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**International Reserves as the core element
of the GFSN for developing economies**

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Abbreviations

AMF	Arab Monetary Fund
CA	current account
EFSD, the Fund	Eurasian Fund for Stabilization and Development
ESM	European Stability Mechanism
EU	European Union
FLAR	Latin American Reserve Fund
GEM	Global Economic Monitor
GFSN	Global Financial Safety Net
IFI	international financial institution
IFS	International Financial Statistics
IMF	International Monetary Fund
IRA	international reserve asset
KAOPEN	Chinn-Ito index
RFA	regional financing arrangement
WEO	World Economic Outlook

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Introduction

International reserve assets (IRAs) play a crucial role in ensuring financial stability, i.e. the ability of a country to effectively mitigate adverse impacts of crises and economic shocks. They are seen as the first and most important element of the Global Financial Safety Net (GFSN). Overall, foreign exchange reserves make almost 80% of the total GFSN resources. Bilateral swap lines, regional financing arrangements (RFAs) and the International Monetary Fund (IMF) account for the remaining part.

However, with the ever-increasing need for diverse financial resources, countries face a difficult trade-off between using IRAs and raising stabilisation financing. In many cases, countries attract resources from RFAs, multilateral development banks, and the IMF, and resort to swap lines even when they have excess reserves (Vinokurov, Levenkov, 2021). Nevertheless, reserves are still used more frequently than elements of other GFSN levels.

Each option has its benefits. On the one hand, the use of international reserves can ensure a certain degree of independence and prompt response to external threats. On the other hand, attracting stabilisation financing from international financial institutions (IFIs) can bring additional resources and support in the context of limited international reserves.

The strategic choice between the use of IRAs and various forms of stabilisation financing is driven by many factors, including the availability of credit resources, exchange rate policies, crisis situations, the level of international reserves, and many others.

Therefore, the aim of this Working Paper is to identify the factors that are significant for the use of IRAs. An analysis of these aspects will improve the understanding of the rationale behind countries' behaviour in the face of uncertainty and help develop recommendations for optimising the management of international reserves and ensuring effective use of stabilisation financing.

Answers to these and other questions are of interest to the Eurasian Fund for Stabilization and Development (EFSD) and its member states. The results of the study will help to better determine the real financing needs of countries and their motivation to access certain GFSN elements. Understanding these issues is important for designing effective financial stability and economic development strategies.

The Working Paper is organised in the following way. [Section 1](#) analyses the IRA dynamics worldwide, as well as in developing economies and the EFSD countries. [Section 2](#) offers a literature review focusing on the quantitative analysis of the demand for reserves and the factors affecting their dynamics. [Section 3](#) describes the methodology and research principles used in the Working Paper. The results of the calculations made are presented in the [Section 4](#). [Section 5](#) summarises the findings.

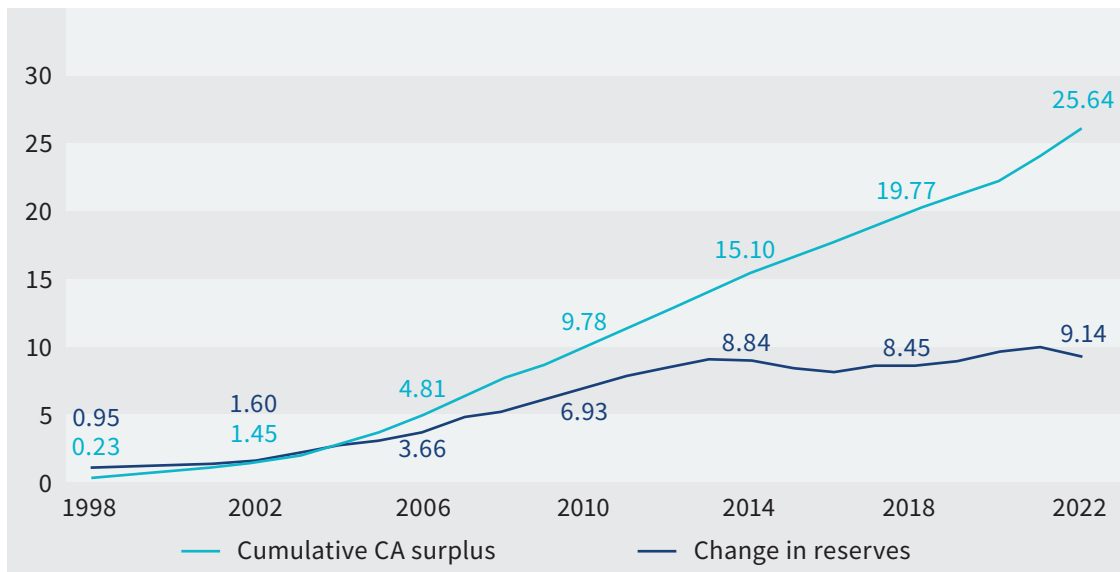
1. Current situation with reserves

1.1. Global IRA Dynamics

The stock and dynamics of international reserves are important indicators of the state of an economy. They play a key role in a country’s ability to respond to emerging risks and threats. Over the last two decades, however, countries have shifted their focus to other instruments.

Approaches to managing current account (CA) surpluses are changing. For example, countries have become more active in building up sovereign wealth funds, which have grown from \$4 trillion in 2008 to \$11.3 trillion in 2023. Although some countries include sovereign wealth fund assets as reserves in their statistics, the growth of foreign exchange reserves was almost 40% lower in the global economy over the same time period — the reserves increased from \$7.3 trillion to \$11.9 trillion. In addition, rather than accumulating funds, countries with a CA surplus have increased their investment in large infrastructure and other projects. These developments can be observed by comparing the dynamics of CA and reserves for 20 countries with the largest CA surpluses — the cumulative surplus of these countries built up since 1998 significantly exceeds their savings in reserves (Figure 1).

Figure 1. Cumulative CA surplus and changes in reserves of the top 20 countries in terms of CA surpluses in 2022, \$ trillions



Source: Author’s calculations based on the IFS.

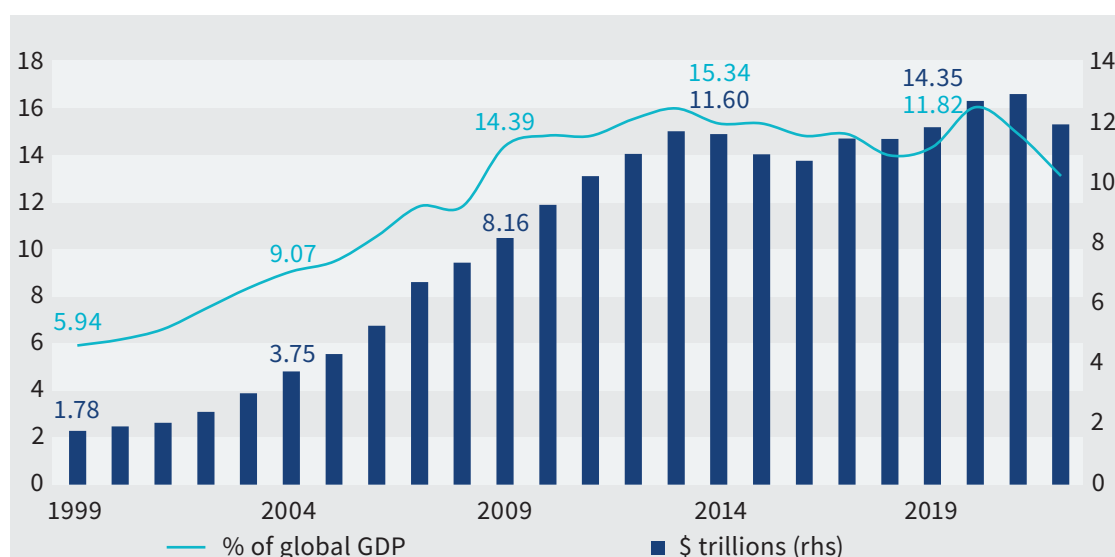
At the same time, countries have more options at their disposal to hedge against crisis developments:

- to attract foreign exchange through swap lines;
- to resort to RFAs and, in some cases, to multilateral development banks; and
- to use new IMF support facilities.

The number of swap lines has grown from 3 in 2000 to 91 in 2020, totalling \$1.8 trillion (Perks et al., 2021). After the 2008–2009 global financial crisis, the development of the RFA “family” received a new impetus. The reason was not only the financial crisis, but also the lack of progress in reforming the Bretton Woods institutions and strengthening the voice of developing economies in them. In 2009, the EFSD was established (at that time it was called the Eurasian Economic Community Anti-Crisis Fund). In 2010, the Chiang-Mai Initiative (a network of bilateral swap agreements) was reformatted into the Chiang-Mai Initiative Multilateralisation. And, most importantly, in 2010 the European Financial Stability Facility was created, the successor of which in 2012 became the European Stability Mechanism, with enormous resources at its disposal (Vinokurov, Efimov, Levenkov, 2019).

Reserves, however, remain the most dynamic and accessible tool for economic authorities. Although the stock of reserves at the global level has fluctuated at 11–12% of global GDP over the past decade (Figure 2), with the steepest decline in the period under review registered in 2022 (Box 1), they are still larger than all other crisis support facilities. Reserves are estimated to account for almost 80% of the total GFSN resources — \$14.3 out of \$18.5 trillion — while bilateral swap lines make \$1.9 trillion (the second element), the RFAs — \$1.3 trillion (the third element), and the IMF — \$1 trillion (the fourth element) (Perks et al., 2021).

Figure 2. Dynamics of international reserves



Source: Author’s calculations based on the WEO.

Box 1. Dynamics of Reserves in 2022

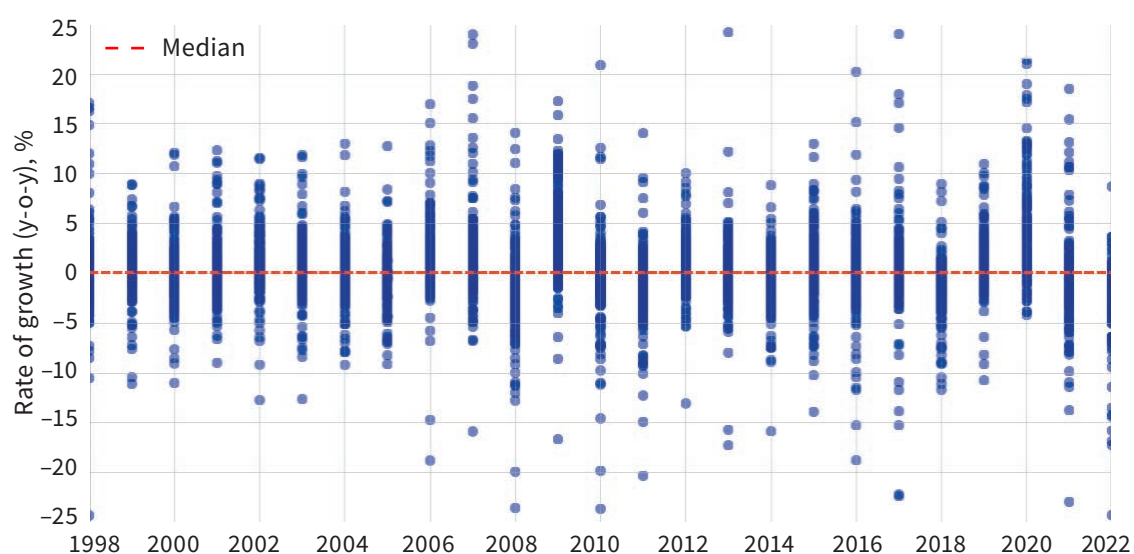
According to the IMF, the total stock of reserves in the world fell by \$1 trillion in 2022 (from \$12.9 to \$11.9 trillion). For the first time since the early 2000s, the stock of reserves held in dollars declined in nominal terms by \$0.6 trillion (from \$7.1 trillion to \$6.5 trillion). Reserves in almost all currencies declined, with the exception of those denominated in Swiss francs and non-traditional reserve currencies. In 2022, central banks’ gold purchases reached a peak since 1967 — 1,136 tonnes, or around \$70 billion. These numbers can only partly explain the decline in foreign exchange reserves. The need to support local currency exchange rates — the dollar index rose by 7.9% over the year — and to reduce new borrowings in the face of their rising costs has played a role.

In the context of a slowdown in the growth of total reserves and the proliferation of alternative instruments that duplicate their functions, researchers shifted their focus away from reserves. However, the freezing of the Bank of Russia’s reserves in 2022 reinvigorated discussions on maximising security, the optimal structure and the required level of reserves. An understanding of the circumstances in which reserves are used is required to answer these questions.

It should be noted that there are different factors driving increases and declines of reserves. Reserves grow due to macroeconomic policy decisions that ensure that savings exceed investment — this helps to build up reserves. Reserves tend to decline due to factors that can be described as speculative (Flood, Marion, 2002).

The relative stability of the overall level of reserves at the global level creates the illusion that their stock does not drastically fluctuate. However, there are frequent and significant fluctuations at the level of individual countries. Let’s look at the maximum sample of 172 countries for which data are available on the level of reserves as a share of GDP. Between 1998 and 2022, reserves as a share of GDP on average increased annually in 89 countries and declined in 76 countries. In some cases, both growth and decline episodes reached double digits, but the median was close to zero (Figure 3).

Figure 3. Rate of growth of reserves as a share of GDP (y-o-y), %

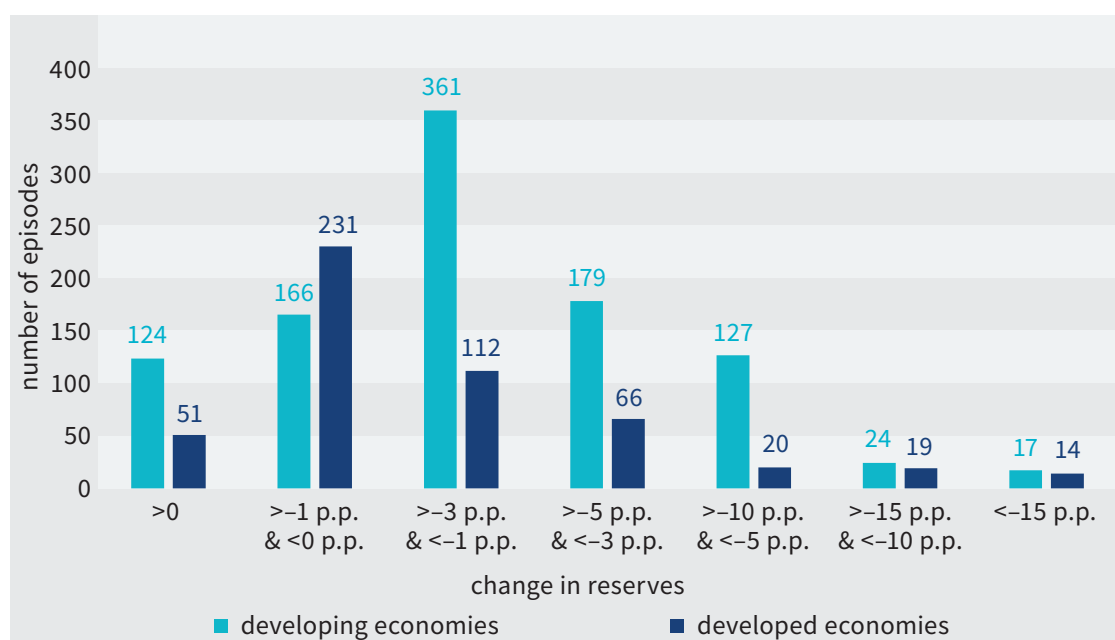


Source: Author’s calculations based on the GEM, WEO.

International reserves are predictably more volatile in developing economies because of their greater vulnerability to capital flight and other external shocks. In addition, developed economies tend to be reserve currency issuers or have swap lines with central banks that are reserve currency issuers. Almost 1,000 episodes of nominal reserve declines in developing countries have been identified for the period of 1998–2022¹. In 124 episodes, reserves as a share of GDP grew, while in 874 episodes they declined. In more than a third of the episodes (36%), the level of reserves as a share of GDP fell by 1–3 p.p. In developed economies, in almost half of the episodes (45%), reserves as a share of GDP did not fluctuate by more than 1 p.p. (Figure 4).

¹ Author’s calculations based on the WDI and COFER data. Details about the data sources will be provided in Section 2.

Figure 4. Distribution of episodes of changes in reserves as a share of GDP, conditional on their decline in nominal terms, 1998–2022



Source: Author's calculations based on the WDI and IMF

The decline in reserves (as a share of GDP) in developing economies was accompanied by an average nominal depreciation of local currency exchange rates against the US dollar of 6.3% year-on-year. At the same time, the current account balance was (-5.1)% of GDP in that period, deteriorating by an average of (-1.0) p.p. relative to GDP year-on-year.

The number of episodes of reserve declines increased after 2010: 27 developing economies experienced reserve declines on average between 2000 and 2009, and 42 — between 2010 and 2019. However, the number of episodes of declines of less than 1 p.p. increased the least, from 6 to 7 annually on average over the decade, while the number of episodes of declines of 1 to 3 p.p. increased from 12 to 18 annually on average over the decade. Against the background of substantial financial support during the coronavirus pandemic, the decline in reserves decelerated, but by 2022 the number of countries had already almost reached the 2014 peak, with a pattern close to that of 2008 (Figure 5).

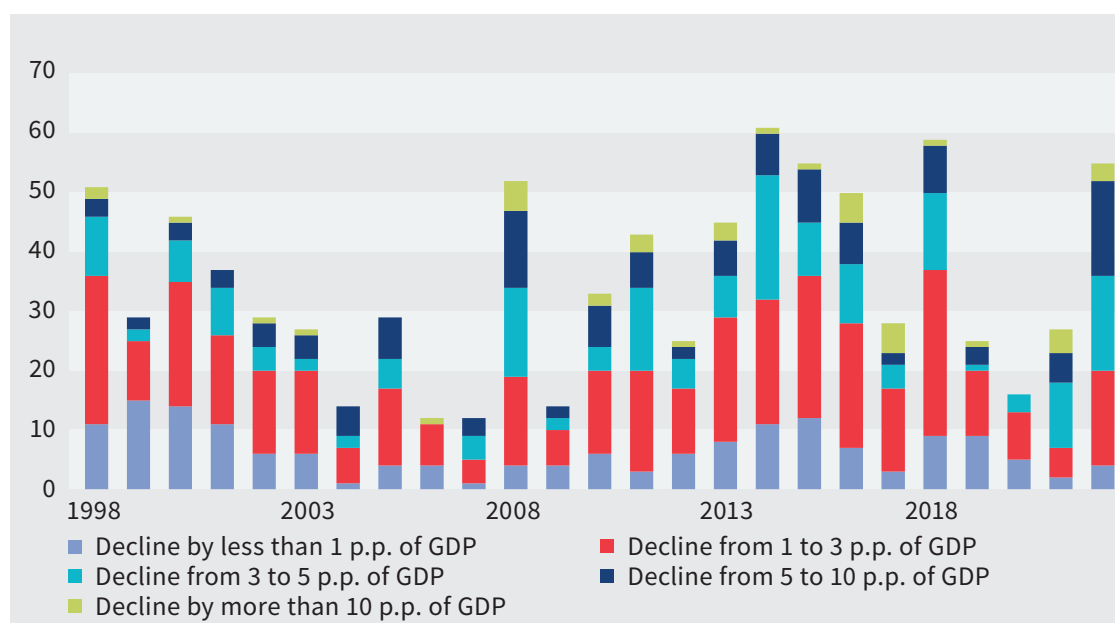
Most fluctuations in the level of reserves are not accompanied by a change in the ARA metric status². According to our calculations based on IMF data, every year, on average in 3 countries reserves decline below the adequate level (1 according to the ARA metric). And the maximum decline was observed in 2007 and 2012 in 8 countries.

The incidence of reserve declines is much higher than the use of other GFSN elements by countries. For the period of 1998–2022, the number of loan agreements between countries and the IMF is around 560, an average of 22 programmes per year. However, excluding the

² The ARA metric is a combined assessment of reserve adequacy based on the IMF's formalised model. It characterises the adequacy of reserves based on various indicators, including import coverage, reserves to broad money, etc. (IMF, 2016).

peak in 2020, when 105 programmes were approved for financing, the annual average drops to 17 programmes per year. The number of programmes with RFAs³ is even lower, at around 140 over the period under review. Thus, although their overall level in the global economy has stopped growing, reserves remain an important instrument for ensuring the macroeconomic equilibrium.

Figure 5. Number of developing countries where reserves declined



Source: Author's calculations based on the GEM, WEO.

At present, there are a number of risks that continue to shape the high reserve needs in developing countries. This is evidenced by the trends in 2023.

The growing borrowings of developing economies from foreign creditors increase their vulnerability to external shocks. The overall public debt of developing countries increased from 35% of GDP in 2010 to 60% in 2021, while their external public debt grew from 19% of GDP in 2010 to 29% of GDP in 2021. At the same time, their ability to generate foreign exchange through exports to service their external debt obligations is also deteriorating, with the ratio of external public debt to exports up from 71% in 2010 to 112% in 2021. Over the same period, the ratio of external public debt service to exports increased from 3.9% to 7.4%. High debt levels make the countries in question vulnerable to external shocks. For example, the tightening of the global financial conditions in 2023 due to policy rate hikes approved by central banks of developed countries led to a significant increase in debt servicing costs (Tsukarev, Taltaev (forthcoming)).

Developing economies tend to generate current account deficits. According to IMF estimates, this group of economies moved to a current account deficit in 2015, which was temporarily replaced by a surplus in 2020–2022 but will return to the negative territory over the forecast period.

³ Loans of the EFSD, AMF, and FLAR were taken into account.

Finally, developing economies face increased pressure on their local currency exchange rates. Given the appreciation of the US dollar, interventions were required in 2022, which in turn led to a decline in reserves. Continued tight monetary policies in developed economies will put further pressure on the currencies of developing countries.

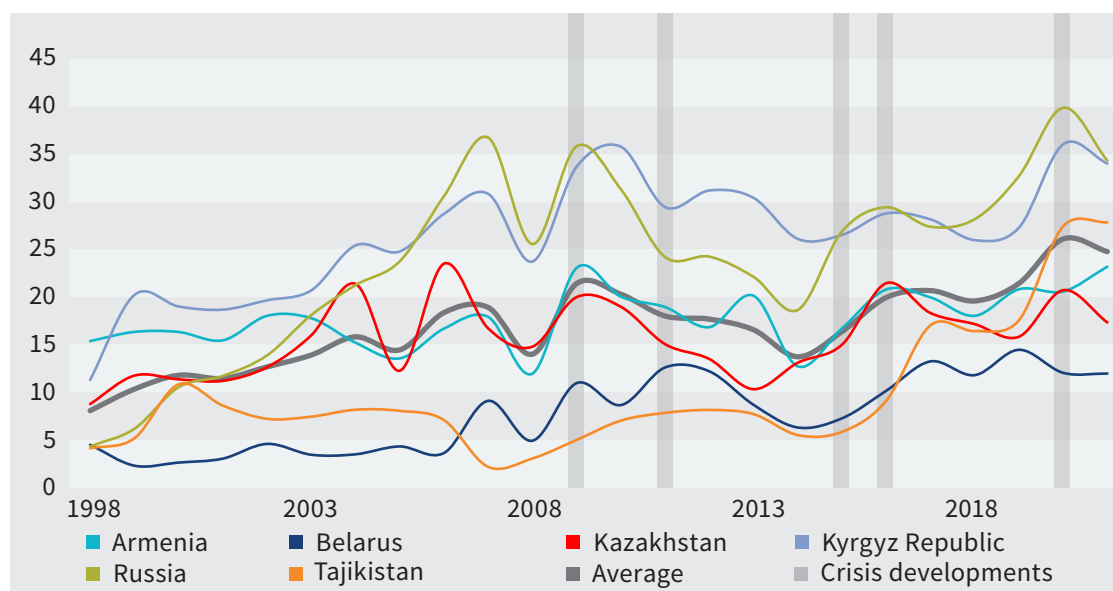
1.2. IRA Dynamics in EFSD Member States

An analysis of the use of reserves and other GFSN elements is of interest to the EFSD member states.

For the EFSD recipient countries, this is primarily a matter of ensuring economic security in the context of persistent current account deficits and the resulting risks to debt sustainability and balance of payments equilibrium. For Russia and Kazakhstan, which have current account surpluses, it is important to maintain an optimal balance of savings and investment in the economy.

In the EFSD member states, there has been a general trend towards an increase in the level of reserves in recent years (Figure 6). Some declines in levels coincide with, but are not limited to, periods of foreign exchange and financial market stress (estimated using the EFSD Early Warning System (Tsukarev, Poghosyan (forthcoming))).

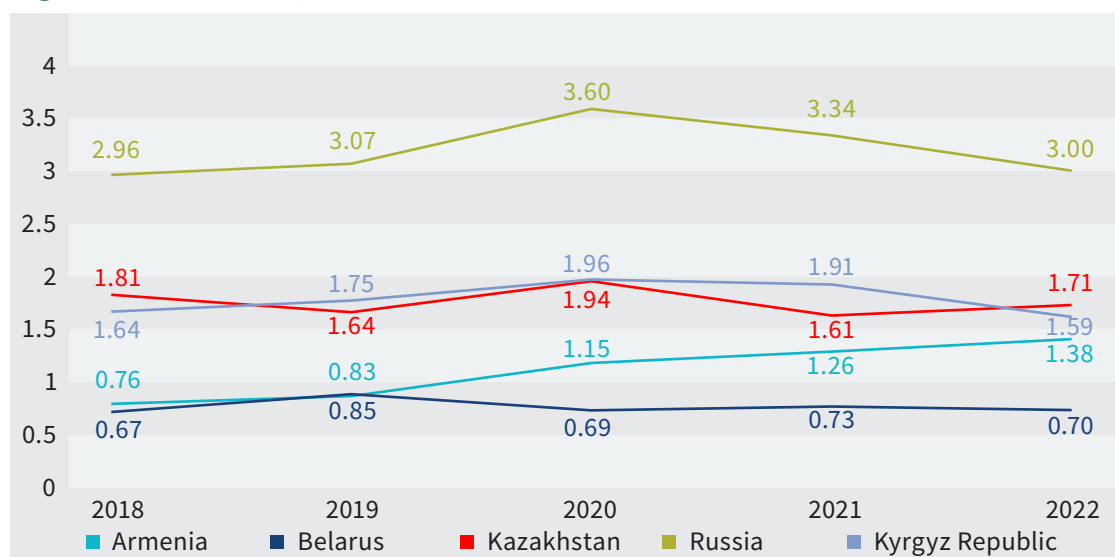
Figure 6. Dynamics of reserves in EFSD countries, % of GDP



Source: Author's calculations.

According to IMF and EFSD experts' estimates using the ARA metric, all EFSD member countries other than Belarus had sufficient reserves at the end of 2022 (Figure 7). Russia remains the leader in the region both in terms of reserves and the ARA metric. Kazakhstan is ahead of other countries in terms of sustainability indicators, despite a lower reserves-to-GDP ratio. The situation in Kyrgyzstan is the opposite — with higher reserves relative to other countries in the region, its ARA metric is inferior to that of Kazakhstan. Armenia and Belarus rank lowest for both EFSD parameters.

Figure 7. ARA metric, 2018–2022.



Source: IMF, EFSD calculations⁴.

However, it should be borne in mind that reserves do not cover all the funds available to countries. Russia and Kazakhstan have sovereign wealth funds comparable in size to their reserves.

The issues of reserve adequacy and management have become more relevant in the light of the sanctions imposed on Russia and Belarus. For other countries, the sanctions have had multiple effects on the balance of payments, such as the expansion of trade in local currencies, which in turn has a significant impact on their dynamics.

The issue of reserves is of interest to the Fund in terms of determining potential financing needs in the event of a foreign currency shortage.

⁴ Calculations are based on official balance of payments data of the countries with no adjustments made.

2. Literature Review

Studies of the dynamics of international reserves focus mainly on the underlying factors of their accumulation and growth. Two motives for reserve accumulation — precautionary and mercantilist — are usually reviewed. The following papers assess and demonstrate the impact of certain country indicators on the motives for reserve accumulation. The importance of both motives has been demonstrated, but the findings suggest that factors related to mercantilist motives play a much smaller role than precautionary factors ([Aizenman and Lee, 2005](#)).

The model of demand for reserves was developed by [Frenkel and Jovanovic \(1981\)](#) who adapted the inventory approach to the demand for money to reserve management. The Buffer Stock model determines the optimal reserve holdings and includes the following factors: a country-specific nominal constant capturing the fixed costs of the macroeconomic adjustment, the standard deviation of the Wiener increment in the reserve assets time-series process operating between stock adjustments, and the opportunity cost of holding reserves. In the Buffer Stock model, the optimal reserve holdings are higher when the volatility of reserve assets goes up, as they are then more likely to hit their lower bound. The authorities are therefore willing to incur higher opportunity costs to avoid frequent macroeconomic adjustments. Higher macroeconomic adjustment costs also raise the optimal reserve holdings, while high opportunity costs lower them.

The results of an empirical work on a model of the demand for reserves ([Frenkel, 1983](#)) based on data for 22 advanced economies between 1971 and 1975 were close to the theoretical estimates. Subsequently, a number of researchers developed the model of the demand for reserves by adding some transformations to it.

[Flood and Marion \(2002\)](#) repeated Frenkel's study based on the IMF International Financial Statistics data in several variations. They used nominal indicators, as in the original paper, and re-estimated the regression by scaling them to GDP, imports, and inflation. In addition, they refined the IRA volatility indicator. The authors note that the process of reserve accumulation is very complex, sometimes with abrupt adjustments in their holdings — falls are a result of speculative attacks while jumps stem from macroeconomic policy changes. Therefore, the authors estimate volatility through the shadow exchange rate, taking into account macroeconomic fundamentals (exchange rate, inflation, interest rates, credit to the economy). The paper proves that reserve volatility influences reserve holdings positively and very significantly at all analysed time intervals. The results are obtained independent of the variable scaling. However, these two indicators — reserve volatility and opportunity costs — explain only about 10–15% of the variation in reserve holdings, demonstrating the need to include additional explanatory variables in the model.

[Jeanne, Ranciere \(2009\)](#) build a theoretical model of the optimal level of reserves, which allow responding to sudden stops in capital flows. The authors empirically estimate the parameters of the model based on data for 34 middle-income countries over 1975–2003. The calculations show that a sudden stop in capital flows is accompanied by a much smaller reduction in the domestic absorption of the economy (less than 3%) due to the use of reserves. This observation confirms that countries accumulate reserves in good times to be able to spend them to smooth shocks in bad times. The GDP growth rate declines on average by 4 p.p. in the first year of the

sudden stop, and by 9 p.p. if the sample is narrowed to episodes of falls in GDP. The authors estimated the optimal level of reserves at 9.1% of GDP or 91% of short-term external debt. This value turned out to be close to the average actual level of reserves over 1975–2003, which was 11% of GDP. However, these results, even at the time the estimates were made, diverged significantly from the level of reserves in the 2000s, especially in Asian countries. The authors admit that this is obviously driven by other factors not included in the model. For example, the effect of policy measures that lead to excessive CA surpluses.

It is worth noting that the authors also conclude that high-risk countries do not hold more reserves. Based on the probit model, it was established that there is no correlation between the level of reserves (% of GDP) and sudden stops of capital flows.

[Obstfeld et al. \(2010\)](#) also made an attempt to construct a theoretical model to explain excess reserve accumulation in the context of financial globalisation. Important factors explaining reserve accumulation are the money supply (the amount of funds that can potentially be converted into foreign currency), financial openness, access to foreign debt markets, and the exchange rate regime. This is due to the fact that historically the biggest threat to the foreign exchange market equilibrium has come from domestic players who have created runs on the foreign exchange market. Therefore, the stock of reserves should potentially be sufficient to deal with attacks of this kind.

Since theoretical models with several variables as explanatory factors can only partially explain the dynamics of reserves, a number of studies have attempted to estimate the maximum number of factors based on empirical data and find the most significant ones among them.

[Cheung, Ito \(2009\)](#) analysed more than 100 economies over 1975–2005 to identify significant factors of reserve accumulation. To this end, they grouped countries into developed and developing economies, and divided the time series into three periods (1975–1981, 1983–1993, 1999–2005) to account for the impact of major financial crises. A total of 27 explanatory variables — conventional macroeconomic variables, financial, institutional, and binary variables characterising country-specific factors — were tested to explain the function of demand for reserves. The results prove that the set of significant explanatory variables differs for different specifications — for developed and developing economies, as well as for different time periods. The propensity to import variable has the highest frequency of significant coefficient estimates, but its effect declines over time. Overall, the empirical results confirm that it is difficult to design a unified model describing the accumulation of international reserves and to develop a unified theory of the demand for international reserves. And the changing global economic environment obviously makes the optimal level of international reserves a moving target.

[Aizenman, Cheung, Ito \(2014\)](#) extend the logic of previous studies by estimating the significance of various factors on reserve growth before and after the global financial and economic crisis. They focus on including new factors in the model — those that, according to the original hypothesis, became more prominent after the crisis — for example, the presence of swap lines with the central bank of a country issuing one of the four reserve currencies, a sovereign wealth fund, and macroprudential requirements. A total of 22 explanatory variables were used in the model. They empirically confirmed that following the global financial crisis, the level of international reserve accumulation was closely related to the level of savings — emerging markets with higher savings rates tend to have larger reserves, which partly explains the higher

levels of international reserves in East Asia compared to Latin America. Other newly identified variables include the availability of swap lines, the implementation of macroprudential regulatory policies, the presence of a sovereign wealth fund, and policies to attract foreign investment. However, they also emphasise that due to the dynamic nature of factors shaping accumulation policies, reserve accumulation patterns will be modified in the future.

[Cabezas, de Gregorio \(2018\)](#) also compare reserve accumulation before and after the global financial crisis in terms of different motives: mercantilist, precautionary, and comparative hoarding — when the accumulation of reserves is induced by the behaviour of other countries. In contrast to [Aizenman et al. \(2015\)](#), they suggest that the slowdown in reserve accumulation after the crisis was not driven by new factors — macroprudential policies, sovereign wealth funds, etc. It is likely that countries had accumulated excess reserve holdings before the crisis, among other things driven by comparative hoarding motives, and were over-insured. Therefore, the need for additional accumulation decreased.

[Bird, Mandilaras \(2011\)](#) estimated the relationship between IMF programmes and reserve accumulation. The authors were able to find a statistically significant effect of the presence of an IMF programme on reserve accumulation in subsequent periods. However, the authors failed to find a correlation between crisis developments and reserve accumulation.

[Aizenman et al. \(2023\)](#) found a potent buffer effect of reserves once they surpass the threshold of 17% of GDP in Europe and Central Asia. The level of development of financial institutions is an important factor. Countries with less developed financial institutions actively use reserves to respond to terms-of-trade shocks to the real exchange rate. In addition, reserves are more important in countries with a medium level of financial openness.

The list of explanatory variables used to estimate the behaviour of international reserves in the studies described above is presented in [Table 1](#).

It is worth mentioning the authors who have investigated the adequacy and dynamics of reserves in the EFSD countries.

[Mironchik \(2005\)](#), based on an analysis of lower-middle-income countries, concluded that reserve needs of developing countries, which include the EFSD member states, were not constant and depended on a variety of factors. The stock of reserves can be estimated relative to imports, aggregate money supply, foreign financial liabilities, and GDP. In each of these cases the significance of certain factors varies, however, in at least one case it was possible to detect the significance of the economy's propensity to export, the trade balance equilibrium, the economy's demand for money, the level of country risk, changes in the exchange rate of the local currency, and the stock of net financial liabilities.

[Skripchenko \(2017\)](#) assessed reserve adequacy metrics for Kazakhstan over 2000–2016 and concluded that, of the conventional metrics, the most impactful indicator of credit risk for the country is the coverage of short-term external debt by remaining maturity with the international reserves.

[Leontyeva, Narkevich \(2015\)](#) applied different methods to estimate the adequacy of the reserve level of the Bank of Russia. According to their estimates, metrics that take into account one

of the motives for holding reserves tend to indicate a more than adequate level of reserves in Russia. However, the IMF's metric that accounts for different motives, as well as the metric adjusted by the authors to the oil price, show that Russia's reserve level was close to optimal at the time of the study in 2015. Therefore, they argue that spending the Bank of Russia's foreign exchange reserves for purposes other than those for which they are intended is not desirable.

At present, in the context of intensified international sanctions, the research focus is different. It has shifted to ensuring the safety of the reserves and finding the best way to structure them. Financial sanctions have significantly undermined confidence in traditional reserve currencies. The freezing of Russia's foreign exchange reserves — the seventh largest in the world — is not the first of its kind, but it has systemic implications for global finance. For example, researchers consider 12 possible solutions that could substitute reserves in traditional reserve currencies (Vinokurov, Grichik, 2022). The paper suggests solutions ranging from compromise to totally unorthodox ones, including abandonment of reserves.

In this context, we will try to shift the research focus in our paper from the accumulation of reserves to their use. What factors were significant not in the period of reserves growth but in the period of their decline? And what are the practical implications for countries in terms of reserve management?

Table 1. Explanatory variables used in IRA studies

		Frenkel, Jovanovic (1981)	Flood, Marion (2002)	Jeanne, Ranciere (2009)	Cheung, Ito (2009)	Obstfeld et al. (2010)	Aizenman, Cheung, Ito (2014)	Bird, Mandilaras (2011)	Cabezas, de Gregorio (2018)	Aizenman et al. (2023)
Classical	Opportunity costs	•	•	•	•		•		•	
	Volatility of reserve holdings	•	•		•		•			
Conventional adequacy parameters	Import quota				•		•		•	
	Foreign trade quota		•			•		•		•
	Terms of trade						• ⁵		•	• ⁶
	Money supply (M2 in % of GDP)				•	•	•	•	•	
	Short-term debt, % of GDP			•				•	•	

⁵ Estimate the commodity terms of trade using an original methodology.

⁶ Also include an additional estimate of the effective terms of trade.

		Frenkel, Jovanovic (1981)	Flood, Marion (2002)	Jeanne, Ranciere (2009)	Cheung, Ito (2009)	Obstfeld et al. (2010)	Aizenman, Cheung, Ito (2014)	Bird, Mandilaras (2011)	Cabezas, de Gregorio (2018)	Aizenman et al. (2023)
Macroeconomic	GDP per capita				•	•		•		•
	Level of economy development (developed/developing)						•			
	Population				•	•		•		
	Exchange rate volatility		•			•			•	
	Exchange rate regime				•		•	•	•	
Financial	Crisis developments (banking and currency crises)				•		•	• ⁷		
	KAOPEN, financial openness index		• ⁸		•	• ⁹	•	•	•	

⁷ Crisis periods are defined as years in which real GDP growth rates fall by 5% or more; and in which depreciation exceeds the average depreciation rate by more than 1.5 standard deviations.

⁸ Gross capital flows to GDP.

⁹ Edwards 2007 Index.

	Frenkel, Jovanovic (1981)	Flood, Marion (2002)	Jeanne, Ranciere (2009)	Cheung, Ito (2009)	Obstfeld et al. (2010)	Aizenman, Cheung, Ito (2014)	Bird, Mandilaras (2011)	Cabezas, de Gregorio (2018)	Aizenman et al. (2023)
Other									
Other indicators		Shadow exchange rate	Probability and size of a sudden stop in capital flows; GDP losses in the event of a fall in capital flows; potential GDP growth rates	Political indicators (level of corruption, quality of bureaucracy, law and order, democracy index, government effectiveness); net debt obligations, net FDI liabilities, net portfolio investment liabilities (all – in % of GDP), oil exporters		Presence of sovereign wealth funds, swap lines, and macroprudential policies; ratio of exports of goods to exports of services; country geographical location; ¹⁰ share of commodities and industrial goods in exports; volume of investment abroad; gross accumulation, % of GDP, oil exporters	Deposit interest rate; CA balance in % of GDP	GDP growth rates, comparative hoarding; ¹¹ volatility of trading partners' GDP growth rates; export quota volatility.	Financial Development Index, Financial Institution Index, Financial Market Index, Financial Market Depth Index ¹²

¹⁰ Used to assess the Joneses Effects – the actual average reserves holdings for the region independent of the country under review.

¹¹ Also an approximation of the Joneses Effects.

¹² Author's estimates based on IMF data using the methodology developed by Sviryzdenka (2016).

3. Research Methodology

3.1. Model Selection and Research Principles

The logic of the study is based on a number of principles and assumptions, drawing on the experience of other researchers.

First. As the management of reserves differs between developed and developing economies, the sample includes only the latter. They are not reserve currency issuers, nor do most of them have a swap agreement with the Federal Reserve System (FRS) and the European Central Bank (ECB). For these reasons, the behaviour of developing economies is more interesting in terms of their response to shocks — under what circumstances do they have to resort to the use of reserves?

Second. A decline in reserves may be the result of a shock or minor fluctuations in macroeconomic variables. In order to distinguish between such episodes, we have decided to consider a year-on-year decline in reserves of more than 1 p.p. of GDP as a decline in reserves. Estimates suggest that the most common decline in reserves in developing economies has been between 1 and 3% of GDP, so this approach allows us to filter out minor changes that are unlikely to be a significant response to shocks.

Third. Two states of reserves are considered — sharp declines and other episodes (minor fluctuations and increases). A decline is labelled as “1” and other episodes — as “0”.

Fourth. A logit model is used to analyse the behaviour of reserves. For the purposes of this study, it is important to estimate the probability of a decline in reserves, i.e. to solve a binary choice task. We are less interested in the results of a linear regression, as it can estimate a continuous process of reserves change, covering the entire range of fluctuations. Its quality will not be sufficient due to the numerous outliers (as seen in [Figure 3](#)). Whereas a logit model allows to take into account and analyse the influence of different factors on the probability of an event occurrence. Hence, in this context it appears to be a more accurate and informative tool.

Fifth. The reserve accumulation behaviour of countries changed in different time periods — a new pattern of behaviour usually emerged following major economic and financial crises. Therefore, two time periods are considered to assess the relevant experience — from 1998 to 2009 (i.e. between the Asian financial crisis and the global financial crisis) and from 2010 to 2021 (after the global financial crisis and including the economic crisis caused by the coronavirus pandemic).

Sixth. The factors used by other researchers as presented in the literature review are included in the model. The indicators that are most widely used and relevant for the task were selected for analysis. At the same time, the analysis was supplemented with conditions characterising the use of various GFSN elements — swap lines, RFA loans (not used in any of the reviewed papers), and IMF loans. All factors are expressed in percent of GDP except for those that have no units of measurement (indices, binary variables).

A logit model with fixed effects that was used for calculations can be presented as follows:

$$\text{logit}\left(\frac{p}{1-p}\right) = a_i + \beta_1 X'_{it-1} \quad (1)$$

$$\text{logit}\left(\frac{p}{1-p}\right) = a_i + \beta_1 X'_{it-1} + \beta_2 X''_{it-1} \quad (2)$$

$$\text{logit}\left(\frac{p}{1-p}\right) = a_i + \beta_1 X'_{it-1} + \beta_2 X''_{it-1} + \beta_3 X'''_{it-1} \quad (3)$$

$$\text{logit}\left(\frac{p}{1-p}\right) = a_i + \beta_1 X'_{it-1} + \beta_2 X''_{it-1} + \beta_3 X'''_{it-1} + \beta_4 X''''_{it-1} \quad (4)$$

where p is the probability that $Y = 1$ (i.e. the decline in reserves was more than 1 p.p. of GDP) with X factors included; a_i is the fixed effect for country i . Since the model is supposed to test a large number of factors that cannot be used simultaneously, the analysis starts with a few conventional variables (X' – classical factors from Table 1), with new groups gradually added to them (X'' – conventional adequacy parameters, X''' – macroeconomic factors, X'''' – financial and other factors). Significant factors are kept in the model, insignificant ones are excluded. All the indicators that have been selected are tested in this way. The authors mentioned in the literature review did the same. For example, [Aizenman, Cheung, Ito \(2014\)](#) tested 27 explanatory variables grouped into 4 categories. They evaluated categories of variables sequentially, keeping only those that were significant and then adding a new category. All dependent variables, also similar to the above studies, are taken with a lag ($t-1$) in order to avoid the problem of endogeneity.

3.2. Data Used and Data Sources

The literature review examined studies that assessed the significance of various factors in countries' demand for reserves. The comparative analysis revealed that many of the variables under consideration were recurrent, e.g. volatility of reserves, lost profits, import or foreign trade quota and others. Some authors add other factors to the study when necessary to test any additional hypotheses. In this context, all the variables from [Table 1](#), which fall into the following groups: classical factors, conventional adequacy parameters, macroeconomic and financial factors, have been included in this analysis. Note that this classification is theoretical and has been applied for the sake of convenience. In addition to the variables previously used in other studies, this study includes factors that characterise a country's use of the GFSN elements: presence of swap lines, assistance from RFAs and the IMF. A variable that indicates the presence of sovereign wealth funds in a country is also added.

Data for each of the indicators were taken from the same source or were calculated using the same methodology (comparable data). A full list of indicators with sources and methods of calculation is presented in [Annex A](#).

The categorisation of countries into developed and developing economies, as well as the identification of certain groups – developing Asia, developing Europe, Latin America and the Caribbean, Middle East and Central Asia, Sub-Saharan Africa – was based on the IMF classification ([Annex B](#)). Initially, all countries were covered, but those lacking key data had to be excluded.

4. Empirical Results

The estimates ([Annex C](#)) show that only a small part of the factors considered were significant. Some factors remained significant in both periods under review, some — only in one. All available data were used in both periods, but countries that never experienced a decline in reserves meeting the above criteria were excluded.

4.1. 1998–2010

Only five of the factors considered were found to have an effect at a 5% level of significance ([Table 2](#)).

The significance of the Joneses effect demonstrates the importance of the external environment and global factors. The level of reserves in the region is found to be more significant than the level of reserves in the country itself. This is aligned with the logic of research that proves that regional effects play a role in reserve accumulation ([Cheung, Qian, 2009](#)). Countries accumulate reserves mimicking the behaviour of their neighbours in the region so that they do not appear less insured in comparison. The implication is that savings policies in the region also prove to be an important indicator in cases of reserve spending. It can be assumed that this is how countries in the region respond to common global shocks.

Of all the shocks considered, only banking crises had a sufficient effect. This could be explained by the severity of the global financial and economic crisis that occurred during this period. At the same time, the money supply factor proved to be insignificant. This shows that the demand for reserves can be generated by the domestic financial market, but it is likely to be formed by more indicators than just the stock of local currency.

It is noteworthy that the factor of volatility of the stock of reserves proved to be significant with an inverse relationship. This may indicate that episodes of sharp drops in reserves leading to higher volatility occurred separately and did not follow one another. A second explanation is that a sharp increase was not followed by an equally sharp decline. During this time period, developing countries were actively accumulating reserves, which also affected the volatility indicator. Similarly, countries with CA surpluses that were actively accumulating reserves were less inclined to spend them.

Episodes of sudden stops in capital flows, i.e. actual shocks that materialised, were significant over the period, while the presence of risk, as reflected by KAOPEN or the financial openness index, was insignificant. This can also be seen as an indicator that the episodes in question affect all countries, not just those with relatively greater freedom of capital flows and a high stock of financial liabilities.

Among the indicators describing foreign trade, terms of trade proved to be significant. This relationship is probably of the same nature as the indicators that have traditionally been included in models — import or foreign trade quota. However, changes in the terms of trade have a direct effect on the trade balance and, thus, the current account balance, which ultimately affects the level of reserves. Therefore, they are more significant than the trade-to-GDP ratio.

4.2. 2011–2021

This period was characterised by a change in countries' behaviour with regard to reserves. Reserves stopped growing steadily at the global level and fluctuations became more frequent. Three factors remained significant, with two new factors added.

External factors, expressed through the Joneses effect, terms of trade, and reserve volatility, were still important. The logic of the influence of these factors remained relevant in the second period.

However, the importance of the exchange rate regime increased, even though the number of cases with a tight peg regime in the overall dataset decreased from 15.5% to 12.4%.

A positive relationship was found with GDP per capita. The higher the GDP, the more likely it is that reserves will decline. It can be assumed that comparatively richer countries were able to support the domestic foreign exchange market and the balance of payments in the context of turbulence and the occurrence of currency crises, while less rich countries did so less often.

It is worth noting that in both periods, the conventional indicator of opportunity costs, i.e. the interest rate differential, which is included in models estimating the demand for reserves, proved to be insignificant. The logic of the impact of this indicator in periods of reserve accumulation can be explained by the fact that countries estimate the costs of a potential crisis to be higher than the loss in profitability. However, in the period in which the crisis has already occurred, this factor does not have an economically justified channel of influence and is therefore of little significance in the model.

Table 2. Significance of factors in episodes of reserve declines

	All countries	
	1998–2010	2011–2021
Joneses effect	●	●
Terms of trade	●	●
Volatility of reserve holdings	●	●
Sudden stop in capital flows	●	—
Banking crisis	●	—
GDP per capita, dollars	—	●
Exchange rate regime	—	●

Source: Author's calculations.

4.3. Impact of Other GFSN Elements on the Use of Reserves

The model failed to detect the significance of the presence of swap lines, RFA loans, or IMF loans in episodes of reserve declines ([Annex C](#)). This is likely to be explained by the rarity of these phenomena ([Table 3](#)). In 1998–2010, IMF loans were provided in 7% of episodes of reserve declines, while RFA resources — in about 3% of such episodes. In 2011–2021, the incidence of loan provision increased to 11.3% and 4.5% respectively. However, these data show that countries used their reserves more than ten times more often than they attracted financial assistance. Admittedly, in some cases, assistance may have come later, but reserves were used to buy time until the assistance arrived.

The number of swap lines has grown substantially since the global financial crisis. Yet, developing countries have swap lines predominantly with the People’s Bank of China. However, when balance of payments support is required, countries more often need traditional reserve currencies.

Table 3. Share of episodes of use/presence of other GFSN elements at the time of reserve declines in developing economies, period average, %

	1998–2010	2011–2021
RFA loans	3.1%	4.5%
IMF loans	7.0%	11.3%
Presence of swap lines	1.3%	23.1%

Source: Author’s calculations.

The relationship can also be scrutinised from a different perspective — did countries use reserves in parallel with other GFSN elements ([Table 4](#))? From this perspective, the number of episodes of parallel use of different GFSN elements is higher. This trend is most evident in the case of RFA and IMF finance. For example, in the first period under review, reserve declines occurred in 10% and 14% of cases of assistance from RFAs and the IMF respectively. In the second period, the incidence increased to 30% and 16% respectively. At the same time, in almost a quarter of the cases where a country’s reserves declined, it had an active swap line and a sovereign wealth fund.

Table 4. Share of episodes of reserve declines at the time of use/presence of other GFSN elements, period average, %

	1998–2010	2011–2021
RFA loans	14.3%	30.2%
IMF loans	10.3%	15.6%
Presence of swap lines	9.1%	23.3%
Presence of sovereign wealth funds	12.9%	22.9%

Source: Author’s calculations.

Reserves remain the most popular GFSN instrument, although the intensity of the use of other GFSN elements — IMF, RFA programmes, presence of swap lines and sovereign wealth funds — increased significantly in the second period under review compared to the first one. When analysing the cases where countries used reserves, we find that IMF or RFA programmes were implemented in parallel in 11% of episodes at most. The use of IMF or RFA assistance was accompanied by reserve declines in one-third of episodes. Taken together, this suggests that in some cases different GFSN elements need to be combined.

4.4. Impacts of Reserve Declines on Macroeconomic Performance

Let us test the hypothesis that, other things being equal, the dynamics of macroeconomic indicators differed in cases where reserves declined and in cases where they did not. To this end, we will make the following calculations.

1. The factors that proved to be significant in the estimated model can be used as bounds. For this purpose, we will estimate the average value for each factor or take its value equal to 1 for binary variables in period t , provided that there was a decline in reserves in this period.
2. Provided that the factor was equal to 1 for binary variables or its value was higher/lower than the average (depending on the nature of the effect of the variable), we will find the GDP growth rate, the change in the nominal exchange rate of the local currency to the US dollar, the CA in % to GDP, and the level of the general government debt in period t .

The results are presented in [Annex D](#).

In the first period (1998–2010), countries with CA deficits used their reserves. This may indicate greater vulnerability of these countries and the need to support the balance of payments. The use of reserves protected against sharp currency depreciation in all cases except for terms of trade deterioration. At the same time, the use of reserves supported higher GDP growth rates in times of banking crises and deteriorating terms of trade. Interestingly, when reserves were used, there was an increase in general government debt. However, as noted above, it was not always the case that countries attracted finance from the IMF or RFAs. For example, this can be explained by the fact that countries issued bonds, i.e. raised finance on their own. It is also possible that during periods of tension the debt increased as the Government fulfilled its obligations under guaranteed public sector loans. At the same time, this suggests that countries tend to use several instruments simultaneously in times of tension.

In the second period (2011–2021), the CA balance is still negative, but smaller than in the first period, probably reflecting a reduction in balance of payments disequilibrium following the global financial crisis. Notably, the CA had a surplus only when there was a currency crisis, which must have led to an appropriate macroeconomic adjustment. Reserves were still used to support the exchange rate of the local currency, except during periods of currency crisis onset, which seems to be natural. The dynamics of the GDP was mixed, but reserves primarily support the equilibrium of the external sector of the economy and do not contribute directly to economic growth, therefore this behaviour of indicators does not raise questions. The situation with debt is unchanged compared to the first period under review. The general government debt tends to grow in periods when reserves are spent.

5. Findings

The period of steady growth in reserves has come to an end. Since about 2010, the stock of reserves at the global level has fluctuated at 11–12% of global GDP. However, an analysis of the use of reserves confirms that they are a popular instrument that countries regularly turn to. On average, 90 countries draw down their reserves each year. It is still premature to say that reserves are no longer relevant or should be abandoned.

Many countries, including most of the EFSD member states, have created reserves that are aligned with conventional adequacy metrics, including the IMF's ARA metric. However, even in developing economies, declines of reserves most often do not exceed a few percent of GDP — in about $\frac{2}{3}$ of episodes they do not fall by more than 3% of GDP, significantly below the level estimated using the metrics. This suggests that, in practice, countries use less than the targeted level permits.

Episodes of reserve declines are so numerous that a number of factors appear to be significant, and they were different before and after 2010. The presence of different factors in different periods is consistent with the findings of other researchers — the macroeconomic situation and, therefore, national policies change. In the first period under review (from 1998 to 2010), reserves were predominantly growing, while in the second period (from 2011 to 2021) they were used more actively. Therefore, more factors became significant. In both periods, factors expressed through the Joneses effect, terms of trade, and reserve volatility were significant. Sudden stops of capital flows and banking crises were also significant in the first period. GDP per capita and exchange rate regime were significant exclusively for the second period.

Since 2010, countries have actively used all GFSN elements. This is evidenced by an increase in their volume and frequency of use. However, reserves are used much more frequently than other GFSN elements. When reserves are used, other GFSN elements are less likely to be used as an auxiliary instrument. The use of other GFSN instruments is more often accompanied by the parallel use of reserves. However, countries generally use all available resources, both own and borrowed.

Other things being equal, countries with CA deficits use their reserves. However, a comparison of use and non-use episodes shows that the use of reserves protects against currency depreciation, but effects on economic growth are mixed. At the same time, in cases where reserves are called upon, the general government debt is more likely to increase, which only adds to the vulnerability of developing economies. This can be seen as a potential for expanding and broadening the network of regional financing arrangements.

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Annex A

Table A.1. List of indicators, their sources, and calculation methods used to design the model

Indicator	Data source or calculation method
Level of international reserve assets, including monetary gold	World Bank World Development Indicators (WDI) data bank
Level of international reserve assets, excluding monetary gold	World Bank World Development Indicators (WDI) data bank
GDP in US dollars	World Bank World Development Indicators (WDI) data bank
Country's population	World Bank World Development Indicators (WDI) data bank
Volume of foreign trade	World Bank World Development Indicators (WDI) data bank
Import volume	World Bank World Development Indicators (WDI) data bank
Exchange rate of the local currency to the US dollar	IMF International Financial Statistics (IFS) database
Money supply (M2)	IMF International Financial Statistics (IFS) database
Balance of payments indicators	IMF International Financial Statistics (IFS) database
Exchange rate changes	Estimated indicator: rate of growth of the nominal exchange rate of the local currency to the US dollar (year-on-year) based on the IMF International Financial Statistics (IFS) database:
Exchange rate regime	A series has been formed in which each of the exchange rate regimes (tight peg, soft peg, floating) is assigned a numerical value from 1 to 3. The data is from the Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) .
Commodity terms of trade	IMF Commodity Terms of Trade database
Banking, currency, and financial crises, as well as episodes of double and triple crises	Information on crises is taken from Nguyen et al. (2022)
KAOPEN is an index that measures the openness of a country's financial account. It is based on binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the AREAER.	Chinn-Ito database. The database was last updated in April 2022.
Sudden stops in capital flows	Estimated indicator: episodes of year-on-year decline in capital flows (under the financial account of the balance of payments) to GDP by more than 5%. This approach is based on the work by Guidotti (2004) and is widely used in literature. For example, Jeanne and Ranciere (2009) justify the use of this indicator by the fact that the periods of sudden stops of capital flows thus determined coincide with well-known crisis periods (for example, South Korea, Thailand and the Philippines in 1997, Argentina in 2001).

Indicator	Data source or calculation method
Financial openness index	Estimated indicator: ratio of the sum of international assets and liabilities to GDP. This approach is based on the work by Lane and Milesi-Ferretti (2017) .
Volatility of the level of reserves	Estimated indicator: the size of the standard deviation of the country's reserves to GDP over the past 5 years.
The Joneses effect (keeping up with the Joneses): countries mimic the behaviour of their regional neighbours to some extent, in particular by continuing to accumulate reserves above prudential levels when neighbouring countries in the region do so.	Estimated indicator: average reserves in percent of GDP in the region, excluding data for this country. This approach is based on the work by Cheung and Qian (2009) .
Opportunity costs in terms of interest income (interest rate differential for long-term US Treasury bonds and the country's long-term liabilities.)	Estimated indicator. Due to the lack of statistics on long-term liabilities of all developing economies, the interest rate differential for deposits and loans on the domestic market was used for calculations. This approach is based on the work by Aizenman (2014) .
IMF loans.	Estimated indicator: dummy variable. IMF Members' Financial Data by Country database. IMF assistance was not categorised by type of loan provided. All episodes of IMF loans in the corresponding year were labelled as "1".
RFA loans.	Estimated indicator: dummy variable. Information was collected on all stabilisation loans provided to countries by the EFSD, AMF, FLAR, ESM. Sources: Official websites of the institutions, information requests. Episodes of RFA loans in the corresponding year were labelled as "1".
Presence of sovereign wealth funds.	Estimated indicator: dummy variable. Information according to the Sovereign Wealth Fund Institute (SWFI) . For each country, the value in the data set becomes "1" upon the establishment of the first sovereign wealth fund.
Presence of swap lines	Estimated indicator: dummy variable. The swap lines of the FRS, the ECB, the Bank of Japan, the People's Bank of China, the Central Bank of Qatar, and the Central Bank of the UAE are taken into account. For each country, the value in the data set becomes "1" from the moment a swap line agreement is signed.

Annex B

Table B.1. Country groups and their composition

Group of countries	Countries
Developing Asia	Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Fiji, India, Indonesia, Lao P. D. R., Malaysia, Maldives, Mongolia, Myanmar, Nepal, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Tonga, Vanuatu, Vietnam
Developing Europe	Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Hungary, Moldova, North Macedonia, Poland, Romania, Russia, Serbia, Turkey, Ukraine
Latin America and the Caribbean	Antigua and Barbuda, Argentina, Aruba, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, the Bahamas, Trinidad and Tobago, Uruguay
Middle East and Central Asia	Algeria, Armenia, Azerbaijan, Bahrain, Djibouti, Egypt, Georgia, Iraq, Jordan, Kazakhstan, Kuwait, Kyrgyz Republic, Lebanon, Libya, Mauritania, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Sudan, Tajikistan, Tunisia, United Arab Emirates
Sub-Saharan Africa	Angola, Botswana, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Democratic Republic of the Congo, Republic of Equatorial Guinea, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Seychelles, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, Zimbabwe

Annex C

Table C.1. Logit model results

	Developing economies, 1998–2009	Developing economies, 2010–2022	Developing economies, 2010–2022 (covering the use of the GFSN elements)
	Coef.	Coef.	Coef.
Level of reserves, % of GDP			
Volatility of reserve holdings	.832***	–.089**	–.052**
Opportunity costs, p.p.			
Sudden stop in capital flows	.455***		
Import quota, % of GDP			
Foreign trade quota, % of GDP			
Terms of trade	.031**	–.065***	–.047**
Money supply (M2), % of GDP			
GDP per capita, dollars		1.822**	1.381
GDP, dollars			
Population, people			
Exchange rate volatility			
Exchange rate regime		.39**	.479**
Banking crisis	2.48*		
Currency crisis			
Debt crisis			
Joneses effect	10.655***	.108***	.134***
Financial account openness index (KAOPEN)			
Financial openness index			
Presence of a sovereign wealth fund			
IMF loans			–.404 (.199)
RFA loans			.135 (.812)

**INTERNATIONAL RESERVES AS THE CORE ELEMENT
OF THE GFSN FOR DEVELOPING ECONOMIES**

	Developing economies, 1998–2009	Developing economies, 2010–2022	Developing economies, 2010–2022 (covering the use of the GFSN elements)
	Coef.	Coef.	Coef.
Presence of swap lines			–.365 (.47)
Pseudo r-squared	0.123	0.119	0.080
Number of obs	1096	1005	752
Prob > chi2	0.000	0.000	0.000
Bayesian crit. (BIC)	711.592	804.843	630.007

*** p<.01, ** p<.05, * p<.1

Annex D

Table D.1. Effects in 1998–2010

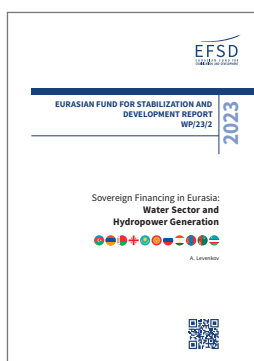
	Banking crisis		Joneses effect		Sudden stop in capital flows		Terms of trade		Volatility of reserve holdings	
	0	1	0	1	0	1	0	1	0	1
CA balance, % of GDP	2.5	-3.8	0.6	-1.2	1.5	-1.5	0.6	-2.9	0.6	-1.4
General government debt, % of GDP	5.1	18.0	-0.2	1.8	-2.1	1.3	-0.2	-2.8	-0.1	2.0
GDP growth rate, %	0.9	3.7	4.4	3.9	4.2	4.1	4.5	5.8	4.5	4.4
Rate of growth of the nominal exchange rate of the local currency to the US dollar, %	21.3	-2.4	4.7	1.2	5.1	4.6	5.2	9.7	5.1	4.9

Table D.2. Response of macroeconomic indicators to declines of reserves in 1998–2010

Macroeconomic indicator	Currency crisis		GDP per capita		Joneses effect		Terms of trade		Volatility of reserve holdings	
	0	1	0	1	0	1	0	1	0	1
CA balance, % of GDP	-0.4	2.2	0.2	0.0	-5.8	-1.0	0.1	-0.5	0.2	-0.5
General government debt, % of GDP	-1.5	17.4	2.1	2.7	-	1.6	1.6	6.4	2.1	2.2
GDP growth rate, %	1.8	-2.5	2.8	3.4	2.9	2.9	3.7	1.9	2.8	3.4
Rate of growth of the nominal exchange rate of the local currency to the US dollar, %	14.5	30.1	6.7	3.8	28.6	2.7	6.6	5.4	6.7	3.4

Table D.3. Response of macroeconomic indicators to declines of reserves in 2011–2021

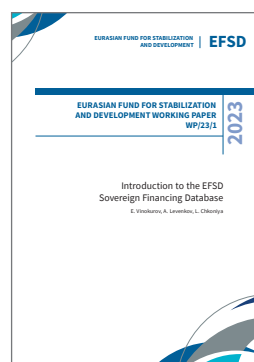
Macroeconomic indicator	Floating		Soft peg		Fixed	
	0	1	0	1	0	1
CA balance, % of GDP	0.5	0.5	0.1	-0.9	-0.3	1.3
General government debt, % of GDP	2.8	3.3	3.5	3.2	1.0	1.5
GDP growth rate, %	2.8	3.5	2.6	2.6	1.2	1.8
Rate of growth of the nominal exchange rate of the local currency to the US dollar, %	8.9	6.5	4.8	2.4	0.6	0.0



Working paper WP/23/2
(RU/EN)

Sovereign Financing in Eurasia: Water Sector and Hydropower Generation

The purpose of this Working Paper is to analyse operations of IFIs, climate funds, and development agencies in the water and HPP sector between 2008 and H1 2023 in 11 countries of the Eurasian region.



Working Paper WP/23/1
(RU/EN)

Introduction to the EFSD Sovereign Financing Database.

In this Working Paper the Sovereign Financing Database (SFD) Methodology is presented and also quantitative and qualitative analysis of sovereign financing operations in 11 countries of the region from 2008 to 2022 is carried out



Working Paper WP/22/1
(RU/EN)

Technical Assistance of International Financial Institutions and Development Agencies in Eurasia.

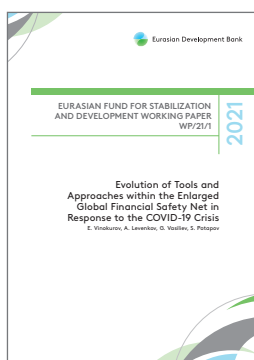
The purpose of this analytical document is to review technical assistance projects implemented by international financial institutions and development agencies in 2009–2021 in 11 Eurasian countries with a detailed thematic and institutional breakdown.



Working Paper WP/21/2
(RU/EN)

Total Debt Is So Much More Than Just Sovereign Debt. Contingent Liabilities in Armenia, Belarus, Kyrgyz Republic and Tajikistan

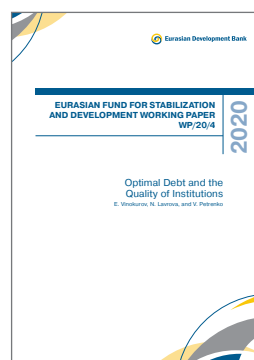
The study aims to contribute to understanding the potential risks and impacts of both explicit and implicit contingent liability shocks on government fiscal and debt positions in the EFSD recipient countries. Special attention is paid to the significance of state-owned enterprises and their role in countries' debt positions.



Working Paper WP/21/1
(RU/EN)

Evolution of Tools and Approaches within the Enlarged Global Financial Safety Net in Response to the COVID-19 Crisis

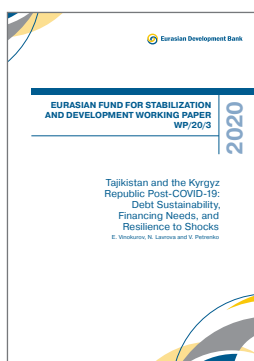
This working paper provides the analysis how the GFSN responded to pandemic on global level and on regional level (in the EFSD countries).



Working Paper WP/20/4
(RU/EN)

Optimal Debt and the Quality of Institutions

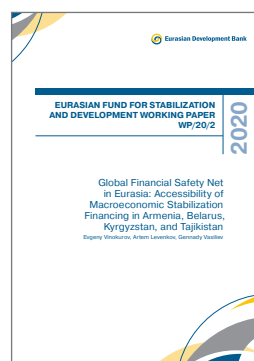
Amid the COVID-19 pandemic policymakers now face the dilemma of whether to stimulate infrastructure development by raising debt, which may reduce future flexibility, or to strengthen their fiscal positions.



Working Paper WP/20/3
(RU/EN)

Tajikistan and the Kyrgyz Republic Post-COVID-19: Debt Sustainability, Financing Needs, and Resilience to Shocks

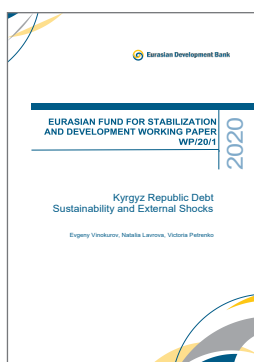
The COVID-19 outbreak has revealed the sensitivity of economies and their debt positions to a wide range of disruptions.



Working Paper WP/20/2
(RU/EN)

Global Financial Safety Net in Eurasia: Accessibility of Macroeconomic Stabilization Financing in Armenia, Belarus, Kyrgyzstan, and Tajikistan

The document estimates the availability of stabilization financing for Armenia, Belarus, the Kyrgyz Republic, and Tajikistan based on three approaches.



Working Paper WP/20/1
(RU/EN)
Kyrgyz Republic Debt Sustainability and External Shocks

The document examines the resilience of the Kyrgyz debt under three stress-scenarios: (1) a global recession, (2) a financial crisis, and (3) the combination of a global recession and a financial crisis.



Working Paper WP/19/2
(RU/EN)
Achieving Stabilization and Development Objectives in a Single Agenda: The Experience of the Eurasian Fund for Stabilization and Development

This working paper analyses the experience of the EFSD, which suggests that in the context of low-income countries, the RFA's stabilisation mandate may benefit from complementing it with developmental agenda.



Working Paper WP/19/1
(RU/EN)
The Eurasian Fund for Stabilization and Development: A Regional Financing Arrangement and Its Place in the Global Financial Safety Net

The objective of the first working paper is to bridge the gap in understanding the dynamics of EFSD development and its place in the Global Financial Safety Net (GFSN) and the region's financial architecture.



M. Grichik

International Reserves as the core element
of the GFSN for developing economies

The **Eurasian Fund for Stabilization and Development (EFSD)** amounting to US\$8.513 billion was established on June 9th, 2009 by the governments of the Republic of Armenia, the Republic of Belarus, the Republic of Kazakhstan, the Kyrgyz Republic, the Russian Federation, and the Republic of Tajikistan. The objectives of the EFSD are to assist its member countries in overcoming the consequences of the global financial crisis, ensure their economic and financial stability, and foster integration in the region. More information about the EFSD is available at: efsd.org/en/.

EFSD Working Papers and Reports are the main format of the Fund's public research. They reflect the Fund's research on global, regional, and country economic trends, economic modelling, macroeconomic analysis, sectoral analysis, global financial architecture, and other issues. EFSD publications are available at: efsd.org/en/research/.

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