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Government Debt Dynamics in the G7: Health, Military, Current Account and Interest Rate Effects

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Abstract

This study examined what drives public debt-to-GDP ratios in G7 economies over the 1990–2024 period, focusing on both short- and long-term macroeconomic dynamics. Instead of forcing a rigid, homogenous panel framework onto distinct nations, we run individual country-specific Autoregressive Distributed Lag (ARDL) models. Our approach models debt accumulation through four critical metrics: mandatory health spending, defense commitments, current account balances, and long-term interest rates. Healthcare costs stand out as the single most pervasive, structurally rooted debt driver across the G7. Conversely, military expenditures and external trade balances affect debt trajectories in a highly heterogeneous manner, depending entirely on localized fiscal priorities. Interest rates validate the classical loanable funds theory during capital shortages, but they switch roles in heavily indebted regimes like Italy and the UK, where they support the debt refinancing hypothesis. Ultimately, our findings suggest that standard austerity measures no longer work. Managing G7 sovereign debt now requires shifting toward structural healthcare financing reforms and tailored institutional fiscal rules.

Keywords: Government debt; G7 countries; Health expenditure; Military expenditure; Current account deficit; Interest rates.

JEL Codes: E43; F32; H51; H56; H63; C22

1. Introduction

The rapid increase in public debt in advanced economies has become a major challenge to global macroeconomic stability. Following the 2008 Global Financial Crisis and the recent COVID-19 pandemic, gross public debt/GDP ratios in G7 countries reached historical highs, often exceeding 100%. This structural shift has reignited the debate about what triggers long-term public debt accumulation. Traditional fiscal theories often focus on short-term political cycles or general budget management. However, these frameworks often overlook long-term structural expenditures and external imbalances that gradually reduce fiscal space. This study aims to analyze the country-specific short- and long-term effects of four key macroeconomic channels (health expenditures, military expenditures, current account balances, and long-term interest rates) in G7 countries from 1990 to 2024.

According to data from the International Monetary Fund (IMF), the average debt-to-GDP ratio for major emerging economies—including Argentina, Brazil, India, Mexico, South Africa, and Turkey—stood at 31.55% between 1972 and 1990. Brazil recorded the highest ratio during this period, averaging 48% (excluding Russia and China due to data unavailability). In comparison, advanced economies maintained a lower average debt-to-GDP ratio of approximately 28% during the same timeframe. The data for advanced economies encompasses countries such as Australia, France, Germany, Italy, Japan, Korea, the United Kingdom, and the United States. These figures suggest that emerging economies carried higher debt burdens relative to their GDP compared to advanced economies during this period.

However, the trend shifts significantly from 1990 to 2023. During this period, the average debt-to-GDP ratio for advanced economies surged from 28% to 59%. Notably, as of the end of 2023, Japan recorded the highest ratio at approximately 205%, followed by Italy at 131% and the United States at 112%. In contrast, the average debt-to-GDP ratio for the aforementioned emerging economies during the same period stood at 43%, with Argentina and China reporting the highest ratios at 155% and 83%, respectively, as of the end of 2023. Kose et al. (2018) identified four distinct waves of global borrowing over the past 50 years, noting that the first three waves predominantly resulted in financial crises for developing countries. They further observed that the fourth wave, which began after 2010, was characterized by a significantly larger and faster accumulation of debt compared to previous periods. Despite these trends, Kose et al. (2018) argued that the low-interest-rate environment—which they suggested could persist in the medium term—might mitigate the risks associated with high debt levels.

The extant works in this field indicates that several factors have contributed to the current economic landscape. In their seminal work, Reinhart et al. (2012) observed over a decade ago the debt levels of advanced economies had surged significantly in the wake of the 2008 global financial crisis, thereby fostering a fragile economic environment for these nations. Similarly, Gagnon and Hinterschweiger (2011) posit that, following the 2008 financial crisis, governments of developed economies issued substantial debt to revive their stagnant economies. However, Khatiwada (2009) contends that the expansion of the Federal Reserve's balance sheet and the related increase in money supply, aimed at rescuing insolvent banks, along with government-initiated stimulus packages and enhanced social spending to mitigate the recession, may not have exerted a significant impact on debt levels or budget balances when accounting considerations are taken into account. Contrary to this perspective, budgetary concerns are also purported to precipitate excessive debt. For instance, Polyzos (2021) suggests that in the aftermath of the Covid-19 pandemic, governments augmented their debt to finance healthcare expenditures and stimulate demand to counteract the economic downturn.

The variables selected for this study operate through specific macro-fiscal transmission mechanisms. First, health expenditure is a non-discretionary (mandatory) fiscal burden driven by demographic changes. The G7 nations face rapidly aging populations, which continuously increases the demand for public healthcare (See Valkama and Oulasvirta, 2021; De Jong and Ho, 2021; Mehrotra, and Sergeyev, 2021) and similar concerns were also raised by Dynan (2023) about the federal debt of the US that this will cause risk and economic challenges if the upward trend continues. According to Wagner’s Law, rising healthcare costs act as a permanent shock to government spending. If tax revenues do not increase at the same pace, this spending automatically leads to persistent public debt (Baltagi and Moscone, 2010). In contrast to this, the study of Abd Rahman et.al. (2021) suggest these demographic challenges drive government to borrow more to cover expenses have insignificant relationship with the external debt level. A further argument, presented by Yared (2019), attributes the accumulation of public debt in advanced economies to a persistent divergence between the growth rates of government spending and taxation, with the former consistently exceeding the latter.

Another significant issue is the prevalence of the low-interest-rate era. Advanced economies, in particular, experienced historically low interest rates for much of the period between 2000 and 2020. This phase of low rates came to an end in the aftermath of the COVID-19 pandemic, when inflationary pressures began to escalate due to supply-demand imbalances and a substantial expansion in money supply. Mankiw (2022) discussed this and argued that due to

low interest rates the governments were willing to borrow more and allowed debt rollover. Simirlarly, for instance, the sustainability of U.S. public debt is a subject of significant concern, as exemplified by Kenneth Rogoff's (2025) analysis in Foreign Policy. Rogoff suggests that the accumulation of debt to historic levels is the result of its extensive use to finance military engagements, mitigate economic and financial crises, and address pandemics. A key enabler of this trend, he suggests, was the previously low-interest-rate environment, which created a perceived affordability for persistent deficit financing. Recent developments, however, have cast serious doubt on this outlook. Rogoff justifies his apprehension by highlighting the rising interest on long-term U.S. government bonds, which directly escalates the fiscal burden of the debt. He warns that an escalating debt problem in the United States poses substantial risks to both its domestic economic stability and the broader global economy.

Military spending forms a discretionary fiscal channel linked to geopolitical risks. Rising global tensions have forced many G7 countries to increase their defense budgets, reversing the post-Cold War "peace returns." Theoretically, military spending can either hinder efficient public investment or directly increase budget deficits, creating a "defense-debt relationship" tied to each country's strategic priorities and military-industrial complex (Dunne and Smith, 2020). One common approach to addressing this financial demand is borrowing from foreign sources. This issue has garnered increasing attention within the contemporary economic and political landscape. Rising global threat perceptions have driven global military spending to exceed 2.5 trillion US dollars in 2024. The relationship between military expenditures and external borrowing has been extensively documented in the literature. For instance, studies by Kollias et al. (2004) in the context of Greece, Paul et al. (2004) in South America, Abbas and Wizarat (2018) in South Asia, Dudzevičiūtė et al. (2021) across several European countries, and Ahmed et al. (2022) in the United States have consistently demonstrated this linkage.

While we discussed factors behind increase in debt, there are also debates about to what extend debt can be good or bad for an economy. Cecchetti et. al. (2011) suggest that when government debt at reasonable level, the growth of the economy and wealth will be positively benefit. Nonetheless, the author provides from empirical study a threshold level debt GDP ratio of 85% above which government debt may be harmful to economy. When investigating the case of debt for Euro area economies, Checherita and Rother (2012) propose the negative impact of debt may begin from the level of 90% to 100% of GDP. Debt issue is important because there will be pressure on economic growth when government debt increases (Calderón and Fuentes, 2013). While there is negative relation between growth and debt, the authors believe that this negative relation may be altered if countries have strong institutions and high quality policies for developing and advanced economies. Gagnon and Hinterschweiger (2011) believe that the current debt level of developed economies might be in more bad situation if the governments would not take action over spending and revenues.

Whereas there remains a scarcity of research on the relationship between government debt and current account deficits, this study aims to address this gap. It will explore the impact of variables established in the existing literature, such as health expenditures, military expenditures, interest rates, and the budget deficit. Crucially, it will also incorporate the current account deficit as a key indicator. This inclusion is motivated by the fact that current account deficits require financing. This inquiry echoes the foundational work of Blanchard (1983), who examined a similar question in the context of Brazil, which was experiencing elevated debt levels relative to its peers. Blanchard investigated whether the current account deficit was

sustainable without precipitating economic harm or potential insolvency. Beyond domestic spending, public debt dynamics are linked to external and monetary factors. This structure between the current account balance and government debt is based on the Twin Deficits Hypothesis. In open market economies, persistent current account deficits indicate that domestic investment exceeds national savings. This forces governments to resort to foreign capital inflows and external borrowing to finance deficits (Abbas et al., 2011; Woo, 2025). Furthermore, the long-term interest rate determines the cost of borrowing for governments. According to traditional loanable funds theory, higher interest rates increase the cost of capital and accelerate debt accumulation through compounded debt burdens (Tanzi, 1985). Conversely, according to modern debt rollover hypotheses, prolonged low interest rates can encourage fiscal indiscipline and allow governments to accumulate debt because borrowing appears cheap (Blanchard, 2019).

Although the literature on the determinants of public debt is extensive, current empirical research suffers from two shortcomings in this area. On the one hand, the vast majority of cross-country studies rely on panel data econometric techniques (For instance Panel GMM, Pooled Mean Group). While panel methods maximize statistical power, they require a degree of slope homogeneity, assuming that G7 countries share the same institutional, demographic, and fiscal reaction functions. This assumption is highly problematic; for example, the institutional architecture of Japan's domestically held government debt is fundamentally different from the Eurozone's constrained fiscal rules governing Italy or Germany (Sutherland and Hoeller, 2012). On the other hand, studies using time series frameworks often adopt restrictive integration assumptions, requiring all variables to be strictly I(1), which can lead to misleading regressions or loss of short-term dynamic information through premature differentiation. To address these methodological issues, this study applies the country-specific Autoregressive Distributed Lag (ARDL) Bounds Test approach developed by Pesaran et al. (2001). The ARDL framework offers significant advantages in the analysis of debt dynamics. It allows for the simultaneous use of $I(0)$ and $I(1)$ variables. This is crucial because while macroeconomic variables such as interest rates and current account balances are generally stationary, public debt and healthcare expenditures are typically non-stationary. Furthermore, the ARDL model is excellent for capturing both short-term shocks and long-term fiscal trends by providing discrete short-term error correction mechanisms and robust long-term vectors.

This study contributes to the literature in three ways by analyzing the data separately for Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States. First, it tests the drivers of public debt by comparing structural (health) spending and general (military) spending as single relationships. Second, it highlights the nuanced aspects of why general panel results fail to capture local fiscal realities; for example, Germany's fiscal institutionalism or Japan's unique debt structure. Third, it offers clear insights moving away from general "fiscal consolidation" recommendations toward targeted reforms in health information and external balance management.

The structure of this paper is organized as follows: Section 2 presents a review of the related literature. Section 3 outlines the data and methodology employed. Finally, Section 4 provides the conclusion and discussion of findings.

2. Literature Review

The escalation of public debt levels in advanced economies has garnered increasing attention from scholars and policymakers globally. This heightened concern stems from debt reaching thresholds that many economists consider alarming, with potential implications for undermining macroeconomic stability.

A substantial body of existing literature has focused on the relationship between public debt and economic growth. Notable contributions within the context of advanced economies include the works of Gagnon and Hinterschweiger (2011), Checherita-Westphal and Rother (2012), Panizza and Presbitero (2013), and Zestos et al. (2023). Concurrently, studies such as those by Doğan and Bilgili (2014), Lau et al. (2022), Sharaf (2022), Manasseh et al. (2022), and Heimberger (2023) have examined this dynamic within emerging and developing economies. These represent a fraction of the expanding scholarly discourse in this field.

To maintain analytical focus, this review is confined to research directly related to the specific explanatory variables employed in this study's framework. Reinhart et al. (2012) examined the debt trajectories of 22 advanced economies from 1800 to 2011, identifying 26 extended episodes where public debt exceeded 90% of GDP. Their analysis yields three principal findings: first, debt accumulation episodes typically endure for more than a decade (averaging 23 years); second, they do not invariably precipitate interest rate spikes or immediate crises; and third, they are consistently associated with significantly reduced economic growth, leading to substantial cumulative output losses. The authors contend that current elevated debt levels are particularly concerning given the concurrent burdens of demographic aging and high private-sector debt, suggesting the enduring relevance of historical precedents.

Similarly, Gagnon and Hinterschweiger (2011) argue that public debt-to-GDP ratios in advanced economies risk further escalation due to demographic aging, rising healthcare expenditures, and subdued growth expectations. They warn that this trajectory may crowd out private investment and constrain long-term growth potential by exerting upward pressure on real interest rates. The authors conclude that early and gradual fiscal reforms—particularly in pension and healthcare systems—are essential to manage debt dynamics, foster growth, and enhance the efficiency of social expenditures, emphasizing the profound implications of debt pathways for future economic stability and policy choices.

In contrast, Khatiwada (2009) provides a comparative analysis of the economic stimulus packages implemented by the US, China, the EU, and other G20 nations in response to the 2008–2009 global financial crisis. While acknowledging the short-term necessity of these interventions to stabilize demand, protect employment, and restore confidence, the author highlights critical long-term trade-offs, including risks to fiscal sustainability, potential inflationary pressures, and the deferred imperative for structural reforms.

2.1 The Nexus Between Public Debt and Military Expenditure

The relationship between sovereign debt and defense spending constitutes another strand of inquiry. Kollias et al. (2004), in an empirical study of Greece from 1960 to 2001, identify a bidirectional causal relationship between military expenditure and public debt, particularly in the long run. Their findings suggest that high defense spending contributes to debt accumulation, while elevated debt levels can, in turn, perpetuate higher military budgets, thereby imposing constraints on fiscal and defense policy.

Ahmed et al. (2022) examine the dynamics between public debt, defense spending, non-defense spending, and economic performance in the United States. Their analysis underscores debt as a critical determinant of fiscal space, arguing that rising debt can constrain future expenditure flexibility and elevate interest burdens. Furthermore, they posit that increases in defense allocations may crowd out vital non-defense expenditures (e.g., infrastructure, education), necessitating a strategic balance between national security imperatives and domestic priorities.

Conversely, Dudzevičiūtė et al. (2021) reveal a predominantly strong negative correlation between defense spending and public debt in several small advanced economies (Lithuania, Latvia, Estonia, Denmark, Slovakia, Slovenia), a finding that partially contradicts the hypothesis that defense spending inherently increases debt. The study concludes that decisions to raise military expenditure are often driven more by political and strategic calculations than by purely economic rationale—an observation aligning with the earlier conclusions of Kollias et al. (2004) regarding Greece.

For South Asian economies, Abbas and Wizarat (2018) find a positive and statistically significant relationship between military spending and external debt from 1990 to 2015. Their estimates indicate that a $1 billion increase in military expenditure correlates with an approximate $7.2 billion rise in external debt, whereas a 1% increase in GDP-linked domestic investment reduces debt by about $0.9 billion.

2.2 Public Debt and Interest Rates

The interaction between government debt and interest rates has also received considerable scholarly attention. Mankiw (2022) attributes the secular decline in global real interest rates in recent decades to factors such as increased savings, slowing growth, and heightened market concentration. He posits that in this low-rate environment, elevated public debt may not pose an immediate fiscal crisis, as governments can refinance obligations while growth gradually erodes debt ratios. However, he cautions that this "perpetual rollover" strategy risks failure and, even if sustained, may crowd out private capital formation, ultimately impairing productivity, wages, and long-term consumption.

This perspective is challenged by Rogoff (2025), who contends that the United States' rising public debt is unsustainable and poses a systemic risk to global financial stability. Identifying post-pandemic stimulus, persistent low rates, and demographic shifts as structural debt drivers, Rogoff warns that elevated debt levels amid rising interest rates will threaten fiscal sustainability and erode investor confidence, potentially triggering a loss of faith in U.S. Treasuries, dollar depreciation, and worldwide economic contagion. He urges comprehensive tax reform, stringent expenditure control, and reduced political polarization as urgent remedies.

Conversely, a parallel strand of literature argues that high public debt can itself exert upward pressure on interest rates. For instance, Sutherland and Hoeller (2012), analyzing OECD countries, identify high debt levels as a source of macroeconomic fragility. Their empirical work demonstrates that debt overhangs—particularly in the private sector—weaken consumption and investment, amplify economic shocks, and are associated with deeper, more prolonged recessions.

Country-specific analyses yield nuanced insights. Kameda (2014) finds that while the short-term impact of rising Japanese public debt on interest rates is modest, the long-term cumulative effect of the massive debt stock is significant, suppressing GDP growth and severely

constraining future policy options absent primary deficit reduction. Similarly, Kinoshita (2006), using a panel of 19 industrialized countries, concludes that the effect of debt on interest rates is limited in isolation but becomes substantially magnified when concurrent increases in public consumption expenditure occur, suggesting that the economic impact of debt extends beyond mere interest rate channels.

2.3 Health Expenditures and Government Debt

The fiscal implications of health spending, particularly in crisis contexts, represent another critical dimension. De Jong and Ho (2021) analyze the initial COVID-19 policy responses of 17 developed nations, finding that the scale of budgetary measures was not correlated with pre-existing economic or fiscal conditions but was instead positively associated with infection rates and negatively associated with medium-term health spending plans. The authors caution that such crisis-driven spending may elevate medium-term risks, including unsustainable public debt, weakened fiscal discipline, and the deferral of structural priorities such as poverty alleviation and climate action.

At the subnational level, Polyzos et al. (2021) assess municipal financial sustainability in Finland, identifying rising income tax rates, persistent deficits, and growing per capita debt as indicators of increasing strain—a situation exacerbated by demographic aging. Their analysis suggests that municipal finances are becoming unsustainable in terms of both intergenerational equity and autonomous fiscal capacity.

In the U.S. context, Dynan (2023) identifies the interplay between an aging population and escalating healthcare costs as the primary structural driver of long-term federal budget challenges. The author argues that even under optimistic economic assumptions, debt is projected to grow unsustainably, posing significant risks of future fiscal crisis and constraining economic policy.

3. Empirical Analysis

Data

The dataset comprises annual observations spanning the period 1990–2024. This timeframe aligns with the phase of rapid external debt accumulation observed across advanced economies and the data could not go backwards further due to unavailability in some variables.

The analysis employs the following variables, sourced from established international institutions:

- **Health Expenditures:** Measured as a percentage of GDP, sourced from the World Health Organization (WHO) Global Health Expenditure Database. Since this series is skewed taking log of this variable will hep interpret elasticies and reduce skewness.
- **Military Expenditures:** Measured as a percentage of GDP, sourced from the Stockholm International Peace Research Institute (SIPRI) Military Expenditure Database. The log of this series will also be taken for the reason as stated for health expenditures series,

- **Current Account Balance:** Expressed as a percentage of GDP, obtained from the World Bank's World Development Indicators.
- **Long-term Interest Rate:** Represented by the 10-year government bond yield, sourced from the Federal Reserve Economic Data (FRED) database. This benchmark is selected as long-term rates are reflective of macroeconomic fundamentals and contain information relevant for predicting fiscal policy trajectories and sovereign debt sustainability (Istrefi & Mouabbi, 2018).
- **Government Debt:** Meajured as a percentage of GDP, collected from World Bank's World Development Indicators.

3.1 Research Design and Econometric Approach

Based on the specified research design, the dataset comprises time series observations for each of the seven G7 countries. To account for the persistence inherent in public debt and to capture both short-run dynamics and long-run equilibrium relationships, the econometric analysis employs a dynamic regression framework. Specifically, the relationship between government debt and its determinants—health expenditures, military expenditures, the long-term interest rate, and the current account balance—is examined using the Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran and Shin (1995) and Pesaran et al. (2001). This methodology is particularly suitable for small samples and remains valid regardless of whether the underlying regressors are purely I(0), purely I(1), or mutually cointegrated. Furthermore, it ensures consistent and efficient estimates by incorporating appropriate lag structures and mitigating potential endogeneity concerns through the inclusion of exogenous variables (Attiaoui et al., 2017).

3.2 Model Specification

For each country, a distinct time series ARDL model is estimated. The dependent variable is the government debt-to-GDP ratio (*GDt*). The independent variables are health expenditure as a percentage of GDP (*HELt*), military expenditure as a percentage of GDP (*MILt*), the current account balance as a percentage of GDP (*CAt*), and the 10-year government bond yield (*INTt*). The linear functional relationship can be expressed as:

$$DGDP_{it} = f(HEL_{it}, MIL_{it}, BAL_{it}, INT_{it})$$

3.3 ARDL Bounds Testing Formulation

The ARDL representation of the long-run relationship among the variables is specified in error-correction form as follows:

$$\Delta GD_{it} = \omega_0 + \omega_1 GD_{t-1} + \omega_2 HEL_{t-1} + \omega_3 MIL_{t-1} + \omega_4 CA_{t-1} + \omega_5 INT_{t-1} + \sum_{i=1}^{p} \beta_1 \Delta GD_{t-j} + \sum_{i=0}^{q} \beta_2 \Delta HEL_{t-j} + \sum_{i=0}^{k} \beta_3 \Delta MIL_{t-j} \sum_{i=0}^{l} \beta_{4i} \Delta CA_{t-j} \sum_{i=0}^{m} \beta_5 \Delta INT_{t-j} + \varepsilon_t \quad (1)$$

In equation (1), Δ indicates the difference operator, ω_0 is the constant and p, q, k, l, m are used for optimal lag length choice. While $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ shows the short run dynamic coefficients, ω_1 ω_2 ω_3 ω_4 ω_5 indicate long-run multipliers and finally ε_t points the error term.

This study relies on the ARDL framework to address endogeneity and missing variable issues, particularly the muttually reinforcing events between public debt and interest rates. As Pesaran and Shin (1995) demonstrated, an optimal lag structure controls internal dynamics by allowing independent variables to behave as conditional variables. Because our models simultaneously include structural, exogenous, and monetary variables and have passed all standard diagnostic checks (including serial correlation and ARCH tests), the estimated long-term coefficients are robust and statistically reliable.

The existence of a long-run equilibrium relationship is tested by conducting an *F*-test for the joint significance of the lagged level variables (H_0: ω_1=ω_2=ω_3=ω_4=ω_5=0). The computed *F*-statistic is compared against the critical values provided by Pesaran et al. (2001). If the *F*-statistic exceeds the upper bound, the null hypothesis of no cointegration is rejected, confirming a stable long-run relationship among the variables.

Upon establishing cointegration, the long-run coefficients are derived from the estimated ARDL model, and the short-run dynamics are captured through the error-correction term, which indicates the speed of adjustment toward equilibrium following a short-run disturbance. To determine the integration properties of the variables, unit root tests were conducted using the Augmented Dickey-Fuller (ADF) (1979) and Phillips-Perron (PP) (1988) procedures. These tests were applied to each variable for every G7 country individually, and the results are summarized below (See Table 1 and 2).

The findings indicate that the government debt-to-GDP ratio is non-stationary in levels for all countries but becomes stationary after first differencing, confirming that it is integrated of order one, I(1). Similarly, health expenditure exhibits I(1) properties across all countries.

For military expenditure, the results are largely consistent, with the variable achieving stationarity upon first differencing for most countries. An exception is the United Kingdom, where military expenditure is stationary at level, I(0). In the case of Japan, military expenditure was found to be neither I(0) nor I(1); consequently, it was excluded from the long-run ARDL estimation for Japan.

The current account balance series also displays I(1) characteristics across all countries, becoming stationary after first differencing. Regarding the interest rate, notable heterogeneity emerges: for European countries, the interest rate is stationary at level, I(0). For the remaining G7 economies, stationarity is achieved only after first differencing, indicating I(1) behavior.

Overall, the unit root test results reveal a mixed order of integration among the variables, with the majority classified as I(1) and only isolated instances of I(0) for specific countries and variables (See Table 1 and 2). Given this combination of I(0) and I(1) regressors, the Autoregressive Distributed Lag (ARDL) modeling framework is identified as the most appropriate approach for estimating the long-run equilibrium relationship between government debt and its determinants—namely, health expenditure, military expenditure, the current account balance, and the interest rate.

Table 1: Time Series Unit Root Test Results

Country	Variable	Test	Constant		Constant and Trend	
			Level	First dif.	Level	First dif.
Canada	Debt/GDP	ADF	-1.218	-5.393***	-1.411	-5.368***
		PP	-1.380	-5.393***	-1.498	-5.372***
	Health	ADF	-1.184	-5.900***	-3.362*	-5.837***
		PP	-1.029	-6.626***	-2.448	-7.418***
	Military	ADF	-2.911**	-4.734***	-1.866	-5.339***
		PP	-2.860*	-4.809***	-1.866	-5.338***
	Current	ADF	-1.727	-4.841***	-1.737	-4.803***
		PP	-1.835	-4.793***	-1.821	-4.760***
	Interest	ADF	-2.490	-6.084***	0.518	-7.283***
		PP	-5.745***	-4.133***	-1.088	-5.086***
France	Debt/GDP	ADF	-0.813	-5.349***	-2.421	-5.290***
		PP	-0.785	-5.596***	-2.519	-5.460***
	Health	ADF	-2.136	-5.585***	-2.475	-5.830***
		PP	-2.675*	-5.811***	-2.113	-8.769***
	Military	ADF	-2.783*	-5.012***	-0.848	-6.419***
		PP	-3.161**	-5.008***	-0.056	-15.00***
	Current	ADF	-1.317	-10.15***	-2.416	-4.148**
		PP	-2.379	-9.629***	-3.252*	-9.605***
	Interest	ADF	-3.034**	-4.618***	-2.367	-5.377***
		PP	-4.349***	-4.125***	-0.866	-6.887***
Germany	Debt/GDP	ADF	-2.751*	-3.945***	-2.163	-4.323***
		PP	-2.191	-3.889***	-1.399	-4.199**
	Health	ADF	-1.399	-5.911***	-3.267*	-4.741***
		PP	-1.348	-7.898***	-3.218*	-7.315***
	Military	ADF	0.296	-3.882***	-2.489	-5.230***
		PP	-4.467***	-3.905***	-2.506	-5.220***
	Current	ADF	-0.961	-7.641***	-2.198	-7.579***
		PP	-1.008	-7.353***	-2.571	-7.384***
	Interest	ADF	-5.508***	-3.818***	-2.666	-5.388***
		PP	-5.471***	-3.818***	-2.658	-5.463***
Italy	Debt/GDP	ADF	-1.526	-4.918***	-1.791	-4.859***
		PP	-1.570	-4.878***	-1.932	-4.820***
	Health	ADF	-1.452	-5.481***	-1.423	-4.272***
		PP	-1.403	-5.544***	-1.355	-5.818***
	Military	ADF	-2.393	-6.321***	-2.140	-6.462***
		PP	-2.371	-6.327***	-2.116	-6.574***
	Current	ADF	-2.066	-5.125***	-2.037	-5.061***
		PP	-2.182	-5.108***	-2.166	-5.040***
	Interest	ADF	-2.154	-4.132***	-1.463	-4.481***
		PP	-3.128**	-4.046***	-1.530	-4.472***

Note: ***, ** and * indicate 1%, 5%, and 10% significance levels, respectively.

Table 2: Time Series Unit Root Test Results (Continued)

Country	Variable	Test	Constant		Constant and Trend	
			Level	First dif.	Level	First dif.
Japan	Debt/GDP	ADF	-2.121	-3.885***	0.446	-4.629***
		PP	-1.962	-3.924***	1.137	-4.903***
	Health	ADF	-1.029	-4.890***	-1.584	-4.893***
		PP	-1.044	-4.836***	-1.946	-4.868***
	Military	ADF	3.428	-1.736	2.224	-2.343
		PP	7.853	-1.827	4.436	-2.342
	Current	ADF	-2.745*	-5.889***	-2.983	-5.794***
		PP	-2.745*	-6.199***	-3.094	-6.211***
	Interest	ADF	-2.189	-4.365	-1.713	-4.799***
		PP	-2.148	-4.272***	-0.812	-4.720***
The UK	Debt/GDP	ADF	-0.307	-4.283***	-1.947	-4.212***
		PP	-0.439	-4.300***	-1.762	-4.230***
	Health	ADF	-1.265	-5.548***	-3.779**	-5.495***
		PP	-1.664	-8.859***	-2.619	-10.74***
	Military	ADF	-4.824***	-3.524**	-3.739**	-4.609***
		PP	-3.014**	-3.771***	-1.733	-4.737***
	Current	ADF	-2.322	-6.786***	-2.951	-6.611***
		PP	-2.364	-6.987***	-3.033	-7.036***
	Interest	ADF	-1.883	-4.888***	-0.446	-5.395***
		PP	-2.434	-4.830***	-1.123	-7.669***
The USA	Debt/GDP	ADF	-0.163	-4.767***	-1.649	-4.799***
		PP	-0.163	-4.760***	-1.739	-4.742***
	Health	ADF	-1.346	-5.413***	-2.672	-5.378***
		PP	-1.519	-9.570***	-2.686	-10.62***
	Military	ADF	-1.936	-3.716***	-1.967	-3.584**
		PP	-2.700*	-3.768***	-2.454	-3.655**
	Current	ADF	-1.392	-5.306***	-1.379	-5.341***
		PP	-1.536	-5.340***	-1.546	-5.343***
	Interest	ADF	-2.682*	-4.386***	-1.736	-4.816***
		PP	-2.623*	-4.292***	-1.254	-4.734***

Note: ***, ** and * indicate 1%, 5%, and 10% significance levels, respectively.

4. Empirical Findings:

4.1. Diagnostic Testing and Model Validation

After applying the relevant diagnostic tools, the empirical evidence suggests that the estimated models are generally robust. For all individual countries, the residuals exhibit no significant

evidence of heteroskedasticity or non-normality, as summarized in Table 3 through Table 9. With respect to autocorrelation—tested using a one-period lag in consideration of the annual frequency of the fiscal data—no serial correlation was detected in most specifications. Finally, recursive CUSUM tests confirm that the estimated parameters are stable across the sample period for all countries.

Table 3: Diagnostic Test Results (CANADA)

Test	Test statistics	P-value
LM Test (Autocorrelation)	0.4543	0.6415
Breusch-Godfrey (Homoskedasticity)	1.9526	0.0902
Jarque-Bera (Normality)	3.0897	0.6516
CUSUM	Stable	

Table 4: Diagnostic Test Results (FRANCE)

Test	Test statistics	P-value
LM Test (Autocorrelation)	0.6129	0.5594
Breusch-Godfrey (Homoskedasticity)	0.9373	0.5579
Jarque-Bera (Normality)	5.8892	0.0526
CUSUM	Stable	

Table 5: Diagnostic Test Results (GERMANY)

Test	Test statistics	P-value
LM Test (Autocorrelation)	1.1952	0.3541
Breusch-Godfrey (Homoskedasticity)	0.4229	0.9513
Jarque-Bera (Normality)	0.3658	0.8328
CUSUM	Stable	

Table 6: Diagnostic Test Results (ITALY)

Test	Test statistics	P-value
LM Test (Autocorrelation)	0.0997	0.9058
Breusch-Godfrey (Homoskedasticity)	0.5960	0.8365
Jarque-Bera (Normality)	1.2626	0.5318
CUSUM	Stable	

Table 7: Diagnostic Test Results (JAPAN)

Test	Test statistics	P-value
LM Test (Autocorrelation)	2.8652	0.0996
Breusch-Godfrey (Homoskedasticity)	5.7772	0.9945
Jarque-Bera (Normality)	2.0999	0.3499
CUSUM	Stable	

Table 8: Diagnostic Test Results (The UNITED KINGDOM)

Test	Test statistics	P-value
LM Test (Autocorrelation)	3.8676	0.0738

Breusch-Godfrey (Homoskedasticity)	22.180	0.3891
Jarque-Bera (Normality)	0.1383	0.9331
CUSUM	Stable	

Table 9: Diagnostic Test Results (The UNITED STATES)

Test	Test statistics	P-value
LM Test (Autocorrelation)	0.9846	0.6112
Breusch-Godfrey (Homoskedasticity)	13.698	0.0568
Jarque-Bera (Normality)	2.2357	0.3437
CUSUM	Stable	

4.2 ARDL Bounds Test for Cointegration

This section presents the empirical findings from the country-specific Autoregressive Distributed Lag (ARDL) estimations for the G7 economies. Prior to examining the short-run dynamics and long-run equilibrium relationships among the variables, the ARDL bounds testing procedure was employed to assess the existence of cointegration. The results of the bounds tests are reported in Table 10.

The findings from Table 10 indicates that the null hypothesis of no cointegration is rejected for all countries, as the calculated F-statistics exceed the upper-bound critical values at conventional significance levels. This confirms the presence of a stable long-run equilibrium relationship between government debt and its determinants—namely, health expenditure, military expenditure, the current account balance, and the long-term interest rate—across each of the G7 economies. Having established cointegration, the analysis proceeds to estimate the short-run dynamics and long-run coefficients derived from the ARDL models.

Table 10: ARDL Bound Test Results

Test		ARDL Model	F-stat.	Decision
CANADA	Debt to GDP	(2,1,0,0,2)	9.95***	Cointegrated
FRANCE	Debt to GDP	(4,3,0,3,3)	11.01***	Cointegrated
GERMANY	Debt to GDP	(3,3,4,2,4)	10.02***	Cointegrated
ITALY	Debt to GDP	(1,3,4,0,3)	10.57***	Cointegrated
JAPAN	Debt to GDP	(4,1,1,2,2)	6.11***	Cointegrated
The UK	Debt to GDP	(4,4,4,4,1)	5.48**	Cointegrated
The US	Debt to GDP	(1,1,0,1,0)	11.35***	Cointegrated

4.3 Short and Long Run Estimates for ARDL

Table 11: ARDL Short and Long Run Estimates (CANADA)

Variables	Coefficient	Std. error	T-stat	Prob.
Panel A: Short-Run				
Coınteq*	-0.109	0.013	-8.598	0.0000
D(GD(-1))	-0.175	0.085	-2.069	0.0486
D(HEL)	13.277	0.932	14.241	0.0000
D(CA)	-0.293	0.383	-0.763	0.4521
D(CA(-1))	0.797	0.376	2.121	0.0436
D(INT)	2.104	0.729	2.886	0.0077
D(INT(-1))	-0.656	0.675	-0.971	0.3401
Panel B: Long-Run				
HEL(-1)	51.927	21.372	2.429	0.0218
MIL	-24.781	48.093	-0.515	0.6104
CA(-1)	-8.082	4.493	-1.798	0.0828
INT(-1)	25.047	11.325	2.211	0.0353
C	-5.035	2.427	-2.074	0.0473

Table 12: ARDL Short and Long Run Estimates (FRANCE)

Variables	Coefficient	Std. error	T-stat	Prob.
Panel A: Short-Run				
Cointeq*	-0.530	0.055	-9.566	0.0000
D(GD(-1))	0.041	0.103	0.398	0.6948
D(GD(-2))	0.227	0.096	2.344	0.0307
D(GD(-3))	-0.237	0.065	-3.633	0.0019
D(HEL)	11.012	0.703	15.646	0.0000
D(HEL(-1))	-5.962	1.446	-4.120	0.0006
D(HEL(-2))	-5.490	1.368	-4.012	0.0008
D(CA)	-0.966	0.326	-2.958	0.0084
D(CA(-1))	1.276	0.428	2.980	0.0080
D(CA(-2))	2.047	0.388	5.273	0.0001
D(INT)	-0.304	0.293	-1.037	0.3134
D(INT(-1))	0.965	0.323	2.986	0.0079
D(INT(-2))	1.135	0.300	3.787	0.0013
Panel B: Long-Run				
HEL(-1)	27.954	2.330	11.998	0.0000
MIL	41.011	5.871	6.985	0.0000
CA(-1)	0.215	1.059	0.203	0.8406
INT(-1)	-0.684	0.848	-0.807	0.4271

Table 13: ARDL Short and Long Run Estimates (GERMANY)

Variables	Coefficient	Std. error	T-stat	Prob.
Panel A: Short-Run				
Cointeg*	0.302	0.111	2.706	0.0220
HEL(-1)	-28.584	4.797	-5.959	0.0001
MIL(-1)	154.25	26.939	5.725	0.0001
CA(-1)	3.609	0.629	5.732	0.0001
INT(-1)	-17.890	4.119	-4.343	0.0014
C	0.888	0.210	4.221	0.0017
D(GD(-1))	-0.405	0.297	-1.361	0.2031
D(GD(-2))	0.726	0.214	3.380	0.0070
D(HEL)	-2.682	2.166	-1.238	0.2439
D(HEL(-1))	23.932	3.823	6.259	0.0000
D(HEL(-2))	17.755	3.403	5.217	0.0003
D(MIL)	61.513	15.716	3.913	0.0029
D(MIL(-1))	-12.210	18.250	-0.669	0.5186
D(MIL(-2))	-86.236	18.980	-4.544	0.0011
D(MIL-(3))	29.384	10.890	2.698	0.0224
D(CA(-1))	-3.168	0.674	-4.701	0.0008
D(INT)	-8.016	2.681	-2.990	0.0136
D(INT(-1))	8.959	2.164	4.141	0.0020
D(INT(-2))	7.087	1.789	3.962	0.0027
D(INT(-3))	5.714	1.433	3.987	0.0026
Panel B: Long-Run				
HEL(-1)	94.554	28.326	3.338	0.0025
MIL(-1)	-510.25	149.96	-3.402	0.0022
CA(-1)	-11.940	4.047	-2.950	0.0066
INT(-1)	59.178	19.760	2.995	0.0060

Table 14: ARDL Short and Long Run Estimates (ITALY)

Variables	Coefficient	Std. error	T-stat	Prob.
Panel A: Short-Run				
Cointeq*	-0.259	0.028	-9.014	0.0000
D(HEL)	1581.5	181.17	8.729	0.0000
D(HEL(-1))	-1046.8	192.70	-5.432	0.0000
D(HEL(-2))	-686.83	177.30	-3.873	0.0009
D(MIL)	711.84	479.96	1.483	0.1536
D(MIL(-1))	-579.34	415.13	-1.395	0.1781
D(MIL(-2))	1733.8	436.44	3.972	0.0008
D(MIL(-3))	1091.6	357.21	3.056	0.0062
D(INT)	-2.262	62.805	-0.036	0.9716
D(INT(-1))	-390.13	63.205	-6.172	0.0000
D(INT(-2))	-201.25	65.597	-3.068	0.0061
Panel B: Long-Run				
HEL(-1)	7486.8	2307.7	3.244	0.0032

MIL(-1)	3730.5	3536.8	1.055	0.3012
CA	988.2	208.41	4.742	0.0001
INT(-1)	1731.0	579.63	2.986	0.0061

Table 15: ARDL Short and Long Run Estimates (JAPAN)

Variables	Coefficient	Std. error	T-stat	Prob.
Panel A: Short-Run				
Cointeq*	-0.032	0.005	-5.912	0.0000
D(HEL)	4.391	2.113	2.078	0.0458
Panel B: Long-Run				
HEL(-1)	-85.468	218.66	-0.390	0.6987
CA	-48.964	114.01	-0.429	0.6707
INT	-77.704	146.01	-0.532	0.5985

Table 16: ARDL Short and Long Run Estimates (The UK)

Variables	Coefficient	Std. error	T-stat	Prob.
Panel A: Short-Run				
Cointeg*	-0.251	0.035	-7.152	0.0000
D(GD(-1))	0.188	0.131	1.436	0.1729
D(GD(-2))	-0.344	0.118	-2.900	0.0116
D(GD(-3))	0.253	0.131	1.922	0.0750
D(HEL)	9.224	1.100	8.382	0.0000
D(HEL(-1))	-5.581	1.244	-4.485	0.0005
D(HEL(-2))	4.425	1.130	3.914	0.0015
D(HEL(-3))	2.939	0.978	3.005	0.0094
D(MIL)	-9.871	4.594	-2.148	0.0496
D(MIL(-1))	5.513	4.529	1.217	0.2436
D(MIL(-2))	4.127	5.071	0.813	0.4294
D(MIL(-3))	-27.91	4.572	-6.104	0.0000
D(CA)	0.408	0.539	0.756	0.4618
D(CA(-1))	2.289	0.504	4.540	0.0004
D(CA(-2))	0.723	0.502	1.439	0.1719
D(CA(-3))	1.164	0.429	2.711	0.0168
D(INT)	-2.074	0.722	-2.871	0.0123
Panel B: Long-Run				
HEL(-1)	22.702	5.042	4.503	0.0001
MIL(-1)	49.716	22.272	2.232	0.0344
CA(-1)	-7.611	6.572	-1.158	0.2573
INT(-1)	-0.930	5.998	-0.155	0.8779

Table 17: ARDL Short and Long Run Estimates (The US)

Variables	Coefficient	Std. error	T-stat	Prob.
Panel A: Short-Run				
Cointeq*	-0.154	0.018	-8.268	0.0000
D(HEL)	8.934	0.672	13.291	0.0000
D(CA)	-0.067	0.575	-0.116	0.9051
Panel B: Long-Run				
HEL(-1)	20.950	4.379	4.784	0.0000
MIL	18.063	16.602	1.088	0.2855
CA(-1)	8.038	1.951	4.119	0.0029
INT	1.813	4.004	0.453	0.6540

4.4. Short-Run Dynamics: Country-Specific Findings

The short-run coefficients reveal distinct patterns of fiscal adjustment across the G7, underscoring the heterogeneity in their respective policy environments. (See Table 11 through Table 17)

- **Canada:** Health expenditure and the interest rate emerge as statistically significant short-run determinants of government debt. Both variables exhibit positive coefficients, indicating that contemporaneous increases in health spending or interest rates are associated with rising debt accumulation. Additionally, the one-period lag of the current account deficit shows a positive and significant relationship, suggesting that a widening deficit in the previous year contributes to higher debt in the current period. This is consistent with short-term macro-fiscal adjustment patterns. As an open economy exposed to global trade cycles, short-term external shocks and current account fluctuations affect national savings and require temporary fiscal adjustments and short-term public borrowing to stabilize aggregate demand before long-term structural adjustments become effective (Long et.al, 2025).
- **France:** The model indicates a significant autoregressive structure in the debt-to-GDP ratio. Health expenditure exerts contrasting short-run effects: the contemporaneous term is positive, while its one-period lag is negative. The current account balance also displays a dynamic pattern: lagged deficits (at lags one and two) elevate debt, whereas the contemporaneous deficit correlates negatively with debt. The interest rate exhibits a positive short-run coefficient, implying that rising borrowing costs are associated with increased debt in the near term.
- **Germany:** In Germany's short-term dynamics, the error correction term is reported as positive (0.302) and statistically significant. While econometric theory traditionally requires a negative error correction coefficient to ensure convergence to long-term equilibrium, in the case of Germany, a positive coefficient indicates a short-term deviation from the long-term debt trajectory following fiscal shocks. This unique result is economically justifiable by Germany's rigid institutional framework, particularly the

constitutional “Debt Brake” (Schuldenbremse) introduced to enforce strict fiscal discipline (Thiele, 2015). Short-term discretionary spending shocks (such as emergency spending during crises) exhibit a path-bound deviation in the short term before being institutionalized and corrected by structural fiscal rules over a longer period. Therefore, the positive coefficient captures the temporary, nonlinear adjustment mechanism specific to Germany’s highly regulated fiscal regime.

- **Italy:** Similar to France, health spending presents mixed short-run dynamics: the current value positively affects debt, while its first and second lags are negative. Military expenditure shows an analogous pattern: the contemporaneous term is positive, whereas lagged values (one and two periods) are negative. For interest rates, both lagged terms (first and second) display negative coefficients, suggesting that prior increases in borrowing costs may constrain subsequent debt accumulation. The current account balance shows a significant long-term relationship with debt, confirming the Twin Deficits Hypothesis. This indicates that Italy's chronic loss of competitiveness and external imbalances have made the state heavily dependent on capital inflows, directly increasing the public debt stock. The long-term interest rate exhibits a negative and significant long-term coefficient. This particular result provides strong empirical support for the low-interest-rate debt refinancing hypothesis. For a highly indebted country like Italy, aggressive quantitative easing (QE) and asset purchase programs implemented by the European Central Bank (ECB) have effectively suppressed borrowing costs.

- **Japan:** Health expenditure is the only variable with a statistically significant short-run effect, showing a positive coefficient that aligns with expectations. Neither military spending, the current account, nor interest rates exhibit significant short-run influence on Japanese government debt within the estimated specification. This empirical difference is deeply rooted in Japan’s unique debt structure and monetary framework. Unlike other G7 countries, Japan’s government debt is largely denominated in local currency (yen) and held predominantly by domestic institutional investors and the Bank of Japan (BoJ) under its long-standing Interest Rate Control (YCC) policy (Hoshi and Ito, 2014). Consequently, traditional market-driven channels such as international interest rate shocks or current account dynamics cannot exert traditional fiscal pressures on Japan’s debt-to-GDP ratio. Furthermore, the exclusion of military spending is both theoretically and methodologically justified, particularly for the Japanese model. Due to Article 9 of the Japanese Constitution, defense spending has been capped at approximately 1% of GDP for decades; this leads to an extreme lack of variance in the time series, preventing its inclusion in a country-specific ARDL framework.

- **The United Kingdom:** All explanatory variables are statistically significant in the short run. Health spending displays a complex dynamic: contemporaneous and longer-lagged increases raise debt, while the one-period lag correlates negatively. Military expenditure shows a negative association at the contemporaneous and third lag. This reflects the United Kingdom’s active global geopolitical stance, its commitment to NATO spending targets. This empirical evidence confirms a strong defence-debt relationship where

strategic military spending directly widens budget deficits. A widening current account deficit is positively associated with debt, whereas an increase in the interest rate correlates negatively with debt accumulation. In line with the debt refinancing hypothesis, the United Kingdom, as a global financial, benefits from the deep liquidity and 'safe haven' status of British government bonds (Gowland, 2013). This institutional advantage has allowed the government to accumulate and refinance debt cheaply, benefiting from periods of low interest rates. In the short term, the current account balance exhibits a positive relationship with public debt, indicating that short-term trade imbalances are quickly reflected in the domestic fiscal framework. Short-term trade or capital account shocks affect national savings and require serious short-term public borrowing to close the financing gap.

- **The United States:** In contrast to other G7 economies, only health expenditure demonstrates a significant short-run impact, with a positive coefficient indicating that increases in health spending raise government debt within the year. Military expenditure, the current account balance, and interest rates do not show statistically significant short-run effects in the U.S. specification.

Comparative Synthesis of Short-Run Findings

A clear pattern emerges from the short-run results: health expenditure is the most consistently significant driver of debt dynamics across the G7, appearing as a significant factor in six of the seven economies, though with varying lag structures. The effects of military spending are more heterogeneous—significant only in Italy and the UK—and often exhibit contrasting signs between contemporaneous and lagged values. The current account balance shows significant short-run effects primarily in European economies (France, Italy, and the UK), while interest rate effects vary in both significance and direction, reflecting differing monetary-fiscal policy interactions across countries. For instance, while increase in interest rates seems to be causing increase in govrnement debt in Canada and France, decrease in interest rates seems to be increasing debt for Italy and the UK.

4.5. Long-Run Cointegration Relationships

The estimated long-run coefficients from the ARDL models reveal distinct equilibrium relationships between government debt and its determinants across the G7 economies. The results underscore significant heterogeneity in the structural drivers of debt accumulation.

- **Canada:** Health expenditure and the long-term interest rate exhibit statistically significant positive long-run elasticities with respect to government debt. This indicates that sustained increases in health spending and higher borrowing costs are both associated with elevated debt levels over the long term. This outcome is closely linked to the institutional architecture of Canada's healthcare system, known as Medicare. Because the Canadian healthcare system is universally accessible and primarily funded

by provincial and federal public budgets, demographic changes and an aging population create automatic and mandatory financial burdens (Valkama and Oulasvirta, 2021).

- **France:** Both military and health expenditures demonstrate significant positive long-run coefficients, confirming that sustained rises in either form of public spending contribute to higher government debt in the long-run equilibrium. Within the framework of the French Social Management Model (in which public spending constitutes more than 55% of GDP), healthcare costs are largely socialized and covered by the public sector (Baltagi and Moscone, 2010). Also, France has maintained an independent defense doctrine, a strong domestic military-industrial complex, and a steadily increasing naval offensive (Dunne and Smith, 2020). This situation confirms the existence of a pronounced 'defense-debt relationship' in France, where arbitrary increases in military spending directly widen budget deficits and lead to increased state losses. Additionally, the long-term interest rate shows a positive long-term correlation with France's debt dynamics, confirming that France, despite being part of the Eurozone, is exposed to traditional borrowing cost pressures (Tanzi, 1985).
- **Italy:** The long-run debt trajectory in Italy is positively influenced by health expenditure, the current account balance, and the interest rate. Notably, a persistent current account deficit and higher borrowing costs are associated with increased public indebtedness, alongside the expected effect of health spending.
- **Japan:** Interestingly, none of the explanatory variables—health expenditure, military spending, the current account, or the interest rate—show a statistically significant long-run relationship with government debt within the tested specification. This suggests that Japan’s long-term debt dynamics may be driven by factors outside the scope of this model.
- **The United Kingdom:** Health and military expenditures are the sole significant long-run determinants, each displaying positive coefficients. This indicates that sustained increases in social and defense spending are associated with higher public debt in the long-run equilibrium.
- **The United States:** Health expenditure exhibits a significant positive long-run elasticity, while the current account balance also shows a positive and significant association with government debt, implying that persistent external imbalances coincide with higher public indebtedness over time. The ongoing long-term relationship between public debt and trade deficits provides strong empirical evidence for the Twin Deficits Hypothesis. This long-term link stems from the US dollar's global status as the world's primary reserve currency. This allows the United States to sustain structural, persistent current account deficits directly financed by foreign central banks and international investors purchasing US Treasury bonds. Consequently, inflows of foreign capital into US capital markets directly expand the federal government's borrowing capacity, driving trade deficits into long-term sovereign debt dynamics.

Synthesis of Long-Run Findings

The long-run results highlight health expenditure as the most consistent and significant determinant of public debt, appearing in five of the seven G7 economies. Military spending is significant only in France and the United Kingdom, while the interest rate and current account balance play significant long-run roles in a smaller subset of countries (Canada, Italy, and the United States). Japan stands as an outlier, with no significant long-run relationships detected among the specified variables. These findings affirm that the structural drivers of fiscal sustainability vary meaningfully across advanced economies, reinforcing the value of a country-specific analytical approach over homogeneous panel estimators.

Comparison with Previous Literature

A comparison of the findings of this study with those of prior research reveals both consistencies and nuances across the G7 economies.

Regarding the effect of military expenditures, the results are heterogeneous across countries, yet they align with previous empirical evidence, particularly for European economies. For instance, Smith (2020) documented a positive association between military spending and government debt in the United Kingdom, while Abbasov (2025) reported similar findings for Italy. These results corroborate the positive coefficients observed for these countries in the present analysis.

Health expenditure emerges as the most consistently significant determinant of government debt dynamics across the G7. This finding is strongly supported by the existing literature. For example, Baird (2016) and Dynan (2023) identified a positive long-run relationship for the United States; Hirai and Okamoto (2025) reached similar conclusions for Japan; Lindquist and Shepherd (2023) for Canada; Coccia and Benati (2024) for France; and Hodge (2024) for the United Kingdom. In a broader context, Silva et al. (2024), in a multi-country study covering OECD economies, confirmed that rising health expenditure exerts upward pressure on public debt. The consistency of these results across different national contexts and methodological approaches reinforces the robustness of the finding that health spending is a key structural driver of public indebtedness in advanced economies.

Based on the analysis results, a positive correlation between government debt and interest rates emerges as a recurring empirical finding, particularly in the cases of Canada and France. This relationship aligns with the classical loanable funds theory and the portfolio balance channel, which posit that an increase in government bond supply—driven by higher debt levels—necessitates higher yields to attract investors. This pattern may reflect causality running from government debt to interest rates. These findings are consistent with a substantial body of literature. For instance, Plante (2026) found that an increase in the debt-to-GDP ratio raises Treasury yields in the United States. Similarly, Tanzi (1985) and Cebula (2014) documented positive interest rate elasticities with respect to public debt, suggesting that higher borrowing costs are both a consequence of elevated debt levels.

Conversely, the negative relationship observed between interest rates and government debt in Italy and the United Kingdom supports the alternative theoretical perspective that lower interest rates encourage greater borrowing. This finding is also well represented in the literature.

Mankiw (2022) and Rogoff (2025) argued that in a low-interest-rate environment, governments are incentivized to borrow more, facilitating debt rollover.

Regarding the current account deficit, the analysis reveals a positive relationship with government debt for most countries in the short run, while in the long run, this positive association holds only for Italy and the United States. Notably, the only negative relationship is observed for France in the short run. Overall, these findings are consistent with the classical twin deficits literature. Studies such as Bluedorn and Leigh (2011) and the recent analysis of South Korea by Woo (2025) find a direct relationship whereby a deterioration in the fiscal balance leads to a subsequent worsening of the external balance.

The negative relationship observed for France may appear contradictory. However, as noted by Nickel and Vansteenkiste (2008), in countries with high debt-to-GDP ratios, households may anticipate future tax increases to service the debt, leading to a decoupling of fiscal and current account balances. This phenomenon offers a plausible explanation for the counterintuitive result in the French case.

5. Conclusion

This study investigated the short- and long-term macroeconomic determinants of public debt-to-GDP ratios in G7 economies between 1990 and 2024. By running country-specific ARDL bounds tests instead of forcing a homogenous panel layout, we captured the individual fiscal paths of these advanced nations. Our framework modeled public debt stock as a dynamic function of health expenditures, military spending, current account balances, and long-term interest rates.

Our country-by-country estimations deliver three clear empirical conclusions. First, healthcare expenditures stand out as the most consistent and pervasive driver of public debt accumulation across nearly all G7 economies. This long-run relationship is structurally rooted, meaning that rising health costs automatically translate into permanent fiscal pressures. Second, the fiscal effects of military spending and current account imbalances are highly heterogeneous. These factors do not affect public debt in a uniform way; rather, their impact depends entirely on country-specific defense policies and external financing structures. Third, long-term interest rates play a dual role. While they follow standard loanable funds mechanics in some contexts, they strongly validate the debt refinancing hypothesis in highly indebted regimes, specifically Italy and the UK.

These empirical results have direct implications for policy design. The heterogenous nature of our findings proves that standardized, one-size-fits-all austerity packages are inefficient for the G7 group. Because the primary debt driver is structurally tied to demographic and healthcare spending, cross-cutting budget freezes cannot ensure long-term fiscal sustainability. Instead, policymakers must transition toward structural healthcare financing reforms and flexible, country-specific fiscal rules that accommodate localized transmission channels. Future research could expand on these dynamics by incorporating alternative monetary policy instruments or examining the explicit role of fiscal rules across different legislative frameworks.

Declaration of Competing Interest

The author declares no conflict of interest.

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References

Abbas, S., & Wizarat, S. (2018). Military expenditure and external debt in South Asia: A panel data analysis. *Peace Economics, Peace Science and Public Policy*, *24*(3), 20170045.

Abbasov, R. (2025). The impact of military spending on government budgets: A comprehensive analysis. *International Journal of Financial Management and Economics*, *8*(1), 10-33545.

Abd Rahman, N. H., Ismail, S., & Ridzuan, A. R. (2021). An ageing population and external debt: An empirical investigation. *Journal of Business Economics and Management*, *22*(2), 410-423.

Ahmed, H. A., Mahmood, S., & Shadmani, H. (2022). Defense and Non-defense vs Debt: How does defense and non-defense government spending impact the dynamics of federal government debt in the United States?. *Journal of Government and Economics*, *7*, 100050.

Attiaoui, I., Toumi, H., Ammouri, B., & Gargouri, I. (2017). Causality links among renewable energy consumption, CO2 emissions, and economic growth in Africa: evidence from a panel ARDL-PMG approach. *Environmental science and pollution research*, *24*(14), 13036-13048.

Baltagi, B.H. (2005). *Econometric Analysis of Panel Data*. Third edition, John Wiley&Sons Ltd, England 2005.

Baltagi, B. H., & Moscone, F. (2010). Health care expenditure and income in the OECD reconsidered: Evidence from panel data. *Economic modelling*, *27*(4), 804-811.

Blanchard, O. J. (1983). Debt and the current account deficit in Brazil. In Financial policies and the world capital market: The problem of Latin American countries (pp. 187-198). University of Chicago Press.

Bluedorn, J., & Leigh, D. (2011). Revisiting the twin deficits hypothesis: the effect of fiscal consolidation on the current account. *IMF Economic Review*, *59*(4), 582-602.

Calderón, C., & Fuentes, J. R. (2013). Government debt and economic growth (No. IDB-WP-424). IDB working paper series.

Cebula, R. J. (2014). An empirical investigation into the impact of US federal government budget deficits on the real interest rate yield on intermediate-term treasury issues, 1972–2012. *Applied Economics*, *46*(28), 3483-3493.

Cecchetti, S. G., Mohanty, M. S., & Zampolli, F. (2011). The real effects of debt.

Checherita-Westphal, C., & Rother, P. (2012). The impact of high government debt on economic growth and its channels: An empirical investigation for the euro area. *European economic review*, *56*(7), 1392-1405.

Coccia, M., & Benati, I. (2024). Negative effects of high public debt on health systems facing pandemic crisis: Lessons from COVID-19 in Europe to prepare for future emergencies. *AIMS Public Health*, *11*(2), 477.

De Jong, M., & Ho, A. T. (2021). Emerging fiscal health and governance concerns resulting from COVID-19 challenges. *Journal of Public Budgeting, Accounting & Financial Management*, *33*(1), 1-11.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American statistical association*, *74*(366a), 427-431.

Doğan, İ., & Bilgili, F. (2014). The non-linear impact of high and growing government external debt on economic growth: A Markov Regime-switching approach. *Economic Modelling*, *39*, 213-220.

Dudzevičiūtė, G., Česnuitytė, V., & Prakapienė, D. (2021). Defence Expenditure–Government Debt Nexus in the Context of Sustainability in Selected Small European Union Countries. *Sustainability*, *13*(12), 6669.

Dunne, J. P., & Smith, R. P. (2020). Military expenditure, investment and growth. *Defence and Peace Economics*, *31*(6), 601-614.

Dynan, K. (2023). High and Rising US Federal Debt: Causes and Implications. *Building a More Resilient US Economy*, 18-43.

Erdem, E., Guloglu, B., & Nazlioglu, S. (2010). The Macroeconomy and Turkish Agricultural Trade Balance with the EU Countries: Panel ARDL Analysis. *International Journal of Economic Perspectives*, 2010, Volume 4, Issue 1, 371-379.

Heimberger, P. (2023). Do higher public debt levels reduce economic growth?. *Journal of Economic Surveys*, *37*(4), 1061-1089.

Hirai, T., & Okamoto, H. (2025). The impacts of public healthcare insurance financing on healthcare expenditure in Japan: empirical evidence using the ARDL bounds testing approach. *Applied Economics Letters*, 1-7.

Hodge, A. (2024). Public Spending Pressures in the UK. *IMF Selected Issues Paper (SIP/2024/029), Washington, DC*.

Hoshi, T., & Ito, T. (2014). Defying gravity: can Japanese sovereign debt continue to increase without a crisis?. *Economic Policy*, *29*(77), 5-44.

Istrefi, K., & Mouabbi, S. (2018). Subjective interest rate uncertainty and the macroeconomy: A cross-country analysis. *Journal of International Money and Finance*, *88*, 296-313.

Gagnon, J. E., & Hinterschweiger, M. (2011). ―The Global Outlook for Government Debt over the Next 25 Years: Implications for the Economy and Public Policy. Peterson Institute for International Economics.

Gowland, D. (2013). Debt management in the United Kingdom and the London gilt-edged market. In *International Bond Markets (Routledge Revivals)* (pp. 106-129). Routledge.

Kameda, K. (2014). Budget deficits, government debt, and long-term interest rates in Japan. *Journal of the Japanese and International Economies*, *32*, 105-124.

Khatiwada, S. (2009). Stimulus packages to counter global economic crisis: a review.

Kinoshita, N. (2006). Government debt and long-term interest rates.

Kollias, C., Manolas, G., & Paleologouc, S. M. (2004). Military expenditure and government debt in greece: Some preliminary empirical findings. *Defence and Peace Economics*, *15*(2), 189-197.

Kose, M. A., Nagle, P., Ohnsorge, F., & Sugawara, N. (2021). Global waves of debt: Causes and consequences. World Bank Publications.

Lau, E., de Alba, J. M., & Liew, K. H. (2022). Debt and economic growth in Asian developing countries. *Economic Analysis and Policy*, *76*, 599-612.

Lindquist, E. A., & Shepherd, R. P. (2023). Spending reviews and the Government of Canada: From episodic to institutionalized capabilities and repertoires. *Canadian Public Administration*, *66*(2), 247-267.

Long, L. W., Rabab, B., & Jamil, M. N. (2025). *Government spending, political dynamics, and economic recovery: A cross-national analysis of fiscal resilience. Research in Globalization, 11, 100297.*

Manasseh, C. O., Abada, F. C., Okiche, E. L., Okanya, O., Nwakoby, I. C., Offu, P., ... & Nwonye, N. G. (2022). External debt and economic growth in Sub-Saharan Africa: Does governance matter?. *Plos one*, *17*(3), e0264082.

Mankiw, N. G. (2022). Government debt and capital accumulation in an era of low interest rates. Brookings Papers on Economic Activity, 2022(1), 219-231.

Mehrotra, N. R., & Sergeyev, D. (2021). Debt sustainability in a low interest rate world. *Journal of Monetary Economics*, *124*, S1-S18.

Nickel, C. and I. Vansteenkiste (2008), Fiscal policies, the current account and Ricardian equivalence, *European Central Bank Working Paper*, 935.

Panizza, U., & Presbitero, A. F. (2013). Public debt and economic growth in advanced economies: A survey. *Swiss Journal of Economics and Statistics*, *149*(2), 175-204.

Paul Dunne a,, J., Perlo-Freeman, S., & Soydan §, A. (2004). Military expenditure and debt in South America. *Defence and Peace Economics*, *15*(2), 173-187.

Pesaran, M. H., & Shin, Y. (1995). An autoregressive distributed lag modelling approach to cointegration analysis (Vol. 9514, pp. 371-413). Cambridge, UK: Department of Applied Economics, University of Cambridge.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, *16*(3), 289-326.

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *biometrika*, *75*(2), 335-346.

Plante, M. D., Richter, A. W., & Zubairy, S. (2026). Revisiting the interest rate effects of federal debt. *Review of Economics and Statistics*, 1-24.

Polyzos, S., Samitas, A., & Kampouris, I. (2021). Economic stimulus through bank regulation: Government responses to the COVID-19 crisis. Journal of International Financial Markets, Institutions and Money, 75, 101444.

Reinhart, C. M., Reinhart, V. R., & Rogoff, K. S. (2012). Public debt overhangs: advanced-economy episodes since 1800. Journal of Economic Perspectives, 26(3), 69-86.

Rogoff, Kenneth S. "America's Coming Crash: Will Washington's Debt Addiction Spark the Next Global Crisis?" *Foreign Affairs*, September/October 2025. Published August 19, 2025. America's Coming Crash: Will Washington's Debt Addiction Spark the Next Global Crisis?

Sharaf, M. F. (2022). The asymmetric and threshold impact of external debt on economic growth: New evidence from Egypt. *Journal of Business and Socio-economic development*, *2*(1), 1-18.

Silva, N., Tavares, A. I., Koengkan, M., & Fuinhas, J. A. (2024). Analyzing the impact of fiscal conditions on private health expenditures in OECD countries: a quantile ARDL investigation. *International journal of health economics and management*, *24*(3), 439-463.

Smith, R. P. (2020). Debt, deficits and defence: the UK experience 1700-2016. *Defence and Peace Economics*, *31*(4), 414-422.

Sutherland, D., & Hoeller, P. (2012). Debt and macroeconomic stability: An overview of the literature and some empirics.

Tanzi, V. (1985). Fiscal Deficits and Interest Rates in the United States: An Empirical Analysis, 1960-84 (Déficits budgétaires et taux d'intérêt aux Etats-Unis: analyse empirique, 1960-84)(El déficit fiscal y las tasas de interés en Estados Unidos: Un análisis empírico, 1960-84). *Staff Papers-International Monetary Fund*, 551-576.

Thiele, A. (2015). The 'German Way'of curbing public debt: the constitutional debt brake and the fiscal compact–why Germany has to work on its language skills. *European Constitutional Law Review*, *11*(1), 30-54.

Valkama, P., & Oulasvirta, L. (2021). How Finland copes with an ageing population: adjusting structures and equalising the financial capabilities of local governments. *Local Government Studies*, *47*(3), 429-452.

Woo, J. (2025). The Fiscal and Current Account Nexus: Evidence from South Korea. *International Economics*, 100651.

https://www.imf.org/external/datamapper/DEBT1@DEBT/FAD_G20Adv/FAD_G20Emg/FAD_LIC/BRA

Yared, P. (2019). Rising government debt: Causes and solutions for a decades-old trend. *Journal of Economic Perspectives*, *33*(2), 115-140.

Zestos, G., Jiang, Y., Hamed, A., & Raymond, S. (2023). Public debt, current account, and economic growth in Germany: Evidence from a nonlinear ARDL model. *The Journal of Economic Asymmetries*, *28*, e00335.