Defusing the Ticking Time Bomb: Growing U.S. Debt and Declines in Real GDP Growth

By

VINCENT C. MONTANTI

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL OF BUSINESS
AT THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF BUSINESS ADMINISTRATION

UNIVERSITY OF FLORIDA

2023

To Dad and Mom

I will always be your “doctor,” and thanks for believing in me always. As you have always told me, "Do not be afraid to dream big dreams."

Your son, partner, and best friend

ACKNOWLEDGMENTS

To Dad:

Just over three years ago, I made a promise to you that I would continue my education journey and obtain my doctorate as a small way of expressing my gratitude for always being my support and believing in me. Unfortunately, we unexpectedly lost you on August 26th, 2021 (after I completed my first year). You and Mom taught me always to follow principles and live by my word, no matter what obstacle or roadblock may disrupt the journey. Thus, I promised you that I would follow through with this endeavor three years ago and stand by my word no matter what.

To the finest mentor, I could ever ask for and someone from whom I still learn. Love you always, and your legacy lives on through me.

Your son, partner, and mentee,

Vince

To my wife, Carley

I also want to express my heartfelt thanks to my loving wife, Carley, who has and continues to be my best friend, my support and motivation. Thank you for your patience as I went through this journey. I first had to fulfill my vow to my dad, and now I am dedicated to being the husband you deserve and want.

Your partner in life,

Vince

Abstract:

The United States increases its debt yearly; however, since 2010, the debt has grown exponentially from $13.5 trillion to over $31 trillion, exacerbated by the COVID-19 recession (Congressional Budget Office, 2022). As a result, even though the United States is still considered the world's ultimate superpower, the debt-to-GDP ratio is approaching a level we have not seen in nearly 80 years. This present study addresses three questions: Considering the stylized facts of the debt-to-GDP ratio, is there an optimal debt-to-GDP ratio before real economic growth starts to be negatively impacted? What are the consequences of a sustained, high debt-to-GDP ratio? Finally, what explains the temporal and cross-sectional variation in the debt-to-GDP ratio, and how should United States policymakers manage it? Using a two-part analysis, including exploratory research and an econometric threshold regression model, I examine the debt-to-GDP ratios and real economic growth exclusively for the United States over 70 years, from 1951 to 2022. My estimation identifies a threshold level of 62.75% total public debt-to-GDP ratio. When debt rises above this threshold, each additional percentage of debt reduces the annual real GDP growth. Since the United States is nearly double the threshold level, I identify five historical strategies that policymakers can implement to improve this ratio, including financial repression, debt restructuring, monetization of debt, strong economic growth, and fiscal consolidation. I conclude that the ultimate and most impactful solution combines fiscal consolidation, debt monetization, and financial repression.

Introduction:

The Congressional Budget Office (CBO) predicts that the public's share of the government debt will continue to rise and reach 195 percent of GDP by 2050, assuming laws governing taxes and expenditures are left unaltered (CBO, 2022). With rising interest rates, the

economy is particularly vulnerable to inflationary pressures. On top of decreasing economic vibrancy and overall reduced national revenue growth, our nation's ever-increasing debt burden puts us at risk for a catastrophic fiscal crisis or extensive devaluation in Treasury assets. Most recently, the COVID-19-induced recession led to an unprecedented shock to the financial system, resulting in the most prominent economic contraction since the Great Depression. In response, we witnessed some of the most historically extreme global monetary and fiscal responses, both in speed and scale to avert a prolonged recession in their countries (IMF, 2020).

Surge in the Central Bank's Debt:

However, we have also seen an incredible surge in the central banks' debt. The average advanced economy's government debt-to-GDP ratio surged by the highest increase of 20% in one year (IMF, 2020), and total US outstanding government debt stands at just over $31 trillion (US National Debt Clock, 2023). According to the CBO (2020), total interest payments on the government's debt could reach $580 billion for the fiscal year in 2022, an increase from prior years' $399 billion interest expense. At this level, the Federal Government spends more on interest payments than Social Security disability insurance, food, nutrition services, housing, and transportation.

Unfortunately, unlike many corporations that refinanced debt to record-low interest rates, the Treasury Department maintained its historical issuance schedule. To further compound this problem, the Fed will likely have to refinance over 40% of existing debt before 2025 (Gillum, 2022). Currently, the weighted average coupon for existing debt is slightly under 1.8%; however, with the current U.S.'s yield curve producing average yields above 4%, the higher coupon payments could push debt service costs closer to $1 trillion annually (Gillum, 2022). If history is

any guide, when debt-to-GDP ratios remain at indefensibility high levels and cross their "tipping point," the country faces dire consequences.

Present Situation:

Following 2008's Great Recession, the United States 'inflation rate was below 2%, the U.S. national debt was slightly over 20 trillion dollars, and the debt-to-GDP ratio was at 106% (Stuart, 2018). Fast forward to the present, and as of September 30, 2022, the United States has a current unemployment rate of 3.7%, inflation is now at 8.2%, the U.S. national debt has grown to over $31 trillion, and the US debt-to-GDP ratio is now at 124% (US Debt Clock, 2022).

The U.S. debt is arguably one of the world's safest and most secure investments, but will foreign investors perceive the same to be true as the debt continues to grow? For one, the Government's ability to deal with future economic crises is fragile. The high debt-to-GDP ratio creates an environment with inflation, global supply chain disruptions, and bottlenecks. Furthermore, while economic growth is likely to influence the public debt-to-GDP ratio negatively (Reinhart & Rogoff, 2010), the current environment might compound the scale of the problem and make the undertaking of reversing high debt more problematic. Going forward, policymakers in the United States face critical decisions on improving the debt-to-GDP ratio before it is too late.

Purpose of Research:

To address these concerns, this research examines the debt-to-GDP ratios and real economic growth exclusively for the United States over 70 years, from 1951 to 2021. After observing my dataset with cluster analysis, I used Hansen's threshold least squares regression model (2000) to identify the specific debt-to-GDP ratio's tipping point when the United States' economic growth slows.

Research Questions:

This present study addresses three questions. First, what are the stylized facts of the debt-to-GDP ratio, and if so, is there an optimal debt-to-GDP ratio? Second, what are the consequences of a sustained, high debt-to-GDP ratio? Third, what explains the temporal and cross-sectional variation in the debt-to-GDP ratio, and how should U.S. policymakers manage it?

Contributions to Literature:

This research contributes to the literature by using exploratory and economic research to examine how long-run average public debt-to-GDP ratios affect average growth rates and provides practical solutions specific to the United States to improve the current ratio without a severe economic contraction. The research differs from earlier studies in three important ways.

First, my research validates and further supports the notion that sustained expansionary monetary and fiscal policy coupled with a high debt-to-GDP ratio is problematic for long-run economic growth. As a recent example, in the early stages of economic contraction due to the COVID-19 crisis in March 2020, policymakers deployed extraordinarily accommodating monetary and fiscal policies to spur economic growth during a worldwide lockdown. However, two years later, the world economy, including the United States', faces the highest inflation rates in the last 40 years (Ivanova, 2022). Should inflation become a more permanent threat, the Government could curb it with restrictive policy decisions such as raising interest rates, increasing tax rates, reducing government spending, and decreasing government purchasing securities. However, these actions could create a full-blown consumer recession that might be more severe than a highly inflationary environment.

Second, by focusing exclusively on the United States, I pinpoint mathematically the country-specific tipping point of when any further increase in the debt-to-GDP ratio starts to

slow real economic growth. Previous research has delved into the long-standing relationship between debt and economic growth, including Reinhart and Rogoff's (2010) seminal work examining this dynamic across nearly 200 years of multi-country data with broader country groupings. With this country-specific analysis, I can also delve into some of the peculiarities of the United States as the world's leading superpower, such as the world's reserve currency and the Fed's access to a printing press to employ unconventional monetary policy.

Third, while I analyze various countries' historical responses to improve the ratios, I will identify and recommend specific solutions to the United States based on the country's idiosyncrasies and structure.

Research Outline:

I divide my research into seven sections. First, I will provide stylized facts about the relationship between debt-to-GDP ratio and real economic growth and what has caused the ratio to increase or decrease over time. Second, I will provide a consensus on a country's average debt-to-GDP ratio before reaching a "tipping point," defined as a negative relationship between expansionary debt and economic growth (Caner et al., 2010, p.2). Third, I will explain the temporal and cross-sectional variation in the debt-to-GDP ratio and how to manage it effectively. Fourth, I will conduct my analysis by first undergoing exploratory research on the United States' debt-to-GDP ratio using descriptive statistics and analyzing histograms and scatterplots to examine the trends with this relationship. Then, I will develop an econometric model to identify a specific ratio as the "tipping point." In the fifth section of my research, I analyze various global policymakers' successes in improving their debt-to-GDP ratio by 25% post-World War II through different policy decisions. My sixth section focuses on the United States' historically successful debt-reduction episodes by examining the five strategies that improve its debt-to-GDP

ratio. Finally, my seventh section proposes the appropriate solution for the United States to improve its debt-to-GDP ratio with practical implications for economists and policymakers amid this challenging economic environment.

Literature Review:

What are the stylized facts of the debt-to-GDP ratio, and what is an optimal debt-to-GDP ratio if one exists?

In this literature review section, I summarize research on the ideal debt-to-GDP ratio that nations should maintain before they reach a "tipping point" that decreases economic growth. My research reveals two empirical stances. The first is that public debt levels and economic growth have a linear, adverse, and causal relationship, with higher debt levels resulting in slower economic growth. The second, and as supported by Bell (2015), is the presence of a "debt cliff," according to which economic development rapidly decreases once the debt-to-GDP ratio crosses a predetermined "cliff." However, based on my examination of the literature, the relationship between public debt and growth needs to be more defined and varies considerably by country classification (Bell et al., 2015). Moreover, according to Chen and Lee (2005), decreasing government spending has two contrarian effects.

On the one hand, increasing government spending can improve economic growth due to the direct consumption effect. In other words, consumers' ability to spend more money on goods and services improves as their actual income rises. On the other hand, increasing government spending can stunt economic growth due to the crowding-out impacts on private expenditures. As a result, government spending can positively or negatively affect a country based on its unique threshold level. This ideal level depends on the relationship between the government investment that might increase private consumption instead of decreasing it.

According to Kumar and Woo (2010), once the threshold level is reached, if the public debt-to-GDP ratio surpasses 10 points, the GDP growth rate falls by .25% (p.9). Also, they note that a negative relationship exists between the increase in the real GDP per person and the level of public debt. The researchers also draw attention to two other problematic risks. One, is that the relationship between debt-to-GDP and real economic growth can be correlated with the error term presenting endogeneity problems. Second, the risk is that this relationship suffers from reversal causality in that a slowdown in economic activity predicts higher public debt-to-GDP ratio and not vice versa. To test this, the authors employed lagged values of public debt, instrumental variables, and the General Method of Moments (GMM) estimation approach. By doing so, Kumar and Woo contend that neither endogeneity nor reverse causality are applicable and prove that as debt-to-GDP increases, GDP growth slows. Several other researchers also validate this notion, which I will highlight below.

Reinhardt and Rogoff (2010)

Reinhart and Rogoff (2010), arguably one of the most prominent researchers in this field, studied a multi-country dataset over two centuries (1790 to 2009) and delved into the relationship between economic growth and inflation at different government debt levels. Their dataset included over 3700 annual observations, and they found that the correlation between government debt and real GDP growth is weak for debt-to-GDP levels below 90% of GDP (p.3). When higher than 90%, the growth rates fall by 1.2 percent. They also discovered that emerging markets have a lower debt threshold before the annual growth rate declines. Once external debt reaches 60% of GDP for emerging markets, yearly growth rates decline by 2% (p.3). In 2012, Reinhart and Rogoff expanded their research. They also identified periods of substantially high public debt when public debt to GDP was higher than 90 percent for at least five years (p.4).

Overall, their research identified 20 occurrences (out of 26 countries) that lasted more than a decade. Surprisingly, even when countries face this high ratio, they take longer to experience an economic contraction since the cost of borrowing money, as evidenced by real interest rates or access to capital, only slowly increases in the capital markets. In Reinhardt and Rogoff's sample size, short-term, real interest rates were lower for 11 of the 26 countries even though public debt-to-GDP was above the 90 percent threshold.

Support for Reinhart and Rogoff's (2010) study

Since Reinhart and Rogoff's 2010 seminal research, many other researchers have supported their claims and the negative consequences of a country operating at a high debt-to-GDP ratio. For instance, Caner, Grennes, and Koehler-Geib (2010) advance Reinhart and Rogoff's (2010) study by running a pooled least square regression for a sample below and above Reinhart and Rogoff's threshold at the 90 percent debt-to-GDP ratio. Many researchers focus on this level, naming it a tipping point because several countries have either crossed or may soon reach this ratio level and run the risk of staying above it for years (Pozen, 2010). Caner, Grennes, and Koehler-Geib (2010) discover that for the 79 countries, the average long-run public debt to GDP's threshold level is 77.1 percent (p.6). Above this level, each percentage point in the public debt ratio to GDP reduces economic growth by 0.0174 percentage points annually and is statistically significant (p.6). Contrarily, when current debt levels are below this threshold, further fiscal spending and government debt increase economic growth. This effect is statistically significant, and the coefficient is .065. These findings support the theory that credit limitations are more accommodating at moderate debt levels. Furthermore, the threshold for advanced and non-advanced economies differs significantly. After repeating the calculations for emerging

countries, Caner, Grennes, and Koehler-Geib (2010) also identified a lower debt-to-GDP ratio of 64 percent when economic growth turned negative.

Baum et al. (2012) and Checherita-Westphal and Rother (2012)

Researchers Baum et al. (2012) and Checherita-Westphal and Rother (2012) applied instrumental variables to study their effect on debt and growth. The goal was to explore if a significant threshold value exists when any additional increase in debt hurts the GDP growth rate. To account for endogeneity issues, the authors used the real GDP growth rate as the endogenous variable and the debt-to-GDP ratio as the dependent variable. Their research found that deficit spending positively impacts economic growth at low debt levels, but this positive impact disappears or becomes negative at higher debt levels. On average, the threshold level occurs between a 60 to 115% debt-to-GDP ratio, which varies based on a country's income and financial strength (p.10). Baum and his team of researchers also controlled for other potentially influential variables, including population growth, secondary education, and unemployment rates, and structured both a dynamic and a non-dynamic panel estimation model.

However, after developing two separate models, both models found a debt threshold value approximately at 0.664, which is significant at the 10% level (p.11). In other words, when the debt ratio is less than 66.4% of GDP, additional debt increases GDP. Conversely, if the ratio is above 66.4%, additional debt reduces the positive impact of economic growth, and any positive effects of GDP begin to dissipate.

Limitations of Reinhart and Rogoff's Relationship between debt and GDP

While Reinhart and Rogoff's (2010) study is beneficial, multiple factors, including the level of debt, a country's macroeconomic environment, and monetary and fiscal policies, can confound the association between increases in debt and the economic growth level. Often, this

event becomes problematic with omitted variables, and even reverse causality may arise when real GDP is regressed on the public debt (De Soyres et al., 2022). The forecast errors described above can be considered exogenous changes, absent any unexpected policy changes, especially over short-term forecast horizons, per the literature (e.g., Auerbach and Gorodnichenko, 2012; Abiad, 2016).

Opposing views from Reinhardt and Rogoff (2010)

Several studies question the 90% debt level proposed by Reinhart and Rogoff's 2010 study being universally applicable. Minea and Parent (2012) state that the tipping point is higher at 115% (p.4). Reinhart and Rogoff (2010) contend that the 90% debt threshold is consistent with most nations; nevertheless, Égert's 2013 analysis discovered that Reinhart and Rogoff's findings were heavily affected by a single significant outlier: real GDP growth of -11% in 1946 (p.4). This anomaly is more apparent with a narrower sample range if one removes this year from 1946–2009 to 1947–2009. By leaving out this outlier in 1946, the higher debt ratio changed from -2% to 1% (p.7). Therefore, by excluding 1946 from the initial period, GDP growth does not decelerate even as the debt-to-GDP ratio exceeds 90%.

Herndon et al. (2013)

Herndon, Ash, and Pollin (2013) also refute Reinhart and Rogoff's claims. After reproducing the same dataset, they demonstrated that there is no stylized fact and that the association between public debt and GDP differs significantly by country and historical period. They tested their analysis from the same sample period, including the controversial period originally omitted in Reinhart and Rogoff's dataset. They employed a nonlinear modeling framework to explain the correlation between debt and GDP and debt-to-GDP ratios exceeding 90%. Using descriptive statistics, Herndon et al. (2013) found selective omissions of available

entries for three countries, resulting in spreadsheet errors. They also found some unusual weightings of statistics, creating a spurious relationship with the debt-to-GDP ratio threshold of 90% and a decline in real economic growth. Finally, they explain that Reinhart and Rogoff had methodological errors that increased the number of countries in the dataset exceeding the debt-to-GDP ratio of over 90% (p.8).

Herndon et al. (2013) also discuss the likelihood of reverse causality. They contend that the association's apparent non-linearity— a steep slope for the debt at lower levels and a shallower slope for the debt at higher levels —indicates reverse causality because tipping points would be expected to produce steeper slopes at higher debt levels (p.12).

Égert's (2013) seminal research and conclusions

Several other researchers concluded that the adverse effects of debt-to-GDP occur at lower threshold levels. For example, Égert (2013) proposed with an econometric model (employing a nonlinear threshold) that real GDP growth is significantly lower when the government's debt-to-GDP ratio starts to exceed 30% (p.5). Égert concluded on several points on this phenomenon. First, the lower debt threshold applies to emerging and developed countries, including the United States, but the adverse effects vary based on the country's classification. For instance, according to his research, the effects on the economy of Belgium were relatively minor compared to those on Germany and the United States. Second, there is much ambiguity surrounding the tipping point for countries, including Austria, Canada, and Ireland, whose tipping points varied between 30% and 70% (p.13). Thus, the tipping point is sensitive to modeling decisions, especially the bare minimum of observations that make up the regime. Third, a nonlinear relationship is nonexistent between public debt and growth in other nations, like Australia and Spain. In these two nations, debt and growth do not have an inversely

proportional relationship. Finally, even if non-linearity can be seen in some nations like Denmark, Italy, and Japan, the connection between debt and growth is favorable under conditions of a large debt.

Less Developed Countries and Effect on Debt-to-GDP and Economic Growth: Caner, Grennes, and Koehler-Geib (2010), Frankel and Romer (1999), and Levine and Renelt (1992):

Most research shows that the difference in the threshold level between developed and developing countries implies that most developing countries encounter growth rate challenges at lower debt-to-GDP levels than developed countries. For example, researchers Caner, Grennes, and Koehler-Geib found Nicaragua as the most extreme scenario. During their 28-year study period, high indebtedness in Nicaragua decreased real GDP growth by 4.7 percentage points annually, equal to a 264-percentage point loss (Caner et al., 2010). This scenario demonstrates the significant outcomes when a country remains above the debt threshold levels over a prolonged period.

Frankel and Romer (1999) and Levine and Renelt (1992) also found that the debt-to-GDP ratio tipping points react differently within low-income nations with less established domestic financial markets. Debt levels in low-income countries also affect growth via the inflation channel in various ways. For instance, governments in underdeveloped bond markets have turned to sell bonds to their central banks to monetize their debt. As a result, empirical research in low-income nations has discovered a link between fiscal deficits and inflation, but there is no link between wealthier and more developed countries (Catao & Terrones, 2005; Pattillo, Poirson, and Ricci, 2004).

Review of Related Literature: What Are the Consequences of a Sustained, High Debt-to-GDP Ratio?

Four views of government debt to economic growth:

The literature has four distinctive views on how government debt affects economic growth. The first view is conventional and states that government debt produces positive demand results in the short term, but long-term economic activity is reduced by crowding-out consequences (Elmendorf & Mankiw, 1998). The second view is grounded in Keynesian theory, which claims that as wealth and income rise, the wealth effect boosts consumer demand for goods. Therefore, this effect promotes more significant government spending and lowers taxes to stimulate demand and GDP (Jahan et al., 2014). The third view is the Ricardian equivalence which states that the public debt has a neutral effect on GDP since any increase in government spending will be neutralized by the future impact of higher taxes (Bernheim, 1987). Finally, the fourth view is the neoclassic theory which identifies that higher public debt crowds out private investments through higher interest rates, leading to an adverse impact on economic growth (Greenwald & Stiglitz, 1987). For my research, I will show that the US debt-to-GDP ratio effects begin with the conventional and Keynesian views and then illustrate the neoclassical view in the long run. To do so, I have outlined three consequences when a country faces a high debt-to-GDP ratio: the debt overhang effect, the crowding-out effect, and high inflation.

Debt overhang:

The debt overhang effect is the first outcome of how a high debt-to-GDP ratio affects economic growth (Cohen, 1990; Krugman, 1988; Sachs, 1989). When debt overhang occurs, it can lead to three sequential effects. First, a high level of government debt can create uncertainty

and a lack of confidence that the Government can repay its debt obligations. Second, investors will then desire a higher rate of return via higher interest rates to compensate for the increased risk of default or missed interest payments. As the financial risk increases, this can hinder the Government's ability to borrow money at low rates, eventually reducing necessary spending to other parts of the economy. Third, as interest rates increase, investors will now desire higher rates of return in the private sector due to the sovereign's nations increased in cost of capital (Trebesch et al., 2012).

Several researchers applied instrumental variables when studying the relationship between public debt and growth to account for potential endogeneity complications when the independent variable correlates with the error term (Lu et al., 2018). Numerous econometric techniques are familiar in this research, including cross-sectional, panel data estimations, and time series. However, these techniques might have acute consequences for the generalizability of results when employing a simple Ordinary Least Square (OLS) regression model. Furthermore, researchers might produce spurious correlations between the independent and dependent variables without controlling for endogeneity with the appropriate instrumental variables (Hill et al., 2021, p.20). The practical implications for these spurious correlations are that policymakers could recommend policies that would be unfitting due to variables unaccounted for in the research. However, adding instrumental variables can improve the coefficients to minimize adverse sources of endogeneity, including selection bias, measurement errors, confounding effects, and reverse causality (Stock, 2015).

For example, researchers Lof and Malinen (2013) employed a Value at Risk dynamic model for estimating long-run effects and a panel vector autoregressions (PVAR) on GDP for a panel of 20 developed countries. The PVAR enabled the authors to assess the impact of growth

on debt and vice versa since debt and GDP were treated as endogenous variables. Their research concluded that an increase in debt harms growth over multiple samples and periods.

Krugman (1988) and Reinhart and Rogoff (2010):

Researchers Krugman (1988) and Reinhart and Rogoff (2010) found that excessive debt results in lower economic growth, even after a crisis. For example, in the crisis of 2008, public funding for excessively indebted banks increased public debt and, as a result, the cost of capital for the private sector. Investors request higher risk premiums when public debt increases, making servicing debt less secure. Krugman further elaborated that a highly indebted country will be substantially restricted in access to capital costs when faced with a financial upheaval.

Contrarian views on debt overhang:

A contrarian perspective is that public debt overhang is minimal since financial globalization provides easier access to high public debt obligations (Reinhart et al., 2012). However, in current research, this phenomenon needs to be better exemplified by advanced economies. Another perspective that rejects concerns about public debt overhang is that causality stems from growth to debt and not vice versa (Mehrotra & Sergeyev, 2020). For instance, there were two periods in recent history (both after World War II) when a public debt overhang was followed by rapid growth, positively impacting the United States and the United Kingdom (Reinhart et al., 2012, p.12). While these contrarian views offer interesting perspectives, I have yet to uncover enough supporting evidence.

Crowding out:

The crowding-out effect is the second outcome of how a high debt-to-GDP ratio affects economic growth. High-interest rates influence a high cost of capital, and low accessibility to liquidity adversely affects public and private sector spending decisions. According to the

Congressional Budget Office (2021), by 2049, paying the interest on the United States' debt will be the third-largest budget expense after Social Security and Medicare, representing 6% of GDP. To support this claim, many researchers have further studied the relationship between government debt and interest rates. In line with De Rugy and Salmon (2020), the combination of crowding out of private investment with high-interest rates will not only lower business confidence but also this pattern would indicate that as more money is directed toward government debt, less money is directed toward corporate debt. As a result, companies must raise interest rates to attract investors and increase the costs with borrowers due to higher market rates.

Cournède et al. (2010):

Cournède et al. (2010) illustrated the influence of higher corporate financing costs from an artificially low interest-rate environment that surfaced after the financial crisis. Using the assumptions and deploying a stylized model for several OECD economies, Cournède's calculations identified that in the long run, GDP would fall by 2.2% in the United States and 2.6% in the euro area when interest rates reach their historical, long-term averages (p.9). Furthermore, he simulated that higher government debt leads to the crowding-out effect as interest rates rise by one percentage point from long-term averages. Meanwhile, Krishnamurthy and Vissing-Jorgensen (2012) employed an asset-pricing model to study the relationship between corporate bond yield spreads over treasuries and the rising government debt-to-GDP ratio. Their findings were that government debt crowds out private sector debt, primarily issued by the financial sector, causing increased costs to finance debt.

Researchers' insights on the generalized method of moments model (GMM):

Several other researchers studied the impact of debt and interest rates by employing a combination of fixed effects and the generalized method of moments model (GMM). Overall, the conclusions utilizing this calculation methodology is mixed. For example, Clements et al. (2003) developed a growth model with four external debt indicators to study the impact of external debt on growth. The authors assessed the model by applying both fixed effects and GMM to compute whether debt service costs could be reduced from 8.7% of GDP to 3% as public investment increases by 0.7-0.8% (p.18). Their finding illustrates that a public investment increase will improve the per capita GDP growth to 0.1-0.2%. Their research also validates lower per capita income growth rates beyond the specific threshold of debt-to-GDP.

Researchers Aisen and Hauner (2013) also applied the GMM model to quantify the influence of budget deficits on interest rates over a panel of 60 established and developing economies from 1970 to 2006. The authors found that budget deficits considerably benefit interest rates, but only when deficits interact with high domestic debt.

Another team of researchers, Emran and Farazi (2009), employed the GMM model and utilized panel data from 60 developing nations from 1975 to 2006 to investigate the crowding-out effect. They implemented a model that identified that a $1 increase in government borrowing reduces private credit by $1.34, further eroding economic growth (p.15).

Reinhart et al. (2011)

Reinhart et al. (2011) assert that government debts might not significantly impact interest rates but affect private credit with financial institutions and barriers to entry with other institutions when competing in the market. Should the barriers to entry exist, Reinhart states that financial institutions will avoid undue risks since the financial institutions would be unable to assess higher interest rates, leading to many capital budget decisions and projects needing

approval for completion. Reinhart et al. also introduced the concept of the "lazy bank model," which states that as the financing costs of government debt increase, the higher costs of capital will deter banks from lending with riskier private sector projects (Hauner, 2009, p.1). For example, in the last five years, Ghana has offered an interest rate on its Treasury Bills above 15% (“Treasury Bill Rates – Bank of Ghana”). The double-digit yield on government treasury bills may induce banks to invest in them rather than lend cash to the private sector. However, the rates also put the private sector in financial harm; if government debt yields 15%, what competitive interest payments must a private company offer to attract investors to provide capital?

This prior research while a little conflating concludes that over time, the crowding-out effect leads to higher rates of interest which drive down business investment. Moreover, the higher interest rates affect productivity and economic growth even further due to the increased cost of capital for raising funds.

Inflation impact:

Inflation is the third outcome of how a high debt-to-GDP ratio affects economic growth. Khan and Naushad (2020) conducted a literature review to study the relationship between economic growth and inflation. They concluded that inflation is highly related to the country's economic growth, and every country is positively or negatively affected by inflation. The three to seven percent inflation target is considered best for economic growth, and when inflation is above this limit level, inflation affects economic growth negatively (p.14).

Barro (1995) also investigated this association and discovered a substantial negative correlation between inflation and economic growth. Barro used regression equations to measure the effects of inflation on growth with a large sample of more than 100 economies from 1960 to

1990. According to the findings, inflation and economic growth have a statistically significant negative association. More specifically, as annual inflation increases by ten percent, real GDP growth decreases by 0.2 to 0.3 percent per year (p.2).

Gillman et al. (2002) used two samples with OECD and APEC member nations from 1961 to 1997. They developed an econometric model with inflation as a central variable and lowering the return on capital. Following the same school of thought as Khan and Senhadji (2000) and employing a monetary endogenous growth model, they found a significant, negative nonlinear inflation effect. However, the model also shows that when both OECD and APEC countries decrease their inflation levels to a single-digit number, they experience economic growth.

While inflation is an outcome that may develop more over time, researchers Coibion et al. (2021) argue that the news of higher future debt leads households and the private sector to anticipate higher inflation both in the short and long run. In doing so, households might initially spend more to prepare for higher interest rates and inflation. This spending might provide a short-term economic boost but can quickly lead to an economic contraction for a country.

Inflation summary:

In summary, if inflation is not closely monitored, the outcome could lead to slower economic growth. If history should repeat itself, the current economic cycle can start as an economic boom and quickly turn into a slowdown, as the United States experienced in the late 1970s. During this period, and only after raising short-term interest rates to a record high of 20% in 1979, the Fed brought inflation down to normal levels (Bryan, 2013). While raising rates to these historically high levels curbed and lowered inflationary pressure, these high rates also led

to a consumer recession due to the high capital costs for borrowing and spending money. The next section will now address the third research question.

What explains the temporal and cross-sectional variation in the debt-to-GDP ratio and how to manage it?

Several fiscal and monetary approaches can positively or negatively affect the debt-to-GDP ratio. I have outlined these decisions below and explained the support or lack thereof of their impact.

First approach: financial repression

In 1973, economists Edward Shaw and Ronald McKinnon were among the first to use the phrase "financial repression.” In short, financial repression is when governments direct funds from the private sector to themselves to reduce debt. Despite being vastly different, Reinhart and Sbrancia's (2015) research confirmed that policies of developed and developing economies have remained relatively consistent over the years. This policy tool would allow governments to issue debt at a lower rate than the market. Restrictions on banks like interest rate caps, direct lending requirements, and reserve requirements are typical forms of financial repression.

According to Best et al. (2019), capital controls are a type of financial repression in and of themselves, restricting investors' ability to arbitrage between countries and making it more difficult for other oppressive policies to lower borrowing costs. On occasion, without imposing limits directly, governments have persuaded investors to operate similarly by using moral suasion. The United States and other leading advanced nations have participated in capital control policies like these throughout history.

Second approach: debt restructuring

The second approach is debt restructuring, a tool that sovereign nations use when facing economic stress and potentially on the verge of financial collapse. According to Bernardini et al. (2019), debt restructuring implies issuing new bonds in place of existing ones with lower values, lower interest rates, or longer maturities. Government securities investors take an economic hit with this taxation effect, which can significantly reduce their wealth. Unfortunately, the decision to restructure domestic debt is conflicted due to two potential ramifications. First, debt restructuring can lead new bond issuers to raise their interest rates to attract new capital. Second, the growth rate may also suffer since debt restructuring involves less wealth for the private bondholders.

Most importantly, if a country's central bankers agree to restructure their debt, while there could be some immediate financial relief to the current debt, how would that adversely affect the future issuance of debt? For instance, if a foreign bondholder just received a substantial haircut on their current investment in the United States or any country, that would more than likely dissuade them from ever lending to that country in the future. Alternatively, at the very least, they would demand a higher interest rate to compensate for that principal or interest payment reduction.

Third approach: debt monetization

The third approach that can reduce a country's debt is known as debt monetization. In short, debt monetization means a government prints or creates new money from the central bank to invest in public spending versus selling bonds to investors. In doing so, the central banks that buy their governments' debt create new money. This process is also known as printing money (Mishkin, 2003). Excessive printing of money can be inflationary, which may bode well with reducing the actual value of debt since high inflation rates pay off debt using money worth less

than when borrowed. However, while debt monetization can reduce the actual cost of debt, higher inflation also means investors will likely demand higher interest rates to compensate for the government's higher leverage ratios. Thus, there are additional considerations whenever a central bank monetizes debt.

Two key considerations for debt monetization:

The first is the composition of the average debt maturity. For instance, the central bank will have to deal with a brief period of high inflation and pay off a sizeable chunk of the debt before paying it off entirely and reissuing it if it is short-term.

The second consideration is that addressing the growth of domestic cash obligations in nations with significant unknown trade exposures can take time and effort. For example, before nominal GDP rises, foreign exchange debt typically loses value due to the exchange rate, further adding pressure to the debt-to-GDP ratio. Depending on a government debt's composition, including maturity, the central bank can initiate inflating debt sooner or more gradually; however, the successful execution of this strategy is more challenging. Michael Krause and Stephen Moyen (2016) simulated how managing an inflation target can impact the debt burden. They found that the public expects inflation to be average when prices are "sticky" and debt maturities are, on average, five years.

Previous research on debt monetization effects:

Several studies have found that debt monetization does not significantly reduce sovereign nations' debt. For instance, Reinhart and Sbrancia (2011) conducted an advanced study of sovereign debts' developed economies and emerging markets from 1945 to the present. They found that a combination of financial repression (debt monetization and financial sector regulation) significantly contributed to debt reductions from 1945 to 1970. However, Hall and

Sargent (2010) employed a combination of a debt dynamics equation for government bonds. They concluded that inflation only modestly contributed to reduced debt in the United States from 1940 to 2009. Similarly, Giannitsarou and Scott (2006) utilized a Value-At-Risk Framework with the G7 countries from 1960 to 2005 and determined that higher inflation had a small impact on the debt. Most recently, Abbas et al. (2010) demonstrated that inflation has insignificantly contributed to debt reduction in advanced economies since the 1980s.

Other past research models linked debt maturity, inflation, and public debt. For example, Missale and Blanchard (1991) developed a model showing that when governments can choose their debt maturity (which most governments do), they have an increased incentive to finance their debt. Still, the fiscal reputational risk (resistance for other countries to lend future money) increases. Aizenman and Marion's (2011) model identifies that governments set their inflation target to match the debt maturity. Specifically, when adjusting their model to the U.S. economy, the authors identify that when the government strategically increases inflation to 5%, the United States can experience a 20% decrease in the debt-to-GDP ratio over five years (p. 9)

Fourth approach: grow the economy:

The fourth and most appealing approach to reducing debt is to sustain an economic growth environment where policies provide an attractive environment for the private sector, including businesses and consumers. The philosophy behind this decision is that the more the consumers and companies spend, the more tax revenue will be generated, directly reducing budget deficits and keeping government expenditures as a control variable. Short-term, higher real growth increases the government's revenue generated from higher taxes without increases in spending. Consequently, growth can be boosted by the primary balance without requiring any active spending or tax policy changes.

Previous research on growth to the economy:

Researchers Amo-Yartey and Okwuokei (2014) utilized panel data from 160 countries from 1970–2009. They estimated the likelihood of a debt reduction occurring with a logistic regression model. They found that sustained economic growth with a political environment that favors this future growth has a significant positive effect and considerably reduces debt short-term.

Over the long term, policies that increase short-term but not long-term growth have minimal effect on debt reduction. The growth accounting breakdown created by Solow (1957) is a helpful tool for assessing the consequences of various measures intended to enhance growth. Meanwhile, Delong and Summers (2012) investigate the circumstances that would prevent this from happening. They found that three factors drive economic expansion, including a residual commonly referred to as total factor productivity (TFP), the surge in labor, and the accumulation of physical capital. These factors suggest that structural reforms can significantly impact developing and emerging markets more than developed economies due to their distance from the global "technological frontier."

Meanwhile Jones (2016) states that the most critical factor in determining differences in GDP between developed and developing nations is also the residual total factor productivity rather than differences in human capital or physical capital. However, one must note that it has been uncommon for advanced nations to experience large-scale, long-term growth increases. Even though developing nations experience growth spurts more frequently, a worrying conclusion is that these spurts are highly unpredictable. Furthermore, while economic developments make growth more likely to accelerate, only a tiny percentage of reforms lead to sustained growth.

Fifth Approach: Fiscal Consolidation

The fifth approach and arguably the most effective way to reduce a country's debt is fiscal policy decisions or reductions in government spending. While restrictive fiscal policy decisions can immediately generate a budget surplus, restrictive fiscal policy decisions can also increase taxation and reduce welfare benefits, further affecting GDP and employment. Consequently, policymakers must analyze the fiscal consolidation's timing, size, and amount before executing this policy instrument.

Previous Positive Research on Fiscal Consolidation

Baldacci et al.'s (2012) study recorded 160 episodes of public debt decreases in over 100 nations from 1980–2012 via fiscal restrictive policy adjustments. Their research confirmed that slow and sufficient fiscal policy reductions versus dramatic spending cuts would produce more robust economic growth. However, Baldacci et al. also observed that a lack of capital and borrowing readily unavailable when executing fiscal policy decisions could negatively affect growth. Thus, the policy decision-makers must orchestrate their efforts with the Fed and financial institutions so that resources are steadily available for the public to assist with their financial resources.

Bernardini et al. (2019) studied 23 advanced countries from 1980 to the mid-2000s and found 11 occurrences of successful debt reduction via fiscal consolidation. In these instances, restrictive fiscal policy decisions significantly strengthened the primary balance. Additionally, the primary balance was kept at relatively high levels. As a result, the average debt ratio decreased significantly in these circumstances, averaging a 41-percentage point reduction per country with an average annual average reduction of 3.3% (p.18).

While the prior research is compelling, one must consider if the uptick in the GDP ratio was attributed more to raising taxes or an actual decrease in the spending ratio. With only a few exceptions, the main contributing factor was a decrease in the spending-to-GDP ratio, which was significant enough to permit a meaningful decrease in the tax ratio. On average, 70% of the expenditures were reduced to enhance the balance, excluding the Netherlands and Denmark (p.21). Importantly, these nations started their fiscal reforms a few years before the decrease in public debt, and any developments in the primary balance aligned with the GDP growth rate's expansion.

Amo-Yartey and Okwuokei (2012) also support that successful debt reduction requires a more decisive fiscal consolidation. These more dramatic fiscal adjustments are necessary for the net effect of debt reduction to have a meaningful impact. Researchers Ali Abbas and others (2011) reached similar conclusions after analyzing debt reduction episodes with 19 advanced economies from 1880 to 2009. For my next research section, before I pivot my research to the potential appropriate policy decisions for the United States, I will discuss my data collection, analysis, and research results.

Data:

I have compiled my dataset directly from the Federal Reserve Economic Data at the St. Louis Fed's website in 2022. This database consists of gross government debt spanning over 71 years, reported quarterly from the Fourth Quarter of 1951 to the Second Quarter of 2022, producing 283 observations. My three main variables of interest are gross public debt, including Federal, State, and local debt, nominal GDP, and real GDP growth. While public debt is readily available for an earlier period than 1951, I could only find reported data on state and local debt beginning in 1951, hence the reason for that as my earliest reportable period. Real GDP is

defined as economic growth after considering the inflationary impact, as measured by the Consumer Price Index (CPI.).

Insert Table #1 Here:

I successfully obtained each quarter's GDP reporting and Total Debt except for four quarters beginning from the Third Quarter of 1976 to the Second Quarter of 1977 (a combination of federal, state, and local, though the federal debt was obtained from 1951). During the 1976 to 1977 period mentioned above, the dataset was missing the total debt by quarter but had the actual debt-to-GDP ratio and GDP for all quarters. Thus, I solved each of the missing quarters (a total of four) using a simple algebra equation and filled the dataset accordingly.

Methodology:

My data methodology and analysis of my research are conducted in two parts. The first part is that I conducted exploratory research by expanding on the previous literature on the relationship between debt-to-GDP and real economic growth. After tabulating the dataset from the Federal Reserve's Economic dataset, I converted my variables into growth rates instead of actual levels since running levels with nonstationary variables can lead to spurious relations (Granger & Newbold, 1974). Second, I generated the percentage change differences for each variable. Following a similar approach to Reinhart and Rogoff's (2010) influential paper, I rely on descriptive statistics for the first part of the analysis. To account for the time-series effects between the relationship of the variables, I use the lagged public debt-to-GDP ratio to estimate these nonlinear parameters.

I then evaluated scatterplots by placing the debt-to-GDP ratio on the horizontal axis as my dependent variable and the real GDP growth on the vertical axis as my independent variable. Next, I analyzed my dependent and independent variables' non-moving and moving averages.

While non-moving averages can help identify outliers and specific data points that are not as noticeable as moving averages (E.g., Second quarter of 1978, Second Quarter of 2020, and Third Quarter of 2020), it is much more difficult to identify patterns and underlying trends. Thus, I analyzed both scatterplots as identified in Tables 3 and 4. For the long-term moving averages, I define the period as five years to account for 20 quarters of GDP (five years) that directly align with a full year of a US president's term plus one more year for any irregularities.

Insert Table #2

Insert Table #3

Insert Table #4

First Robustness Test: Unit Root

After I have identified an observable difference, that as the debt-to-GDP ratio increases, real GDP decreases, I perform my first robustness test to confirm that all the variables in my analysis are stationarity. Since most time series data are nonstationary, that may produce spurious results; that is, they suggest a relationship between the variables even though there is none (Granger & Newbold, 1974); I test this possibility by using the Augmented Dickey-Fuller's (ADF) unit root test. Next, I compare the alternative hypothesis that the series is stationary with the null hypothesis that it is nonstationary (Dickey & Fuller, 1979). I reject the null in favor of the alternative hypothesis if the test statistic is lower than the critical threshold. As seen from Table 5, I conclude that the time series is stationary after noticing that the p-value is 0.000, which is highly significant and less than .05. Therefore, I have rejected the null hypothesis that real GDP has a unit root.

Insert Table #5

Histograms and Descriptive Statistics

After conducting my first robustness test, I conducted both unconditional and conditional research by creating various histograms to analyze the descriptive statistics of my sample size. For my unconditional research, my sample size consisted of 283 total observations and the mean real GDP growth was 3.07%. I then performed conditional research and partitioned my data into three levels based on the clusters of observations.

When portioning the data, I used continuous levels. Even though by observing the scatterplot, the data points are grouped more closely than other observations with some gaps between such observations, I used levels where the clusters are directly uninterrupted with the other observations. The three levels are when debt-to-GDP is less than 60%, debt to GDP is greater than 60% and less than 100%, and when debt-to-GDP is greater than 100%. My initial observations are that when debt-to-GDP is below 60%, real economic growth averages 3.49% annually. When the debt-to-GDP ratio is between 60% and 100%, real economic growth slows to 3.08%. Moreover, when the debt-to-GDP ratio is greater than 100%, real economic growth slows to 2.34%.

Insert Table #6

Insert Table #7

Insert Table #8

Insert Table #9

Econometric Model: Threshold Level Regression

My next step in data analysis is by creating the econometric regression model. First, I purposely studied and conducted two time periods from 1966 to 2019 and from the 4th Quarter of 1951 to 2nd Quarter of 2022 to observe if the impact of the more extended period and the most recent recession induced by COVID might impact the long-term threshold level. As you can

notice from Tables 11 and 12, the additional 15 years of data, including the 2020's recession, where GDP contracted considerably and rebounded significantly, increased the threshold level modestly. Furthermore, I also run the regression utilizing both moving and non-moving averages. Finally, contrary to Reinhart and Rogoff's (2010) pooled least squares regression model, I use Hansen's threshold least squares regression model (2000) to identify the specific debt more accurately to the GDP ratio's tipping point when economic growth slows down. One of the drawbacks of the threshold model is that the number of regimes and threshold values must fit the data better than alternate linear and nonlinear conditions (Egert, 2013). These issues are addressed by the testing approach created by Hansen (1999), which first uses a grid search to pinpoint the threshold values endogenously and then bootstraps methods to test the various models sequentially against one another. By executing my econometric model in my statistical software, I have further supported my exploratory research and identified a threshold value that provides that real economic growth starts to slow down.

Threshold Regression Model

The specifications for the threshold LS regression model are as follows:

Where y represents the long-run real GDP growth rate, and X represents the long-run average public debt-to-GDP ratio. C represents control variables.

RGDPMA=.1506909 (DEBT-to-GDP) + .048259 (CPI) + -4.224578(C)

Results: Regression Model

According to my threshold level regression and observing the period from 1966 to 2019, when the average long-run public debt-to-GDP ratio exceeds 58%, the United States' economic growth starts to slow, as identified when the coefficient changes to negative. Below this line, more debt spurs economic expansion. However, when I ran the regression with the sample period

from 1951 (Fourth Quarter) to 2022 (Second Quarter), the threshold level increased to 62.75%. I relied on the moving averages for my regression since the non-moving average indicates that economic growth increases as the debt-to-GDP ratio increases beyond the threshold level of 88.76%. When the threshold level is below 88%, economic growth turns negative. This threshold would directly contrast with all previous literature and logical sense, and the R-squared value only explains less than 14% of the relationship. When using the moving average, the threshold level reduces to 62.75%, but it is also highly significant since the p-value is substantially less than .05, and the regression explains more than 36% of that relationship, as identified by the R-squared value.

Insert Table #10

Insert Table #11

Multiple-Thresholds Regression Results

I then ran the regression using multiple thresholds to evaluate if there was a meaningful, statistically significant relationship. At the two-level threshold, I found that the first threshold level slightly increases from 62.75% to 63.44% for a total of 102 observations; however, when debt-to-GDP is more significant than 63.44% and less than 93.84%, the relationship is not meaningfully significant since the p-value is significantly larger than .05.

Insert Table #12

I then proceeded to run the next threshold level. At the three-level threshold, I found that the first threshold level decreases from 62.75% to 53.85% for 72 observations, whereas debt-to-GDP is more significant than 53.85% and less than 70.51% for a total of 78 observations. Moreover, the relationship is also highly significant since the p-value is significantly smaller than .05. However, between 70.51% and 93.84%, the relationship is insignificant since the p-

value is substantially higher than .05. Hence, I relied on the first-threshold level for purposes of my research since the results were highly significant with a p-value less than .05.

Insert Table #13

Dummy variable inclusion:

After studying the relationship between the threshold levels, I wanted to evaluate any potential change in this threshold level by adding a dummy variable. Reverting to the St. Louis database, I found a dataset that provided by quarter the dates that the United States was in a recession as inferred by the GDP-based recession indicator. I went through the same sample period and evaluated the business cycle of the United States based on if the United States was in a recession or not. I coded 0 for each quarter that the United States was not in a recession and 1 for each time that the United States was in a recession. While the threshold level was consistent with 62.75%, I found that when the debt-to-GDP ratio was higher than 62.75%, the dummy variable was significant at the 10% level but not at the 5% level, as noted since the p-value was .0655. Hence, this dummy variable inclusion did not significantly impact the relationship between debt-to-GDP and real economic growth.

Insert Table #14

Second robustness test:

The second robustness test (the first was using Dickey Fuller's Unit Root Test) was to analyze if one time-series variable might help forecast future values of the other time-series variable and not reverse. To do so, I used the Granger-causality test to evaluate the significance levels by observing the F-tests on the lagged values of the debt-to-GDP ratio and the real economic growth (Granger, 1969). If the p-values of the test are less than .05, it suggests that there is statistically significant evidence to support the hypothesis that debt-to-GDP can help predict future changes

in real economic growth. However, since the p-value is greater than .05 suggests that there is not enough supporting evidence to reject this hypothesis. This conclusion would dramatically differ from the prior research; however, this result is likely due to the unconditional set of observations in the sample size. If I were to re-run the Granger test but partition the data into the three levels, I would suspect that the results would support the hypothesis that debt-to-GDP can help predict future values of real GDP. While the robustness test is helpful, the Granger-causality test has its limitations. These limitations include possibly inaccurate findings when there is a nonlinear causal relationship and when the time series is nonstationary (Maziarz, 2015). For this reason, I tested earlier to confirm that the variables are stationary by using the difference in growth rates versus the absolute levels; however, the relationship between debt-to-GDP and real economic growth is more curvilinear. My next section will visit prior literature to analyze historical, successful debt reduction episodes by examining various countries' policy decisions.

Insert Table #15

Previous research on defining successful debt reduction

According to the literature reviews, nations have traditionally used a combination of multiple strategies, with the mix varied across countries and historical periods. Each has advantages and possible disadvantages of its own. The existing literature that discusses the patterns of these reductions has examined incidents in terms of the amount of debt eliminated over a given time frame. However, there has yet to be a consensus on what constitutes a significant decrease in the public debt-to-GDP ratio. As Nickel, Rother, and Zimmermann (2010) describe, a significant debt reduction event is one where the debt-to-GDP ratio decreases by more than 10% over five straight years (p.20). According to a study by Finger and Sadikov (2010), a reduction in the debt-to-GDP ratio is notable when it is greater than 20 percentage

points (p.37). The IMF (2003) states that a debt ratio reduction is only meaningful if it decreases by at least 18 percentage points over three years. Bandiera (2008) defines a debt reduction as substantial, between 30 and 190 percentage points of GDP (p.10). Due to the lack of a universal agreement, I will concentrate my research on post-World War II nations that have lowered their debt-to-GDP ratio by at least 25% percentage points and analyze their successful policy decisions.

International Strategies' Historical Success and Implications on Reducing Debt to GDP.

Bernardini et al.'s (2019) seminal study analyzed 206 episodes of significant debt reductions for a group of advanced countries between 1970 and 2009. While the most significant debt reduction episodes occurred due to a combination of higher inflation, growth-enhancing measures, and fiscal consolidation accounting for 106 episodes (52%) of debt reductions, I will analyze all five strategies to provide a holistic analysis.

Financial repression:

Financial repression is the first strategy governments use to lower the cost of paying off debt. It functions as a hidden tax on people who own government debt and currency and frequently uses inflationary monetary policy. In addition, financial repression aims to maintain low interest rates and keep up government bond demand. For example, shortly following World War II, one of the most well-known instances of financial repression in American history occurred when the Fed and Treasury agreed to buy government securities in the open market due to the astronomically significant level of debt (Best et al., 2019). At that time, the Treasury bought and sold securities at par with various maturities. After the war ended, the Treasury and the Fed agreed that they should continue doing so, and this continued until 1951.

Financial repression also took place during the financial crisis in 2008. During this time, the financial system faced concerns about the stability of the macroeconomic environment, and attention was driven to prevent a potential implosion rather than keep borrowing costs low. This process was known as quantitative easing, where the Federal Reserve increased its holdings of U.S. Government debt and the size of its balance sheet to restore the financial system and faith to investors. The European Central Bank started a similar quantitative easing program in 2015 and purchased corporate paper, bonds, and other assets (Best et al., 2019).

Other recent measures included Spain capping interest rates on deposits in 2010 and Ireland capitalizing its banks using the National Pension Reserve. (Reinhardt & Sbrancia, 2015).

Debt Restructuring

The second strategy is debt restructuring. With debt restructuring, a government may elect to reduce the coupon or rate of interest it pays to its bondholders, change the maturity of the bonds, or implement a combination of both when it decides to restructure its debt. While debt restructuring may provide some relief to the sovereign nation due to the new terms, there are consequences, arguably the most dramatic being the nation's reputation. Not only can the reputation be adversely affected, but a poor reputation can increase the risk that future newly issued bond rates must increase to attract investors. In Bernadini's 2019 research, Greece's most notable recent debt restructuring occurred in October 2009. Three key takeaways emerged from this debt restructuring episode following the Greek debt crisis. First, restructuring the debt does not eliminate the necessity to enhance the primary balance. Even if Greece ran a 100% debt cancellation policy, the primary balance had to be restored to balance (p.30). Second, debt restructuring is like an up-front tax that lowers bondholder wealth and could negatively impact the economy when citizens own a large amount of public debt. For Greece, the Greeks paid

approximately 30% of the debt, and foreign nationals paid most of the tax (p.30). Again, this tax effect has profound implications when attracting foreign investors to buy such sovereign debt. Third, scheduling a debt restructuring takes much work. Some researchers who have studied the Greek debt restructuring assert that the restructuring fell short of expectations because it was implemented too late. Bernadini and others claim that the restructuring would have successfully reduced public debt quickly and at a low cost to the Greek economy if it had started in 2010 when the adjustment program first started.

Debt Monetization

The third strategy is debt monetization. This strategy occurs when monetary policy is used to lower the cost of government debt through higher inflation. With an increasingly inflationary environment like the one we were facing in 2022, there is a steady increase in financial assets. The debt on assets stays fixed, even while assets appreciate. Thus, the ratio between debt to assets improves due to asset appreciation. However, inflation has a cost, particularly for foreign investors who own government debt and currency; investors will be repaid with a depreciating currency. Additionally, domestic consumers will experience a rise in the price of goods and services. If wage growth does not keep pace with this price increase, actual spending will decline, which would slow down the rate of economic expansion. Several nations, notably France, Italy, Finland, and Japan, benefited from monetization and inflation after World War II to lower their debt-to-GDP ratios. Specifically, the public debt-to-GDP ratio decreased by 114 points in France, 48 points in Italy, 44 points in Finland, and 44 points in Japan (Bernardini et al., 2019, p.12). As a result, each country's debt reduction process moved quickly, with a 15% reduction in the debt-to-GDP ratio (p.12). The key takeaway is that inflation improves the debt-to-GDP ratio in two ways. The first is that government revenue (i.e.,

tax dollars) rises when inflation is high, but expenditures, usually made in nominal terms, remain constant. Second, people frequently move into higher tax brackets because of inflation, which raises the average tax rate and reduces deficits. The counter-perspective is that slow tax payments could hurt the principal balance due to excessive inflation.

According to Tanzi's 1978 research, tax collection lags the actual value of a decline in government revenue when there is high inflation. In other words, the more significant the loss of real value in government income, the longer it takes to collect the real money due to the impact of higher inflation and a depreciating currency (i.e., being paid back with a depreciating currency). Thus, the effect of high inflation is circumstantial.

Growth

The fourth strategy is growth-enhancing measures, which are desirable for governments because reasonably small increases in GDP growth rates can significantly boost the likelihood that debt can be paid off and lessen the need for other policies to be adjusted. The formal economic principle behind this is the widely viewed Laffer Curve model that states that when facing a favorable environment for consumers and businesses, including low taxes, stimulus spending, and other incentives, consumers and businesses will spend more money because of the attractive environment (Laffer, 2004). In doing so, economic growth can increase as the economy strengthens. First, economies that experience significant growth tend to see an improvement in their overall financial health, as indicated by a rising debt-to-GDP ratio. The higher interest rates make it easier for investors and businesses to look toward future gains. Second, substantial growth increases the government's short-term revenue without increasing spending requirements. Throughout history, many countries have implemented "growth-enhancing" policies to decrease their debt-to-GDP ratio significantly. Germany, for example,

implemented its economic reforms in the early 2000s and went from being called the “sick man of Europe” to “Europe’s Economic Superstar” and experienced rapid growth (Dustmann et al., 2014, p.2). South Korea drastically decreased its debt-to-GDP ratio in the late 1990s by utilizing a policy known as the Miracle on the Han River strategy (OECD, 2021). The tricky part with such a strategy is that when too much stimulus is initiated, overall spending increases and less tax revenue is collected, leading to a higher debt environment and higher capital costs. Unfortunately, the literature on large growth-enhancing policies needs to support this strategy lasting in the intermediate term.

Fiscal consolidation

The fifth strategy is debt reduction through fiscal adjustments. In Bernardini and others' research in 2019, out of the 30 successful debt reduction episodes, 11 of the 13 fiscal consolidation approaches occurred between 1980 and the mid-2000s (p.18). In all these cases, the countries experienced a sizeable increase with the primary balance for a sustained period through revenue gain and spending reductions. For the reported sample size, the debt-to-GDP ratio declined by more than 35% over a 10-year period with an average annual decline of 3.3% (p.18). While the primary balance improved, one key observation is what were the potential ramifications when governments' spending was reduced?

Bernardini et al. (2019) supported two crucial conclusions. First, the average country’s GDP growth rate with the fiscal consolidation policy was 3.8%, with the lowest rate being 2% for only Belgium and Denmark. Later, Belgium and Denmark improved their debt-to-GDP ratio through fiscal consolidation in the late 1990s by implementing a series of austerity measures. These measures included reducing government spending, raising taxes, and privatizing state-owned enterprises. The measures were successful in reducing budget deficits and stabilizing

public finances. As a result, both countries brought down their debt-to-GDP ratios to below 60% by the decade's end.

United States as the Clinical Focus

Now that my research has analyzed various historical strategies with foreign countries, this section will focus on the United States' historical success in reducing its debt-to-GDP ratio. Unfortunately, the most recent occurrence of when the United States encountered a reduction in its debt-to-GDP ratio happened in 1994-2001, influenced by a combination of strong economic growth, reductions in military spending, and discretionary spending. As a result of all three fiscal policy actions, the debt-to-GDP ratio decreased from approximately 65% to 54% ("Federal Debt: Total Public Debt as Percent of Gross Domestic Product") and the U.S. Government's budget was balanced and ran a surplus from 1998 to 2001 (Schick, 2000). Since War II, the most significant decline in the United States' debt-to-GDP ratio occurred from 1946 to 1974 (de Rugy & Kling, 2022). This decline was due to rapid and robust real economic growth, strong and swift fiscal consolidations, financial repression, and the high inflationary period of the 1970s. During this period, the United States also implemented restrictive fiscal spending since government expenditures fell more than 33% of GDP in less than three years (Henderson, 2010).

Financial repression

The United States instituted financial repression policies several times throughout history, including the following more recognizable episodes. First, in 1963, the United States employed several policies and capital controls, including a capital control technique known as the interest equalization tax, to reduce investment outlays from the United States. In this capital control, the United States Government imposed a 1% tax on the sale of foreign bonds and

executed other branch efforts, including moral suasion to compel U.S. firms to repatriate funds (de Rugy & Kling, 2022).

Regulation Q was updated in 2013 following the 2007-2008 financial crisis, where the Federal Reserve Board would set minimum capital requirements to make sure banks had enough capital to continue lending despite losses or economic downturns (Board of Governors of Federal Reserve, 2015). Another action was in the 1960s when the Fed and commercial banks engaged in moral suasion to have the banks engage in specific measures per the economy's trends (Reinhart & Sbrancia, 2015).

What impact did these financial repression tools have? One significant result was the artificially low-interest rates on government debt, which helped to lower the debt ratio. Researchers Reinhart and Sbrancia (2015) calculated a tax they refer to as the "financial repression tax" to measure the fiscal advantage of artificially low-interest rates. In doing so, the authors reveal that this financial repression tax may have been popular with voters since it was less transparent and detectable than other taxes. The financial repression tax was computed in years with a negative real interest rate by multiplying the negative real interest rates by the total government debt. The tax allowed the taxpayers to account for the savings in interest payments that resulted from the government's lower interest payments. They contend that this financial repression tax understates the actual tax because equilibrium real interest rates were far above zero during high real growth (Bernardini et al., 2019).

Monetization of debt

In addition to these actions, the Fed helped the government reduce its interest payments by monetizing debt. Aside from the recent quantitative easing that transpired during the Covid-induced recession, the government permitted a considerable increase in deficits

between 1940 and 1951 to prevent a default on government bonds (e.g., military spending). As a result, from June 1946 to June 1947 and June 1947 to June 1948, the Consumer Price Index (C.P.I.) rose by 17.6% and 9.5%, respectively. The C.P.I. inflation rate hit 21% in early 1951 (De Rugy et al., 2022). Due to this unprecedented pace of inflation, the government enacted the Treasury-Federal Reserve Accord, which separated monetary policy from government debt management. During this period, the Fed aimed to combat anti-inflationary measures and maintain stable exchange rates.

While the debt-to-GDP ratio's decline was not as significant as in the earlier period, the inflationary effects in the 1970s improved economic growth in two ways. First, inflation helped control the interest payments on debt. Second, despite poor economic performance in the 1970s, higher-than-expected inflation sustained a higher gross G.D.P. growth than the interest rates (De Rugy & Kling, 2022).

Growth-enhancing strategies

The least effective strategy is using growth-enhancing strategies as a standalone. Former President Reagan adopted this strategy. While he was influential in fostering a conducive environment for economic growth, his policy decisions increased the United States' public debt-to-GDP ratio by 20% (U.S. Department of the Treasury: Fiscal Services, 2018). As a result, the United States was forced to deal with twin deficits for many years as a result, which also caused a current account deficit.

Fiscal consolidation

The United States has a long history of using fiscal consolidation to improve its debt-to-GDP ratio. One of the most recent examples was during the early 1990s when the country implemented a series of spending cuts and tax increases to reduce its budget deficit. These cuts

helped to improve the debt-to-GDP, and in 2001, the surplus was 2.5% of G.D.P., the largest surplus as a ratio to the G.D.P. since 1948 (Clinton White House Archives, 2000). Before this successful debt reduction, Economist Henderson (2010) identified that after World War II, the United States quickly reduced military spending, dramatically cutting down on work relief programs. From 1944 to 1948, the U.S. government reduced spending by $72 billion or 75% and reduced federal spending from 44% of the Gross National Product to less than 9% (Henderson, 2010). Despite the significant reduction in government spending, this period is often referred to as the "postwar economic boom" (Marglin & Schor, 1992, p.5) due to the following factors:

1. Investment in infrastructure: The Government invested heavily in infrastructure and housing, which boosted economic growth and created more jobs (Pruitt, 2020)
2. Increased consumer spending: Consumer spending increased due to rising wages and pent-up demand for goods and services.
3. Return to the workforce: When the war ended, soldiers returned to the labor market, and companies expanded their employee population (Steelman, 2013)

New Regression: United States 'Historical Fiscal Outlays

Since my research has identified that fiscal consolidation and adjustments are among the most successful strategies to improve the debt-to-GDP ratio quickly, I expanded my research to focus on the current government spending outlays. However, one complication is that the U.S. Government has lacked a budget surplus for over 20 years, and since 1960, Congress has modified the U.S. debt ceiling 78 times (U.S. Department of Treasury 2022). Thus, to say that fiscal consolidation could be an uphill battle is an understatement.

To better understand fiscal spending's role, I analyze historical, and current U.S. spending outlays to improve the debt-to-GDP ratio. I gathered my dataset from the United States

White House homepage. The homepage has a table organizing outlays by Superfunction and Function from 1940 to 2027. To stay consistent with my prior datasets, I started this dataset beginning in 1951 until the year 2022. Since the fiscal budget is only reported annually, I converted the data into quarterly frequency and set the quarter as constant for each year.

Data analysis

Like the debt-to-GDP and economic growth regressions, I analyzed non-moving and moving averages. When using the non-moving averages, I found that all variables are not statistically significant. However, I ran the regression using the moving averages to overcome this initial hurdle.

In total, there are four key categories of variables in the outlay's dataset, and for each variable, I analyzed the variable as a percentage of GDP. The four key areas that make up the nation's budget are national defense used to secure our borders and protect citizens, human resources such as education and healthcare programs, physical resources for infrastructure development, and lastly, net interest on the debt, which consists of the government's interest on its debt minus the interest it receives (Congressional Budget Office, 2020). In other words, interest payments to investors in Treasury-issued debt account for the bulk of the budget's outlays. The projection was that even with infrastructure (building a road, railroad, bridge) that might be built and completed today, the overall effect might only impact the economy or GDP five years later (lag effect). Therefore, I utilized five-year moving averages to investigate the possibility of a connection between spending levels and actual economic expansion.

Part One: Exploratory Research

Following a similar approach from my debt-to-GDP and real economic growth exploratory research, I plotted the fiscal outlays as a percentage of GDP by year to observe any

potential trends of how spending has changed throughout the last 70 years. The two most apparent observations are national defense and human resources. Table #16 in the Appendix shows that national defense represented nearly 15% of GDP in the 1950s. As of 2022, that outlay represents less than 4%. Human resources were less than 4% of GDP in the 1950s and now represent approximately 20% of G.D.P.

Insert Table #16

Part Two: Regression

For part two, I created another threshold regression. I added real GDP, national defense, human resources, physical resources, net interest, and debt-to-GDP as independent variables to my regression formula. The dummy variable is the U.S. recession indicator (if the United States was in a recession or not in a recession) and the current price index via the non-moving averages. In creating this threshold regression, I found that only some variables were significant. Thus, I used the same regression formula but with the moving averages this time. Again, it takes time for economic and policy decisions (such as spending and building infrastructure) to impact the economy; thus, moving averages better depict this trend. With present conditions, the outcome of strong economic growth in 2021 was due to what occurred in 2020 (Covid-induced recession) rather than the actions in 2021.

Results

As visible in Table 17 in the Appendix, the regression and r-squared value explains 52.7% of the variation of the dependent variable. In other words, national defense, human resources, physical resources, net interest, C.P.I., and the dummy variable of a recession explains 52.7% of the real economic growth of five years in the United States. Human resources and net

interest are highly significant variables since the p-values are less than .05. Surprisingly, the coefficient of net interest has a positive impact. While at the surface level, having a government pay more interest on its debt could be construed as problematic, the previous literature offers a possible explanation for why the coefficient is positive. At a low debt-to-GDP ratio, an increase in debt boosts economic growth. Thus, the United States can continue to issue new debt until the tipping point is reached and still increase real economic growth. Once the United States reaches the tipping point, further debt issuance would slow down real economic growth, and the net interest effect's coefficient might turn negative. Unfortunately and as referenced previously, the United States is presently at a condition well above the tipping point so further issuance of new debt would only adversely affect real economic growth.

Insert Table #17

Practical Solution for the United States

Now that I have analyzed the historical to present outlays with fiscal policy, I will conclude with my recommendation for the combination of solutions for United States policymakers to reduce the debt-to-GDP ratio while still experiencing sustainable, economic growth. Unfortunately, when faced with obstacles that prevent the execution of high-quality changes, policymakers may choose quick fixes. Nevertheless, policymakers should consider that for the United States to strategically reduce its debt-to-GDP ratio yet still experience positive economic growth, they must enact a combination of fiscal consolidation methods while not tipping the U.S. economy into a hard landing.

First solution: inflating debt

The first solution is to maintain an inflation target. Staying consistent with Missale and Blanchard's 1991 research, their model showed that a government has the incentive to inflate away its debt when it chooses debt maturity. However, by doing so, it can damage the Government's credibility. As the initial debt level rises, the maximum amount of time that debt can accrue interest without jeopardizing the model's credibility declines.

In their 2019 research, Best et al. simulated that increasing inflation to 24% could reduce America's debt-to-GDP ratio by a fifth in just five years (p.36). The challenging part is that the average interest rate on debt must be lower than inflation, and the Government needs to sway investors that inflation will continue in the future. Thus, hoarding cash would be detrimental, and the higher inflation expectations should encourage further spending for investment purposes and personal needs. Coincidentally and in cases where the public is uninformed about the Federal Reserve's attempts to increase debt rapidly, the average and peak inflation rates are reduced (Best et al., 2019). The researchers attribute this phenomenon because a higher proportion of the eventual inflation is unexpected.

However, an intentional policy of high inflation would present substantial difficulties and risks and is unlikely to resolve the debt issue on its own. As Japan's experience over the past three decades demonstrates, in the current economic climate, raising inflation to a level where it is meaningful is difficult. More critically, counting on inflation as the policy tool to reduce debt could cause people to lose faith in the future worth of money.

Second solution: financial repression

The second solution is financial repression. Policymakers need to change their debt composition and lengthen the maturity of outstanding debt, which will reduce the interest payments the Government needs to make. Since this policy tool is a delicate balancing act, the

U.S. government must pursue this policy with a few parameters. First, this policy implementation must gradually change to give investors time to adjust their strategies and the overall impact on the financial markets. Second, the Government must continue to be very clear and transparent with their communication, like the current FED's communication with their interest rate hikes. Third, the Government's efforts and success depend upon full coordination with the U.S. Federal Reserve to ensure that the policy decisions are consistent with the present financial markets. By doing so, the Government and the Federal Reserve can tackle the upcoming debt problem. Before the end of 2024, over $6 Trillion of U.S. debt is set to mature (SchiffGold, 2022). With the current weighted-average interest rates at 1.8% and certain treasury bonds currently earning 4% interest, there is a significant decrease in service costs if the debt were to be refinanced before maturity. The delta (difference between 4% and 1.8%) is 2.2% multiplied by $6 trillion is $2.2 billion in interest costs savings alone.

Financial repression can keep interest rates low, allowing the Government to service its debt more quickly. However, the likely most significant consequence of doing so, which will have to be orchestrated with precision, is the market's perception of the stability and creditworthiness of the Government. Should the market, including foreign investors, view this policy technique as a sign of increased risk, future borrowing costs can rise considerably.

Third solution: fiscal consolidation

The third strategy is fiscal consolidation. Notably, government spending has escalated significantly over the past decade, as evidenced by a comprehensive national outlays and expenditures analysis. The amount of money the Government has spent on human and social programs compared to historical contributions is alarming. To help illustrate the impact of certain fiscal policy decisions, I have leveraged the research from the Congressional Budget

Office's annual policy alternatives and implications on the federal budget (2020). This information is intended to assist lawmakers as they solve budgetary concerns. Overall, the CBO provides tax savings estimates for 83 potential alternatives to reducing federal spending or increasing revenues over the next decade, beginning in 2021 and ending in 2030. Choices show the tax impact for the decade from 2021 to 2030. I have identified four tax solutions that have contributed to some of the most significant impacts of the decade in reducing federal spending or increasing federal revenue:

1. Raise the social security retirement age by 2025. Full Retirement Age (FRA), also called retirement age, is the age at which an employee is entitled to all social security benefits. Today in the United States, the FRA is 67 for those born after 1959. According to the Congressional Budget Office, if the FRA is increased to 70 years old for anyone born in 1978 or later, government spending would decrease by $2.2 billion in 2025, $4.3 billion in 2026, and $7 billion in 2027 (p.33). The total decrease in spending would be $72 billion from 2021 to 2030.
2. Set federal Medicaid spending caps. Medicaid is a federal-state partnership program that covers healthcare costs for some low-income adults, older adults, and people with disabilities. The federal percentage varies from state to state, ranging from 53% to 79%. On average, the Federal Government covers about 65% of program costs (Congressional Budget Office, 2020). Therefore, the Government should create an overall cap per state (approximately at 50% per state) that determines how much money to give states to administer the program. If instituted in 2021, the change in outlays would decrease by $2 billion in 2023, $63 billion in 2024, and $90 billion in 2025 (p.19). From 2021 to 2030, spending would decrease by $972 billion.

3. Implement the "Ultra-Millionaire Tax Act" proposed by Elizabeth Warren. According to the University of Berkeley economists Saez and Zucman (2014), the wealth of America's top 130,000 households is about the same as the bottom 117 million households combined. Therefore, introduce a wealth tax, proposing a 2% tax on all households with assets between $50 million and $1 billion and imposing a 3% to 6% tax on wealth above $1 billion (which only accounts for 75,000 households). This action will provide $3.75 trillion in additional revenue over ten years (Warren, 2019).
4. Raise the statutory U.S. corporate tax rate from 21%. From 1993 to 2017, the highest tax rate was 35%. A modest corporate tax rate increase of just one percentage point in the next decade would add $8.5 billion in 2023, $9.1 billion in 2024, $9.8 billion in 2025, and $99.3 billion from 2021 to 2030 (p. 77).

These four options would improve our deficit while creating an economic environment that still favors capitalism and keeps Americans from being disappointed by a socialist and unattractive tax system.

Contributions to Research

My study has contributed to research and literature in three ways. First, I extend previous literature by studying previous sovereign nations' monetary and fiscal policy decisions and how those decisions have impacted their economy. However, as validated in my research, there may be significant country variations in the strength of those impacts and the precise thresholds specific to each country. These results should worry American officials, policymakers, and the public, given the country's current trend of public debt. Consequently, I proposed four fiscal solutions to either decrease federal spending or increase federal revenues, reducing the current U.S. national debt.

Second, from a global perspective, my contributions and research reveal that specific national features govern how debt impacts the economy. In contrast, earlier studies offered precise tipping points generalizing countries by income and financial level. For instance, according to Cordella, Ricci, and Ruiz-Arranz (2010), even high public debt levels do not stunt economic expansion in countries with stable institutions and macroeconomic policies. Reinhart and Rogoff (2010) assert that when a country becomes more industrialized, the debt overhang only begins to negatively affect that country when the debt-to-GDP ratio surpasses 77%. My research suggests that real economic growth slows down in the United States when the debt-to-GDP ratio rises to 62.75%. What happens to economic growth if the United States debt-to-GDP turning point is below the 62.75% threshold level? If historical deficits were used to finance profitable public investments, more spending and more debt might have a favorable impact on growth. Again, by targeting one country, I can find the threshold level specific to the United States, and policymakers can act accordingly with their fiscal and monetary measures.

Third, my findings can influence borrowing and debt relief decisions, especially with the overlooked, unfunded debt obligations. Government debt has a detrimental effect on economic growth, with current and unfunded liabilities such as Medicare and Social Security exacerbating the situation. Unfortunately, current research only studies the total current liabilities of countries and ignores the unfunded liabilities. Unfortunately, the size of the unfunded debt obligations is much more significant than the current national debt. For example, as of September 17, 2022, the United States has over $30 trillion in National Debt and over $170 trillion with unfunded liabilities (U.S. Debt Clock 2023). Moreover, as I identified with the U.S. fiscal outlays and spending research, the recent national spending has increased dramatically with social programs over the last 50 years and encompasses most of the annual federal budget. Thus, future research

should examine current and funded debt obligations and unfunded obligations, especially when Medicare and Social Security debt account for nearly 80% of all U.S. debt (U.S. National Debt Clock 2023).

My results raise several questions. To begin, the United States has surpassed the threshold level of the debt-to-GDP ratio, and it has been over 20 years since the federal government ran a budget surplus; at what point do policymakers act to structurally lower the debt-to-GDP ratio before further weakening real economic growth? Secondly, the United States has the U.S. dollar, the world's reserve currency. How would current debt levels be further negatively impacted if the dollar ceased to be the world's currency or if it depreciated significantly?

Extensions for Future Research:

Future research in the literature studying the relationship between a country's debt-to-G.D.P. ratio and real economic growth could be extended to explore other public expenditures on healthcare, education, infrastructure, and other social welfare projects that affect the economic health of a nation. In addition to studying the direct effects of public expenditure on a nation's economic well-being, it would also be productive to investigate if specific economic policies - such as tax incentives or regulatory reforms - could lead to improved financial stability while positively impacting economic growth.

Furthermore, future research should investigate how external shocks such as natural disasters or pandemics can affect a nation's debt levels and real economic growth potential over time. For instance, by performing comparative analyses across multiple countries hit by similar external shocks (i.e., comparing the impacts of two different natural disasters in two different

countries), researchers can examine what sorts of policy interventions were most effective at helping these nations rebound economically while keeping their national debts under control.

Due to country-specific factors, researchers should continue to evaluate these various policies and shocks on a country-by-country basis and calculate the specific threshold levels by country rather than by country classification. I hope that future work will answer these questions to provide a complete picture of the phenomenon documented here.

Limitations to Research:

My research and analysis feature some limitations. One question remains whether the debt overhang is the reason for a slowdown in real economic growth or if this slowdown is a reverse causality. After WWII, the United States experienced an impressive burst of growth. That remarkable period offers insights into how public debt can spur economic progress; however, it is not necessarily a reliable parallel to current circumstances as our nation currently faces multiple decades-long overhangs in public debt that may stifle further development.

Another limitation of my research is that most studies focus on developed economies, so the findings may need to be generalizable to developing economies. Also, since research is often based on aggregate data, the research needs to consider the heterogeneity of countries. In other words, the results of one's research may only apply to some countries.

Finally, limits exist concerning the scope and methods of the study. For example, many studies only examine the short-term effects of high debt-to-GDP ratios, so the long-term effects still need to be determined. In addition, many economists have differing views about the appropriate way to measure debt levels, and GDP, so different studies often use varying methods, making comparing results difficult. Furthermore, research often relies on cross-sectional data, which can be affected by other factors such as institutions and market structure.

Conclusion

The purpose of my work was to formally evaluate and estimate the debt-to-GDP-threshold value while accounting for other relevant variables that influence growth. I sought to establish an analytical foundation for the debt-growth relationship by evaluating the threshold value. I analyzed prior literature from the original Reinhart-Rogoff framework using both exploratory research and developing an econometric model. My results confirm that once the U.S.'s debt-to-GDP ratio surpasses 62.75%, each additional percentage of debt will reduce real economic growth. Fortunately, the United States deleveraging success is possible with a favorable external environment defined by a moderate and controlled inflation level, financial repression, and sustained fiscal consolidation. The path toward debt containment and a reduction will require the United States to maintain a change over the short, medium, and long terms. By increasing government incentives to consolidate aggressively, policymakers can improve current debt levels and debt service costs to avoid some consequences when facing an unsustainable debt-to-GDP ratio.

Most importantly, policymaker credibility is essential to ensure that appropriate and measurable fiscal policies are executed and that leaders are held accountable for their decisions. At the same time, policymakers must be prepared to tackle the political and economic risks with these restrictive fiscal and monetary decisions. Primarily, these risks will mean a decrease in economic growth and result in less consumer and business spending, job losses, and decreases in manufacturing activity. Thus, gradual, sustained consolidation is essential during this process and these tough decisions will have to be made sooner than later for the sake of our children and grandchildren's future.

Appendix and Tables

Table 1: Variables of Interest and Data Sources

Variable	Time Series	Data Source
Public Debt	General government, gross debt	Federal Reserve Economic Data: St. Louis Fred
Nominal GDP	GDP non-adjusted for inflation	Federal Reserve Economic Data: St. Louis Fred
Real GDP Growth	GDP adjusted for inflation	Federal Reserve Economic Data: St. Louis Fred

Table 2: Non-Stationary GDP

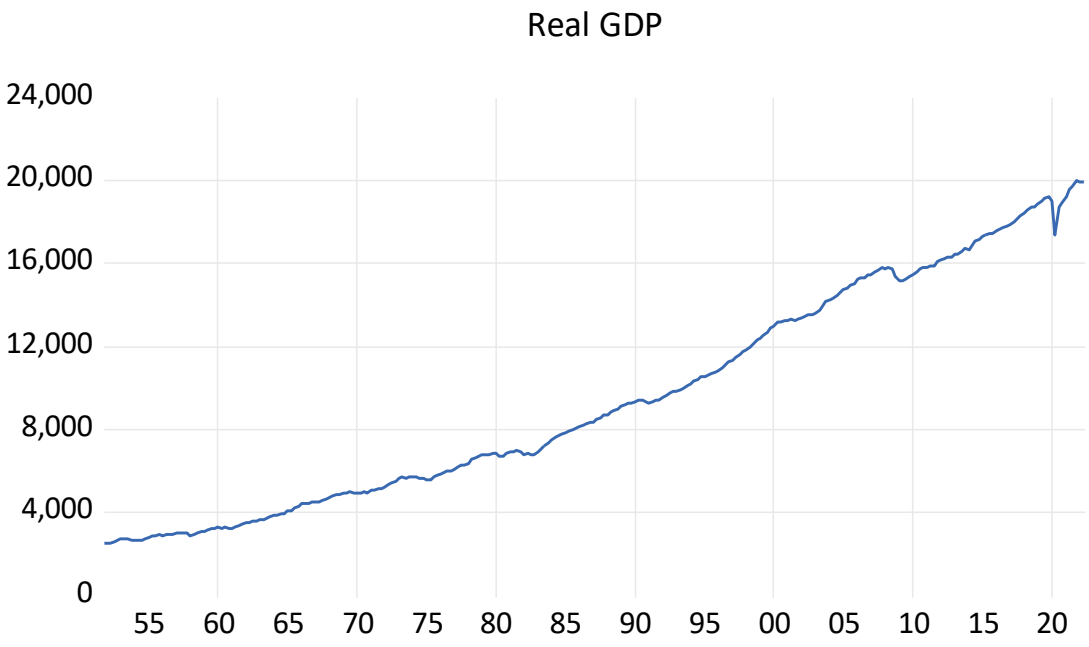


Table 3: Stationary GDP

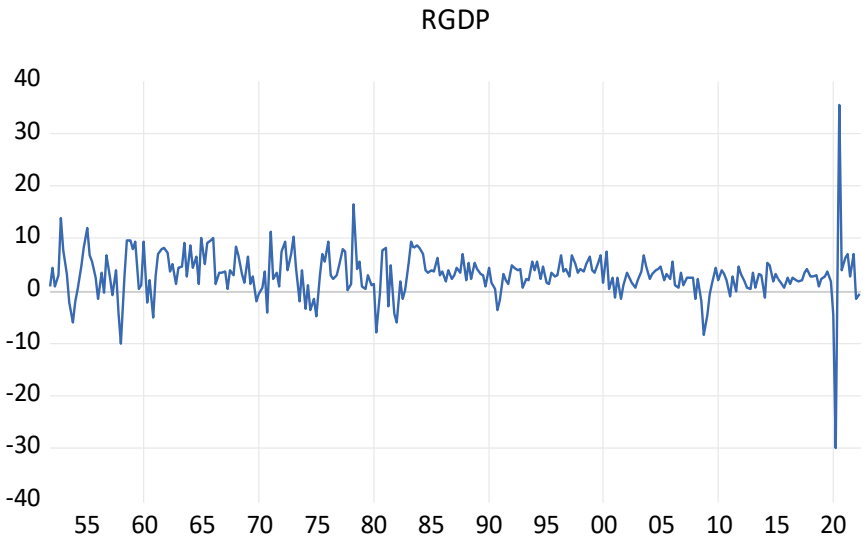


Table 4: Debt-to-GDP to Real GDP Non-Moving Average to Moving Average Debt-to-GDP to Real GDP

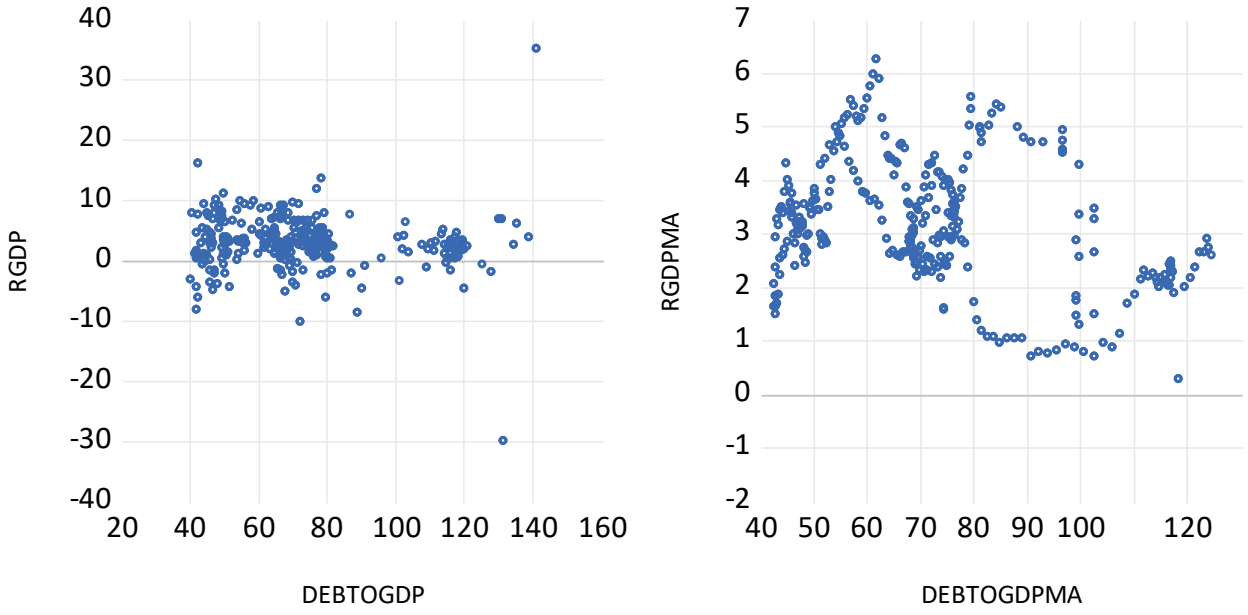


Table 5: Unit Root Test

Null Hypothesis: RGDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-15.59259	0.0000
Test critical values:	1% level	-3.453317	
	5% level	-2.871546	
	10% level	-2.572174	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RGDP)
Method: Least Squares
Date: 10/23/22 Time: 06:22
Sample: 1951Q4 2022Q2
Included observations: 283

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGDP(-1)	-0.926373	0.059411	-15.59259	0.0000
C	2.842604	0.326108	8.716767	0.0000

R-squared	0.463872	Mean dependent var	-0.032084
Adjusted R-squared	0.461964	S.D. dependent var	6.169174
S.E. of regression	4.525145	Akaike info criterion	5.864218
Sum squared resid	5754.019	Schwarz criterion	5.889981
Log likelihood	-827.7869	Hannan-Quinn criter.	5.874548
F-statistic	243.1289	Durbin-Watson stat	2.006817
Prob(F-statistic)	0.000000		

Table 6: Histogram and Descriptive Statistics: All 283 Observations

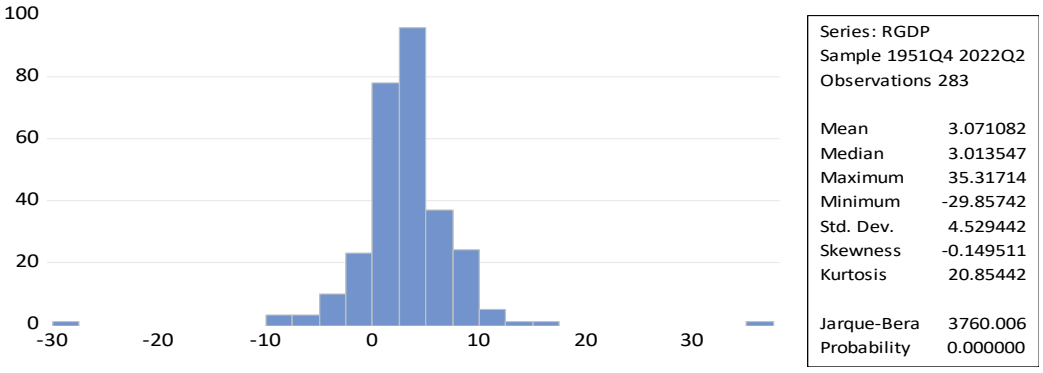
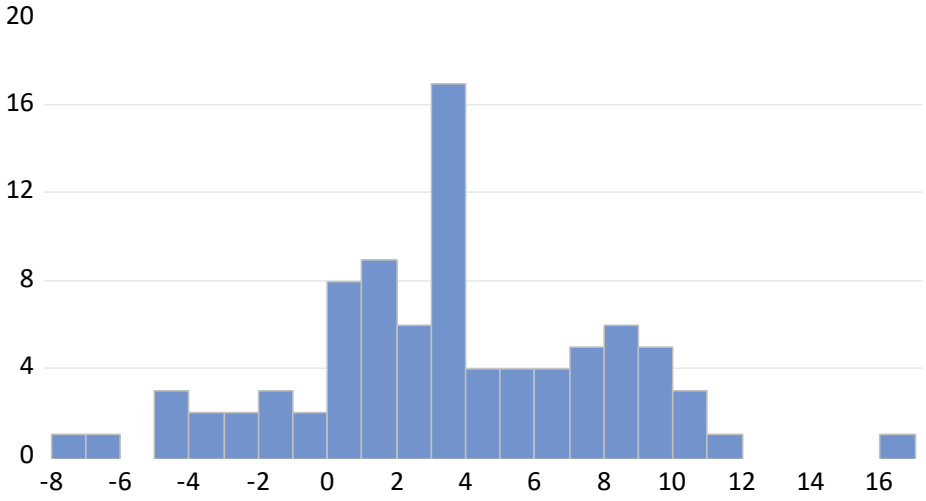
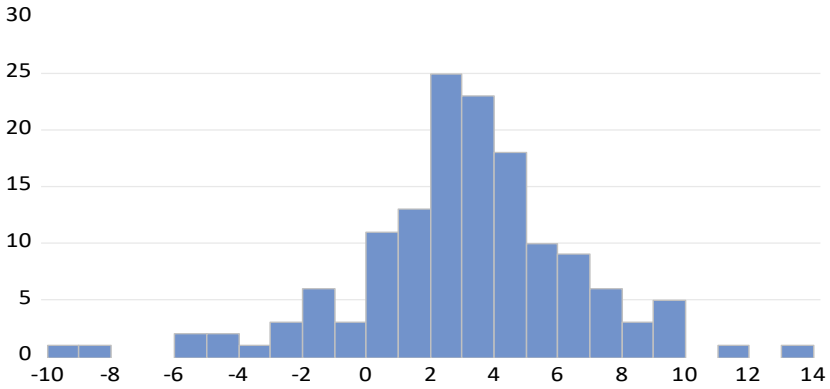


Table 7: Histogram and Descriptive Statistics: Debt-to-GDP <60%



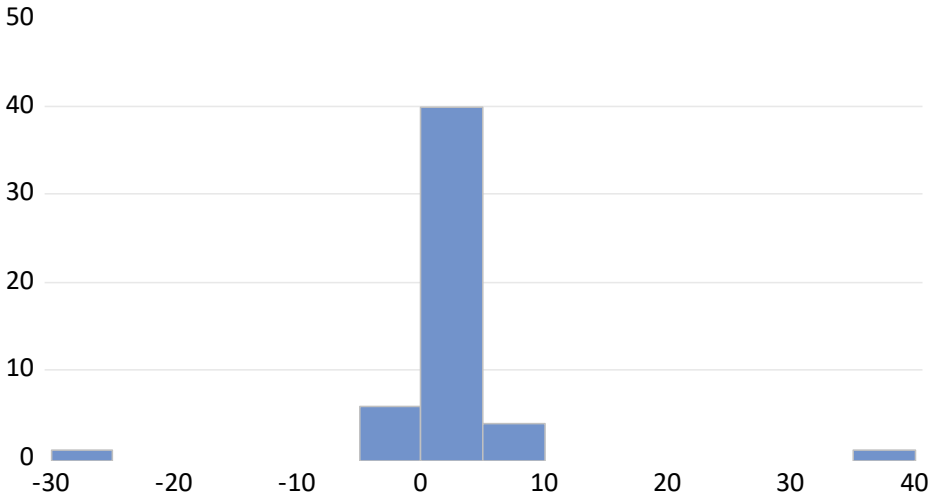
Series: RGDP	
Sample 1951Q4 2022Q2 IF DEBTOGDP<=60	
Observations 87	
Mean	3.491800
Median	3.332728
Maximum	16.37634
Minimum	-7.990637
Std. Dev.	4.333947
Skewness	-0.039875
Kurtosis	3.220917
Jarque-Bera	0.199971
Probability	0.904851

Table 8: Histogram and Descriptive Statistics: Debt-to-GDP >60% and less than 100%



Series: RGDP	
Sample 1951Q4 2022Q2 IF (DEBTOGDP>60 AND DEBTOGDP <=100)	
Observations 144	
Mean	3.080332
Median	3.139657
Maximum	13.79831
Minimum	-9.984530
Std. Dev.	3.528620
Skewness	-0.451790
Kurtosis	4.820792
Jarque-Bera	24.79045
Probability	0.000004

Table 9: Histogram and Descriptive Statistics: Debt-to-GDP >100%



Series: RGDP	
Sample 1951Q4 2022Q2 IF DEBTOGDP>100	
Observations 52	
Mean	2.341573
Median	2.401929
Maximum	35.31714
Minimum	-29.85742
Std. Dev.	6.783083
Skewness	0.143126
Kurtosis	21.35976
Jarque-Bera	730.5191
Probability	0.000000

Table 10: Threshold Regression: One Threshold, Non-Moving Averages

Dependent Variable: RGDP
Method: Discrete Threshold Regression
Date: 10/16/22 Time: 20:34
Sample: 1951Q4 2022Q2
Included observations: 283
Selection: Trimming 0.15, Max. thresholds 1, Sig. level 0.05
Threshold variable: DEBTOGDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBTOGDP < 88.76318 -- 228 obs				
DEBTOGDP	-0.081249	0.027992	-2.902576	0.0040
CPI	-0.481370	0.112792	-4.267761	0.0000
C	10.29039	2.065932	4.980993	0.0000
88.76318 <= DEBTOGDP -- 55 obs				
DEBTOGDP	0.058671	0.063323	0.926538	0.3550
CPI	0.774557	0.221337	3.499444	0.0005
C	-6.519152	7.150887	-0.911656	0.3627

R-squared	0.138817	Mean dependent var	3.071082
Adjusted R-squared	0.123272	S.D. dependent var	4.529442
S.E. of regression	4.241086	Akaike info criterion	5.748489
Sum squared resid	4982.346	Schwarz criterion	5.825778
Log likelihood	-807.4112	Hannan-Quinn criter.	5.779479
F-statistic	8.930128	Durbin-Watson stat	1.918928
Prob(F-statistic)	0.000000		

Table 11: Threshold Regression: One Threshold:

Dependent Variable: RGDPMA
Method: Discrete Threshold Regression
Date: 10/16/22 Time: 20:50
Sample: 1951Q4 2022Q2
Included observations: 283
Selection: Trimming 0.15, Max. thresholds 1, Sig. level 0.05
Threshold variable: DEBTOGDPMA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBTOGDPMA < 62.75224 -- 99 obs				
DEBTOGDPMA	0.150690	0.017490	8.615673	0.0000
CPI	0.048259	0.029567	1.632150	0.1038
C	-4.224578	0.957860	-4.410435	0.0000
62.75224 <= DEBTOGDPMA -- 184 obs				
DEBTOGDPMA	-0.026603	0.003760	-7.074627	0.0000
CPI	-0.020881	0.032295	-0.646556	0.5185
C	5.223053	0.323283	16.15627	0.0000

R-squared	0.367060	Mean dependent var	3.192594
Adjusted R-squared	0.355635	S.D. dependent var	1.158520
S.E. of regression	0.929971	Akaike info criterion	2.713647
Sum squared resid	239.5625	Schwarz criterion	2.790936
Log likelihood	-377.9811	Hannan-Quinn criter.	2.744637
F-statistic	32.12803	Durbin-Watson stat	0.117487
Prob(F-statistic)	0.000000		

Table 12: Threshold Regression: Two Thresholds:

Dependent Variable: RGDPMA
Method: Discrete Threshold Regression
Date: 10/16/22 Time: 20:57
Sample: 1951Q4 2022Q2
Included observations: 283
Selection: Trimming 0.15, Max. thresholds 2, Sig. level 0.05
Threshold variable: DEBTOGDPMA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBTOGDPMA < 63.43678 -- 102 obs				
DEBTOGDPMA	0.138984	0.015260	9.107640	0.0000
CPI	0.040294	0.027219	1.480371	0.1399
C	-3.615857	0.846995	-4.269042	0.0000
63.43678 <= DEBTOGDPMA < 93.84048 -- 137 obs				
DEBTOGDPMA	-0.004974	0.011427	-0.435258	0.6637
CPI	-0.112031	0.039035	-2.870049	0.0044

C	3.863145	0.858389	4.500458	0.0000
93.84048 <= DEBTOGDPMA -- 44 obs				
DEBTOGDPMA	0.064483	0.018703	3.447658	0.0007
CPI	0.038742	0.053271	0.727250	0.4677
C	-5.467907	2.078283	-2.630973	0.0090

R-squared	0.459214	Mean dependent var	3.192594
Adjusted R-squared	0.443424	S.D. dependent var	1.158520
S.E. of regression	0.864302	Akaike info criterion	2.577497
Sum squared resid	204.6830	Schwarz criterion	2.693430
Log likelihood	-355.7158	Hannan-Quinn criter.	2.623982
F-statistic	29.08372	Durbin-Watson stat	0.206794
Prob(F-statistic)	0.000000		

Table 13: Threshold Regression: Three Thresholds:

Dependent Variable: RGDPMA
Method: Discrete Threshold Regression
Date: 10/16/22 Time: 20:58
Sample: 1951Q4 2022Q2
Included observations: 283
Selection: Trimming 0.15, Max. thresholds 3, Sig. level 0.05
Threshold variable: DEBTOGDPMA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBTOGDPMA < 53.84842 -- 72 obs				
DEBTOGDPMA	0.123529	0.030902	3.997434	0.0001
CPI	0.064138	0.027030	2.372808	0.0184
C	-3.104698	1.504394	-2.063753	0.0400
53.84842 <= DEBTOGDPMA < 70.50872 -- 78 obs				
DEBTOGDPMA	-0.217396	0.023798	-9.135148	0.0000
CPI	-0.249555	0.067287	-3.708791	0.0003
C	18.48400	1.653348	11.17974	0.0000
70.50872 <= DEBTOGDPMA < 93.84048 -- 89 obs				
DEBTOGDPMA	-0.011644	0.016572	-0.702608	0.4829
CPI	-0.095674	0.041863	-2.285380	0.0231
C	4.404349	1.301600	3.383797	0.0008
93.84048 <= DEBTOGDPMA -- 44 obs				
DEBTOGDPMA	0.064483	0.017996	3.583093	0.0004
CPI	0.038742	0.051258	0.755819	0.4504
C	-5.467907	1.999727	-2.734326	0.0067

R-squared	0.504805	Mean dependent var	3.192594
Adjusted R-squared	0.484705	S.D. dependent var	1.158520
S.E. of regression	0.831633	Akaike info criterion	2.510626
Sum squared resid	187.4272	Schwarz criterion	2.665203
Log likelihood	-343.2536	Hannan-Quinn criter.	2.572606
F-statistic	25.11445	Durbin-Watson stat	0.254707
Prob(F-statistic)	0.000000		

Table 14: Threshold Regression with Dummy Variables:

Dependent Variable: RGDPMA
Method: Discrete Threshold Regression
Date: 10/16/22 Time: 21:05
Sample: 1951Q4 2022Q2
Included observations: 283
Selection: Trimming 0.15, Max. thresholds 1, Sig. level 0.05
Threshold variable: DEBTOGDPMA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DEBTOGDPMA < 62.75224 -- 99 obs				
DEBTOGDPMA	0.146282	0.017450	8.382968	0.0000
CPI	0.060734	0.029902	2.031072	0.0432
USRECQ*DEBTOGDPMA	-0.011306	0.005530	-2.044261	0.0419
C	-3.990818	0.955192	-4.178029	0.0000
62.75224 <= DEBTOGDPMA -- 184 obs				
DEBTOGDPMA	-0.026863	0.003726	-7.210616	0.0000
CPI	-0.030600	0.032403	-0.944356	0.3458
USRECQ*DEBTOGDPMA	-0.004824	0.002608	-1.849509	0.0655
C	5.313944	0.323815	16.41042	0.0000

R-squared	0.384081	Mean dependent var	3.192594
Adjusted R-squared	0.368403	S.D. dependent var	1.158520
S.E. of regression	0.920711	Akaike info criterion	2.700521
Sum squared resid	233.1201	Schwarz criterion	2.803573
Log likelihood	-374.1238	Hannan-Quinn criter.	2.741841
F-statistic	24.49818	Durbin-Watson stat	0.113499
Prob(F-statistic)	0.000000		

Table 15: Granger Causality Tests

Pairwise Granger Causality Tests
Date: 10/16/22 Time: 21:12
Sample: 1951Q4 2022Q2
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
RGDP does not Granger Cause DDEBTOGDP	280	13.4634	3.E-06
DDEBTOGDP does not Granger Cause RGDP		1.19687	0.3037

Table 16: Federal Fiscal Outlays as a Percentage of GDP by Year: Graph

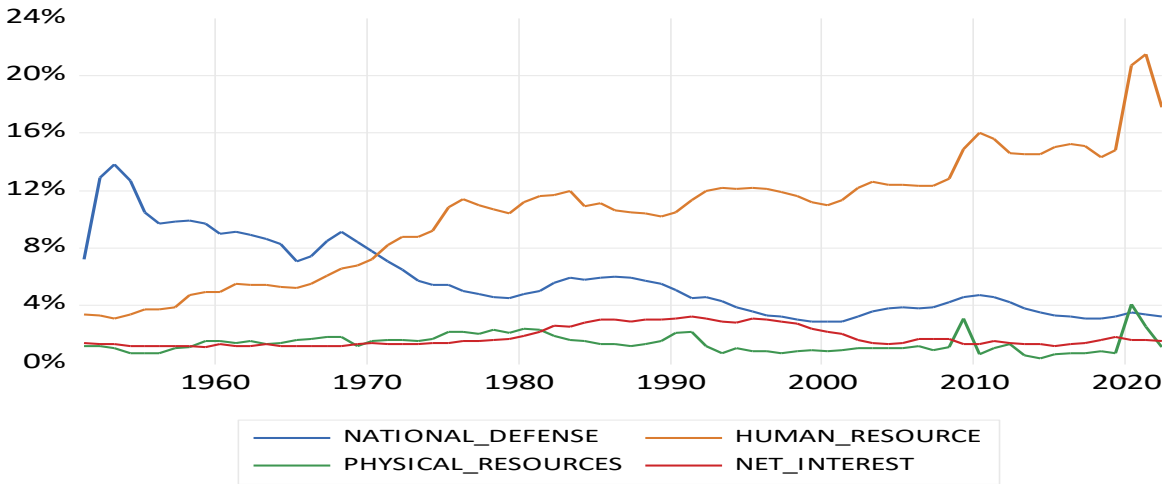


Table 17: Federal Fiscal Outlays as a Percentage of GDP by Year: Regression

Dependent Variable: RGDPMA
Method: Least Squares
Date: 10/29/22 Time: 21:13
Sample: 1951Q4 2022Q2
Included observations: 283

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.316965	0.517864	10.26711	0.0000
NATIONAL_DEFENSE	-0.046275	0.040549	-1.141209	0.2548
HUMAN_RESOURCE	-0.237014	0.025077	-9.451382	0.0000
PHYSICAL_RESOURCES	0.150506	0.087650	1.717119	0.0871
NET_INTEREST	0.201049	0.077020	2.610351	0.0095
CPI	0.039066	0.017346	2.252206	0.0251
USRECQ	-0.666038	0.143302	-4.647784	0.0000

R-squared	0.527026	Mean dependent var	3.192594
Adjusted R-squared	0.516744	S.D. dependent var	1.158520
S.E. of regression	0.805364	Akaike info criterion	2.429378
Sum squared resid	179.0165	Schwarz criterion	2.519548
Log likelihood	-336.7570	Hannan-Quinn criter.	2.465533
F-statistic	51.25703	Durbin-Watson stat	0.152019
Prob(F-statistic)	0.000000		

References

Abbas, S. M. Ali, et al. "A Historical Public Debt Database." *SSRN Electronic Journal*, 2010, 10.2139/ssrn.1750734. Accessed 18 Nov. 2021.

Abbas, S. M., & Christensen, J. E. (2010). The Role of Domestic Debt Markets in Economic Growth: An Empirical Investigation for Low-Income Countries and Emerging Markets. *IMF Staff Papers*, *57*(1), 209–255. https://econpapers.repec.org/article/palimfstp/v_3a57_3ay_3a2010_3ai_3a1_3ap_3a209-255.htm

Abiad, Abdul, et al. "The Macroeconomic Effects of Public Investment: Evidence from Advanced Economies." *Journal of Macroeconomics*, vol. 50, no. C, 2016, pp. 224–240, econpapers.repec.org/article/eeejmacro/v_3a50_3ay_3a2016_3ai_3ac_3ap_3a224-240.htm. Accessed 24 Sept. 2022.

Aisen, A., & Hauner, D. (2013). Budget deficits and interest rates: a fresh perspective. *Applied Economics*, *45*(17), 2501–2510. https://doi.org/10.1080/00036846.2012.667557

Aizenman, J., & Marion, N. (2011). Using inflation to erode the U.S. public debt. *Journal of Macroeconomics*, *33*(4), 524–541. https://econpapers.repec.org/article/eeejmacro/v_3a33_3ay_3a2011_3ai_3a4_3ap_3a524-541.htm

Auerbach, Alan J, and Yuriy Gorodnichenko. "Measuring the Output Responses to Fiscal Policy." *American Economic Journal: Economic Policy*, vol. 4, no. 2, May 2012, pp. 1–27, www.aeaweb.org/articles?id=10.1257/pol.4.2.1, 10.1257/pol.4.2.1.

Baldacci, E., Gupta, S., Mulas-Granados, C., & Devereux, M. B. (2012). Reassessing the fiscal mix for successful debt reduction. *Economic Policy*, *27*(71), 365–406. http://www.jstor.org/stable/23271545

Bandiera, Luca, Public Debt and its Determinants in Low Income Countries - Results from 7 Country Case Studies (2008). Available at SSRN: https://ssrn.com/abstract=1143511 or http://dx.doi.org/10.2139/ssrn.1143511

Barro, Robert. "Inflation and Economic Growth." *RePEc - Econpapers*, 1 Oct. 1995, econpapers.repec.org/paper/nbrnberwo/5326.htm.

Baum, A., Checherita-Westphal, C., & Rother, P. (2012). *A Service of zbw Leibniz-Informationszentrum Wirtschaft Leibniz Information Centre for Economics*. https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1450.pdf

Bell, Andrew & Johnston, Ron & Jones, Kelvyn. (2015). Stylised fact or situated messiness? The diverse effects of increasing debt on National economic growth. Journal of Economic Geography. 15. 449-472. 10.1093/jeg/lbu005.

Bernardini, S., Cottarelli, C., Galli, G., & Valdes, C. (2019, June 16). *Reducing Public Debt: The Experience of Advanced Economies over the Last 70 Years*. Papers.ssrn.com. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3405018

Bernheim, B. Douglas, and Nber Ricardian. 1987. Ricardian Equivalence: An Evaluation of Theory and Evidence. *Chicago Journals* 2: 263–304.

Best, Tom, et al. "Reducing Debt Short of Default." *Sovereign Debt*, 17 Oct. 2019, pp. 225–274, academic.oup.com/book/35147/chapter-abstract/299350390?redirectedFrom=fulltext, 10.1093/oso/9780198850823.003.0007. Accessed 30 Oct. 2022.

Blanchard, Olivier, and Roberto Perotti. “An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output.” *The Quarterly Journal of Economics*, vol. 117, no. 4, 2002, pp. 1329–1368, www.jstor.org/stable/4132480.

Board of Governors of Federal Reserve. “Federal Register :: Request Access.” *Unblock.federalregister.gov*, 3 Feb. 2015, www.federalregister.gov/documents/2015/02/03/2015-02038/regulation-q-regulatory-capital-rules-interim-final-rule-to-exempt-small-savings-and-loan-holding. Accessed 18 Feb. 2023.

Bryan, Michael. “The Great Inflation | Federal Reserve History.” *Www.federalreservehistory.org*, 22 Nov. 2013, www.federalreservehistory.org/essays/great-inflation.

Caner, M., Grennes, T. J., and Köhler-Geib, F. (Fritzi) N. (2010). Finding the Tipping Point - When Sovereign Debt Turns Bad. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1612407

Caner, Mehmet, et al. “Finding the Tipping Point - When Sovereign Debt Turns Bad.” *Papers.ssrn.com*, 20 May 2010, papers.ssrn.com/sol3/papers.cfm?abstract_id=1612407. Accessed 20 Aug. 2022.

Catao, Luis A.V. & Terrones, Marco E., 2005. "**Fiscal deficits and inflation**," Journal of Monetary Economics, Elsevier, vol. 52(3), pages 529-554, April.

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. https://econpapers.repec.org/article/eeeeecrev/v_3a56_3ay_3a2012_3ai_3a7_3ap_3a1392

-1405.htm

Chen, S.-T., & Lee, C.-C. (2005). Government size and economic growth in Taiwan: A threshold regression approach. *Journal of Policy Modeling*, *27*(9), 1051–1066. https://doi.org/10.1016/j.jpolmod.2005.06.006

Clements, B. J., Bhattacharya, R., & Nguyen, T. Q. (2003). External Debt, Public Investment, and Growth in Low-Income Countries. *IMF Working Papers*, *2003*(249). https://doi.org/10.5089/9781451875904.001.A001

Clinton White House Archives. (2000, December 29). [Webpage]. Retrieved from https://clintonwhitehouse4.archives.gov/textonly/WH/new/html/Fri_Dec_29_151111_2000.html"

Cohen, D. (1990). Debt Relief: Implications of Secondary Market Discounts and Debt Overhangs. *The World Bank Economic Review*, *4*(1), 43–53. https://doi.org/10.1093/wber/4.1.43

Coibion, O., Gorodnichenko, Y., & Weber, M. (2021, February 22). *Fiscal Policy and Households' Inflation Expectations: Evidence from a Randomized Control Trial*. Papers.ssrn.com. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3789381

Cordella, Tito & Ricci, Luca & Ruiz-Arranz, Marta. (2010). Debt Overhang or Debt Irrelevance?. ERN: Debt; Debt Management (Topic). 57. 10.1057/imfsp.2009.20.

Cournède, B. (2010, July 1). *Gauging the Impact of Higher Capital and Oil Costs on Potential Output*. Ideas.repec.org. https://ideas.repec.org/p/oec/ecoaaa/789-en.html

DeLong, J. Bradford, and Lawrence Summers. "Fiscal Policy in a Depressed Economy." *Brookings Papers on Economic Activity*, vol. 43, no. 1 (Spring), 2012, pp. 233–297,

econpapers.repec.org/article/binbpeajo/v_3a43_3ay_3a2012_3ai_3a2012-01_3ap_3a233-297.htm. Accessed 30 Oct. 2022.

"Debt Limit." *U.S. Department of the Treasury*, 2022, home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/debt-limit#:~:text=Congress%20has%20always%20acted%20when. Accessed 16 Jan. 2023.

De Rugy, Veronique, and Arnold Kling. "The Five Channels of Debt Reduction: Economic and Policy Tools for Reducing the Debt-To-GDP Ratio | Mercatus Center." *Www.mercatus.org*, 9 May 2022, www.mercatus.org/research/policy-briefs/five-channels-debt-reduction-economic-and-policy-tools-reducing-debt-gdp.

De Rugy, Veronique & Salmon, Jack. "Debt and Growth: A Decade of Studies." *Mercatus Center*, 15 Apr. 2020, www.mercatus.org/publications/government-spending/debt-and-growth-decade-studies.

De Soyres, Constance, et al. "Public Debt and Real GDP: Revisiting the Impact." *IMF Working Papers*, vol. 2022, no. 076, Apr. 2022, p. 1, 10.5089/9798400207082.001. Accessed 21 June 2022.

Dickey, David A., and Wayne A. Fuller. "Distribution of the Estimators for Autoregressive Time Series with a Unit Root." *Journal of the American Statistical Association*, vol. 74, no. 366, June 1979, p. 427, 10.2307/2286348.

Dustmann, Christian, et al. "From Sick Man of Europe to Economic Superstar: Germany's Resurgent Economy." *Journal of Economic Perspectives*, vol. 28, no. 1, Feb. 2014, pp. 167–188, www.ucl.ac.uk/~uctpb21/Cpapers/jep_germany_competitiveness.pdf, https://doi.org/10.1257/jep.28.1.167.

Egert, B. (2013a). *Public Debt, Economic Growth and Nonlinear Effects: Myth or Reality*.

Ideas.repec.org. https://ideas.repec.org/p/ces/ceswps/_4157.html

Égert, Balázs (2013) : The 90% Public Debt Threshold: The Rise and Fall of a Stylised Fact, CESifo Working Paper, No. 4242

Elmendorf, Douglas W, and N. Gregory Mankiw. "Government Debt." *National Bureau of Economic Research*, 1 Mar. 1998, www.nber.org/papers/w6470.

Emran, M. S., & Farazi, S. (2009). Lazy Banks? Government borrowing and private credit in developing countries. Institute for International Economic Policy: The George Washington University.

"Federal Debt: Total Public Debt as Percent of Gross Domestic Product." *Stlouisfed.org*, 2019, fred.stlouisfed.org/series/GFDEGDQ188S.

"Federal Net Interest Costs: A Primer | Congressional Budget Office." *Www.cbo.gov*, 15 Dec. 2020, www.cbo.gov/publication/56910#:~:text=historically%20low%20levels.-. Accessed 12 Feb. 2023.

Finger, Harald, and Azim Sadikov. "Finance and Development." *Finance and Development | F&D*, 1 June 2010, www.imf.org/external/pubs/ft/fandd/2010/06/finger.htm. Accessed 30 Oct. 2022.

Frankel, Jeffrey A., and David Romer. "Does Trade Cause Growth?" *The American Economic Review*, vol. 89, no. 3, 1999, pp. 379–399, www.jstor.org/stable/117025.

Giannitsarou, C., & Scott, A. (2006, October 1). *Inflation Implications of Rising Government Debt*. RePEc - Econpapers. https://econpapers.repec.org/paper/nbrnberwo/12654.htm

Gillman, M., Harris, M. N., & Matyas, L. (2002). Inflation and Growth: Some Theory and Evidence. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.268139

Gillum, Lawrence, et al. “The U.S. Government Could Be on the Hook for $1 Trillion in Annual Interest Expenses.” *LPL Financial Research*, 8 Nov. 2022, lplresearch.com/2022/11/08/the-u-s-government-could-be-on-the-hook-for-1-trillion-in-annual-interest-expenses/#more-26035. Accessed 12 Nov. 2022.

Granger, C. W. J. (1969). "Investigating Causal Relations by Econometric Models and Cross-spectral Methods". Econometrica. 37 (3): 424–438. doi:10.2307/1912791. JSTOR 1912791.

Granger, C. W. J.; Newbold, P. (1974). "Spurious regressions in econometrics". Journal of Econometrics. 2 (2): 111–120. CiteSeerX 10.1.1.353.2946. doi:10.1016/0304-4076(74)90034-7

Greenwald, B., and J.E. Stiglitz. “Keynesian, New Keynesian, and New Classical Economics.” *Oxford Economic Papers*, vol. 39, no. 1, Mar. 1987, pp. 119–133, 10.1093/oxford journals.oep.a041773. Accessed 27 Apr. 2019.

Hall, G. J., & Sargent, T. J. (2010, January 1). *Interest Rate Risk and Other Determinants of Post-WWII U.S. Government Debt/GDP Dynamics*. National Bureau of Economic Research. https://www.nber.org/papers/w15702

Hansen (1999). “Threshold Effects in Non-Dynamic Panels: Estimation, Testing, and Inference.” *Journal of Econometrics*, vol. 93, no. 2, Dec. 1999, pp. 345–368, 10.1016/s0304-4076(99)00025-1.

Hansen, B. E. (2000). Sample Splitting and Threshold Estimation. *Econometrica*, *68*(3), 575–603. https://doi.org/10.1111/1468-0262.00124

Hauner, D. (2009). Public debt and financial development. *Journal of Development Economics*, *88*(1), 171–183. https://ideas.repec.org/a/eee/deveco/v88y2009i1p171-183.html

Herndon, T., Ash, M., & Pollin, R. (2013). Does high public debt consistently stifle economic growth? A critique of Reinhart and Rogoff. *Cambridge Journal of Economics*, *38*(2), 257–279. https://doi.org/10.1093/cje/bet075

Henderson, D.R. "The U.S. Postwar Miracle | Mercatus Center." *Www.mercatus.org*, 4 Nov. 2010, www.mercatus.org/research/working-papers/us-postwar-miracle. Accessed 12 Feb. 2023.

Hill, Aaron D., et al. "Endogeneity: A Review and Agenda for the Methodology-Practice Divide Affecting Micro and Macro Research." *Journal of Management*, vol. 47, no. 1, 14 Oct. 2020, pp. 105–143, https://doi.org/10.1177/0149206320960533.

IMF Annual Report 2020 | COVID-19. (2021). www.imf.org. https://www.imf.org/external/pubs/ft/ar/2020/eng/spotlight/covid-19/

International Monetary Fund. (2010). A Historical Public Debt Database. In *Google Books*. International Monetary Fund. https://books.google.com/books?id=VJUYEAAAQBAJ&pg=PA4&lpg=PA4&dq=of+government+publications+found+from+the+League+of+Nations

Ivanova, Irina. "Inflation Hit 9.1% in June, Highest Rate in More than 40 Years." *Www.cbsnews.com*, 13 July 2022, www.cbsnews.com/news/inflation-june-cpi-report-hit-new-high-40-years-9-1-percent/.

Jahan, Sarwat, et al. "What Is Keynesian Economics? - back to Basics - Finance & Development, September 2014." *Imf.org*, Sept. 2014, www.imf.org/external/pubs/ft/fandd/2014/09/basics.htm.

Khan, N., & Naushad, M. (2020, February 22). *Inflation Relationship with the Economic Growth of the World Economy*. Papers.ssrn.com. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3542729

Khan, M. S., & Senhadji, A. (2000, December 1). *Financial Development and Economic Growth: An Overview*. Papers.ssrn.com. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=880870

Krishnamurthy, A., & Vissing-Jorgensen, A. (2012). The Aggregate Demand for Treasury Debt. *Journal of Political Economy*, *120*(2), 233–267. https://doi.org/10.1086/666526

Krause, M.U., and S. Moyen (2016). "Public Debt and Changing Inflation Targets", American Economic Journal: Macroeconomics, Vol. 8, No. 4, pp. 142–76.

Krugman, Paul. "Financing vs. Forgiving a Debt Overhang." *Journal of Development Economics*, vol. 29, no. 3, Nov. 1988, pp. 253–268, https://doi.org/10.1016/0304-3878(88)90044-2.

Kumar, Manmohan S, and Jaejoon Woo. *Public Debt and Growth;by Manmohan S. Kumar and Jaejoon Woo; IMF Working Paper 10/174;July 1, 2010*. 2010.

Laffer, Arthur. "The Laffer Curve: Past, Present, and Future." *The Heritage Foundation*, 1 June 2004, www.heritage.org/taxes/report/the-laffer-curve-past-present-and-future.

Levine, Ross, and David Renelt. "A Sensitivity Analysis of Cross-Country Growth Regressions." *The American Economic Review*, vol. 82, no. 4, 1992, pp. 942–963, www.jstor.org/stable/2117352.

Lof, Matthijs, and Tuomas Malinen. "Does Sovereign Debt Weaken Economic Growth? A Panel VAR Analysis." *Papers.ssrn.com*, 1 Oct. 2013.

Lu, G., Ding, X.D., Peng, D.X. & Chuang, H.H.C. (2018). Addressing endogeneity in operations management research: Recent developments, common problems, and directions for future research. *Journal of Operations Management,* 64, 53-64.

Marglin, Stephen A., and Juliet B. Schor. *The Golden Age of Capitalism*. 23 Jan. 1992, https://doi.org/10.1093/acprof:oso/9780198287414.001.0001. Accessed 24 Mar. 2020.

Maziarz, Mariusz. "A Review of the Granger-Causality Fallacy." *The Journal of Philosophical Economics : Reflections on Economic and Social Issues*, vol. VIII., no. 2, 20 May 2015, pp. 86–105, hrcak.srce.hr/clanak/229894. Accessed 23 Oct. 2022.

Mehrotra, N. R., & Sergeyev, D. (2020). Debt sustainability in a low interest rate world. *Journal of Monetary Economics*. https://doi.org/10.1016/j.jmoneco.2021.09.001

Mishkin, Frederic S. (2003). The Economics of Money, Banking, and Financial Markets (7th ed.). Addison Wesley. P. 643. ISBN 978-0-321-10683-4.

Missale, A., & Blanchard, O. J. (1991, December 1). *The Debt Burden and Debt Maturity*. National Bureau of Economic Research. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=392981

Minea, A. and Parent, A. (2012) Is High Public Debt Always Harmful to Economic Growth? Reinhart and Rogoff and Some Complex Nonlinearities. Working Papers 201218, CERDI

OECD "Sustaining the Miracle on the Han River." *OECD*, 25 Oct. 2021, www.oecd.org/country/korea/thematic-focus/sustaining-the-miracle-on-the-han-river-103653fa/.

Okwuokei, J. C., Amo-Yartey, C., & Narita, M. (2014). "Chapter 7. Fiscal Consolidation in the Caribbean: Past and Current Experiences". In Caribbean Renewal. USA: International

Monetary Fund. Retrieved Oct 23, 2021, from https://www.elibrary.imf.org/view/books/071/20625-9781484369142-en/ch07.xml

"Options for Reducing the Deficit: 2021 to 2030 | Congressional Budget Office." *Www.cbo.gov*, 9 Dec. 2020, www.cbo.gov/publication/56783.

Plotinsky, Benjamin. "Options for Reducing the Deficit: 2021 to 2030 | Congressional Budget Office." *Www.cbo.gov*, 9 Dec. 2020, www.cbo.gov/publication/56783.

Poirson, Hélène, et al. "What Are the Channels through Which External Debt Affects Growth?" *IMF Working Papers*, vol. 04, no. 15, 2004, p. 1, 10.5089/9781451843293.001.

Pozen, Robert. 2010." The U.S. Public debt hits its tipping point". The Boston Globe, February 23.

Pruitt, Sarah. "The Post World War II Boom: How America Got into Gear." *HISTORY*, 14 May 2020, www.history.com/news/post-world-war-ii-boom-economy.

Reinhart, C. M., & Rogoff, K. S. (2009, January 15). *The Aftermath of Financial Crises*. Www.nber.org. https://www.nber.org/papers/w14656

Reinhart, C. M., & Rogoff, K. S. (2010). Growth in a Time of Debt. American Economic Review, 100(2), 573–578. https://doi.org/10.1257/aer.100.2.573

Reinhart, C. M., & M Belen Sbrancia. (2011*). The Liquidation of Government Debt; Carmen M. Reinhart, Belen Sbrancia; Macro-Financial Stability in the New Normal; April 7, 2011*. https://www.imf.org/external/np/seminars/eng/2011/res2/pdf/crbs.pdf

Reinhart, Carmen M., and Vincent R. Reinhart, and Kenneth S. Rogoff, 2012, "Public Debt Overhangs: Advanced-Economy Episodes since 1800," Journal of Economic Perspectives, Vol. 26, No. 3, pp. 69–86.

Salmon, J., & de Rugy, V. (2020). Debt and Growth: A Decade of Studies. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3690510

Schick, Allen. “A Surplus, If We Can Keep It: How the Federal Budget Surplus Happened.” *Brookings*, 1 Dec. 2000, www.brookings.edu/articles/a-surplus-if-we-can-keep-it-how-the-federal-budget-surplus-happened/.

SchiffGold. “U.S. Debt: Annualized Interest Surges More than $22B in a Single Month | Seeking Alpha.” *Seekingalpha.com*, 9 Sept. 2022, seekingalpha.com/article/4539915-us-debt-annualized-interest-surges-more-than-22b-in-a-single-month. Accessed 19 Feb. 2023.

Solow, R.M. (1957) Technical Change and the Aggregate Production Function. Review of Economics and Statistics, 39, 312-320. https://doi.org/10.2307/1926047

Sovereign Borrowing Outlook for OECD Countries. (2021). https://www.oecd.org/daf/fin/public-debt/Sovereign-Borrowing-Outlook-in-OECD-Countries-2021.pdf

Steelman, Aaron. “Employment Act of 1946 | Federal Reserve History.” *Www.federalreservehistory.org*, 22 Nov. 2013, www.federalreservehistory.org/essays/employment-act-of-1946.

Stock, J. H. (2015). Instrumental variables in statistics and econometrics. https://scholar.harvard.edu/files/stock/files/instrumental_variables_in_economics_and_statistics.pdf.

Tanzi, Vito (1978): Inflation, Real Tax Revenue, and the Case for Inflationary Finance: Theory with an Application to Argentina, IMF Staff Papers, Vol. 25, No. 3, pp. 417-451.

“Treasury Bill Rates – Bank of Ghana.” *Bog.gov.gh*, 2021, www.bog.gov.gh/treasury-and-the-markets/treasury-bill-rates/.

Trebesch, C., Papaioannou, M., & Das, U. (2012, August 1). *Sovereign Debt Restructurings 1950-2010 : Literature Survey, Data, and Stylized Facts*. IMF.

https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Sovereign-Debt-Restructurings-1950-2010-Literature-Survey-Data-and-Stylized-Facts-26190

US Debt Clock. "U.S. National Debt Clock : Real Time." *Usdebtclock.org*, 2019, www.usdebtclock.org/.

U.S. Department of the Treasury. Fiscal Service. "Federal Debt Held by the Public." *FRED, Federal Reserve Bank of St. Louis*, 1 Jan. 1970, fred.stlouisfed.org/graph/?g=k977.

Warren, Elizabeth. "Ultra-Millionaire Tax | Elizabeth Warren." *Elizabethwarren.com*, 2019, elizabethwarren.com/plans/ultra-millionaire-tax.

BIOGRAPHICAL SKETCH

Vince Montanti, CFA, CFP, AIF, is the chief operating officer, financial advisor, researcher, and "student" at Montanti Advisory Services LLC. After graduating from the University of Florida's Warrington College of Business with a major in finance, Vince worked for Merrill Lynch as a private wealth advisor at Jacksonville's branch office for five years. During that time, he obtained his Series 7 and 66 exam licenses, his CFA's charter holder designation and became a Certified Financial Planner (CFP). In July 2011, Vince had an in-person discussion with his dad on a family trip to Italy to join the family business and serve clients as their personal chief financial officer. Through the Montanti Difference™, Vince helps his clients build an amazing life of significance so that they can take care of the people they love and causes they care about and make a difference in the world. The Montanti Difference™ is their genuinely personal approach to planning for our clients' families' success as if it were their own.

Working full-time at the family practice, Vince pursued his Accredited Investment Fiduciary Designation (AIF) and his executive MBA from Penn State University, graduating in 2013. Most recently, Vince is completing his last semester in the Doctor of Business Administration with a concentration in Finance at the University of Florida.