**Financial Sustainability Measures and Debt Crisis**

**Abstract:** This paper assesses the predictive power of calibrating financial sustainability measures on the probability of a debt crisis. Data are at a yearly frequency, span the period 1980–2020, and cover 196 countries. The standardized cumulative debt-to-GDP ratio is important for low-income developing countries (LIDCs) and emerging economies (EEs) but it is not for advanced economies (AEs). The IMF and the World Bank policymakers and analysts need to take a more comprehensive approach to evaluating debt stability and systemic vulnerabilities in LIDCs and EEs because of these financial institutions’ deep gaps in a globally interconnected world.

**Keywords:** Debt crisis, financial measures, logit, forecasting

**JEL classification:** F34; G32; C58; G17

1. **Introduction**

Debt sustainability is a critical issue in today’s global economy, where rising debt levels pose significant risks to economic stability. Financial sustainability refers to the ability of an economy to manage its debt over the long term without resorting to excessive borrowing or triggering a financial crisis. The global debt crisis that looms over advanced economies, emerging markets, and low-income countries underscores the need for robust financial sustainability measures. This paper explores the different financial sustainability measures and debt crises in advanced economies, emerging markets, and low-income economies. It examines the unique challenges each category faces and evaluates the effectiveness of various financial sustainability strategies. The paper also provides policy recommendations tailored to the specific needs of these economies.

Financial sustainability is the capacity of an economy to manage its debt while ensuring continued economic growth and stability (Lu and Taylor, 2016; [Gleißner](https://link.springer.com/article/10.1007/s11573-022-01081-0#auth-Werner-Glei_ner-Aff1-Aff2) et al., 2022). It involves maintaining a balance between revenues and expenditures, controlling debt levels, and avoiding the pitfalls of excessive borrowing. The key indicators of financial sustainability include the debt-to-GDP ratio, fiscal deficit, debt servicing costs, and external debt levels. According to the International Monetary Fund, 2021, global debt reached a record high of over 350% of global GDP in 2021, with advanced economies accounting for a significant portion of this debt. Emerging markets and low-income countries have also seen substantial increases in their debt levels, often driven by the need to finance development projects or stabilize economies during crises.

The global debt landscape is complex, with different economies facing varying degrees of risk and vulnerability. Advanced economies typically have more robust financial systems and greater access to capital markets, allowing them to manage higher debt levels. In contrast, emerging markets and low-income countries often face higher borrowing costs and greater exposure to external shocks, making debt sustainability a more pressing concern. Advanced economies, such as the United States, Japan, and Eurozone countries, generally have well-developed financial systems, high-income levels, and deep capital markets (Kohler et al., 2023). These economies can often sustain higher levels of debt due to their ability to borrow in their own currency, access to a broad investor base, and established fiscal and monetary institutions.

However, advanced economies face challenges in maintaining financial sustainability, particularly as public debt levels have risen sharply in recent years (Board of Governors of the Federal Reserve System, 2024). Aging populations, slowing economic growth, and the increasing cost of social welfare programs are significant pressures on fiscal sustainability. Additionally, high levels of debt can constrain fiscal policy, limiting the ability of governments to respond to economic downturns. To maintain financial sustainability, advanced economies employ several strategies: fiscal consolidation, monetary policy coordination, structural reforms, and debt management (Adrian et al., 2015).

Emerging economies, such as Brazil, India, and Turkey, are characterized by rapid economic growth, increasing integration into the global economy, and evolving financial markets. However, these economies also face higher volatility, exposure to external shocks, and less developed institutional frameworks, making financial sustainability more challenging (Badia et al., 2021). Emerging markets often borrow in foreign currencies, which exposes them to exchange rate risks. Additionally, they are more vulnerable to changes in global financial conditions, such as rising interest rates or capital flight, which can exacerbate debt crises. Political instability and governance issues further complicate debt management in these economies. To address these challenges, emerging economies can implement the following strategies: prudent fiscal policies, diversifying the economy, strengthening financial institutions, and access to contingent financing, such as IMF credit lines, which provide liquidity support during periods of financial stress.

Low-income economies, including many countries in Sub-Saharan Africa and South Asia, face significant challenges in achieving financial sustainability (Essl et al., 2019). These economies often have limited access to capital markets, high levels of poverty, and underdeveloped financial systems. They also rely heavily on external financing, including foreign aid and concessional loans, which can create dependency and exacerbate debt sustainability issues. The high levels of external debt in low-income countries, often denominated in foreign currencies, make these economies vulnerable to exchange rate fluctuations and global economic conditions (World Bank, 2017). Additionally, weak institutional frameworks and governance challenges can undermine efforts to manage debt effectively. To improve financial sustainability, low-income economies can pursue the following strategies: debt relief and restructuring, development of domestic capital markets, capacity building, economic diversification and poverty reduction. Fostering economic diversification and reducing poverty can improve the resilience of low-income economies to external shocks. Investing in infrastructure, education, and health can support long-term economic growth and reduce the need for external borrowing.

Considering divergent perspectives, a crucial inquiry for decision-makers is how to quantify the debt crisis, select appropriate metrics, and detect overheating in real-time. In our study, we use logistic regression analysis. Our approach adds to the existing literature. We consider three different income groups of 196 countries (advanced economies, emerging economies, and low-income developing economies) and consider two measures capturing debt crisis using debt/GDP growth: (1) the cumulative 2 years debt/GDP growth; and (2) the standardized cumulative 2 years debt/GDP growth. The logit regression performed above does not include any other variable that may have predictive power for debt crises. We add: inflation (annual growth of the Consumer Prices Index (CPI), average over the period, percent),gdp\_ncconstgr (real GDP growth, percent, annual), and reserves (Central Bank's international reserve assets, billions of US dollars).

We demonstrate that, in contrast to the general belief, the debt crisis appears to be more frequent for low-income developing economies (53,62%) and emerging economies (20,69%) compared to advanced economies (1.19%). As a consequence, the volatility is high in particular for low-income developing and emerging economies. The heterogeneity of financial development implies a huge dispersion of the level of debt to GDP growth. The cumulative debt-to-GDP is a better indicator of a debt boom. To minimize this asymmetry, cumulative GDP-to-growth is standardized. The standardized 2-year debt/GDP is more appropriate as the crisis variable is binary (0 or 1). The logit regressions confirm the country's heterogeneity in terms of debt-to-GDP. For advanced and emerging economies, the standardized cumulative debt-to-GDP is significant whereas it is not for low-income developing market ones.

The rest of the paper is structured as follows. Section II outlines the data and methodology used to extract debt cycles and presents stylized facts about their behavior. Section III explores the empirical relationship between debt cycles and financial measurements. Section IV concludes.

1. **Methodology**

We use a database that contains a binary variable on the debt crisis. Our objective is to assess the predictive role of the key indicators of financial sustainability, including the debt-to-GDP ratio, inflation, GDP, and reserves, in debt crises. Data are at a yearly frequency, span the period 1980-2020, and cover 196 countries. Given that our notion of a crisis is a binary event (i.e., it happens or it doesn't), using limited dependent-variable approaches like logit or probit makes sense when aiming to predict a crisis. Probit models have been used in many previous empirical research that have used discrete choice models (see, for example, Eichengreen et al., 1996; Frankel and Rose, 1996; Berg and Patillo, 1999). A logit structure is employed. The sole distinction is that, in both logit and probit models, the basic latent variable that is supposed to produce the discrete event has a slightly different distribution; in the logit instance, it is more fat-tailed.

We are interested in predicting stress or crises. The focus is on the tail of a distribution. Tail risk is the risk that future realizations lie in the tail of the distribution. Tail risk realizations occur with small probability but entail large losses (stress events, crises). Stress or crisis realizations are coded as binary variables. The 0-1 classification may be based on pre-determined criteria: a) the crossing of a threshold of a variable below (or above) which the extreme event is assumed to occur, b) the occurrence of events (e.g., defaults), and c) both events and crossings of multiple thresholds. Different thresholds produce different timing of tail risk realizations (stress, crises). Events are often difficult to precisely define.

The variable to forecast is therefore:

)

Assume that there is an underlying response variable

What we observe is:

The probit model is the cumulative distribution function (cdf) of the standard normal distribution:

 (1)

 Where the logit model is the cdf of the logistic distribution

 (2)

where is a vector of explanatory variables and is a vector of parameters. In the probit model, is replaced with where is the standard normal cumulative distribution function.

The interpretation of the estimated coefficients is not straightforward because the model is not linear: a) the slope of the function depends on the specific values of the explanatory variables, and b) assessing the impact of the explanatory variables on the dependent variable requires using F(.). For both probit/logit: a) predicted values can be interpreted as probabilities, b) predicted probabilities are between 0 and 1, and c) logit tends to better encounter fat tail and then extreme events. The difference between logit and probit is small.

1. **Results**

We classify countries into 3 groups “Advanced economies”, “Emerging Market Economies”, and “Low-Income Developing Countries”. We aim to reveal the debt crisis frequency in these 3 groups. Furthermore, we aim to reveal which income group is more often affected by a debt crisis, and why.

**Table 1: Frequency of debt crises in AEs, EEs, and LIDCs**

**Advanced Economies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  | Cumulative | Cumulative |
| Value | Count | Percent | Count | Percent |
| 0 | 1661 | 98.81 | 1661 | 98.81 |
| 1 | 20 | 1.19 | 1681 | 100.00 |
| Total | 1681 | 100 | 1681 | 100 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**Emerging Economies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  | Cumulative | Cumulative |
| Value | Count | Percent | Count | Percent |
| 0 | 3154 | 79.31 | 3154 | 79.31 |
| 1 | 823 | 20.69 | 3977 | 100.00 |
| Total | 3977 | 100 | 3977 | 100 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**Low-income Developing Economies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  | Cumulative | Cumulative |
| Value | Count | Percent | Count | Percent |
| 0 | 1103 | 46.38 | 1103 | 46.38 |
| 1 | 1275 | 53.62 | 2378 | 100.00 |
| Total | 2378 | 100 | 2378 | 100 |
|  |  |  |  |  |
|  |  |  |  |  |

 Source: author’s calculations

Table 1 shows that debt crises appear to be more frequent for LIDCs (53.62%) and EEs (20.69%) compared to AEs (1.19%). This constitutes a stylized fact supported in many papers.

The higher frequency of debt crises in low-income and emerging economies compared to advanced economies can be attributed to several key factors, which are supported by economic research and analysis. Low-income countries and emerging economies often have weaker economic structures, including low levels of income, limited economic diversification, and high dependence on a narrow range of commodities or exports. This makes them more vulnerable to external shocks, such as commodity price fluctuations, natural disasters, or global economic downturns, which can trigger a debt crisis when these shocks reduce government revenue or increase the cost of borrowing.

LIDCs and EEs usually have limited access to international capital markets and face higher borrowing costs due to perceived higher risks. When they do borrow, it is often at higher interest rates, with shorter maturities, or from less stable sources of funding (e.g., foreign aid, concessional loans). This creates a debt structure that is more prone to crisis, particularly if refinancing becomes difficult. Also, many low-income countries suffer from weak institutions, including poor governance, inadequate legal frameworks, and low administrative capacity. These weaknesses can lead to poor debt management, corruption, and inefficient use of borrowed funds, which increases the likelihood of debt becoming unsustainable.

Low-income economies and to a lesser extent emerging economies are more exposed to external shocks, such as terms of trade shocks, exchange rate volatility, and global financial crises. Due to their limited economic buffers (e.g., small foreign exchange reserves, low fiscal space), these countries are less able to absorb shocks, making debt distress more likely. LIDCs and EEs often have higher debt-to-GDP ratios due to lower GDP levels and higher borrowing needs to finance development projects. High debt levels relative to the size of the economy increase the risk of a debt crisis, particularly when growth slows or external financing conditions tighten.

Many low-income and emerging countries rely heavily on external financing, including loans and grants from international organizations and bilateral donors. This external dependence makes them more susceptible to changes in global financial conditions, donor fatigue, or shifts in international lending practices, which can precipitate a debt crisis. The need for structural adjustments and economic reforms often leads to austerity measures that can exacerbate economic distress and social unrest, further complicating debt sustainability. These adjustments can sometimes lead to short-term economic pain, making it more difficult for governments to maintain fiscal discipline. A lot of LIDCs and EEs have a history of repeated debt crises, partly due to colonial legacies, civil conflicts, and historical mismanagement. This can create a cycle of debt dependency and crisis, as new borrowing is often used to service existing debt rather than for productive investment.

These factors combine to make debt crises more frequent in low-income and emerging economies. Advanced economies, on the other hand, benefit from more stable economic environments, stronger institutions, better access to capital markets, and greater economic resilience, which significantly reduce the likelihood of debt crises. Emerging economies fall somewhere in between, with some still vulnerable to crises, especially if they are in transition or facing significant external shocks.

The rationale behind this is the fact that the size of the financial market is more important in AEs, leading banks to take more risks and therefore to face crises. It is also due to the fact that advanced countries can borrow much more as they are more credible borrowers.

On the contrary, debt crises are less developed in AEs, which are therefore less prone to potential crises. Also, examining the simple statistics, we observe that for low-income developing economies the mean (96.42) is much higher than the median (-0.07) (driven by a strong asymmetry – more observation on the right tail of the distribution as can prove the maximum value)[[1]](#footnote-1). The asymmetry is also important but to a lesser extent for advanced countries and emerging ones. As a consequence, the volatility is high (in particular for low-income developing economies). The heterogeneity of financial development implies a huge dispersion of the level of debt to GDP growth. So clearly this implies strong asymmetries and outliers in the data. To minimize this asymmetry, we clustered the data in groups, truncated the sample, smoothed the data, or standardized the data.

We regress the debt crisis variable on both measures of debt: (1) the cumulative 2 years debt/GDP growth; and (2) the standardized cumulative 2 years debt/GDP growth.

**Table 2: Debt crisis regression using ML – binary logit**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | z-Statistic | Prob.  |
|  |  Cumulative 2-year DEBT/GDP growth |
| DEBT\_GDPG2 | 0.008803 | 0.001705 | 5.164163 | 0.0000 |
| C | -2.332890 | 0.226111 | -10.31747 | 0.0000 |
|  |  |  |  |  |
|  |  Standardized cumulative 2-year DEBT/GDP growth |
| SDEBT\_GDPG2 | 0.162170 | 0.025179 | 6.440712 | 0.0000 |
| C | -1.899897 | 0.155587 | -12.21119 | 0.0000 |

 Source: author’s calculations

We observe in the regression that the cumulative debt-to-GDP significantly explains the occurrence of a debt crisis at a horizon of a year. This result is robust for standardized/non-standardized variables. The only difference is the value of the coefficient 0,1621 for the standardized and 0,0088 for the non-standardized. The first one makes more sense and is easier to interpret as the crisis variable is binary (0 or 1).

The logit regression performed above does not include any other variable that may have predictive power for debt crises. We now add: gdp\_ncconstgr (Real GDP growth (percent, annual), inflation (annual growth of the Consumer Prices Index (CPI), average over the period, percent), and reserves (Central Bank's international reserve assets, billions of US dollars).

**Table 3:** **Debt crisis with inflation, real GDP growth, and reserves**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | z-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| SDEBT\_GDPG2 | 0.1317 | 0.0225 | 5.8447 | 0.0000 |
| INFLATION | 0.0071 | 0.0068 | 1.0312 | 0.3024 |
| GDP\_NCCONSTGR | 0.0252 | 0.0138 | 1.8277 | 0.0676 |
| RESERVES | -0.1295 | 0.0371 | -3.4881 | 0.0005 |
| C | -1.3104 | 0.2317 | -5.6536 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |

Source: author’s calculations

Variables in the multivariate model, Table 3, have all the expected signs and are significant except inflation. If real GDP growth increases then the probability of a debt crisis is higher. On the contrary, if reserves are higher, the probability of a debt crisis decreases. Table 3 reveals that a 1% increase in standardized cumulative 2 years of debt/GDP growth explains 13.17% of the debt crisis. The real GDP growth explains only 2.52% of the debt crisis, while a 1% increase in reserves decreases the debt crisis by -12.95%.

**Table 4:** **Debt crisis for the three different income groups**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | z-Statistic | Prob.  |
|  | **Advanced economies** |
| SDEBT\_GDPG2 | 0.2202 | 0.1125 | 1.9577 | 0.0503 |
| INFLATION | -0.1411 | 0.0520 | -2.7118 | 0.0067 |
| GDP\_NCCONSTGR | -0.2753 | 0.0556 | -4.9457 | 0.0000 |
| RESERVES | -0.1102 | 0.0916 | -1.2024 | 0.2292 |
| C | -3.2030 | 0.6352 | -5.0420 | 0.0000 |
|  |  |  |  |  |
|  | **Emerging economies** |
| SDEBT\_GDPG2 | 0.1516 | 0.0414 | 3.6540 | 0.0003 |
| INFLATION | 0.0059 | 0.0061 | 0.9590 | 0.3375 |
| GDP\_NCCONSTGR | 0.0180 | 0.0146 | 1.1963 | 0.2316 |
| RESERVES | -0.1243 | 0.0600 | -2.0726 | 0.0382 |
| C | -1.5107 | 0.3226 | -4.6829 | 0.0000 |
|  |  **Low-income developing countries** |
| SDEBT\_GDPG2 | 0.0679 | 0.0198 | 3.4308 | 0.0006 |
| INFLATION | 0.0009 | 0.0081 | 0.1206 | 0.9039 |
| GDP\_NCCONSTGR | 0.0153 | 0.0226 | 0.6781 | 0.4977 |
| RESERVES | -0.0615 | 0.0278 | -2.2130 | 0.0268 |
| C | -0.3880 | 0.3560 | -1.0898 | 0.2757 |
|  |  |  |  |  |

Source: author’s calculations

*Note*: Estimation for the 3 different income groups (“Advanced economies”, “Emerging Market Economies”, and “Low-Income Developing Countries”) separately.

The 3 regressions confirm the countries' heterogeneity in terms of debt-to-GDP. For advanced and emerging economies and to a lesser extent for low-income countries, the standardized cumulative debt-to-GDP is significant. It results that the fit of the regression is the highest for advanced economies. Again the explanation behind this is the dependence of the group of countries to the financial markets.

Advanced economies typically have well-developed financial markets, better access to international capital, and more robust financial institutions. This makes them more sensitive to fluctuations in debt levels as they are closely monitored by global investors and rating agencies. As a result, the debt-to-GDP ratio is a significant indicator in these economies, and the fit of the regression model is higher due to the stability and predictability of their financial data. Emerging economies are in a transition phase, often experiencing rapid economic growth and increasing integration into global markets. While their financial systems are not as mature as those in advanced economies, they are still significantly influenced by their debt levels. The standardized cumulative debt-to-GDP ratio remains a significant indicator, but the fit of the regression might not be as high due to the greater variability and risk factors inherent in these economies. For low-income countries, the significance of the debt-to-GDP ratio is generally lower. These countries often rely more on concessional financing and official development assistance, which can make their economies less sensitive to the same market pressures faced by more developed economies. Additionally, their financial data may be less consistent or reliable, leading to a lower fit in the regression model. In summary, the significance of the standardized cumulative debt-to-GDP ratio across different economic groups highlights the varying degrees of market dependency and financial stability. Advanced economies show the highest regression fit due to their strong linkages with global financial markets and more stable economic environments.

A 1% increase in inflation reduces debt in advanced economies by -14.11%. Moreover, a 1% increase in real GDP results in a -27.53% reduction in debt. Which implications result? In advanced economies, when inflation increases, the real value of debt decreases. This occurs because debt is typically fixed in nominal terms, meaning higher inflation reduces the real burden of debt. For governments, this can alleviate fiscal pressures by lowering the real cost of servicing debt, making it easier to meet obligations without requiring large budget surpluses or spending cuts. Policymakers in advanced economies may find some leeway in using inflationary policies to manage high debt levels, although this approach can have long-term costs, such as higher interest rates and reduced investor confidence. An increase in real GDP leads to a reduction in the debt-to-GDP ratio. Economic growth boosts government revenues through higher tax receipts and reduces the relative burden of existing debt. This is particularly significant as it reflects a sustainable method of reducing debt without the negative side effects associated with inflation. The relationship between GDP growth and debt suggests that policies promoting economic growth—such as investments in infrastructure, education, and technology—are crucial for long-term debt sustainability. These policies can help economies grow out of their debt burdens rather than relying on inflationary pressures.

Policymakers must strike a balance between using inflation to manage debt and fostering real GDP growth. While inflation can offer short-term relief, sustainable debt reduction is more effectively achieved through policies that promote economic growth. Effective coordination between monetary and fiscal policies is essential. For example, if a country relies too heavily on inflation to manage debt, it may face higher interest rates, which could negate the benefits. Therefore, a combination of moderate inflation and robust growth-oriented policies would be ideal. Advanced economies should be cautious of relying too much on inflation to manage debt, as this could lead to an inflationary spiral, harming long-term economic stability. Central banks need to maintain credibility and ensure that inflation expectations remain anchored.

The fact that a 1% increase in reserves leads to a 12.43% decrease in debt in emerging economies suggests a significant and potentially beneficial relationship between reserves and debt levels. Higher reserves may provide emerging economies with a stronger buffer against economic shocks, which can reduce the need for external borrowing. This improved financial stability can lead to a reduction in overall debt levels. With increased reserves, countries might appear more creditworthy to investors and creditors. This could lower borrowing costs and reduce the need for high levels of debt. Enhanced reserves provide governments with more leeway to implement economic policies without relying heavily on external debt. This can lead to more stable economic management and better long-term growth prospects. Higher reserves can mitigate the risks associated with currency fluctuations and balance of payments crises. As countries become less reliant on external debt, their vulnerability to global financial turbulence decreases. Reducing debt can free up resources for investment in infrastructure, education, and other critical areas, supporting sustainable economic development. Overall, this relationship underscores the importance of building and maintaining adequate reserves as a strategy for debt management and economic stability in emerging economies.

In low-income developing nations, where a 1% increase in reserves leads to a 6.79% decrease in debt, similar as in EEs but somewhat scaled-down implications apply. Even though the impact is smaller compared to emerging economies, increasing reserves still helps stabilize low-income developing nations' economies. This stability can lessen the need for external debt and provide a buffer against economic shocks. A 6.79% decrease in debt from a 1% increase in reserves is substantial. It can alleviate some of the fiscal pressures these countries face, potentially improving their economic conditions and enabling them to allocate more resources to development projects. By boosting reserves, these countries can enhance their creditworthiness, potentially leading to lower interest rates on future borrowings and better financial terms. Greater reserves offer low-income countries more flexibility in managing their economic policies, reducing reliance on debt to finance deficits or respond to economic challenges. With reduced debt, low-income developing nations may have more scope to invest in key areas such as infrastructure, education, and healthcare, which are crucial for long-term growth and poverty alleviation. Overall, while the magnitude of the effect is smaller in low-income developing nations compared to emerging economies, increasing reserves still plays a crucial role in managing debt and fostering economic stability and growth.

Figure 1 plots the debt crisis in-sample forecasts for the income groups. The model can predict well the period of debt crisis for AEs (panel a). The actual (orange) and the fitted (green) lines have a comovement in most of the cases. Even though there remain some parts unexplained by the model, it assesses, forecasts, and signals accurately the timing of the crisis for example, for Cyprus 2013, Greece 2013, Ireland 2013, and Portugal 2013. The model gives faulse alarms of debt crisis for Belgium 1985, Estonia 2005, Latvia 2010, Slovak Republic 2013, and Slovenia 2012. The standardized debt-to-GDP ratio is often used as a key indicator to forecast debt crises because it provides a measure of a country's debt burden relative to its economic output. However, its predictive power can vary significantly among different advanced economies due to several factors. Differences in economic structure and resilience is an important factor. Cyprus, Greece, Portugal, and Ireland are crisis prone economies. These economies often had underlying vulnerabilities such as high levels of external debt, large fiscal deficits, and weak financial systems. When the debt-to-GDP ratio increased, these vulnerabilities were exacerbated, leading to a loss of market confidence and a subsequent debt crisis. For instance, Greece had significant issues with tax collection and structural inefficiencies that made its high debt level unsustainable.

**Figure 1: In-sample forecasts for the three groups**



Source: author’s calculations

On the other hand, in other advanced countries such as Belgium, Estonia, Latvia, Slovak Republic, and Slovenia give false alarms.These countries may have more robust economic structures, with better fiscal management, stronger institutions, and more diversified economies. Even when the debt-to-GDP ratio rises, these economies can maintain market confidence and access to capital markets, avoiding a crisis. Belgium, for example, had high debt levels for many years but managed to avoid a crisis due to its strong economic fundamentals and investor confidence.

Institutional and policy frameworks is another factor.Weak institutional frameworks, including ineffective fiscal policies and lack of monetary sovereignty (in the case of Eurozone countries), made crisis-prone economies more susceptible to debt crises.In the case of Greece and Portugal, the lack of control over monetary policy within the Eurozone limited their ability to respond to rising debt levels.Countries like Belgium and Estonia have stronger institutional frameworks, which include effective fiscal rules, sound financial regulation, and credible monetary policies. These factors help mitigate the risk of a debt crisis even when the debt-to-GDP ratio is high.Estonia, for example, has consistently maintained low levels of public debt and a prudent fiscal policy, which helps in maintaining market confidence.

Market Perception and Investor Confidence in advanced economies might be different.For countries like Greece and Ireland, once market confidence is shaken, rising debt levels can quickly spiral into a crisis as investors demand higher risk premiums or withdraw financing altogether.In contrast, countries with a strong reputation for fiscal prudence and economic stability, like Belgium, are often given more leeway by investors, who may not react as negatively to rising debt levels.

The implications of the model, in Figure 1 (a), give some limitations in generalizing across advanced economies. The standardized debt-to-GDP ratio may not be a one-size-fits-all indicator. Its effectiveness in predicting crises is contingent upon the underlying economic, institutional, and market conditions of each country. The IMF and the World Bank policymakers and analysts should consider additional factors such as external debt levels, fiscal policies, financial market structure, and investor sentiment when assessing the risk of a debt crisis. Also, the results in Figure 1 (a) imply signals a need for comprehensive risk assessment. Relying solely on the debt-to-GDP ratio could lead to either underestimating or overestimating the risk of a crisis. A more comprehensive risk assessment should include other economic indicators, stress tests, and scenario analyses to capture the full scope of potential vulnerabilities.

Policy implications for advanced economies are as follows: a) for countries with weaker economic structures, efforts should be made to strengthen fiscal discipline, enhance institutional quality, and improve economic resilience, and b) for more resilient economies, maintaining investor confidence through transparency, sound fiscal management, and proactive economic policies remains crucial to avoid crises despite higher debt levels. While the standardized debt-to-GDP ratio is a useful tool, it should be applied with caution and in conjunction with other indicators to effectively predict and manage the risk of debt crises in different types of advanced economies.

The model can predict well the period of debt crisis for EEs (panel b). We notice that debt crisis are longer and more frequent in emerging economies relative to advanced economies. There is better overlapping of actual debt crisis and true signals (forecasts) comparing to advanced economies. Still, there are some false signals of debt crisis. The ability of the standardized debt-to-GDP measure to forecast debt crises more effectively in emerging economies than in advanced economies is tied to several factors, including the economic structure, financial market development, and the external vulnerabilities of these economies.

The emerging economies tend to have more volatile economic environments, with less diversified economic structures and a greater reliance on external financing. As a result, fluctuations in debt levels, particularly external debt, can more readily lead to a crisis. The standardized debt-to-GDP measure effectively captures this vulnerability, making it a stronger predictor of crises in these contexts. Advanced economies generally have more stable and diversified economic structures, making them less susceptible to sudden crises based on debt levels alone. They often have more robust financial markets and better access to global capital markets, allowing them to manage higher debt levels without triggering a crisis.

Financial markets in emerging economies are often less developed, with higher interest rates and shorter debt maturities. This makes them more sensitive to changes in investor sentiment and global financial conditions. As a result, a rise in the debt-to-GDP ratio can quickly translate into a debt crisis, making the measure a more reliable predictor. In contrast, advanced economies have more developed financial markets, which can absorb shocks and provide governments with more options to manage debt. This reduces the predictive power of the debt-to-GDP ratio, as these countries can often roll over debt or refinance it under better terms, avoiding a crisis even when debt levels are high.

Emerging economies often have higher levels of external debt relative to their foreign exchange reserves. This makes them more vulnerable to currency devaluations and capital outflows, which can quickly escalate into a debt crisis. The standardized debt-to-GDP ratio effectively captures this risk, improving its predictive accuracy. Advanced economies generally have larger foreign exchange reserves and lower levels of external debt, providing a buffer against external shocks. As a result, the debt-to-GDP ratio might signal a crisis even when the country has the means to avoid one, leading to false alarms.

For policymakers in emerging economies, the model underscores the importance of maintaining manageable debt levels and developing financial markets to reduce vulnerability to debt crises. For advanced economies, it highlights the need for more nuanced indicators that capture the complexities of their financial systems and economic resilience. The model could be refined by incorporating additional variables that account for the differences in financial market development, external vulnerabilities, and the role of foreign exchange reserves. This would improve its accuracy across different types of economies. The findings in Figure 1 (b) suggest that emerging economies should prioritize strengthening their financial institutions and building foreign exchange reserves to mitigate the risks identified by the debt-to-GDP measure. Advanced economies, on the other hand, might benefit from monitoring other indicators, such as private sector debt levels or financial market stress, to complement the debt-to-GDP ratio.

Low-income developing countries have the longest and most frequent debt crises relative to either emerging or advanced economies. The standardized debt-to-GDP measure can forecast debt crises more effectively in low-income developing countries than in both emerging and advanced economies due to several key factors inherent to these economies.

Low-income developingcountries often have weaker economic structures, including less diversified economies, limited industrial bases, and higher reliance on primary commodity exports. This makes them more susceptible to external shocks, such as commodity price fluctuations, which can quickly lead to fiscal imbalances and debt crises. The standardized debt-to-GDP measure is more predictive in these contexts because even small increases in debt relative to GDP can quickly become unsustainable. Emerging and advancedeconomies generally have more robust and diversified economic bases, which provide greater resilience against shocks. As a result, the same level of debt relative to GDP might be more manageable for these countries, leading to fewer debt crises and reducing the predictive power of the debt-to-GDP measure.

The LIDCs typically have limited access to international capital markets, relying heavily on concessional loans and aid. When they do access markets, they face higher interest rates and shorter maturities, making debt more burdensome. Consequently, their debt situations can deteriorate rapidly if external conditions worsen, which the debt-to-GDP ratio can effectively signal. In contrast, advanced and emerging economies have better access to international capital markets, allowing them to refinance or roll over debt more easily. This access can delay or mitigate the impact of rising debt levels, reducing the effectiveness of the debt-to-GDP ratio as a predictor of crises.

The LIDCs often face significant institutional and governance challenges, including weak fiscal management, corruption, and political instability. These factors can exacerbate the impact of rising debt levels, making the debt-to-GDP measure a more reliable indicator of impending crises. These countries are more vulnerable to external shocks, such as sudden changes in global demand, natural disasters, or political instability, which can quickly turn a manageable debt situation into a crisis. The debt-to-GDP measure, therefore, serves as an early warning indicator in such fragile environments. Emerging and advanced economies are generally better equipped to absorb external shocks due to stronger financial systems, diversified economies, and higher levels of foreign exchange reserves, making debt crises less frequent and reducing the measure's accuracy in predicting crises.

For low-income developing countries, the model emphasizes the need for cautious debt management and the importance of maintaining low debt levels relative to GDP. Policymakers should be aware that even modest increases in debt can quickly become unsustainable, leading to a crisis. While the debt-to-GDP ratio is a useful indicator, the existence of false signals suggests that it should be used in conjunction with other indicators, such as debt composition, external vulnerabilities, and institutional quality, to improve the accuracy of crisis predictions.

The model's implications also highlight the need for international support in strengthening the fiscal institutions and governance structures of low-income developing countries. Better institutional frameworks can help these countries manage their debt more effectively and reduce the frequency and duration of debt crises. The findings suggest that debt management strategies should be tailored to the specific vulnerabilities of low-income developing countries, with an emphasis on building economic resilience, diversifying income sources, and improving access to concessional financing.

1. **Policy Recommendations**

To mitigate the risk of debt crises and enhance financial sustainability, tailored policy recommendations are necessary for advanced, emerging, and low-income economies. Advanced Economies should: a)prioritize structural reforms that enhance productivity and labor market flexibility to support long-term growth, and b) governments should continue efforts to consolidate public finances, including reducing deficits and managing public debt sustainably. Emerging Economies should focus on: a) diversifying their economic base to reduce vulnerability to external shocks, and b) strengthening financial institutions. Building resilient financial institutions and regulatory frameworks can help emerging markets better manage debt and respond to crises. Low-income developing countries should: a) actively engage in international debt relief initiatives to reduce their debt burdens and create fiscal space for development, and b) develop domestic financial markets. Strengthening domestic capital markets can reduce reliance on external borrowing and improve debt sustainability.

International organizations, including the IMF and World Bank, should continue to provide financial assistance, technical support, and policy advice to help countries manage debt sustainably. Moreover, the IMF and World Bank should support LIDCs and EEs with Sustainable Development Goals (SDGs) and Environmental, Social, and Governance (ESG). Aligning debt management strategies with the SDGs and ESG can ensure that borrowing contributes to sustainable development and poverty reduction.

1. **Conclusion**

Financial sustainability is crucial for preventing debt crises and ensuring long-term economic stability across different types of economies. Advanced economies, emerging markets, and low-income countries each face unique challenges in managing debt, and their approaches to financial sustainability must be tailored accordingly. While advanced economies benefit from robust financial systems and access to capital markets, emerging and low-income economies face greater vulnerabilities and must implement strategies that address their specific risks.

Effective financial sustainability measures, including prudent fiscal policies, structural reforms, and international cooperation, are essential for managing debt and promoting economic stability. By understanding the distinct needs of different economies, policymakers can develop targeted strategies to mitigate debt risks and foster sustainable development.

Findings show that debt crises appear to be more frequent for LIDCs (53.62%) and EEs (20.69%) compared to AEs (1.19%). We observe in the regression that the cumulative debt-to-GDP significantly explains the occurrence of a debt crisis at a horizon of a year. This result is robust for standardized/non-standardized variables. The only difference is the value of the coefficient 0,1621 for the standardized and 0,0088 for the non-standardized. We employ the standardized debt-to-GDP ratio to measure its impact on debt crisis in the three income groups, 196 countries. We also add real GDP growth, CPI, and reserves. For advanced and emerging economies and to a lesser extent for low-income countries, the standardized cumulative debt-to-GDP is significant. For AEs, inflation and real GDP growth are significant indicators in explaining the debt crisis, while reserves remain important for EEs and LIDCs. This relationship underscores the importance of building and maintaining adequate reserves as a strategy for debt management and economic stability in both income groups.

While the standardized debt-to-GDP ratio is a useful tool for AEs, it should be applied with caution and in conjunction with other indicators to effectively predict and manage the risk of debt crises in different types of advanced economies. It highlights the need for more nuanced indicators that capture the complexities of their financial systems and economic resilience. Emerging economies should prioritize strengthening their financial institutions and building foreign exchange reserves to mitigate the risks identified by the debt-to-GDP measure. For low-income developing countries, policymakers should be aware that even modest increases in debt can quickly become unsustainable, leading to a crisis.

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**APPENDIX A**

**Table A1: Debt to GDP simple statistics for AEs, EEs, and LIDCs**

|  |  |  |  |
| --- | --- | --- | --- |
|  AEs |  |  EEs |  LIDCs |
|  |  |  |  |  |  |
|  Mean | 3.850164605 |  | 3.432807941 |  | 96.41670317 |
|  Median | 0.755096465 |  | 0.540781468 |  | -0.067840448 |
|  Maximum | 415.1903076 |  | 788.5715942 |  | 94968.49219 |
|  Minimum | -87.37636566 |  | -65.47934723 |  | -88.86165619 |
|  Std. Dev. | 20.29227954 |  | 28.34972238 |  | 2759.050287 |
|  Skewness | 10.29636161 |  | 11.18624659 |  | 32.79080388 |
|  Kurtosis | 178.8737676 |  | 268.5919951 |  | 1114.250022 |
|  |  |  |  |  |  |
|  Jarque-Bera | 1525974.595 |  | 6825725.058 |  | 65160086.65 |
|  Probability | 0 |  | 0 |  | 0 |
|  |  |  |  |  |  |
|  Sum | 4496.992258 |  | 7916.055112 |  | 121677.8794 |
|  Sum Sq. Dev. | 480543.3026 |  | 1852544.079 |  | 9599184053 |
|  |  |  |  |  |  |
|  Observations | 1168 |  | 2306 |  | 1262 |

1. See Appendix A for more details. [↑](#footnote-ref-1)