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The Paradox of Thrift: A Case Study of United States of America

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ABSTRACT: Vermann (2012) and Thies (1996)'s papers indicate that the paradox of thrift is no longer in vogue in United States of America (USA). This paper argues that the paradox of thrift is still applicable to USA even though she is operating with sufficient demand. The main objective of this paper is to determine whether the paradox of thrift is applicable to USA after the Great Depression. In doing this, a vector error correction model was estimated using annual data of gross national income, gross domestic saving, gross domestic investment and final consumption expenditure from 1971 to 2020. The results of the investigation showed that final consumption expenditure and gross domestic saving increase when gross national income increases. Gross national income falls and current saving is unchanged when previous saving rises. The paradox of thrift is applicable to USA after the Great Depression. The target of economic policy should be gross national income and not gross domestic saving because naturally both final consumption expenditure and gross domestic saving will increase if gross national income increases in USA.

KEYWORDS: Paradox of Thrift, Vector Error Correction Model, United States of America

JEL Classification: C01, E12, E21

1. INTRODUCTION

The paradox of thrift is the paradoxical result of the simple Keynesian model that when planned saving rises (the saving function shifts up), income falls and actual saving is no higher than before (Amacher and Ulbrich, 1986). The saving which is intended to be made by all the households in the economy during a period (say, a year) in the beginning of the period is called planned (or ex-ante or desired) saving. The actual saving is the ex-post or realized saving of all the households in the economy during a period, say a year. The words, "planned saving" used by Keynes made research on the paradox of thrift difficult because data on planned saving are not compile by data reporting agencies. Although data on actual saving are compiled by data reporting agencies, the words, current saving is used in place of actual saving in this study. Paradox of thrift becomes practicable in applied research when the words, previous saving is used in place of "planned saving" and the words, current saving is used in place of "actual saving". This change in semantics from planned saving to previous saving and actual saving to current saving does not alter the analysis of the Keynesian economic theory about the paradox of thrift. However, with this change in semantics from planned saving to previous saving and actual saving to current saving, paradox of thrift is the result of the simple Keynesian model that when previous saving rises (the saving function shifts up), income falls and current saving is unchanged (Chuba, 2021).

Saving is a paradox because in kindergarten we are all taught that thrift is always a good thing (Samuelson, 1958:237).Many economists believe that a major contribution of Keynesian economics was the surprising discovery that an increase in planned saving may not be beneficial. When Keynesian economists criticized saving, they do so in the context of a nation which is operating with deficient demand. In this case, equilibrium income is less than the full-employment level of income. An increase in saving implies a decrease in consumption expenditures which causes demand to become more deficient (Amacher and Ulbrich, 1986). This paper argues that the paradox of thrift is applicable even to a nation which is operating with sufficient demand. This is because all other things being equal, an increase in previous saving causes the saving schedule as well as the leakages line to shift upward. Based on Keynesian model, an upward shift in the leakages line causes the equilibrium level of national income to fall while current saving remained unchanged (chuba, 2021). The paradox of thrift is applied to United States of America (USA) in this study. The USA is chosen for this study not only because she has sufficient demand but because the paradox of thrift was postulated by Keynes (1936) based on the Great Depression which began in United States in the late 1920s. The economic

Conditions and circumstances change and so economic theory that is plausible in the previous period may be irrelevant in the current period. Is the paradox of thrift still applicable to USA from 1971 to 2020 afterthe Great Depression?

Vermin (2012) investigates whether saving is good or bad for United States of America and concludes that it is OK to save for that big purchase since future consumption benefits both you and society. Vermann's paper indicates that the paradox of thrift is no

longer in vogue in USA. Thies (1996)'s paper, "The Paradox of Thrift: RIP" indicates that the paradox of thrift is no longer in vogue in USA. This paper argues that the paradox of thrift is applicable to USA even though she is operating with sufficient demand.

The main objective of this paper is to determine whether the paradox of thrift is applicable to USA from 1971 to 2020 after the Great Depression. This study is significant because of the followings reasons. It reveals that the paradox of thrift is still in vogue in United States of America. It demonstrates that the paradox of thrift is applicable to a nation which is operating with sufficient demand. It reveals that the target of economic policy should be gross national income and not gross domestic saving because naturally both final consumption expenditure and gross domestic saving will increase if gross national income increases in USA.

This paper consists of six sections. The next section is literature review. Section 3 presents the methodology. Section 4 discusses the results. The conclusions based on research findings are drawn in section 5 and section 6 suggested areas for further studies.

2. LITERATURE REVIEW

Many economists believe that a major contribution of Keynesian economics was the surprising discovery that an increase in planned saving may not be beneficial. When Keynesian economists criticize saving, they do so in the context of a nation which is operating with deficient demand. In this case, equilibrium income is less than the full-employment level of income. An increase in saving implies a decrease in consumption expenditures which causes demand to become more deficient.

An increase in planned saving means an upward shift in the saving schedule and also in the leakages line while the injections line remains unchanged. The increase in planned saving also means that consumers must spend less at each level of national income. This would be reflected by a downward shift of the consumption schedule and the total expenditures schedule. According to Keynesians, an upward shift in the leakages line and a downward shift of the total expenditures schedule cause the equilibrium level of national income to fall while actual saving remained unchanged. As people increase saving, their thrift ultimately causes income and output to decline. Furthermore, the intention to increase saving does not result in any increase in actual saving (Amacher and Ulbrich, 1986).

Keynes propounded the fundamental psychological law of consumption which forms the basis of the consumption function. He wrote, "The fundamental psychological law upon which we are entitled to depend with great confidence both a prior from our knowledge of human nature and from the detailed facts of experience, is that men are disposed as a rule and on the average to increase their consumption as their income increases but not by as much as the increase in their income" (Jhingan, 2003).

This law has three related propositions: (1) When income increases, consumption expenditure also increases but by a smaller amount. The reason is that as income increases, our wants are satisfied side by side, so that the need to spend more on consumer goods diminishes. It does not mean that the consumption expenditure falls with the increase in income. In fact, the consumption expenditure increases with increase in income but less than proportionately. (2) The increased income will be divided in some proportion between consumption expenditure and saving. This follows from the above proposition because when the whole of increased income is not spent on consumption, the remaining is saved. In this way, consumption and saving move together. (3) Increase in income always leads to an increase in both consumption and saving. This means that increased income is unlikely to lead either to fall in consumption or saving than before. This is based on the above proposition because as income increases consumption also increases but by a smaller amount than before which leads to an increase in saving. Thus with increased income both consumption and saving increase (Jhingan, 2003).

Thies (1996) reviews the Keynesian revolution in economics and why the paradox of thrift is no longer in vogue. Thies' paper, "The Paradox of Thrift: RIP" and the counter arguments against paradox of thrift from the works that he reviewed are not sufficient to draw a conclusion that the paradox of thrift is no longer in vogue since such conclusion is not based on research findings.Singh (2018) analyzes the impact of saving during two historical recessions in order to know if saving is good or bad for USA. There are many weaknesses in Singh's study. First, the dependent variable was not stated. Second, the periods covered by the two historical recessions were not stated. Third, the research method used in the study was not stated. Fourth, data were not obtained for the study. Fifth, the analysis was too theoretical for an impact study. Sixth, the chart he was analyzing was not presented in his paper. Seventh, the research findings based on the objectives of the study were not presented. Eighth, the conclusion that saving is bad or good for USA was not drawn.

Vermann (2012) investigates whether saving is good or bad for USA. Using graphical approach, the paper shows the trends of U.S. personal saving rate, growth rate of gross domestic product (GDP), and recession periods from 2000 to 2011. It was found that during the Great Recession, the personal saving rate increases and growth rate of gross domestic product (GDP) falls. The conclusion is that it is OK to save for that big purchase since future consumption benefits both you and society, a conclusion that is not in line with his research findings. Singh has not established the transmission mechanism from previous saving to gross national income in USA. Moreover, the effect of an increase in previous saving on current saving in USA was not evaluated.

Fanti and Zamparelli (2020) analyze the paradox of thrift in the two-sector Kaleckian growth model. They consider an economy with one consumption and one investment good, and differential sectoral mark-ups. They show that when the investment function depends on aggregate capacity utilization and on the aggregate profit share [the Bhaduri-Marglin (1990) investment function] the paradox of thrift in its growth version may fail if mark-ups are higher in the investment good sector. In this case, the reduction in

the saving rate produces a reallocation of economic activity towards the investment good sector; the aggregate profit share rises and its positive effect on investment may offset the reduction in average capacity utilization if investment is relatively more sensitive to profitability than to the level of activity. This paper does not address the main issues about the paradox of thrift. The main issues about the paradox of thrift is the nexus among gross domestic saving, final consumption expenditure, and gross national income; and the effect of an increase in previous saving on current saving and gross national income.

Chuba (2021) determines whether the paradox of thrift is applicable to Nigeria from 1986 to 2019 using a vector error correction model. The results of his investigation show that final consumption expenditure and gross domestic saving increase when gross national income increases. Gross national income falls and current saving is unchanged when previous saving rises. He concludes that the paradox of thrift is applicable to Nigeria. His paper is based on a developing country which is operating with deficient demand. He does not apply the paradox of thrift to a developed country which is operating with sufficient demand. This gap in literature is filled in this study in order to make a contribution to knowledge.

3. METHODOLOGY

3.1 Theoretical Framework of the Study

The theoretical framework of the study is based on Keynes view of the accounting or definitional equality between savings and investment. It shows that actual savings and investment are always equal at any period of time and at all levels of income (Jhingan, 2003). Symbolically,

$$S_t = Y_t - C_t \quad (1)$$

$$I_t = Y_t - C_t \quad (2)$$

Where Y is income, C is consumption, S is savings, I is investment and subscript t is time in the current period. Since $Y_t - C_t$ is common in equations (1) and (2), we can say that savings is equal to investment. Symbolically,

$$S_t = I_t \quad (3)$$

3.2 Model specification

Based on the theoretical framework of the study, the functional form of the model for this study is stated in equation (4) below.

$$GNI = f(GDS,\ FCE,\ GDI) \quad (4)$$

Where GNI is gross national income, GDS is gross domestic saving, FCE is final consumption expenditure, GDI is gross domestic investment and f is functional notation. The linear form of equation (4) is:

$$GNI = b_0 + b_1 GDS + b_2 FCE + b_3 GDI + e_t \quad (5)$$

Where b_0 is constant term, b_1 to b_3 are regression coefficients and e_t is the error term at time t.

This paper follows Palić et al. (2017) to utilize the Johansen cointegration test and vector error correction model to determine the relationships among a set of economic variables. The vector error correction model is used for this study because of three reasons. First, the time series are not stationary in their levels but are in their first differences. Second, the variables are cointegrated. Third, the variables of interest are simultaneously related, hence the need to treat each variable symmetrically and allow feedback among them.

The VECM is superior to a single equation approach for capturing the long run dynamics of variables (Enders, 1995 and Feasel et al. 2002). This technique enables us to verify the stationarity as well as the order of integration of the variables that are used in the model. The VECM also saves one from the agony of endogeneity problem and the inherent spurious inferences associated with OLS estimates.

The Johansen approach to cointegration is described in brief in this section. If the set of economic variables is observed, the long-run equilibrium can be written as:

$$\Pi Z_t + e_t = 0, \quad (6)$$

Where Π is matrix of parameters, Z_t is vector consisted of neconomic variables, $e_t$is vector of innovations or vector of stationary random variables (Bahovec and Erjavec, 2009). The equilibrium is reached if $\Pi Z_t = 0$. In that case, the deviation from the long-run equilibrium is given by:

$$e_t = -\Pi Z_t, \quad (7)$$

If the long-run equilibrium is reached, the deviation$e_t$is described to be a stationary process. It has to be emphasized that there are some differences between long-run equilibrium definition of economic theorists and of econometricians. Economic theorists use this term in the sense of equality between actual and desired state of economic variables. In econometric sense, the term refers to the long-run relationship between non-stationary variables. Cointegration does not require the long-run equilibrium to be the result of a market mechanism or behavior of individuals (see, for example, Palić et al., 2016) as cited in Palić et al. (2017).

The vector error correction model is given by:

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \cdots + \Gamma_k \Delta Z_{t-k+1} + \Pi Z_{t-k} + e_t, \quad (8)$$

Where$\Gamma_i = A_i + A_{i-1} + \cdots + A_1 - I, \Gamma_k = \Pi = A_k + A_{k-1} + \cdots + A_1 - I, A_1, A_2, \ldots, A_k$are square matrices of the order n, k is the lag length, and$i = 1, 2, \ldots, k - 1$. In the equation (13) the term ΠZ_{t-k} is observed as the long-run part of the model, whereas the short-run is presented by

$$\sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-i}$$

(Bahovec and Erjavec , 2009). In order to determine the number of cointegration relations, the rank of matrix Π must be observed. There are three possible situations. If matrix Π is a zero-matrix, the cointegration is not present. If matrix Πis of full rank or the rank is equal to the number of variables in the model (rank is equal to n), it is said that the process is stationary. If the rank of matrix Π is not full or the rank is lower than the number of variables in the model (rank is lower than n), it is said that the process is non-stationary. The matrix Π can be written as:

$\Pi = \alpha\beta$,(9)

Where$\alpha$is the matrix of error correction speed (speed of variables needed to return in equilibrium), β is the cointegration matrix (contains the parameters of long-run equations). Both matrices, α and β, are of rank n. r. Consequently, there are cointegration relations between variables. In order to determine the number of cointegration relations, the maximum eigenvalue test and trace test are conducted. For the detailed explanation of maximum eigenvalue test and trace test see Bahovec and Erjavec (2009) and Enders (2015) as cited in Palić et al. (2017).

3.3 Estimation Method

The VECM is estimated using e-view 10. The time series properties of the data are analyzed using Augmented Dickey-Fuller (ADF) unit root test of Dickey and Fuller (1979). Test of co integration is carried out using the Johansen (1988) maximum likelihood procedure. The lag length is determined by the likelihood ratio (LR), final prediction error (FPE), Akaike information criteria (AIC), Schwarz information criteria (SC), and Hanna-Quinn information criteria (HQ). The VECM is estimated in order to determine the short and long run relationships among gross national income, gross domestic saving, final consumption expenditure and gross domestic investment in USA and to measure the deviation of the variables from long run equilibrium within the short run and the speed of adjustment of the variables to long run equilibrium.

3.4 Sources and Description of Data

The empirical analysis is conducted using annual data. The time span covered is 1971 to 2020. The choice of 1971 as the base year is due to the fact that the data of most of the variables required for the study are available as from that year. The choice of 2020 as the terminal year is premised on the fact that the data of the variables required for the study are available only up to that year. The data of gross national income, gross domestic savings, final consumption expenditure and gross domestic investment are obtained from World Development Indicators (WDI, 2020). Gross capital formation is used as a proxy of gross domestic investment. All the data are in current US$.

4. RESULTS

4.1 Pre-Estimation Tests

Table 1 presents the results of descriptive statistics. There is evidence of significant variation in the trends of the variables over the period under consideration. This shows the large difference between the minimum and maximum values of the series. All the variables display a mean lying between their minimum and maximum levels. This implies that they fall within the expected changes over the period under study. The skewness of each variable is 0 approximately. This implies that all the variables are symmetric .Kurtosis reveals that all the variables are flatter than normal. This implies that they are platykurtic as they have values lower than 3.The Jarque-Bera statistics is close to zero and the probabilities of Jarque-Bera statistics are greater than 5 percent. These results show that all the series are normally distributed and so unlogged data are used in model estimation.

Table 1: Descriptive Statistics Results

Statistic	GNI	GDS	FCE	GDI
Mean	8.88E+12	1.63E+12	7.17E+12	1.89E+12
Median	7.37E+12	1.50E+12	5.97E+12	1.59E+12
Maximum	2.17E+13	3.89E+12	1.75E+13	4.50E+12
Minimum	1.07E+12	2.34E+11	8.40E+11	2.30E+11
Std. Dev.	6.19E+12	1.01E+12	5.07E+12	1.25E+12
Skewness	0.4687	0.4371	0.4578	0.3958

Kurtosis	1.9664	2.2250	1.9180	1.9538
Jarque-Bera	4.0566	2.8435	4.1858	3.5858
Probability	0.1316	0.2413	0.1233	0.1665
Sum	4.44E+14	8.14E+13	3.59E+14	9.44E+13
Sum Sq. Dev.	1.88E+27	5.01E+25	1.26E+27	7.62E+25
Observations	50	50	50	50

Source: Author's computation using e-view 10.

The unit root test is conducted using Augmented Dickey-Fuller (ADF) test (Table 2). All the variables are non-stationary at levels because ADF test statistic is less than test critical values in absolute terms and p-value of each variable is greater than 5 percent at 1 percent, 5 percent and 10 percent levels of significance. All the variables are stationary at first differences because ADF test statistic is greater than test critical values in absolute terms and p-value of each variable is less than 5 percent at 1 percent, 5 percent and 10 percent levels of significance. The ADF test indicates that the variables are of the same order of integration at 1 percent, 5 percent and 10 percent level of significance.

Table 2: Augmented Dickey-Fuller Test

Variables	**Levels**		**First Differences**		**Order of Integration**
	ADF test statistic	**Prob***	**ADF test statistic**	**Prob***	
GNI	-0.4533	0.9824	-5.7342	0.0001	I(1)
GDS	-1.9040	0.6370	-4.2497	0.0079	I(1)
FCE	-0.6084	0.9739	-4.2723	0.0074	I(1)
GDI	-2.4550	0.3481	-5.1913	0.0005	

Test critical values: 1% level -4.1706
5% level -3.5107
10% level -3.1855

*Mackinnon (1996) one sided p-values

Source: Author's computation using e-view 10.

The cointegration test was conducted using Johansen test for cointegrating vectors (Table 3). The Trace statistic is greater than 5 percent critical value and p-value is less than 5 percent for all the hypothesized numbers of cointegrating equations. The Trace test denotes rejection of all the hypothesized numbers of cointegrating equations at 5 percent level. The Trace test indicates 4 cointegrating equations at the 5 percent level. The Max-Eigen statistic is greater than 5 percent critical value and p-value is less than 5 percent for all the hypothesized numbers of cointegrating equations. The Maximum Eigenvalue test denotes rejection of all the hypothesized numbers of cointegrating equations at 5 percent level. The Maximum Eigenvalue test indicates 4 cointegrating equations at the 5 percent level. Both the Trace and Maximum Eigenvalue tests indicate that all the variables are cointegrated or there is long-run equilibrium relationship among the variables. Since the variables are cointegrated and are stationary in their first differences, the VECM is applied in data analysis.

Table 3: Johansen Test for Cointegration Vectors

Hypothesized No. of CE (s)	Trace			Maximum Eigenvalue		
	Trace Statistic	**0.05 Critical Value**	**Prob****	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob****
None*	126.543	47.856	0.0000	58.106	27.584	0.0000
At most 1*	68.437	29.797	0.0000	36.404	21.132	0.0002
At most 2*	32.033	15.495	0.0001	19.922	14.265	0.0057
At most 3*	12.110	3.842	0.0005	12.110	3.842	0.0005

*denotes rejection of the hypothesis at the 0.05 level

** Mackinnon- Haug- Michelis (1999) p-values

Source: Author's computation using e-view 10.

The lag length selection was done using the VAR Lag Order Selection Criteria (Table 4). The Sequential modified LR test statistic (LR), Final prediction error (FPE) and Akaike information criterion (AIC) indicate maximum lag length 5 at 5 percent level. The Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) indicate maximum lag lengths 1 and 3 at 5

percent level respectively. Since the value of LR (30.0506) at lag 5 is the smallest out of the values indicated by these five criteria, the VECM is estimated at a maximum lag length 5 based on Sequential modified LR test statistic (LR) criterion.

Table 4: VAR Lag Order Selection Criteria

Lag	LR	FPE	AIC	SC	HQ
0	NA	9.40e+91	223.1277	223.2883	223.1875
1	538.4113	2.74e+86	210.3785	211.1815*	210.6778
2	21.1139	3.16e+86	210.5031	211.9484	211.0419
3	49.5969	1.43e+86	209.6643	211.7520	210.4426*
4	16.0575	1.80e+86	209.8020	212.5320	210.8197
5	30.0506*	1.22e+86*	209.2610*	212.6334	210.5182

*Indicates Lag Order Selected by the Criterion

Source: Author's computation using e-view 10.

4.2 Vector Error Correction Estimates

The long run vector error correction estimates of GNI are presented in table 5. A 100 percentage point increase in previous saving causes gross national income to fall by 17.78 percentage point in the long run. That is there is a negative relationship between previous saving and gross national income in USA. This result is in support of Keynesian proposition that as people increase saving, their thrift ultimately causes national income and output to decline. It is also in support of the Keynesian view that other things held constant, an increase in previous saving leads to an upward shift in the saving schedule and also in the leakages line which cause the equilibrium level of national income to fall.

Table 5: Long Run Vector Error Correction Estimates of GNI

Variable	Coefficient	Standard Error	t-statistic
GDS(-1)	-0.1778	0.2542	-0.6996
FCE(-1)	-0.3129	0.1091	-2.8685
GDI(-1)	-4.2552	0.5755	-7.3936

Source: Author's computation using e-view 10.

The short run error correction estimates of D(FCE) are presented in table 6. A 100 percentage point increase in gross national income causes a 69.84 percentage point increase in final consumption expenditures in USA implying that consumption is a positive function of income. This result confirms the Keynesian proposition that increase in income always leads to an increase in consumption. The coefficient of error correction term is negative but statistically insignificant. The negative sign of the error correction term indicates a backward movement of final consumption expenditure toward long run equilibrium from short run disequilibrium. The coefficient of error correction term reveals that the deviation of the final consumption expenditure in the short run from long run equilibrium is corrected by 24.59 percent in one year.

Table 6: Short Run Error Correction Estimates of D(FCE)

Variable	Coefficient	Standard Error	t-statistic
Constant Term	5.59E+11	5.59E+11	1.6599
D[GNI(-5)]	0.6984	0.3652	1.9125
D[GDS(-1)]	1.0819	0.6691	1.6170
D[FCE(-3)]	0.5914	0.6830	0.8659
D[GDI(-2)]	0.9998	0.7440	1.3438
ECM(-1)	-0.2459	0.1599	-1.5375

R-squared: 0.8200 S. E. Equation: 1.04E+11 F-statistic: 4.7714

Source: Author's computation using e-view 10.

The short run vector error correction estimates of GNI are presented in table 7. A 100 percentage point increase in previous saving causes gross national income to fall by 158.66 percentage point in the short run. That is there is a negative relationship between previous saving and gross national income in USA. This result is in support of Keynesian proposition that as people increase saving, their thrift ultimately causes national income and output to decline. It is also in support of the Keynesian view that other things held constant, an increase in previous saving leads to an upward shift in the saving schedule and also in the leakages line which cause the equilibrium level of national income to fall.

The regression coefficient of error correction term is negative but statistically insignificant. The negative sign of the error correction term indicates a backward movement of gross national income toward long run equilibrium from short run disequilibrium. The

coefficient of error correction term reveals that the deviation of the gross national income in the short run from long run equilibrium is corrected by 45.03 percent in one year.

Table 7: Short Run Error Correction Estimates of D(GNI)

Variable	Coefficient	Standard Error	t-statistic
Constant Term	1.03E+12	5.5E+11	1.8648
D[GNI(-5)]	1.4841	0.6014	2.4677
D[GDS(-4)]	-1.5866	1.4650	-1.0830
D[FCE(-2)]	-1.0867	0.9250	-1.1748
D[GDI(-3)]	-3.1827	1.3528	-2.3526
ECM(-1)	-0.4503	0.2634	-1.7098

R-squared: 0.7832 S. E. Equation: 1.71E+11 F-statistic: 3.7857

Source: Author's computation using e-view 10.

The short run error correction estimates of D(GDS) are presented in table 8. A 100 percentage point increase in previous saving causes current saving to fall by 59.62 percentage point in the short run. The previous saving has an insignificant negative effect on current saving. Therefore, current saving is unchanged when previous saving rises in USA. This result confirms the Keynesian view that all other things being equal, an increase in previous saving leads to an upward shift in the saving schedule and also in the leakages line which cause the equilibrium level of national income to fall while current saving is unchanged.

A 100 percentage point increase in gross national income causes a 35.46 percentage point increase in gross domestic saving in USA implying that saving is a positive function of income. This result confirms the Keynesian proposition that increase in income always leads to an increase in saving.

The regression coefficient of error correction term is negative but statistically insignificant. The negative sign of the error correction term indicates a backward movement of gross domestic saving toward long run equilibrium from short run disequilibrium. The coefficient of error correction term reveals that the deviation of the gross domestic saving in the short run from long run equilibrium is corrected by 3.07 percent in one year.

Table 8: Short Run Error Correction Estimates of D(GDS)

Variable	Coefficient	Standard Error	t-statistic
Constant Term	-4.18E+10	2.3E+11	-0.1824
D[GNI(-5)]	0.3546	0.2489	1.4247
D[GDS(-4)]	-0.5962	0.6064	-0.9833
D[FCE(-3)]	0.3864	0.4655	0.8301
D[GDI(-2)]	0.9300	0.5071	1.8339
ECM(-1)	-0.0307	0.1090	-0.2818

R-squared: 0.7418 S. E. Equation: 7.08E+10 F-statistic: 3.0094

Source: Author's computation using e-view 10.

In a nut shell, increase in gross national income always leads to an increase in final consumption expenditure and gross domestic saving in USA. Gross national income falls and current saving is unchanged when previous saving increases in USA. The paradox of thrift is applicable to USA from 1971 to 2020. These results are in line with Chuba (2021) for Nigeria.

4.3 Post-Estimation Tests

The results of the VEC residual serial correlation LM tests are shown in table 9. The Edge worth expansion corrected likelihood ratio statistic at lags 1, 2, 3, 4 and 5 and at 16, 32, 48, 64 and 80 degrees of freedom are 17.4537, 33.2308, 45.5620, 55.2144 and 753.3666 and their p-values are 0.3568, 0.4071, 0.5733, 0.7750 and 0.0000 respectively. The Rao F-statistic at lags 1, 2, 3 and 4 and at 16 and 46.5, 32 and 42.2, 48 and 29.0 and 64 and 14.0 degrees of freedom are 1.1211, 1.0388, 0.8469 and 0.5277 and their p-values are 0.3647, 0.4485, 0.7009 and 0.9564 respectively. The null hypothesis of no serial correlation at lags 1 to 4 is accepted because of high p-values.

Table 9: VEC Residual Serial Correlation LM Tests

Lag	LRE* stat	Df	Prob.	Rao F-stat	df	Prob.
1	17.4537	16	0.3568	1.1211	(16, 46.5)	0.3647
2	33.2308	32	0.4071	1.0388	(32, 42.2)	0.4485
3	45.5620	48	0.5733	0.8469	(48, 29.0)	0.7009

4	55.2144	64	0.7750	0.5277	(64, 14.0)	0.9564
5	753.3666	80	0.0000	NA	(80, NA)	NA

*Edge worth expansion corrected likelihood ratio statistic

Source: Author's Computation Using E-view 10.

Table 10 presents the results of Jarque-Bera (JB) normality test. If the computed p-value of the JB statistic in an application is sufficiently low, which will happen if the value of the statistic is very different from zero, one can reject the hypothesis that the residuals are normally distributed. But if the p-value is reasonably high which will happen if the value of the statistic is close to zero, we do not reject the normality assumption (Gujarati, 2004, 148). The JB statistic is 14.0994 and the computed p-value of the JB statistic is 7.92 percent. The computed p-value of JB statistic is reasonably high which indicates that the value of the statistic is close to zero. Therefore, the null hypothesis that the residuals are multivariate normal is accepted.

Table 10: VEC Residual Normality Tests

Component	Jarque-Bera	Df	Prob.
1	2.490378	2	0.2879
2	2.376176	2	0.3048
3	4.064103	2	0.1311
4	5.168744	2	0.0754
Joint	14.09940	8	0.0792

Source: Author's computation using e-view 10.

The Inverse Roots of Autoregressive (AR) Characteristic Polynomial is presented in Figure 1 in order to verify whether the vector error correction model is stable. The vector error correction model is stable if all roots of the characteristic AR polynomial have absolute values less than one and lie inside the unit circle. In this study, at least one root is equal to 1 which indicates that the model is unstable. That is the impact of the shock in some variables might not decrease with time. This can also be checked from the positive value of the coefficient of error correction term that is presented in table 8 of this paper.

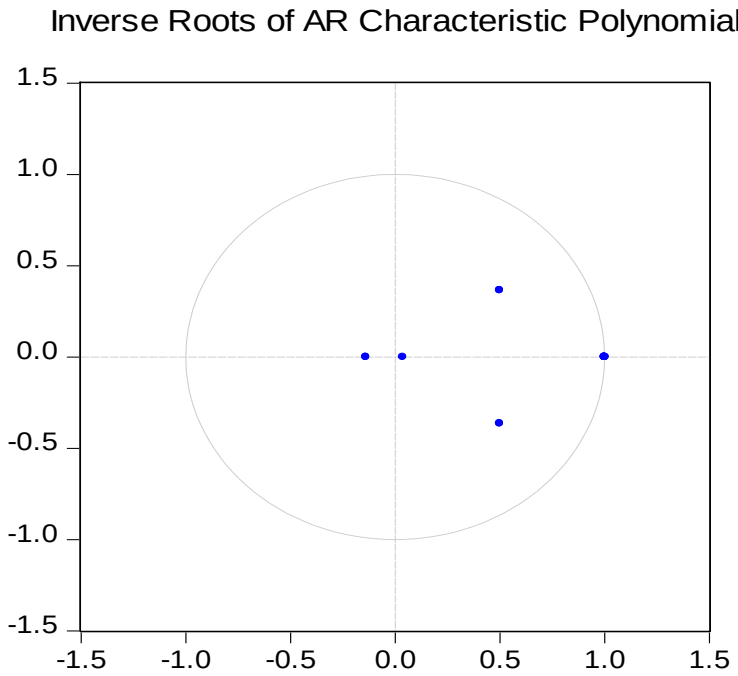

Figure 1: Stability Test

Source: Author's computation using e-view 10.

5. CONCLUSIONS

The following conclusions based on research findings are drawn. Increase in gross national income always leads to an increase in final consumption expenditure and gross domestic saving in USA.Gross national income falls and current saving is unchanged when previous saving increases in USA. The paradox of thrift is applicable to USAafterthe Great Depression. The target of economic

policy should be gross national income and not gross domestic saving because naturally both final consumption expenditure and gross domestic saving will increase if gross national income increases in USA.

6. SUGGESTED AREAS FOR FURTHER STUDIES

i. Determinants of Economic Growth in United States of America.
ii. Interest Rate Differential and Economic Growth in United States of America.

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