



ECONOMIC GROWTH IN THE USA: ECONOMETRIC MODEL AND FORECAST

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Abstract

Research background: Economic theory identifies many determinants of economic growth. The role of savings and budget deficits in stimulating growth remains a subject of controversy. This study provides a long-term analysis of the causes of economic growth using the most recent data for the world's largest economy, while simultaneously examining the role of savings, budget deficits, and R&D expenditures in economic growth.

Purpose: Identification of the causes of economic growth and its forecast for the U.S. economy.

Research methodology: Data from the FRED database for the U.S. economy from 1960 to 2023 was used. A linear econometric model, the OLS method, and statistical tests were applied for the analysis. The forecast for the years 2024–2028 was conducted using the exponential smoothing ETS model and the constructed linear model.

Results: Savings, budget deficit reduction, and R&D expenditures had a positive and significant impact on economic growth in the U.S. However, they were not the only determinants of economic growth. Based on an econometric forecast, it was found that the U.S. economy may experience a slowdown in economic growth between 2024 and 2028.

Novelty: Empirical confirmation of theoretical growth models where savings and technology determine economic growth, incorporating an analysis of current data. It challenges the claims about the negative impact of savings on economic growth and the positive effect of budget deficits on growth. Additionally,

it allows for the future development of the research tool used in the study for future analyses, studies and forecast.

Keywords: economic growth, USA, econometric model, econometric forecast, savings, government deficit, R&D expenditures.

JEL classification: C20, C51, C53, E20, E37, O47

Introduction

The issue of economic growth remains a subject of research and theoretical discussion in economics. In 2024, the Nobel Prize in Economic Sciences was awarded to researchers studying economic growth. Despite years of research, the topic of growth still sparks controversy among economists. It seems that the most important issue is the role of the state, the budget deficit in long-term growth, and the relationship between savings and growth. For this reason, further verification and identification of growth factors, using modern research tools, appears to be both interesting and necessary.

In this study, we attempt to examine the causes of economic growth in the United States from 1960 to 2023 and provide a forecast for USA economic growth for the years 2024–2028. The purpose of the study is to identify the factors driving economic growth in the USA. We test two hypotheses: first, that savings have a positive impact on economic growth, and second, that the budget deficit has a negative impact on economic growth. We use quantitative methods: a linear econometric model, an exponential smoothing model, and statistical tests. We also present policy recommendations for the future economic strategy.

The paper consists of four sections. In the first section, we review economic theories on economic growth and present empirical studies on its causes. The second section outlines the methodology of our study, while the third section presents the results of our analysis. This paper concludes with our findings, recommendations for future research, and policy recommendations for the USA.

Attempts to explain economic growth have, of course, been made in previous research. However, our study stands out due to its long-term analysis covering recent data from the world's largest economy. Additionally, it simultaneously examines the impact of savings and the budget deficit on economic growth, as well as the role of R&D expenditures in the

economic growth of the USA. Empirical studies in this field often focus on explaining the role of only one factor in economic growth. Moreover, our study goes a step further by providing an econometric forecast, whereas many other studies focus solely on explaining the historical causes of growth.

1. Economic growth – theory and empirical research

When we refer to economic growth, we generally understand it as a process in which a given economy, over a specified period, has increased its productivity and produced more goods than in the previous period (or a designated baseline period). Economic growth occurs, when the real market value of all goods and services produced in an economy during a given period is higher compared to the previous period. The most commonly used measure of economic growth is the year-over-year (y/y) and quarter-over-quarter (q/q) GDP growth rate, adjusted for inflation (economic growth as changes in real GDP).

Economic growth has been a subject of interest among economists from various schools and traditions for a long time. Attempts to explain economic growth emerged partially during the era of mercantilists and physiocrats (Piętak, 2016). A more systematic theory of growth can be traced to A. Smith's work on the causes of the wealth of nations. The classical school, represented by A. Smith, laid the foundation for more formalized considerations of the causes of growth, which were later continued, developed, or challenged by economists from the orthodox school (such as neoclassical or new classical economics) as well as heterodox schools (such as Keynesian and neo-Keynesian economics). The clash between representatives of different schools (mainly classical/neoclassical economists and Keynesian/neo-Keynesian) has led to the distinction between short-term and long-term perspectives on economic growth in macroeconomic theory (Kuder, 2014). In the short run price and wage rigidity, as well as labor market imbalances, are assumed, meaning that the level of output is determined by the level of aggregate demand (Hall, Taylor, 2007). During this period, the economy is in long-term disequilibrium, and current output deviates from potential output. Fiscal and monetary policies can stimulate economic growth in the short term. In the long run, price and wage adjustments occur, and the labor market reaches equilibrium, where labor demand and supply balance out at a given real wage level. From a long-term perspective, the level of output depends on the productivity of production factors (supply side), and current output aligns with potential output. Monetary policy in the long run affects only the price level (money is neutral), while fiscal policy can influence the structure of GDP. The assumption of money neutrality has been

and continues to be a challenge. F.A. Hayek (2014) and economists from the Austrian school reject the idea that money affects only nominal variables, even in the long run. They refer to the Cantillon effect, capital theory, and the structure of production, arguing that changes in money supply influence interest rates, leading to a miss location of productive resources and economic crises.

The distinction between the short run and long run is reflected in the classification of growth models. D. Kuder (2014) categorizes them into Keynesian, neoclassical, real business cycles, and endogenous growth models. Most of these models are long-term and emphasize the supply side of the economy. Only Keynesian models qualify as short-term growth models, highlighting the role of demand in shaping economic growth. The development of Keynesian models was significantly influenced by the construction of the IS-LM model and Keynes's analysis of the factors determining national income. However, Keynesian growth models (such as the Harrod model, Kaldor model, Kalecki model, and Domar model) further expand this approach and provide a broader perspective on the impact of investment expenditures on the economy (Kuder, 2014).

Neoclassical growth models are based on the Cobb-Douglas production function which represents the relationship between output and the inputs of production factors (Uramek, 2006). The production function demonstrates that the productivity of economy depends on labor resources, capital and technology. The most popular exogenous growth model is the Solow model. The Solow model emphasizes the role of savings and technological progress in shaping economic growth dynamics (Dykas, Tokarski, 2013). The main conclusion that can be drawn from this model is that an increase in savings, and consequently in capital per unit of labor, can temporarily increase the economic growth rate in the short run, but this increase will not be sustained. To achieve a higher growth rate in long run, changes in technology and improvements in the methods of combining production factors in the manufacturing process are necessary. The Solow model serves as the foundation for another exogenous growth model – the Golden Rule model by Phelps. Phelps focuses on the role of savings in long-term growth and on determining the optimal savings rate that maximizes consumption per worker (Kuder, 2014). The Solow model was also expanded within the framework of the Mankiw-Romer-Weil model, which identified human capital as a key determinant of growth (Uramek, 2006).

Endogenous models attempt to explain the causes of growth within the model itself, assuming that variables previously considered exogenous can be transformed into endogenous ones. These models adapt the assumption of rational economic agents in the long run and reject the assumption of constant returns to scale (Dykas, Tokarski, 2013). Among endogenous

models, the Lucas model and the Romer model are particularly notable. In the Lucas model, the production function included not only physical capital and labor inputs but also human capital inputs (Uramek, 2006). The levels of both human and physical capital are explained within the model and depend on investment expenditures, the depreciation of physical capital (in case of physical capital inputs), and the growth rate of human capital (in the case of human capital inputs). The Lucas model also suggests that a decrease in social time preference, leading to reduced consumption and increased savings, enables higher investment and an accelerated growth rate in the long run. Similarly, to the Mankiw-Romer-Weil model, it supports the idea that an increase in human capital stock stimulates economic growth. The Romer model places a greater emphasis on scientific and technological knowledge and explains its role within the model (Dykas, Tokarski, 2013). According to Romer's model, scientific and technological knowledge, as well as technological progress, can be stimulated by allocating labor and capital resources to the "production" of technical scientific knowledge. Therefore, it does not treat the technological variable as exogenous.

It can be concluded that long-term economic growth depends on four main factors: labor inputs, physical capital inputs, human capital inputs, and technology. These are highly aggregated variables, and a microeconomic analysis of each can be conducted. Labor inputs depend on household preferences regarding the allocation of their time between work and leisure, demographic trends, as well as the overall dynamics of the labor market and real wages. Capital inputs are determined by net investment expenditures, which in turn are financed by savings. As Lucas indicated in his model, the increase in savings can depend on household preferences and intertemporal substitution. Technology, on the other hand, is influenced by labor and capital inputs dedicated to the creation of new knowledge and production methods. Thus, technological progress can be achieved by altering the structure and level of expenditures in the economy – for example, by redirecting spending to the R&D sector.

Growth theory also identifies many other factors that may stimulate economic growth but are not included in strictly defined models. D. Miłaszewicz (2011) lists geographical location, economic openness, and institutional factors as growth stimulants, referring to them as deep determinants of growth. Calling these factors "deep" emphasizes their fundamental nature and long-term impact on growth. Similar conclusions are presented by N. Mankiw and P. Taylor (2022), who, in addition to the classical long-term growth factors, highlight free trade, foreign investments, investments in education, health, and nutrition, property rights, political stability, public order and natural population growth. They also suggest that governments should implement policies that foster the development of these areas, thereby promoting overall

economic well-being. A. Smith (2008) naturally emphasized the role of capital accumulation in long-term growth. However, he also highlighted the importance of labor division and specialization, which he believed could increase productivity, reduce costs of transitioning between jobs, and stimulate capital accumulation as well as technological advancements in labor equipment – thus enhancing productive capacity. Among the factors that positively influence economic growth, economic freedom and a democratic system are also noted (Piątek et al., 2014). Economic growth, therefore, depends not only on quantitative variables that can be expressed numerically but also on qualitative variables that are difficult to reduce to an algebraic framework. This distinction is crucial, as it can impact econometric modeling and forecasting efforts. It is also important to recognize that there are numerous growth stimulants, and as economic theory evolves, new factors may continue to be identified as contributors to economic growth.

Empirical research confirms, or at least does not provide grounds for rejecting, the fundamental conclusions from theoretical considerations and models regarding the factors stimulating economic growth. P. Misztal (2011), examining the relationship between savings and economic growth from 1980 to 2010 using a regression analysis and the Granger causality test, indicates that regardless of a country's level of economic development, an increase in gross savings contributed to GDP growth. Similar conclusions emerge from studies on individual national economies. For Kosovo's economy, a relationship between domestic savings accumulation (understood as deposits) and economic growth was confirmed for the years 2010-2017 (Ribaj, Mexhuani, 2021). An analysis of the relationships between GDP growth, investments, and savings in Cameroon from 1980 to 2010 demonstrated a causal link between economic growth, investments, and savings, as well as a dependence of investments on savings (Ngouhouo, Mouchili, 2014). A study conducted in Nigeria from 1981 to 2021 showed that a 1% increase in household savings and business savings led to GDP growth of 0.22% and 0.23%, respectively, *ceteris paribus* (Chukwu et al., 2024). Discrepancies arise when determining the role of public sector savings and the impact of budget deficits on economic growth. N. Kryeziu and E. Hoxha (2021) demonstrated that between 1995 and 2015, in Eurozone countries, an increase in the budget deficit-to-GDP ratio had a positive impact on economic growth. Conversely, a study on selected MENA countries found a negative relationship between budget deficits and economic growth (Kassem, 2024). A negative impact of the budget deficit on economic growth was also confirmed for India's economy (Kumar, 2019) and for the economies of Pakistan and Afghanistan in the long run (Masheed et al., 2024). One may conclude that while the positive role of savings in long-term growth is empirically confirmed, controversies arise regarding the role of potential budget surpluses and the impact of deficits on economic growth.

The positive role of human capital in economic growth is also uncontested in empirical research. However, the main challenge lies in the lack of a standardized human capital indicator for assessing its impact on growth. Researchers use various variables to represent human capital, but none can fully capture its essence. H. Vinod and S. Kaushik (2007) demonstrated a statistically significant impact of human capital on economic growth in 18 developing economies from 1982 to 2001, using the adult illiteracy rate as an indicator. N. Duwal and S. Paudel (2024) found that government health expenditures, life expectancy at birth, and school enrollment had a positive impact on GDP growth between 2014 and 2023 in a study of 48 Asian countries. T. Kausar et al., (2021) used labor force resources, education expenditures as a percentage of GDP, and trade openness as explanatory variables in their analysis of human capital's impact on economic growth based on data from 181 countries. Their findings confirmed the significant role of human capital in driving growth. Other researchers assessing the impact of human capital on growth have used government expenditures on health and education, as well as secondary school enrollment rates (Dhobha, Madondo, 2024). A. Ndrejoni and A. Ndrejoni (2024) showed that a 1% increase in education expenditures in Albania between 1994 and 2021 led to a 0.18% increase in GDP growth, *ceteris paribus*. A review of empirical studies highlights that the primary issue is the lack of a standardized human capital measure that could consistently serve as an explanatory variable for GDP growth.

The positive impact of R&D expenditures has also been empirically confirmed. A study on the European Union covering the years 2002–2012 found that a 1% increase in the share of R&D expenditures in GDP would lead to a 2.2% increase in the GDP growth rate, *ceteris paribus* (Sokolov-Mladnović et al., 2016). A similar study analyzing data from 52 countries for the period 1996–2010 demonstrated a positive and significant long-term impact of R&D expenditures on economic growth (Gumus, Celikay, 2015). Comparable conclusions were drawn from a study on Turkey, which showed that between 1980 and 2013, a 1% increase in the share of R&D expenditures in GDP led to a 0.263% higher GDP growth rate, *ceteris paribus* (Bozkurt, 2015).

E.W.F. Peterson (2017) argues that population growth may negatively impact GDP per capita in the short term; however, in the long term, population growth can have a positive effect on GDP through the “demographic dividend” and the entry of younger generations into the labor market. He also highlights that a decline in the mortality rate has a beneficial impact in this context and emphasizes the importance of demographic structure and immigration. D. Miłaszewicz (2011) conducts a comparative analysis of national economies and demonstrates a positive relationship between economic freedom and GDP per capita. Similarly, D. Piątek

et al., (2014), analyzing the causes of growth in 25 transitioning economies between 1990 and 2011, conclude that there is a strong positive relationship between political freedom, a democratic system and economic freedom with the rate of economic growth.

2. Research methodology

The study utilized time series data from the Federal Reserve Economic Data (FRED) database, covering the years 1960–2023 and focusing on the U.S. economy. The research was conducted using a linear econometric model. The dependent variable was the year-over-year real GDP growth rate. The explanatory variables in the model were selected from a set of seven candidate variables:

1. Gross Saving as percent of Gross National Income (change from year ago in percentage points).
2. Federal Government Surplus or Deficit as percent of Gross Domestic Product (change from year ago in percentage points).
3. Real R&D Expenditures (percent change from year ago).
4. Real Gross Private Domestic Investment (percent change from year ago).
5. All Employees, Total Nonfarm (percent change from year ago).
6. Federal Government Current Expenditures (percent change from year ago).
7. Federal Receipts as percent of Gross Domestic Product (change from year ago in percentage points).

From the listed variables, the final model included the first three, while the remaining ones were excluded based on Pearson's linear correlation coefficients between variables to prevent an overestimation of model fit (as multicollinearity among explanatory variables should be minimized). Additionally, the backward stepwise regression method and statistical significance of model parameters were used for selection (with a significance level of 0.05, verifying statistical significance based on the p-value of estimated parameters). The Dickey-Fuller test was applied to check the stationarity of the time series. The final model used for further analysis is presented in equation 1:

$$y_t = \alpha_0 + \alpha_1 x_{1t} + \alpha_2 x_{2t} + \alpha_3 x_{3t} + \varepsilon_t \quad (1)$$

where:

y_t – growth rate of Real Gross Domestic Product ($t = 1, 2, \dots, n$),

x_{1t} – Gross Saving as percent of GNI, change from year ago in percentage points ($t = 1, 2, \dots, n$),

x_{2t} – Federal Government Surplus or Deficit as percent of GDP, change from year ago in percentage points ($t = 1, 2, \dots, n$),

x_{3t} – Real R&D Expenditures, percent change from year ago ($t = 1, 2, \dots, n$),

$\alpha_0, \alpha_1, \alpha_2, \alpha_3$, – structural parameters of the model,

ε_t – random component,

t – observation number.

The model parameters were estimated using the OLS method. The estimated model was verified using the following tests and coefficients:

- coefficient of determination R^2 ,
- standard error S_e ,
- student's t test,
- runs test,
- lagrange multiplier test for autocorrelation,
- white's test,
- Jarque-Bery's test.

After verifying the model, a forecast of the explanatory variable's values for the period from 2024 to 2028 was conducted using the ETS exponential smoothing algorithm in the AAA version in Microsoft Excel. The obtained values were then used to forecast the dependent variables for the years 2024–2028, utilizing the estimated econometric model. The forecast was determined using the formula presented in equation 2:

$$\hat{y}_T = \hat{\alpha}_0 + \hat{\alpha}_1 x_{1T} + \hat{\alpha}_2 x_{2T} + \hat{\alpha}_3 x_{3T} \quad (2)$$

where:

T – forecast period numbers ($T = n + 1, n + 2, \dots, n + h$),

h – forecast horizon,

$\hat{y}_T$ – forecast value.

The forecast was verified using ex-ante prediction errors, calculated as the square root of the ex-ante prediction variance. Relative ex-ante errors were also computed (as the ratio of the ex-ante error to the forecast value), along with the mean ex-ante error and the mean relative ex-ante error. The matrix formula for the ex-ante prediction variance used in the analysis is presented in equation 3:

$$V^2 = X_{TP} \cdot D^2(\hat{\alpha}) \cdot X_{TP}^T + Se^2 \quad (3)$$

where:

V^2 – ex-ante prediction variance,

X_{TP} – vector of explanatory variables values in the forecasted period,

$D^2(\hat{\alpha})$ – variance-covariance matrix of structural parameter estimators,

Se^2 – variance of the random error term.

3. Results

The use of the year-on-year real GDP growth rate in the study allowed for meeting the assumption of low variability of the dependent variable. Figure 1 presents the development of the real GDP growth rate in the USA from 1960 to 2023.

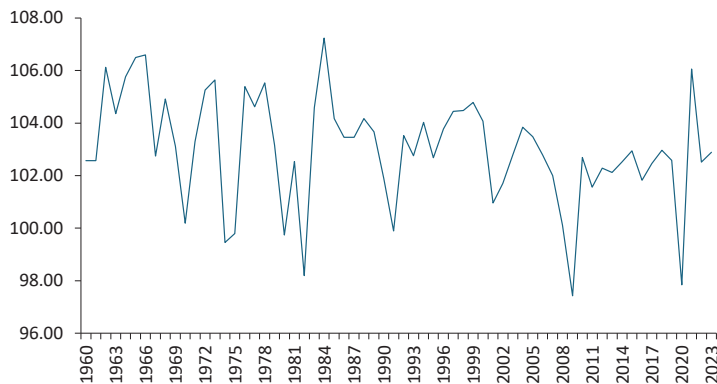


Figure 1. Growth rate of Real Gross Domestic Product in the USA

Source: own elaboration based on FRED data.

The coefficient of variation for the dependent variable was 2.01%, indicating low variability. The time series exhibits random fluctuations without a clear trend or seasonal variations. The stationarity of the time series was confirmed by the DF test. A linear regression model was constructed, where the dependent variable consisted of the increments of the variable in the time series, and the explanatory variable was the value of the variable from the previous period. This allowed for the calculation of the theoretical value of the “t” statistic, which amounted to -6.18 . The critical values from the DF test table, for the number of observations “n” and a significance level of 0.05, were $dL = -1.94$ and $dU = -1.97$. Based on

the critical values and the theoretical value of the statistic, it was concluded that the time series is stationarity.

The explanatory variables exhibited very high variability, which allowed for meeting another assumption of the linear model. Figure 2 presents the development of the values of the explanatory variables in the model.

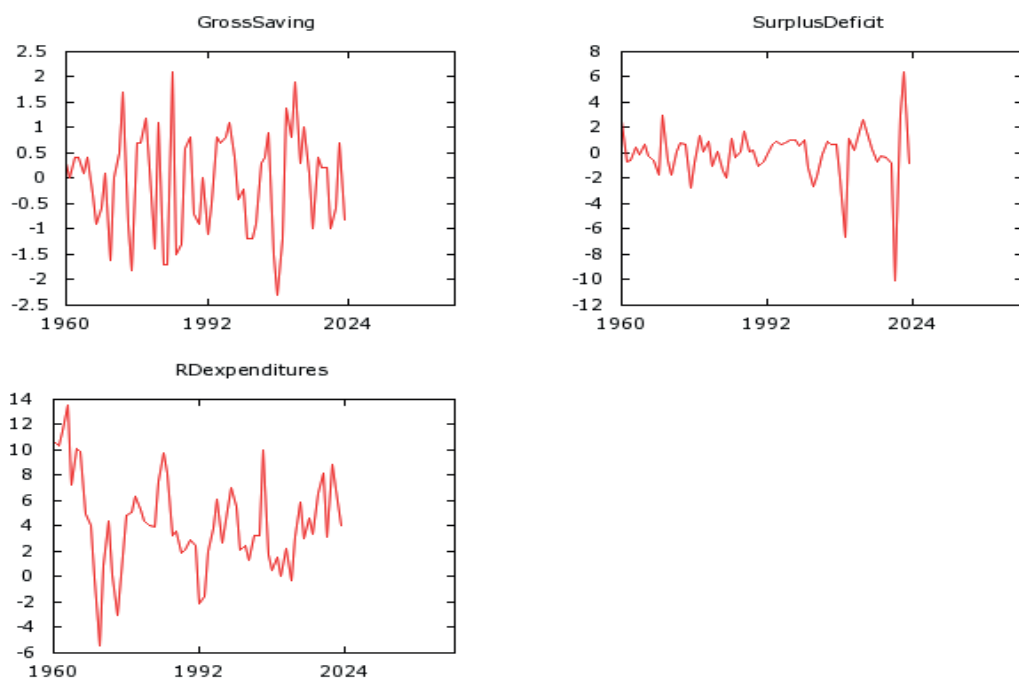


Figure 2. Gross Saving as percent of GNI, Federal Government Surplus or Deficit as percent of GDP and Real R&D Expenditures in USA

Source: own elaboration based on FRED data.

The coefficients of variation for the explanatory variables in the model exceeded 85%, indicating very high variability. The time series exhibited random fluctuations without clear trends or seasonal variations. The DF test, conducted for these time series was done in the same manner as for the dependent variables, which confirmed their stationarity. The theoretical DF test statistic values were as follows: -6.95 for variable x_{1t} , -7.60 for variable x_{2t} , -4.00 for variable x_{3t} .

The explanatory variables showed a moderate and positive correlation with the dependent variable, meaning that higher economic growth rates were associated with higher increases

in the share of savings in the national income, the surplus/deficit-to-GDP ratio, and real R&D expenditures. The moderate correlation may have been due to the fact that explanatory variables represented dynamic values rather than absolute values. Additionally, the explanatory variables were not strongly correlated with each other. Table 1 presents the Pearson correlation coefficients between the variables.

Table 1. Pearson's linear correlation coefficient values between variables

	y_t	x_{1t}	x_{2t}	x_{3t}
y_t	1	0.501	0.475	0.484
x_{1t}	0.501	1	0.481	0.235
x_{2t}	0.475	0.481	1	0.152
x_{3t}	0.484	0.235	0.152	1

Source: own elaboration based on FRED data.

There was a weak correlation between the explanatory variables, except for variable x_{1t} and x_{2t} , where a moderate correlation was observed. This could be attributed to the principles of national accounting, as national savings also included public sector savings.

The econometric model estimated using the OLS method is presented in equation 4:

$$\hat{y}_t = 102.18 + 0.58x_{1t} + 0.28x_{2t} + 0.21x_{3t} \quad (4)$$

The estimated model indicates that, under the ceteris paribus assumption:

- A 1 p.p. increase in the share of gross savings in national income led to a 0.58 p.p. increase in real GDP growth rate,
- A 1 p.p. increase in the surplus or decrease in the deficit in federal government budget as a percentage of GDP led to a 0.28 p.p. increase in real GDP growth rate,
- A 1% increase in real R&D expenditures led to a 0.21 p.p. increase in the real GDP growth rate.

The vector of structural parameters in the model is largely consistent with conclusions drawn from empirical research and economic theory analysis. Table 2 presents the regression statistics of the estimated model.

Table 2. Regression statistics

	Coefficient	Standard Error	t statistics	p-value
Cut point value	102.18	0.3121	327.3677	0.0000
x_{1t}	0.5777	0.2316	2.4947	0.0154
x_{2t}	0.2812	0.1074	2.6179	0.0112
x_{3t}	0.2142	0.0559	3.8307	0.0003
Standard Error	1.5798			
Multiple R	0.6748			
R^2	0.4554			
Adjusted R^2	0.4281			
Observations	64			

Source: own elaboration.

The R^2 coefficient indicates that the model explains 45.5% of the variation in the dependent variable. The standard error of 1.58 suggests that theoretical values deviated from the empirical values of the real GDP growth rate by an average of 1.58. The p-values indicate that, at the 0.05 significance level, the structural parameters are statistically significant. This is further confirmed by the t-Student statistics, as their values are smaller than the critical value obtained from the t-Student test table for the significance level of 0.05 and $n-k-1$ degrees of freedom (critical value = 2.00). Table 3 presents the theoretical values of the statistical tests used to verify the estimated model.

Table 3. Theoretical values and critical values of the statistical tests used

Test	Theoretical value	Critical value
Lagrange Multiplier (for autocorrelation)	$nR^2 = 2.02$	$\chi^2 = 5.99$ ($\alpha = 0.05$ and 2 degrees of freedom)
Jarque-Bery (for normality of distribution)	JB = 2.28	$\chi^2 = 5.99$ ($\alpha = 0.05$ and 2 degrees of freedom)
White (for homoscedasticity)	$nR^2 = 12.87$	$\chi^2 = 16.91$ ($\alpha = 0.05$ i 9 degrees of freedom)
Runs test (for randomness)	$k = 22$	25.13:40.62 ($\alpha = 0.05$, $nA = 34$ i $nB = 30$)

Source: own elaboration.

The conducted statistical tests indicate the absence of autocorrelation in the error term, a normal distribution of the error term, and homoscedasticity. Therefore, the model meets the standard criteria for error term. However, the runs test revealed that the series in the model are

not random and that there is nonlinear relationship between dependent variable and explanatory variables. The result of this test suggests the need for improvements in the analytical form of the model.

Based on historical values and the exponential smoothing model (ETS), forecasts for the explanatory variables were generated. Table 4 presents the forecasted values of explanatory variables for the period from 2024 to 2028.

Table 4. Forecasts of explanatory variables values for the period from 2024 to 2028

Year/Variable	x_{1t}	x_{2t}	x_{3t}
2024	-0.36	-4.20	4.89
2025	-0.24	-5.24	8.39
2026	0.28	-4.21	10.47
2027	0.44	-4.67	8.79
2028	0.41	-4.71	3.72

Source: own elaboration using Excel forecast sheet

The forecasted values of the explanatory variables for the years 2024–2028 were then used to predict the values of the dependent variable using the previously constructed econometric model. Figure 3 presents the econometric forecast of the real GDP growth rate in the USA for the period 2024–2028.

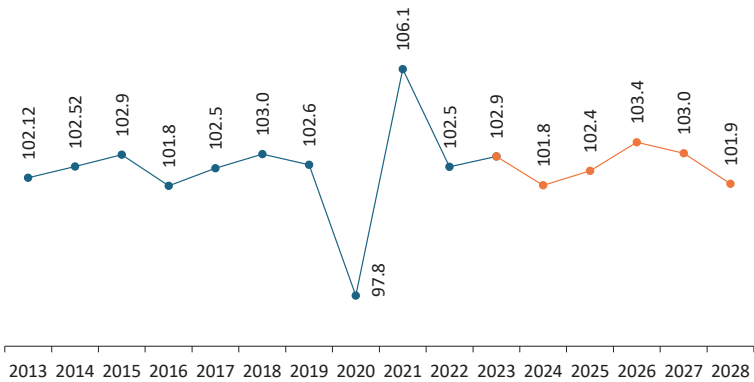


Figure 3. Econometric forecast of real GDP growth rate in the USA for the 2024–2028 period

Source: own elaboration.

The verification of the presented econometric forecast based on ex-ante errors indicates that, when predicting the real GDP growth rate in the USA for the years 2024-2028 using the estimated model, the average prediction error is 1.62. The mean relative ex-ante prediction error amounted to 15.8%. Table 5 presents the values of the ex-ante prediction errors.

Table 5. Ex ante prediction errors

Year	Ex ante prediction error	Relative ex ante prediction error
2024	1.61	0.016
2025	1.63	0.016
2026	1.63	0.016
2027	1.63	0.016
2028	1.63	0.016

Source: own elaboration.

4. Discussion

The study results indicate a significant and positive impact of savings, budget deficit reduction, and R&D expenditures on economic growth in the USA from 1960 to 2023. The growth forecast for the USA also suggests that there should not be a significant decrease in real GDP growth rate from 2024 to 2028. Finding similar studies in terms of methodology is quite challenging and problematic because other studies focusing on economic growth in the USA do not use the same explanatory variables, cover a smaller research sample, or do not employ econometric models as an analytical tool. S. Bakari and S. Tiba (2022), when examining the causes of growth in the USA from 1970 to 2016, do not consider savings, the budget deficit, or research and development expenditures as variables that could stimulate growth. They instead conclude that, in the long run, growth is influenced by consumer spending, investments, inflows of FDI, population size, and exports. A study conducted for the USA and Germany for the years 1960–2013, which used production function to explain the causes of growth, indicated that energy resources and capital play a crucial role in growth, while technological changes play a smaller role (Lindenberger et al., 2017). In the context of US growth, variables such as government size and inflation rate have also been used, with findings suggesting that they have a significant and negative impact on economic growth in both the short and long run (Choi, 2021). Despite the wide variety of studies on the US economy, comparing our study's findings with the cited research suggests that our analysis should incorporate more

explanatory variables. One can also identify similarities between the findings of these studies and our analysis regarding the positive impact of deficit reduction on growth in the USA (if we partially equate deficit and government size), as well as the positive impact of savings on growth (assuming a correlation between savings, investments, and capital).

Conclusions

The analysis conducted indicates that savings, budget deficit reduction, and investment in R&D had a significant impact on economic growth in the United States from 1960 to 2023, although they were not the only factors driving growth. These findings confirm the research hypotheses that assumed a positive impact of increased savings and budget deficit reduction on economic growth. The forecast based on the constructed econometric model suggests that the U.S. economy is unlikely to experience a recession. According to the forecast, real GDP growth will peak at 3.4% in 2026. After 2026, growth will decline, reaching its lowest level of 1.9% in 2028.

It is important to note that the constructed econometric model and the corresponding forecast may have limitations. The runs test indicated that the analytical form of the model should be modified. A potential change in the functional relationship can be theoretically justified based on the law of diminishing returns, which suggests the absence of a linear relationship between input factors and output, or Austrian capital theory, which emphasizes the heterogeneity of production factors. The model's coefficient of determination suggests that additional explanatory variables should be included to improve its explanatory power. Moreover, the model does not account for factors that are difficult or impossible to measure, such as institutional and legal conditions, geopolitical situations, human capital, or unexpected technological changes. Including omitted variables would lead to a higher value of the R^2 coefficient, however, it could also introduce the problem of multicollinearity among the explanatory variables. Transforming the variables or incorporating lags of the finally selected explanatory variables could lead to the increased value of the coefficient of determination and could also help to achieve randomness of the residuals. These challenges related to measurement and the multitude of factors influencing economic growth have been discussed in the study. Future research could focus on developing indicators that capture variables currently difficult to measure. This could lead to more detailed forecasts and a reduction in ex-ante prediction errors.

Based on the analysis results and in light of the recent change in government in the USA, the new administration should implement economic policies that promote savings accumulation and increase spending on R&D. This can be achieved through both tax and legal system reforms. Additionally, controlling inflation through the U.S. monetary authorities should support an increase in national savings. In terms of fiscal policy, efforts should focus on reducing the federal budget deficit, particularly by limiting expenditures. This could help mitigate the crowding-out effects on private investments. To achieve sustainable economic growth and create an institutional environment conducive to long-term development, public policy transparency and a well-defined long-term strategy would be beneficial. Establishing such a framework could help reduce uncertainty and encourage private sector investment and innovation.

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