Exploring the Causal and Co integration relationship between Savings, Capital Formation and Economic Growth in India – An Empirical Analysis

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ABSTRACT
There is a lot of discussion on the factors which influences the growth rate of an economy over the past few years. Theoretically, economists propounded that domestic savings as one of the vital factors for rapid economic development of a nation. Empirically, it is proved in some of the countries that domestic savings is the prime engine for the robust growth of the economy. Lot of research work has been done on the role of gross domestic savings in the economic growth of India in the past, but the results are ambiguous and confusing. That motivated to undertake the present research study to understand whether there is any role for domestic savings in the economic development in India or not. If there is a relationship, what would be nature and strength of that relationship? Whether domestic savings causes the growth rate or growth rates causes the domestic savings. These are the fundamental questions to be examined. After conducting statistical analysis, it is clearly proved that there is a bidirectional relationship between gross domestic savings and gross domestic product in the short run, and there is long run co integration relationship between these variables also. But when it comes to capital formation and gross domestic product, a bidirectional relationship existed, but lacked long run co integration relationship. The period of the data is from 1950-51to 2017-18.

Keywords: Domestic Savings, Capital Formation, Economic Growth, Co integration

1. INTRODUCTION

Since the beginning of the 1990's most of the developing economies has been focusing on the ways to enhance the growth rate of the economy, India is not enough among the countries. There is a lot of debate and research on the economic development of the nation since then. The researchers and policy makers finally came to the conclusion that three major factors which will become the engine for the growth of the economy, they are domestic savings, capital formation and foreign capital. In the initial growth stage, any economy ought to rely on domestic capital for a reasonable period. If the economy is sustained in terms of economic development, then foreign capital will come and supplement to the domestic savings. Both will create capital formation. We can say that, higher the savings, higher will be the investment in terms of capital formation and that leads to higher growth rate in the economy. Hence, the pillar for the economic development of any nation is domestic savings, that will be transformed into investment (capital formation) and that gives ignition to the economic growth to any economy.

Theoretically, it is supported by Neoclassical economists Harrod (1939), Domar (1946), Solow – Sown (1956), Ramsey (1928), Cass (1965) and Koopmans (1965), Frankel (1962), Romer (1986) laid emphasis on domestic savings, capital formation and foreign capital which play a central role in the progress of the economy. All the Neoclassical economists strongly supported domestic savings as the pivot of economic growth for any economy during the initial stage that will be converted into capital formation like fixed assets of the nation. These

fixed assets will help the nation to generate output forever. During the initial stage of economic development, foreign investors are reluctant to invest in the economy as the growth rate would be less and inevitably the nation has to depend on domestic savings for capital formation and economic growth. It is clearly evident in India's case as the economy used to depend heavily on domestic savings and a little bit foreign aid supplemented the growth rate during 1947-48 to 1990-91. During this period, India was heavily depending on domestic savings for capital formation and therefore, the economic growth rate was less than 5% in all most all the financial years. As part of economic reforms, the economy's doors are gradually opened to the foreign investors for investing in our country. Since, 1991-92 onwards foreign investment started flowing into the economy and at the same time, the domestic savings also started improving its size.

Table - 1Share of GDS in GDP (%)
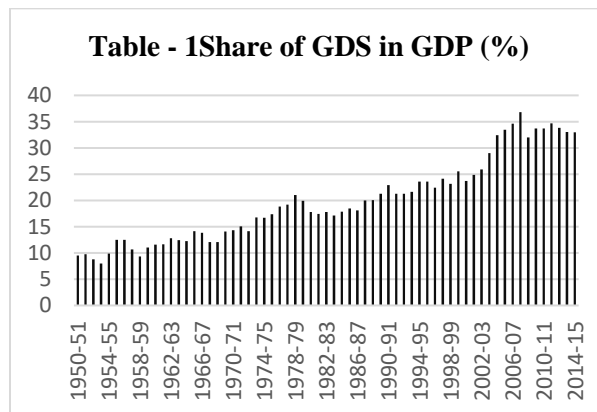
From the above Table-1, it is very clear that the growth rate of domestic savings increased substantially during the post reform era.

After thoroughly going into various research studies, it is clearly understood that the prerequisite for the economic development of any nation is substantial mobilization of domestic savings. The economy's twin primary tasks of alleviating poverty and growing in terms of economic development is essentially reinforced the government of India to enhance the gross domestic savings of 32% of gross domestic product. Currently, India's domestic savings are above 32% of GDP and it is satisfactory number compared to other emerging nations in the world. In order to achieve a target

growth rate of above 7% or more and to reduce the poverty level substantially, India should mobilize enormous financial resources in the form of savings and that should be effectively converted into investment, hence growth can be achieved. Too much dependence on foreign capital rather than domestic savings is not advisable, as foreign capital is looked like a fair weather friend. After studying the dynamic relationship between savings and economic growth in different countries, we came to know that there is an ambiguity in the results.

The primary objective of the present research study is to investigate the short term and long term interrelationship among the three observed variables namely domestic savings, capital formation and economic growth in India as the previous research findings were not similar. And also the direction of relationship is to be unearthed among the variables is another objective of the present research work.

2. Theoretical Evidence between Domestic Savings and the Level of Economic Growth:

In simple definition, economic growth means increase in national income or stock over a period of time. According to the National Accounting System (United Nations, 1995), savings is defined as disposable income excluding consumption spending. Therefore, the national disposable income minus national consumption forms the national savings. There has been a heating debate at the international level about the impact of domestic savings on the economic development of a country. Many economists believe that a high savings rate is an accelerator for higher economic growth of a nation and it is one of the barometers for the healthy development of the financial system of the country.

A number of research works has been done the conventional theory of economic growth purported by Harrod (1939). Domar (1946) and Solow (1956) that domestic savings propels the economic growth. The growth models of Harrod(1939), Domar (1946) and Solow (1956) state that raise in domestic savings will be utilized for higher capital formation, which in turn boosts the economic growth. The first of

increase in domestic savings is the readily availability of funds for investment.

3. Review of Literature:

The empirical literature on examining the interrelationship among the savings, investment and economic growth gave incomplete evidence. Some of the empirical studies found that savings cause economic growth and on the other hand, it is vice versa. In some cases, there is no relationship between savings and economic growth. Differentiation in macroeconomic variables like level of income, stage of economic growth, population, balance of payment, openness of the economy and fundamentals of the economy are the reasons for divergent results in their research studies.

(Sinha, 1996) studied the growth of interrelationship of economic growth and domestic and private sector savings in India. He found that gross domestic private savings is more important than gross domestic savings in determining the GDP and he found that there is no causality in any direction among the variables.

(Jappelli and Pagano 1994), (Carroll and Weil 1993), (Sinha. D and Sinha.T 2007) investigated the dynamic interaction in between savings and economic growth in different countries. They found that there is a positive causal relationship which runs from economic growth to savings.

(Lewis, et al 1956)(Renelt, et al 1992)(N. Gregory Mankiw, et al 1992), (Orts, 2004) (Sarfraz, 2008) found a quite opposite results that supports a theoretical model of Harrod and Domar that savings cause economic growth.

(Bacha, 1990)(Ichiro Otani, 1990)(Gregorio, 1991), (Jappelli, 1994) studied the nexus between economic growth and savings by applying the econometric tool of OLS method and found that there is a unidirectional relationship between savings and economic growth. They said that higher the savings, more the growth rate of the economy.

(Krieckhaus, 2002) has undertaken a research work in Latin American countries about what causes the economic growth. He found that higher savings leads to higher capital formation

and that boosts the economic growth of the nations.

(Carroll and Weil, 1993) examined the interrelationship between domestic savings and level of economic growth in OECD countries by taking annual time series data and observed a controdictory results stating that economic growth is the cause of level of savings in those countries in Granger sense.

(Mohan, 2006) has undertaken time series annual data of twenty countries which are having different levels of per income and applied Granger Causality test to find out the relationship between savings and economic growth. He classified all the twenty countries into four groups like low-income countries (LIC), low-middle income countries (LMC), upper-middle income countries (UMC) and high-income countries (HIC). The basic hypothesis of the research is whether income level of the economy causes the direction of causality between economic growth rate and savings. The findings show that, in case of low-income countries, the results are mixed, causality moves from economic growth rate to growth rate of savings, in case of low-middle income countries. With reference to high-income countries, the causality moves from economic growth rate to savings, but in a bidirectional causality is existed in case of upper-middle income countries.

(Sarfraz, 2008) done a research analysis on the causal relationship between savings and economic growth in Pakistan by taking quarterly time series data and applied Vector Error Correction model and co integration model. He observed in his research study that there is unidirectional short run causality from gross domestic product to gross domestic savings. His findings absolutely support the theoretical model of Keynesian Theory that the level of output in a nation depends on the level of savings.

(Suresh Kumar Patra, 2017) has done a research work on the long run relationship between savings and economic growth in India during the time period 1950-51 to 2011-12. He observed that the increased savings enhances the growth rate of the economy in terms of GDP during the pre and post reforms period in the long run. He

found that during the pre reform period, economic growth causes the level of savings in the short run.

(Khan, 2010) has done a similar research study in Pakistan to study the nexus between the level of savings and the level of economic growth by applying the ARDL, Bound Test and Johansen Co integration test. His findings disclosed that there is a long run relationship between the observed variables and the direction of causality is from economic growth to savings i.e., unidirectional relationship only.

(Katircioglu S.T and Naraliyeva, 2006) have tried to investigate the relationship between the foreign direct investment, domestic savings and economic growth in Kazakhstan during the period 1993-2002. He applied time series techniques like Granger Causality and Co integration Tests. His results showed that there is a unidirectional relationship from domestic savings to economic growth in Kazakhastan in the long run.

(Saltz, 1999) has done a research work in seventeen selected countries which are having different levels of per capita income to analyse the relationship between savings and economic growth. He applied Vector Error Correction (VEC) and Vector Auto Regressive (VAR) models for anyasis of the time series data. Nine countries showed that economic growth is the cause of increased savings, two countries showed that domestic savings are the cause of increased growth of the economy. Three countries showed that there is no relationship between the two observed variables. And the remaining two countries showed a shocking results of two way causal relationship between the variables.

(Baharumshah, Thanoon and Rashidb, 2003) investigated the nexus between economic growth and domestic savings in five selected Asian countries like Singapore, South Korea, Malysia, Thailand and the Philippines by taking the annual data from 1960 to 1997 with the help of Vector Error Correction Model. Except Singapore, increase in savings is not the cause of economic growth in Granger sense in all the countries.

(Verma, 2009) also investigated the dynamic relationship between the sectoral savings, sectoral investment, foreign capital inflows and the GDP growth rate in India during 1951-2005 and applied ARDL procedure to test for both the long run and short turn effect of these variable. The research findings shows that there is a negative impact of public investment on GDP growth rate in India and found that none of the three sectoral savings, sectoral investments have any positive impact on the GDP growth rate in India. The research findings are quite opposite to neoclassical theory approach and stated that GDP growth is affecting household and private savings in the long run. The direction of causality is from savings to investment which is relevant to the growth model but, causality is lacked from domestic investment to economic growth.

4. Econometric Methodology
4.1. Data and Variables
The prime objective of the present research study is to investigate the impact of domestic savings and capital formation on gross domestic product which is considered as a proxy for the economic growth in India. The annual time series data on gross domestic savings (GDS), gross capital formation(GCF) and gross domestic product (GDP) data has been taken from the Reserve Bank of India's website Handbook of Statistics on Indian Economy from 1950-51 to 2017-18. The number of annual observations are 68.

4.2. Variable Description:
Later, we calculated with the help of MS Excel the growth rate in gross domestic savings (GDS_gr), growth rate in gross capital formation (GCF_gr) and growth rate in gross domestic product (GDP_gr). The variables which are to be observed in the study are GDS_gr, GCF_gr, GDP_gr.

4.3. Research Methodology:
The present research study is totally based on secondary data. To achieve the basic objective of the nature of short run and long run relationship among the identified variables, we used Augmented Dickey Fuller Test to find out the stationary of the data. Later for investigation of causal relationship, we used Granger

Causality Test is used. For understanding the co integration relationship among the variables, we used Johansen Co integration test is applied. The statistical tool is EViews 9 version.

5. Data Analysis:

5.1. Statistical analysis is performed on the time series data assuming that the selected variables are stationary. Time series data should be stationary when its mean and variance is constant over a period of time. If the selected data is nonstationary, it is to be transformed into stationary which enables us the analysis will be clearer and get accurate results. Augmented Dickey Fuller – Unit Root test (Gujarati, 2003) checks the stationarity conditions.

H_{10} = The GDS_gr has a unit root

H_{11} = The GDS_gr does not have unit root and it is stationary.

H_{20} = the GCF_gr has a unit root

H_{21} = the GCF_gr does not have unit root and it is stationary

$$H_{30} = the\ GDP_{gr}\ has\ a\ unit\ root$$

H_{31} = the GDP_gr does not have a unit root and it is stationary.

Table – 2 Unit Root Test Results GDS_gr

ADF Test	T-Statistics	P-Value
Lag length 0	-7.563388	0.0000
At 1%	-3.533204	
At 5%	-2.906210	
Philip Peron Test	-7.551999	0.0000
At1%	-3.533204	
At 5%	-2.906210	

Table – 3 Unit Root Test Results GCF_gr

ADF Test	T-Statistics	P-Value
Lag length 0	-8.393301	0.0000
At 1%	-3.533201	
At 5%	-2.906210	
Philip Peron Test	-8.391787	
At1%	-3.533204	
At 5%	-2.906210	

Table – 4 Unit Root Test Results GDP_gr

ADF Test	T-Statistics	P-Value
Lag length 0	-5.7196640	0.0000
At 1%	-3.533204	
At 5%	-2.906210	
Philip Peron Test	-5.771181	
At1%	-3.533204	
At 5%	-2.906210	

In all the cases, the P-Value is <0.05 and hence the alternative hypothesis will be accepted that is the data is stationary. After converting the data at first level itself the data is stationary. The below given graphs show the movement of the data.
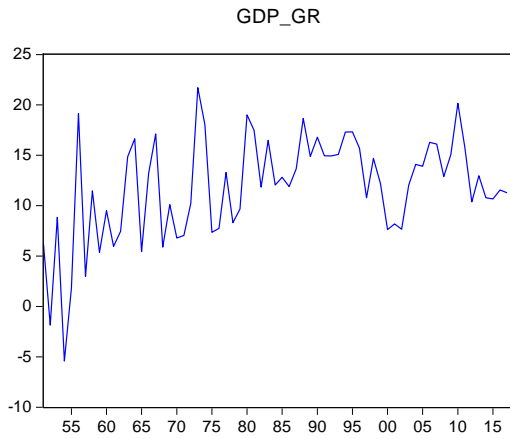
Movement of Gross Domestic Savings Growth Rate During 1951-52 to 2017-18

GDS_GR
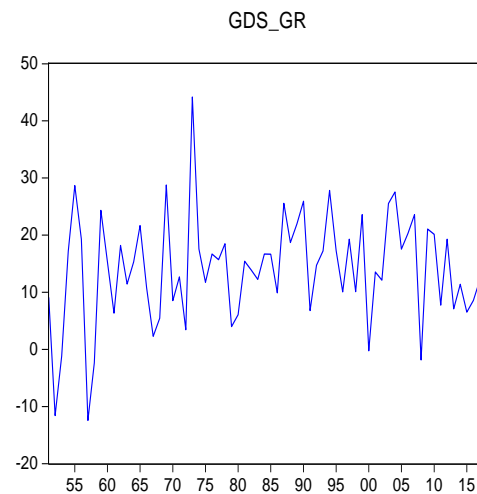
Movement of Gross Capital Formation Growth Rate During 1951-52 to 2017-18

GCF_GR
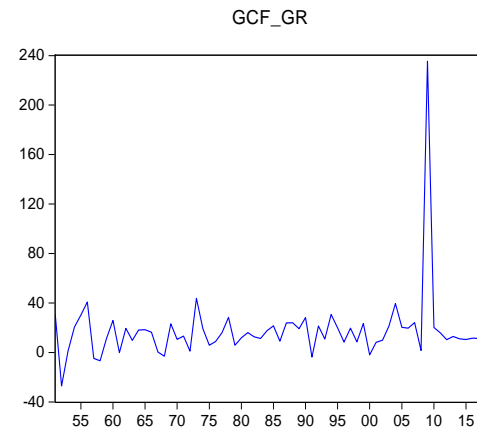
Movement of Gross Domestic Product Growth Rate During 1951-52 to 2017-18

GDP_GR

5.2. Direction of the Relationship: Granger Causality test is applied to understand the direction of causal relationship among the observed variables. It does mean that whether domestic savings causes gross domestic product or gross domestic product causes domestic savings and also to investigate whether gross capital formation causes gross domestic product or gross domestic product causes capital formation. The precondition for conducting the causality test is the data should be stationary. ADF test shows that the all the variables are stationary at level itself. Pair wise Granger Causality test is applied for Gross Domestic savings and gross domestic product. The hypothesis is framed as followed;

H_0 = GDP_gr does not granger cause GDS_gr

H_1= GDP_gr does granger cause GDS_gr

Table 5: Granger Causality Test Results between GDP_gr and GDS_gr				
Null Hypothesis	Lag Length	F-Statistics	P - value	Decision
GDP_GR does not Granger Cause GDS_GR	2	0.29548	0.7453	Accept H_1

H_0 = GDS_gr does not granger cause GDP_gr

H_1= GDS_gr does granger cause GDP_gr

Table 6: Granger Causality Test Results between GDS_gr and GDP_gr				
Null Hypothesis	Lag Length	F-Statistics	P - value	Decision
GDS_gr does not granger cause GDP_gr	2	2.07544	0.1344	Accept H_1

From the statistical analysis, it is very clear that there is bidirectional relationship between gross domestic savings and gross domestic product in the short run. The causality is moving from savings to growth rate and from growth rate to savings.

After conducting Granger causality test, we conducted Johnson Co integration test for identifying the long run relationship between gross domestic savings and gross domestic product. After adjustment, the number of sample became 58. The lag intervals are 1 to 8.

For running the Johansen co integration test, the following hypothesis is framed;

H_0 = there is no co integration between GDS_gr and GDP_gr

H_1= there is a co integration between GDS_gr and GDP_gr

Date: 02/02/20   Time: 15:06

Sample (adjusted): 1960 2017

Included observations: 58 after adjustments

Trend assumption: Linear deterministic trend

Series: GDS_GR GDP_GR

Lags interval (in first differences): 1 to 8

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.* *
None *	0.188527	23.18795	15.49471	0.0029

At most 1 *   0.173775   11.07152   3.841466   0.0009

Trace test indicates 2 co integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

The Johansen Co integration test showed that there is a long run relationship between Growth rate of gross domestic savings and growth rate of gross domestic product as the P value is <0.05 that is rejecting the null hypothesis and accepting the alternative hypothesis.

In the second stage, we conducted Granger Causality Test between gross capital formation and gross domestic product. The data is stationary at first level. The following hypothesis is designed;

H_0 = GDP_gr does not granger cause GCF_gr

H_1= GCF_gr does granger cause GDS_gr

Table 7: Granger Causality Test Results between GDP_gr and GCF_gr				
Null Hypothesis	Lag Length	F-Statistics	P - value	Decision
GDP_gr does not granger cause GCF_gr	2	0.05586	0.9457	Accept H_1

H_0 = GCF_gr does not granger cause GDP_gr

H_1= GDP_gr does granger cause GCF_gr

Table 8: Granger Causality Test Results between GCF_gr and GDP_gr				
Null Hypothesis	Lag Length	F-Statistics	P - value	Decision
GCF_gr does not granger cause GDP_gr	2	2.15657	0.1246	Accept H_1

Since the calculated p value in both the cases is >0.05 hence, we are accepting the alternative hypothesis. Here also we can find a bidirectional relationship between growth rate of gross capital formation (GCF_gr) and growth rate of gross domestic product (GDP_gr).

After conducting causality test between the two variables, we need to find out whether there is any long run relationship between these two observed variables or not. To find out the long run relationship, we conducted Johansen Co integration test. The results are as follows;

The following hypotheses are designed for long run relationship between GCF_gr and GDP_gr.

H_0 = there is no cointegration between GCF_gr and GDP_gr

H_1= there is a cointegration between GCF_gr and GDP_gr

Date: 02/02/20 Time: 15:11

Sample (adjusted): 1953 2017

Included observations: 65 after adjustments

Trend assumption: Linear deterministic trend

Series: GDP_GR GCF_GR

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.403195	52.22783	15.49471	0.0000
At most 1 *	0.249744	18.67715	3.841466	0.0000

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

The results show that the calculated p value is 0.0000 which is <0.05. hence we accept null

hypothesis. It does mean that there is no cointegration relationship between GCF_gr and GDP_gr.

CONCLUSION

The present research paper tried to throw light on the short run and long run relationship among the three variables viz., gross domestic savings, gross capital formation and gross domestic product. Time series data must be stationary as a precondition for conducting any statistical analysis. The data is analyzed in terms of stationarity. After converting the data into stationarity, then to understand the short run causal relationship is examined by applying Granger causality test. It is vivid from the results, that there is a bidirectional relationship between gross domestic savings and gross domestic product in the short run. Causality is moving in both the directions. In between the gross capital formation and gross domestic product, there is a bidirectional relationship is identified. Causality is moving in both the directions. After that, Johansen Cointegration test is applied to examine the long run causality relationship between gross domestic savings and gross domestic product. The results showed that there is a long run relationship between domestic savings and gross domestic product. But the results showed that there is no long run relationship between capital formation and gross domestic product as per the statistical analysis.

REFERENCES

- Bacha, E. (1990). A three-gap model of foreign transfers and the GDP. *Journal of Development Economics*, 279-296. Retrieved from https://www.econstor.eu/bitstream/10419/186468/1/td221.pdf

- Gregorio, J. D. (1991, December). Economic growth in Latin America. *Journal of Development Economics, 39*, 59-84. Retrieved from https://s3.amazonaws.com/academia.edu.documents/48802304/0304-3878_2892_2990057-g20160913-32243-jlbeng.pdf?response-content-disposition=inline%3B%20filename%3DEconomic_growth_in_Latin_America.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWOWY

- Ichiro Otani, D. V. (1990). Long-term growth in developing countries and its determinants: An empirical analysis. *World Development*, 769-783. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/0305750X9090001E

- Jappelli, T. P. (1994). Savings, Growth and Liquidity Constraints. *The Quarterly Journal of Economics, 109*(1), 83-109. Retrieved from https://doi.org/10.2307/2118429

- Khan, M. S. (2010, July). Old Wine in New Bottles: Saving – Growth Nexus: Innovating Accounting Techniques in Pakistan. *Theoretical and Applied Economics*, 49-60.

- Krieckhaus, J. (2002, October). Reconceptualizing the Developmental State: Public Savings and Economic Growth. *World Development, 30*(10), 1697-1712. Retrieved from https://doi.org/10.1016/S0305-750X(02)00064-5

- Lewis, W. A. (1956). Lewis' Theory of Economic Growth. *The American Economic Review, 46*(4), 632-641. Retrieved from https://www.jstor.org/stable/1814286

- Mohan, R. (2006). Casual Relationship between Savings and Economic Growth in Countries with DIfferent Income Levels. *5*, 1-12.

- N. Gregory Mankiw, D. R. (1992, May). A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics, 107*(2), 407-437. Retrieved from https://doi.org/10.2307/2118477

- Naraliyeva, S. T. (2006, June). Foreign Direct Investment, Domestic Savings and Economic Growth in Kazakhstan: Evidence from Co-integration and Causality Tests. *Investment Management and Financial Innovations, 3*(2).

- Orts, M. A. (2004, February). Does saving really matter for growth? Mexico (1970–2000). *Journal of International Development, 16*(2), 281-290. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1002/jid.1075

- Rashidb, A. Z. (2003, January). Savings Dynamics in Asian Countries. *Journal of Asian Economics, 13*(6).

- Renelt, R. L. (1992, September). A Sensitivity Analysis of Cross-Country Growth Regressions. *The American Economic Review, 82*(4), 942-963. Retrieved from https://www.jstor.org/stable/2117352

- Saltz, I. S. (1999, September). An examination of the causal relationship between savings and growth in the third world. *Journal of Economics and Finance, 23*, 90-99.

- Sarfraz, G. S. (2008, September). SAVINGS AND ECONOMIC GROWTH IN PAKISTAN: AN ISSUE OF CAUSALITY. *Pakistan Economic and Social Review, 46*(1), 17-36. Retrieved from https://www.jstor.org/stable/25825322?seq=1

- Sinha. (1996). Savings and Economic Growth in India. *MPRA Paper University Library of Munich, Germany*, 637-647.

- Solow, R. a. (1956). Economic Growth and Capital Accumulation. *Economic Record*, 334-361. doi:https://doi.org/10.1111/j.1475-4932.1956.tb00434.x

- Suresh Kumar Patra, D. S. (2017, December). Revisiting the Causal nexus between Savings and Economic Growth in India: An Empirical Analysis. *Economia, 18*(3), 380-391.

- T, S. D. (2007). Toda and Yamamoto Causality Test between Per Capita Savings and Per Capita GDP for India. *Ritsumeikan Asia Pacific University, Japan, Macquarie University, Australia and ITAM, Mexico*.

- Retrieved from https://mpra.ub.uni-muenchen.de/2564/

- Verma, R. (2009). Household, Private and Public Savings and Investment, Foreign Capital Inflows and GDP Growth in India with Structual Breaks 1950-2005. *Singapore Economic Review Conference, Singapore* (pp. 1-27). University of Wollongong.

- Weil, C. D. (1993). Savings and Growth: A Reinterpretation. *National Bureau of Economic Research*, 1-100. Retrieved from https://www.nber.org/papers/w4470.pdf