, as well as potential liabilities associated with litigation to which the state is a party (IMF, 2008; IMF, 2016). Implicit contingencies reflect expectations regarding state intervention in situations of systemic or social risk (e.g., support for public enterprises or entities considered strategic).

The probability of contingent liabilities materialising increases in adverse macroeconomic conditions, through channels that affect the solvency and liquidity of exposed entities and amplify the risk of activating public commitments. In recessions or amid financial market tensions and rising financing costs, the payment capacity of some secured debtors deteriorates, increasing pressure on public enterprises and the likelihood of activating guarantees, recapitalisations, or other forms of budgetary support (IMF, 2008; IMF, 2016).

From the perspective of fiscal stress-testing tools, this correlation with the business cycle is important because adverse scenarios tend to combine economic activity shocks, interest rate shocks and financing shocks, and contingent liabilities can simultaneously amplify the effects on the budget balance and debt dynamics (IMF, n.d.; IMF, n.d.). In the case of public-private partnership (PPP) contracts, contingent liabilities can materialise as a result of the private partner's failure to perform, the termination or renegotiation of the contract, as well as through the activation of guarantee clauses. This contractual structure requires the treatment of PPP exposures as a financial risk relevant to the field of budgetary and fiscal relations, by including them in fiscal risk registers/inventories and through sensitivity assessments that quantify the potential effects on the deficit, debt and financing needs (Aslan and Duarte, 2014; IMF, 2016; IMF, 2018).

The fiscal impact of materialisation is transmitted through three channels, each with distinct implications for budgetary and fiscal policy, as well as for public debt management. The first channel is the budget deficit, arising from additional spending (transfers, subsidies, compensations), recapitalisations, or other interventions that are immediately reflected in the budget balance (IMF, 2016; IMF, 2018). The second is public debt, which occurs when a materialised obligation is transformed into explicit debt or when the state assumes the liabilities of an entity. Thus, the contingent liability is converted into an increase in the debt stock and can have a significant impact on the sustainability of public finances (IMF, 2008; IMF, 2016). The third channel is the gross financing requirement, a particularly relevant channel in stressed conditions, as materialisation can concentrate payments in a short time frame, amplifying liquidity pressures and refinancing risk (IMF, 2016; IMF,

n.d.). From this perspective, contingent liabilities are also assessed through the time profile of cash outflows and through the interaction with market conditions and financing costs (IMF, 2016).

The integration of contingencies into the analysis of financial risk in the field of budgetary and fiscal relations is based on the following complementary tools: the fiscal risk register and the materiality assessment. The register provides a structured record of exposures, triggering events, legal/contractual basis, maximum exposure and monitoring threshold parameters. The materiality assessment allows for the ranking of risks according to the probability of materialisation and the size of the budgetary impact, providing a methodological basis for establishing management priorities and for the structured presentation of risks in fiscal reporting (IMF, 2008; Budina and Petrie, 2013; IMF, 2018). Within the framework of fiscal transparency practices, systematic reporting of financial risks in the field of budgetary and fiscal relations, as well as contingent liabilities, ensures budgetary discipline by improving information on exposures, control mechanisms and institutional responsibilities (IMF, 2008; IMF, 2018).

In Moldova, public finance sustainability assessments and financial risk analyses in the field of budgetary and fiscal relations are treated in separate analytical sections. Thus, financial stress scenarios in the field of budgetary and fiscal relations only partially capture the effects of contingency materialisation. In this context, a need is proposed to develop an integrated framework that explicitly links stress-testing in the field of budgetary and fiscal relations to the analysis of contingent liabilities across two analytical stages. The first stage is based on alternative macro-fiscal scenarios (a baseline and adverse scenarios) and estimates the evolution of the budget balance (deficit) and debt for each scenario over the projection horizon. The second stage identifies and quantifies relevant contingent liabilities and assesses their materiality based on two operational criteria — probability of materialization and size of budgetary impact — so that their materialization can be coherently introduced into stress scenarios and reflected in outcomes regarding the budget balance, debt and financing needs (IMF, 2008; Budina and Petrie, 2013; IMF, 2016; IMF, 2018).

## METHODOLOGY AND DESIGN OF STRESS TESTING

The research is based on a quantitative-applicative approach, which integrates two tools frequently used in the modern architecture of financial risk management in the field of budgetary and fiscal relations: (i) stress-testing of the budgetary position and public debt based on alternative macroeconomic scenarios; and (ii) assessing the materiality of contingent liabilities through a fiscal risk register, operationalized through a scoring system. This integration allows the treatment of financial risks in the field of budgetary and fiscal relations as a single portfolio, in which risks with immediate manifestation in budget execution (macro-budgetary and financing) are analysed alongside contingent risks, whose materialisation is conditioned by triggering events. In this framework, the intended result is the quantification of potential pressures on the main budgetary and fiscal variables (budget balance, public debt stock, and gross financing need) within a unified analytical framework, enabling the comparability of results across scenarios.

In the adopted methodological architecture, stress testing quantifies the sensitivity of the main fiscal indicators to macro-financial shocks, using budget elasticities and projection rules for expenditure components with high rigidity. In addition, the fiscal risk register operationalises contingent liabilities through a materiality measure and materialisation scenarios that estimate the potential impact of conditional obligations on the fiscal position (IMF, 2016; IMF, 2018).

The dataset used includes: (a) macroeconomic indicators, namely nominal and real gross domestic product (GDP), GDP deflator and inflation, as well as the exchange rate; (b) monetary-financial indicators, in particular interest rates relevant to the cost of debt and financing conditions; (c) data on budget execution, including total revenues and by main categories, as well as public expenditures classified by economic and functional components; (d) information on the stock and structure of public debt, broken down by currency, maturity, interest rate type and cost.

For contingent liabilities, data come from official reports and documents on state guarantees, exposures associated with publicly owned enterprises (SOEs), disputes with potential tax impact and commitments related to public-private partnerships (PPPs). The series are harmonised at a temporal level, and the variables are transformed into standardised indicators (percentages of GDP, weights, growth rates), to ensure comparability across years and scenarios. In the empirical application, the analysis interval covers the period 2010–2024, respectively 2014–2024, depending on the availability of series for each indicator. The interval 2010–2024 is used to estimate and calibrate basic macro-fiscal relationships, in particular the elasticities of budget revenues (total and by main categories – VAT, excise duties, and direct taxes) with respect to nominal GDP, with control variables for the price level and the exchange rate. A longer time series increases the stability and precision of the parameters used in the stress test's transmission rules. The 2014–2024 interval is reserved for the main fiscal stress test application and the assessment of contingent liabilities. Starting with 2014, the relevant data sets for the fiscal indicators and the debt/financing block (including the variables used for the GFN, the debt structure and the inventory of contingents) are available in a more homogeneous and methodologically comparable form, in the context of the strengthening of the medium-term budgetary

framework and the gradual alignment with the GFSM standards. The partial overlap of the intervals thus reflects the separation between the calibration phase (2010–2024) and the main application phase (2014–2024), not analytical redundancy.

The robustness of the parameters used in the stress test is assessed by re-estimating the elasticities on the 2014–2024 sub-sample and by checking the stability of the sign and order of magnitude of the key coefficients. Usual stationarity and structural break tests are applied to the time series; when instability is indicated, we report alternative specifications or use conservative parameter calibrations in the scenarios.

The stress test model is defined based on three scenarios: the baseline scenario (S0), the moderate adverse scenario (S1) and the severe adverse scenario (S2). For each scenario, alternative trajectories of the main macroeconomic variables – gross domestic product (GDP), inflation, exchange rates, and interest rates – are established, and these changes are translated into the dynamics of revenues, expenditures, and the budget balance through transmission rules. The transmission is approximated by budgetary elasticities, estimated econometrically when the data series allow, respectively calibrated in situations where statistical information requires a parametric approach. The financing component reflects the effects of interest rate and exchange rate changes on the cost of debt service and the gross financing need (GFN), in line with fiscal stress-testing frameworks in the literature (IMF, 2016; EC, 2020; IMF, 2018).

The stress-testing design follows standard fiscal risk toolkits (IMF, 2016; EC, 2020) and draws on empirical work in Moldova that operationalises two ingredients used in the present transmission block: (i) potential-output/structural-balance decomposition and (ii) scenario-path construction for key macroeconomic drivers.

Covalschi and Lazăr (2016) estimate potential GDP for the Republic of Moldova using a production-function approach and employ cycle-sensitive fiscal parameters to derive structural fiscal measures. Although their contribution is not framed as a stress test, it provides a local operational precedent for the steps used here: linking revenue dynamics to a macroeconomic base, calibrating fiscal elasticities, and interpreting fiscal outcomes under alternative macroeconomic conditions.

On the scenario side, Toacă et al. (2025) implement autoregressive specifications with seasonal adjustment to generate forecast paths for Moldova's external sector dynamics. This approach is relevant for constructing coherent baseline and adverse macroeconomic trajectories, given the tight links between external demand, GDP, exchange-rate movements, and revenue bases.

Against this background, the present framework combines elasticity-based fiscal mapping with debt-dynamics and refinancing channels, and complements these with a fiscal risk register for contingent liabilities, so that deficit, debt and gross financing needs can be traced consistently under compound macro-financial shocks while preserving accounting identities.

The sensitivity of budget revenues to macroeconomic developments is quantified by estimating the elasticities between budget revenues and nominal gross domestic product (GDP), including inflation and the exchange rate as control variables. The estimation is carried out separately for total revenues and, where available, for the main revenue categories: value added tax (VAT), excise duties, and direct taxes. The basic specification adopts a logarithmic form, which allows the interpretation of the estimated coefficients as elasticities and their use in the transmission rules within the stress test:

$$\ln(R_t) = \alpha + \beta \ln(PIB_t^{nom}) + \gamma \ln(CPI_t) + \delta \ln(ER_t) + \varepsilon_t \qquad (1)$$

Where:

$R_t$ - represents the budget variable analyzed at time $t$ (for example, total or category revenues);

$GDP_t^{nom}$ - nominal GDP;

$CPI_t$ - price index (or deflator);

*ERt* - exchange rate;

$\alpha$ - constant (intercept): the base level of $\ln(R_t)$, when the explanatory variables are at their reference level.

$\beta$ - coefficient (elasticity) of revenues with respect to nominal GDP.

$\gamma$ - coefficient associated with the price level (CPI/deflator as an index): shows how income changes (in log terms) when the general price level changes, after controlling for nominal GDP and exchange rate.

$\delta$ - coefficient associated with the exchange rate *ERt*: captures the sensitivity of income to exchange rate movements

$\varepsilon_t$ - error term (residual) at time t: everything that affects income in year/quarter $t$ and is not included in the model (shocks, unmodeled discretionary fiscal measures, measurement errors, administrative factors, etc.)

Elasticities can be estimated using ordinary least squares (OLS), with standard time-series checks, including stationarity tests and identification of potential structural breaks. In situations where variables are non-stationary and cointegration relationships exist, robust specifications, such as error-correction models, can be

used while maintaining the economic interpretation of the estimated coefficients as elasticities.

Budgetary expenditures are projected differentially, reflecting structural rigidities and specific indexation mechanisms. Components with high rigidity (personnel costs, transfers, and interest payments) are estimated using dedicated rules, such as inflation indexation, quantitative volume rules, or formulas derived from the cost of financing, since discretionary adjustments are usually limited in the short term. For the discretionary components, a fiscal adjustment rule is introduced, such as maintaining a balance/deficit target or gradual stabilisation, to ensure coherence in the fiscal trajectory across scenarios.

Accounting identities are explicitly maintained in the projection exercise to ensure internal coherence between the budget and debt blocks. The budget balance is defined as the difference between total revenues and total expenditures:

$$BB_t = Inc_t - TE_t \qquad (2)$$

On this basis, the gross financing need is determined by the budget deficit (respectively surplus), debt amortisation, and the variation of the liquidity reserve (buffer), according to the identity:

$$GFN_t = -BB_t + Amort_t + \Delta Buffer_t \qquad (3)$$

Where:

$BB_t$ – budget balance;

$Inc_t$ – income;

$TE_t$ – total expenses;

$GFN_t$ – means the gross financing requirement in the period *t*.

$Amort_t$ – amortization of debt at the time *t*, i.e. principal repayments (amounts paid to return principal, not interest) that fall due during the period *t*

$\Delta Buffer_t$ – represents the variation in the Treasury's liquidity stock/financing reserves during the period *t*, introduced to reflect the policy of maintaining an operational buffer; a $Buffer_t > 0$ increases GFN, and a $Buffer_t > 0$ reduces it.

For interest expenses, the transmission of interest and exchange rate shocks is reflected gradually, through refinancing and interest rate adjustment, in accordance with the practice of budgetary-fiscal stress testing (IMF, 2016; IMF, 2018).

## QUANTIFICATION OF CONTINGENT LIABILITIES

Contingent liabilities are analysed through a fiscal risk register, in which each exposure is assessed along three dimensions: probability of materialisation (P), potential budgetary impact (I), and time horizon (T). The materiality of the exposure is summarised by a composite score, defined as follows:

$$R = P \times I \times T \qquad (4)$$

Where:

P - reflects the probability of activation (e.g., on an ordinal scale of 1–5, from "very low" to "very high");

I - captures the magnitude of the potential impact (e.g., as ranges of % of GDP or as a score of 1–5 correlated with magnitude thresholds);

T - captures the temporal proximity (e.g., 1 = >3 years; 2 = 1–3 years; 3 = <1 year).

Based on the *R* score, exposures are classified into materiality bands (low, medium, high), enabling prioritisation of financial risk management interventions in the field of budgetary and fiscal relations. Mitigation measures are selected according to the type of exposure and include, among others, limiting or capping guarantees, introducing contractual clauses and risk-sharing mechanisms in public-private partnerships (PPPs), provisioning and strengthening reporting requirements, and establishing alert thresholds for state-owned enterprises (SOEs). For disputes with potential budgetary-fiscal impact, the approach aims at management strategies that reduce the probability of materialisation and the size of the potential loss (IMF, 2008; IMF, 2016; Budina and Petrie, 2013; IMF, 2018).

The stress register integration: the test is achieved by introducing the materialisation (total or partial) of contingent liabilities as an additional shock, reflected either in expenditures (e.g., transfers, recapitalisations, compensations) or directly in the gross financing need (GNF), when payments are concentrated in time. This mechanism is operationalised through dedicated scenarios ("S1+Cont", "S2+Cont"), built to capture the amplification of financing pressures under adverse conditions.

## INDICATORS OF FINANCING VULNERABILITIES AND CONSTRAINTS

Financing vulnerabilities are assessed through a set of indicators that correlate the structure of public debt with liquidity pressures and exposure to macro-financial shocks. A first indicator concerns foreign exchange risk, measured by the share of foreign exchange-denominated debt in total public debt:

$$FX\_share_t = \frac{D_t^{FX}}{D_t} \qquad (5)$$

A second indicator captures refinancing risk through maturity concentration, operationalised as the share of repayments due in the next 12 months relative to total debt or, alternatively, to budget revenues. In addition, interest expenses reported to revenues are used as indicators of pressure on the fiscal space and the sensitivity of the budget position to increases in the cost of financing. The gross financing need (GFN), expressed as a percentage of gross domestic product (GDP), is a synthetic indicator of market pressure and refinancing dependence in scenarios, with increased relevance in stress conditions (IMF, 2016; IMF, 2018).

The limitations of the analysis derive mainly from the granularity and low comparability of public information on contingent liabilities, especially for state-owned enterprises (SOEs), litigation, and public-private partnerships (PPPs), as well as from potential methodological breaks in the statistical series. Under these conditions, the scenarios are documented transparently by presenting the parameters, projection rules, and transformations applied to the data, and the results are interpreted as risk ranges and orders of magnitude of pressures on the budget balance, public debt and gross financing need, not as point estimates.

## FISCAL-BUDGETARY POSITION OF MOLDOVA IN 2024: STRESS TESTING BASELINE SCENARIO

The stress-testing calibration starts from the fiscal-budgetary position observed in 2024, used as a reference scenario for the initial levels of the aggregates and for the set of financing variables that enter into the construction of the gross financing need and the debt trajectory. From the macroeconomic perspective, nominal GDP was estimated at 323.8 billion lei (current market prices), and the real annual growth rate was 0.1% (NBS, 2025). Under these conditions, the variation of the tax base is weak, and the dynamics of budgetary revenues remain constrained; in the model, the transmission of macro shocks to revenues is captured through elasticities/ reaction coefficients (reported in the methodological annexe), which implies a limited potential for endogenous correction of budgetary deviations through growth, in the absence of discretionary adjustments.

On the execution side, the state budget recorded a deficit of 13.1 billion lei in 2024, approximately 4% of GDP (MF, 2025). The value sets the order of magnitude of the initial imbalance and serves as a benchmark for the amplitude of simulated deviations in stress scenarios, including for assessing effects on the GFN. On 31 December 2024, state debt accounted for 37.5% of GDP (MF, 2025). In stress testing, this anchor becomes relevant through two mechanisms that enter directly into the debt dynamics equations: (i) the interest rate channel, which influences the marginal cost of refinancing and, through portfolio rollover, interest and GFN expenses; (ii) the exchange rate channel, which affects the stock and debt service to the extent that the portfolio includes a component denominated or indexed in foreign currency, with implications for foreign exchange risk and refinancing risk.

To triangulate the order of magnitude through an external source, the IMF macro-fiscal framework places the fiscal deficit in 2024 at around 4.4% of GDP (IMF, 2024). The difference with the state budget deficit is treated as a result of distinct statistical parameters and methodologies, so the IMF figure is used strictly as an anchor of magnitude, not as an accounting equivalent of execution. Overall, the initial setting indicates an already significant deficit and a level of debt that makes the assessment of interest rate and exchange rate shocks in stress scenarios material (MF, 2025; IMF, 2024).

## SCENARIO RESULTS: FISCAL BALANCE, DEBT AND GROSS FINANCING NEED (GFN)

The stress-test framework is formulated to preserve the accounting identities of the budget and financing blocks, ensuring the internal coherence of the transmission between macro-financial shocks and fiscal variables. The budget balance is defined by equation (2) as the difference between total revenues and total expenditures, and the gross financing need (GFN) is determined by equation (3) as a function of the deficit (respectively the surplus), debt amortisation, and the variation of the liquidity buffer. In adverse scenarios, the deterioration of the balance results from the dual mechanism of the contraction of economic activity (erosion of the tax base and, implicitly, of revenues) and the short-term rigidity of some categories of expenditures, including debt service, such that discretionary adjustments cannot fully absorb the shock in the immediate horizon (NBS, 2025; MF, 2025a).

The year 2024 provides a quantitative anchor for this mechanism. Nominal GDP is estimated at around 323.9 billion lei, and real growth is almost zero (0.1%), which limits the support provided to revenues by the dynamics of the economic base (NBS, 2025). At the same time, the state budget deficit is around 4.0% of GDP (approx. 13.1 billion lei), which serves as the starting point for calibrating the imbalance (MF, 2025b). Interest expenses are around 1.33% of GDP (approx. 4.3 billion lei) and become immediately relevant in stress testing when interest rate shocks affect the marginal cost of refinancing and, through portfolio rollover, interest expense and GFN (MF, 2025b).

In the debt channel, shock transmission operates simultaneously through the accumulation of deficits and through changes in the differential between the effective cost of financing and the dynamics of nominal GDP (r–g mechanism). Even under conditions of a moderate initial level of debt (below 40% of GDP in 2024), the combination of weak real growth, volatile deflator/ inflation and rising interest rates can accentuate the slope of the debt trajectory, with first-order effects on the refinancing risk (MF, 2025). In this architecture, the GFN tends to become the critical variable in stress, as it reflects not only the current deficit, but also the volume of principal refinancing and the policy of maintaining or rebuilding liquidity reserves. As a result, financing pressures may increase rapidly, especially in years with concentrated maturities and in a restrictive market regime, when the quantity and price of financing become effective constraints on fiscal adjustment.

Thus, for Moldova, the profile on scenarios S0–S2 shows an orderly and cumulative deterioration of the three target variables (BB, debt, GFN), with effects that amplify towards the end of the horizon, exactly as suggested by the r–g mechanism and the role of GFN as a constraint variable.

In the baseline scenario (S0), the budget balance remains around −4% of GDP in 2024–2026 (−3.9; −4.1; −4.0), after which it gradually improves to −3.5% in 2028. Government debt rises almost linearly from 37.8% of GDP in 2024 to 45.0% in 2028, suggesting persistent debt accumulation. The GFN increases from 4.5% to 5.3% of GDP, suggesting increasing financing pressure even without shocks, amid refinancings and the maintenance of amortisations in the debt profile.

In the moderate adverse scenario (S1), the deterioration of the budget balance compared to S0 is relatively stable, but material: between −0.4 p.p. (2024) and −0.8 p.p. (2026–2027), remaining at −0.7 p.p. in 2028. This deviation is gradually translated into the stock: the debt exceeds the baseline trajectory by +0.7 p.p. in 2024 and reaches +3.5 p.p. in 2028 (48.5% vs 45.0%). In parallel, the GFN increases by +0.5 p.p. in 2024 and by +1.0 p.p. in 2028 (6.3% vs 5.3%), indicating that financing pressure increases not only "through the deficit" but also through the refinancing component and buffer management as conditions become more restrictive.

In the severe adverse scenario (S2), the dynamics are steeper and concentrated in the second part of the interval. The budget balance deteriorates from −5.0% (2024) to a minimum of −5.9% (2027), remaining at −5.7% in 2028; as a deviation from S0, it increases from −1.1 p.p. (2024) to −2.2 p.p. (2028). The cumulative effect on the debt is substantial: the difference from S0 rises from +1.7 p.p. in 2024 to +7.5 p.p. in 2028, when the debt reaches 52.5% of GDP. GFN becomes the variable that most directly "signals" the constraint: it increases from 5.8% in 2024 to 8.0% in 2028, i.e. +1.3 p.p. above S0 in 2024 and +2.7 p.p. in 2028. This profile suggests a rapid increase in financing pressure in the short term, in line with the hypothesis that, in stress, the gross financing need simultaneously aggregates the current deficit, principal refinancing and liquidity policy.

## INTEGRATION OF CONTINGENT LIABILITIES AND MATERIALITY

Integration of contingent liabilities extends stress testing beyond macro-fiscal sensitivities captured by the balance and debt, by including rare, "tail" risks that are activated episodically but can generate concentrated fiscal pressures. In the context of the Republic of Moldova, this analytical layer is justified by the nature of some exposures that become budgetary relevant when they materialize (guarantees, state-owned enterprises, energy sector, litigation, disasters and PPP commitments), as well as by good practice recommendations on the identification, quantification and systematic reporting of fiscal risks (IMF, 2016).

The materiality of exposures is assessed by an ordinal prioritisation index, defined by equation (4), R=P×I×TR = P \times I \times TR=P×I×T. In this formulation, PPP reflects the probability of activation on a scale of 1–5 (from "very low" to "very high"), III captures the magnitude of the potential impact, calibrated on thresholds in % of GDP, and TTT encodes the temporal proximity (1: >3 years; 2: 1–3 years; 3: <1 year). The RRR index is used to prioritise and select mitigation measures, without being interpreted as an expected loss in a probabilistic sense. In order to anchor the scoring in orders of magnitude relevant for a small economy and to maintain comparability between heterogeneous exposures, the proposed thresholds for III are: I=1I=1I=1 <0.1% of GDP; I=2I=2I=2 0.1–0.3%; I=3I=3I=3 0.3–1.0%; I=4I=4I=4 1.0–3.0%; I=5I=5I=5 >3.0% (with internal marking for systemic impact at >5% of GDP). On this basis, exposures are grouped into operational alert classes: low (≤10\le 10≤10), moderate (11–25), high (26–45) and very high (>45), in line with the "heatmap" logic used in fiscal risk management frameworks (IMF, 2016). The detailed register of exposures and P–I–T scoring is presented in Annexe A.

The integration in the S0–S2 scenarios is performed as a "layer" on top of the BB–debt–GFN trajectories already estimated for macro-financial shocks, precisely to separate a continuous transmission channel (gradual deterioration of the fiscal position and tightening of financing conditions) from a discrete channel (activations with a concentrated temporal profile). In the S1 scenario, the activation of an exposure classified as "high" (R=26R=26R=26–45), introduced in the year of materialisation in the form of a one-off shock on expenditure and/or a concentrated increase in the gross financing need, depending on the nature of the obligation (e.g. transfers/recapitalisations versus quick payments associated with guarantees). In the S2 scenario, either the activation of a "very high" exposure (R>45R>45R>45) or the simultaneous activation of two "high" exposures with T=3T=3T=3 is considered, to capture situations in which financing pressures increase abruptly. This specification aims to reproduce the essential property of contingencies: they can convert an adverse but incremental trajectory into an immediate financing need, with persistent effects on debt when covering the shock involves borrowing (IMF, 2016).

Interpreting the results through the GFN lens is central in this framework. While the budget balance reflects deterioration through revenue and expenditure mechanisms, the GFN reacts more quickly to the materialisation of contingencies, as it aggregates the current deficit, principal refinancing and liquidity policy (buffer). Therefore, two scenarios may have relatively close balance profiles, but may diverge significantly in terms of financing constraints when a contingent liability with concentrated payment is activated. In a more restrictive market environment, this jump in the GFN takes on operational significance: it influences the timing of issuances, the composition of financing and the marginal cost, amplifying the risk of refinancing even before the full effects are observed in the debt stock. In this sense, the inclusion of contingent liabilities is not only descriptive but also enhances stress testing's ability to assess fiscal resilience under adverse conditions by explicitly linking the macro-financial channel with the discrete channel of rare, high-impact events (IMF, 2016).

# CONCLUSIONS

The stress-testing analysis applied to the Republic of Moldova shows that fiscal vulnerability is not determined exclusively by the initial level of debt, but by the combination of a persistently negative budget balance, the sensitivity of the cost of financing and the profile of the gross financing need. In the reference scenario, the fiscal position improves slowly, but the debt dynamics and the gradual increase in the GFN indicate a financing constraint that remains relevant even in the absence of major shocks. In the adverse scenarios, the deterioration of the balance is transmitted cumulatively to the debt stock, and financing pressures increase more rapidly than the deficit-only reading would suggest, highlighting the role of refinancing channels and the marginal cost of borrowing.

The comparative results indicate a significant asymmetry between the balance and financing pressure paths: differences between the scenarios are moderate for BB but substantial for GFN, particularly towards the end of the projection horizon. This finding is critical for assessing resilience, as the GFN synthesises the current deficit, principal refinancing and liquidity policy, so that its variations are directly relevant to the issuance schedule, the funding mix and refinancing risk. The integration of contingent liabilities strengthens the analytical value of the framework by introducing rare risks with concentrated fiscal impact, which can transform gradual debt pressures into abrupt financing needs. The materiality index, based on probability, impact and temporal proximity, provides a replicable prioritisation scheme compatible with medium-term budgetary planning, allowing contingencies to be treated as a "layer" over macro-financial scenarios. The direct implication is that fiscal resilience depends not only on the average trajectory of indicators, but also on the institutional capacity to anticipate activations with a concentrated temporal profile that immediately affect the GFN and, through financing, the debt trajectory.

From a policy perspective, the results support three directions: (i) strengthening debt and refinancing risk management (maturities, currency, cost), (ii) explicitly integrating GFN into sustainability assessment, alongside balance and debt, and (iii) strengthening fiscal risk governance through operational registers, alert thresholds and regular reporting mechanisms that link contingent exposures to macro-fiscal scenarios. Overall, the proposed framework provides a coherent basis for simultaneously interpreting "continuous" (macro-financial) and "discrete" (contingent) vulnerabilities, providing a more complete reading of financing constraints and risks of deviation from the baseline trajectory.

The main limitations stem from the reliance on calibration assumptions (elasticities, refinancing rules, buffer treatment) and the level of granularity available for contingent liabilities. A natural extension of the research is to refine the parameters based on historical series and the structure of the debt portfolio, and to explicitly quantify the contingencies through alternative activation scenarios, so that the contributions to GFN and debt can be systematically decomposed and compared across risk sources.

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