Dynamics of Savings and Investment and Determination of Rate of Interest in Indian Money Market: A Classical Approach

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Abstract
Purpose: The present study aims to examine the impact of savings and investment dynamics on the determination of the rate of interest in India. **Methodology**: For this purpose, a classical approach is adopted, and it is assumed that gross domestic saving (GDS) is positively associated with deposit rates for various term deposits of 1-3 years (DR1), 3-5 years (DR2), and above 5 years (DR3), while gross domestic investment (GDI) is negatively associated with the lending rate (LR) of interest. To test the efficacy level of this approach, the Dynamic Ordinary Least Square (D-OLS) method and Impulse Response Function (IRFs) are employed. To check the robustness of the DOLS findings, fully modified ordinary least squares (FMOLS) and canonical cointegration regression (CCR) techniques are used. **Finding:** The econometric results show that DR_1 and DR_2 are positively associated with GDS and follow the classical ideas. However, DR_3 is negatively associated with GDS. Additionally, the outcomes of the econometric analysis for GDI and LR support the principles advocated by classical economists. The IRFs results corroborate the results obtained through the DOLS model whereas; the robustness tests seem to be very much consistent with our earlier findings. **Conclusion:** The result of the study may present a better insight into understanding the relationship among GDS, GDI, DR, and LR and can improve the efficiency of India's monetary policy.
Keywords: Savings, Investment, Deposit rate, Lending rate, Cointegration, Dynamic ordinary least square, Impulse Response Function.

1. Introduction

The global economic order encountered a major shift after the outbreak of the First World War. The countries were divided into two groups and started imposing economic sanctions on each other. Most economies moved from a capitalist economy to a regime where government interventions became loud (Kennedy, 1984).This development further worsened the situation, and the world witnessed the most devastating Second World War until 1944 (Harrison, 1998). This geopolitical situation also changed the economic environment, which had little scope for a laissez-faire capitalist economy. Since classical economists' theories are based on laissez-faire capitalist economies (Atkinson and Oleson, 1998), they failed to explain many of the economic problems of that time (Krugman, 2007).India, being a British colony, also passed through the same phase. After gaining

independence in 1947, India moved away from the capitalist structure of the economy (Mazumdar, 2013). Despite being part of many international organisations, India declared its economy a socialist model in 1956 (Desai and Bhagwati, 1975) and paved the way for state-controlled industrial development. In 1969, India further moved towards a controlled economic structure by nationalising major commercial banks (Shetty, 1978). With all these developments and structural changes in the economy, India placed itself in an economic environment where there was little place for capitalism and consequently left no space for the classical approach to the management of the economy. However, this state-controlled economic system did not last for long, and in 1991, India was forced to introduce economic reforms and open the space for capitalism (Mukherji, 2002), where classical theories are assumed to be effective (Hill, 2010). Since it is not possible to analyse the effectiveness of all theories of classical economists in a single research paper therefore, we will restrict ourselves to knowing the effectiveness of classical theory of the rate of interest in the Indian economy.The classical theory of interest rate is frequently referred to as the real theory of interest rate (Wicksell, 1936). This theory believes that saving rises as interest rates rise and investment rises as interest rates fall (Mwega et al., 1990). For the present work, two types of interest rates are used: deposit rates and lending rates. The deposit rate of interest creates motivation for savings as it is given as a reward to savers, and hence savings are associated with the deposit rate of interest (Yunusa et al.,2021).In India, there are three types of deposit rates, depending on the time period. These are the rates of interest on deposits for 1 to 3 years (DR_1), the rate of interest on deposits for a period of more than 3 years to 5 years (DR_2), and the rate of interest on deposits for a period above 5 years (DR_3). All three deposit rates will be used to identify the relationship between savings and the rate of interest. As far as the investment is concerned, it is assumed to be associated with the lending rate (Lawal, 1982), and hence, while analysing the relationship between investment and rate of interest, the lending interest rate will be used. In this context, the present paper makes an attempt to empirically investigate the efficacy of the classical theory of rate of interest in India.

2. Review of Literature

The slope of the supply curve is positive, indicating that saving is directly proportional to the interest rate (Caminati, 1981). When the interest rate is lower, businesses will demand more credit for investment; when it is high, they will demand less credit for investment (Alhakimi and Shama, 2020**).** Furthermore, classical economists believe that the equilibrium rate of interest is established when the demand for and supply of savings are equal (Leigh, 1951).

Fry and Mason (1982) computed a saving function for seven Asian economies using a life cycle saving model and aggregated time series data. They observed that the interest rate coefficient in the saving function is positive and statistically significant. Greene and Villanueva (1990) investigated the factors influencing private investment in developing countries between 1975 and 1985 and came to the conclusion that interest rates have a negative impact on investment. The amount of savings is unrelated to the level of real interest rates (Dorn Busch, 1990), and the contribution of real interest rates to growth is not due to their impact on investment levels. According to Khan and Villanueva (1991), the interest rate is a good proxy variable for the efficiency of capital accumulation.

Ogak et al. (1995) found that high real interest rates enhanced savings. When interest rates rise, people save and invest more (Athukorala, 1998). The study concluded by Seshaiah and Sriyval (2005) revealed that savings and investment are cointegrated and that there is unidirectional causality between saving and investment. Using an ARDL model, Verma (2007) discovered that domestic saving drives investment in India in both the short and long run.

Using a fixed effect model, Salahuddin et al. (2009) discovered that the influence of interest rates on investments is insignificant. Acha and Acha (2011) analysed the Nigerian interest rate. They come to the conclusion that neither the deposit rate nor the lending rate affects the decision to save or invest.

Tokuoka (2012) found that a rise in the real interest rate had a negative effect on corporate investment in India. Simon-Oke and Jolaosho (2013) used a vector auto-regression (VAR) model and concluded that the real

interest rate has a negative impact on savings in Nigeria.Khan et al.(2014) examined the relationship between interest rates and household savings in Pakistan. In his study, interest rates were found to be positively correlated with household savings.

Chuba and Ebhotemhen (2017) examined the classical theory of interest rate in Nigeria. Their findings revealed that neither a unidirectional nor bidirectional causal relationship exists between interest rates and gross domestic investment.

After examining the available literature, it has become apparent that there are a few of empirical studies regarding the determination of interest rates from a classical perspective. Moreover, it is quite surprising that there is a lack of empirical studies specifically focused on the Indian context. This paper, therefore, seeks to fill in this gap by providing a time series analysis of the dynamic relationship between savings and investment for India using the dynamic ordinary least squares method and trying to examine the efficacy of the classical theory of interest rate.

3. Methodology

The primary goal of this study is to empirically examine the effectiveness of classical theory on interest rates in India between 1975 and 2021. In order to test the classical theory of interest rates, it is necessary to identify measurable variables that correspond to the variables in the theoretical framework. Thus, the present study used separate interest rates, such as the deposit interest rate for saving and the lending interest rate for investment. The information regarding the selected variables, such as gross domestic savings (GDS), gross domestic investment (GDI), and lending interest rate, is taken from the World Development Indicator, provided by the World Bank, while deposit interest rate data (deposits of 1-3 years, 3-5 years, and above five years) is taken from the Reserve Bank of India. After identifying and collecting the data, we used the ADF Test (Dickey and Fuller, 1979) for unit root without trend with the following equation:

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \sum_{i=1}^{k} \varphi_i \Delta Y_{t-1} + \varepsilon_t \qquad 1$$

The result of the ADF test provides a framework for co-integration (Engle & Granger, 1987). For this, the study employed an Engle and Granger cointegration test using the following equation:

$$\Delta \hat{e}_t = \rho \hat{e}_{t-1} + \sum_{j=1}^{K} \beta_j \Delta \hat{e}_{t-j} + V_t \qquad 2$$

Based on the cointegration results, the study moved towards a dynamic ordinary least square (Stock and Watson**,** 1993) rather than a standard OLS. This is because dynamic OLS corrects serial correlation and endogeneity problems in models by taking the leads and lags of the first differenced regressors (Saikkonen**,** 1991; Ogunjimi, 2021). Also, OLS assumes that the model parameters are constant throughout time; hence, it ignores any possible time-series dynamics. Furthermore, vector autoregressive (VAR) models are used in the analysis of multivariate time series (Liang and Schienle, 2019**)**. On the contrary, the Stock-Watson method is a single equation approach designed to accommodate serially correlated errors through a generalised least squares (GLS) technique (Aigheyisi, 2020). Moreover, for the robustness check, the present study used Fully Modified Ordinary Least Square (Philips and Hansen, 1990) and Canonical Cointegration Regression (Park, 1992) because both have the power to tackle challenges such as serial correlation, small sample bias, and endogeneity (Musa et al., 2019). Due to the strengths of these estimators, their results are employed as benchmarks for gauging the robustness of the Dynamic Ordinary Least Squares (DOLS) results. These advantages compel us to use the dynamic ordinary least squares (D-OLS) approach in order to get correct findings under the classical economists' premise that the deposit rate of interest establishes a positive relationship with saving and the lending interest rate establishes a negative relationship with investment. The model may be specified as:

$$GDS_t = \alpha_0 + \alpha_1 DR_{1t} + \alpha_2 DR_{2t} + \alpha_3 DR_{3t} + \sum_{j=0}^{k} \Delta\alpha_1 DR_{1t+k} + \sum_{j=0}^{m} \Delta\alpha_2 DR_{2t+m} + \sum_{j=0}^{n} \Delta\alpha_3 DR_{3t+n} + u_t \quad 3$$

$$GDI_t = \beta_0 + \beta_1 LR_t + \sum_{j=0}^{k} \Delta\beta_1 LR_{t+k} + u_t \quad 4$$

(Where GDS = gross domestic saving, GDI = gross domestic investment, DR_1, DR_2, DR_3 are the deposit interest rates of 1-3 years, 3-5 years, and above five years respectively, LR= lending rate, α_0 and β_0= drift component, α_1 to $\alpha_3$and β_1 are the coefficients, Δ=first difference operators and u_t= Stochastic Error terms).

4. Graphical Representation

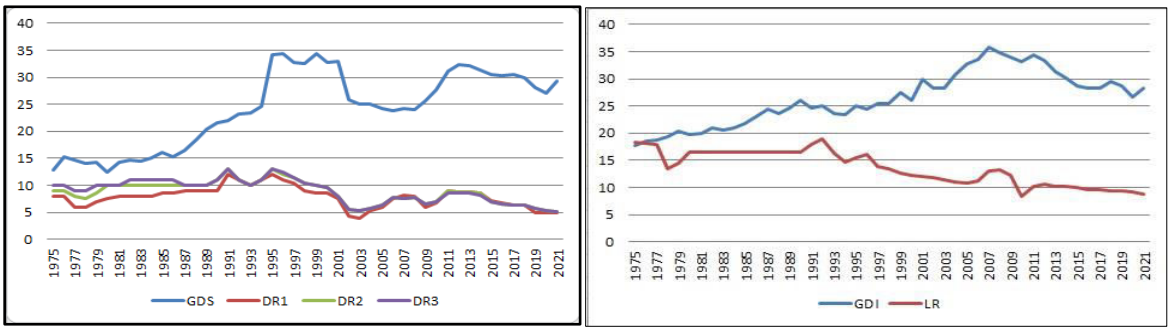

Figure 1: Trend of GDS and DRs (1975-2021) **Figure 1:** Trend of GDI and LR (1975-2021)

The relationship between GDS and deposit rates for various term deposits, namely 1-3 years (DR1), 3-5 years (DR2), and above 5 years (DR3), is represented in Figure 1. Similarly, the relationship between GDI and LR is represented in Figure 2. Figure 1 shows that all three types of deposit rates follow almost the same pattern, whereas Figure 2 shows that at the beginning of the study period, GDI seemed to be lower than LR because the lending interest rate was higher. As the LR decreased, the GDI went up and up until 2021. This pattern clearly indicates the negative relationship between them. Moreover, their empirical findings and descriptions are represented in Table 3.

5. Results and Discussion

With the help of the above-mentioned econometric model, the empirical analysis of the classical theory of interest rates is done. The summary statistics of the D-OLS model are represented in Table 3 in the form of long-run coefficient results. ADF is used to determine the order of stationarity of the data in Table 1.

Table: 1
Summary Statistics for Equation 1

	Levels		First Differences		
Variables	**t-Statistics**	**Prob.**	**t-Statistics**	**Prob.**	**Order of Integration**
GDS	-1.54	0.5069	-5.69	0.0000	I(1)
GDI	-1.77	0.3923	-7.40	0.0000	I(1)
DR1	-1.63	0.4581	-5.63	0.0000	I(1)
DR2	-1.09	0.7113	-5.33	0.0001	I(1)
DR3	-0.93	0.7687	-5.48	0.0000	I(1)
LR	-1.29	0.6244	-6.79	0.0000	I(1)

Source: Author`s Calculations

The statistical information in equation 1 shows that the series in the models are non-stationary at level but become stationary after their first differences, i.e., they are integrated at order one at a 5 percent or .0.05 level of significance. Therefore, the study examines the presence of cointegration among variables. Table 2 displays the cointegration findings.

Table 2
Summary Statistics for Equation 2

Dependent Variable	Null Hypothesis	Prob.	Decision
GDS	Residual has a unit root	0.0082	Reject the Null Hypothesis
GDI	Residual has a unit root	0.0334	Reject the Null Hypothesis

Source: Author`s Calculations

The findings of the residual-based Granger cointegration reveal that the residuals of both series are stationary at level I (0). Furthermore, the residual test results prohibit the possibility of spurious regression (Woolridge, 2012).

Table: 3
Summary Statistics of Equation 3

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
DR_1	3.036	1.354	2.240	**0.0355**
DR_2	8.326	4.077	2.042	**0.0510**
DR_3	-10.556	2.804	-3.763	0.0008
C	22.039	3.488	6.319	0.0000
R-squared				**0.86**
Adjusted R-squared				0.79
Summary Statistics of Equation 4				
LR	-1.287227	0.305178	-4.217954	0.0001
C	44.31974	4.237048	10.46005	0.0000
R-squared				**0.60**
Adjusted R-squared				**0.56**

Source: Author`s Calculations

Table 3 displays the least squares outcomes of D-OLS estimations for equations 3 and 4. In equations 3 and 4, GDS and GDI are dependent variables, while deposit and lending interest rates are independent variables, respectively. The explanatory power of both equations is high, as shown by the values of R-squared, which indicate that 86 percent and 60 percent of variations in saving and investment are caused by deposit and lending interest rates, respectively. However, the remaining variations are attributable to factors not included in these two equations. Moreover, the positive and statistically significant impact of DR_1 and DR_2 suggests that 1-3 years and 3-5 years of deposit rate of interest positively influence the saving behaviour of Indians at a 5 percent and 10 percent level of significance, respectively, whereas the impact of DR_3 on saving for periods beyond 5 years is negative. The statistical result demonstrates conclusively that as deposit interest rates increase, people's decisions to save money in banks decline and eventually become negative. This indicates that the deposit rate is more effective for periods of 1–3 years. The negative relationship between savings and DR3 may have been due to the high return on the capital market. Those who have been able to save for a long period of time may have transferred their savings from the banking sector to the capital market in search of a high return. The data provided by Global Economy reveals that the capital market return in India was 19.7 percent during the period from 1984 to 2021, which is much higher than DR3 (Global Economy, 2023). However, as far as investment is concerned, the negative and statistically significant probability value of the lending rate indicates that a 1 percentage point increase in the lending rate will lead to a decline of 1.29% in the interest rate in India. Overall, the above-mentioned result supports the classical theory of interest rates in India during the study period.

5.1Impulse Resopnse Function

In addition to examining the DOLS model, we also generate the Impulse Response Functions (IRFs). The findings of the IRFs are represented in Figure 3.

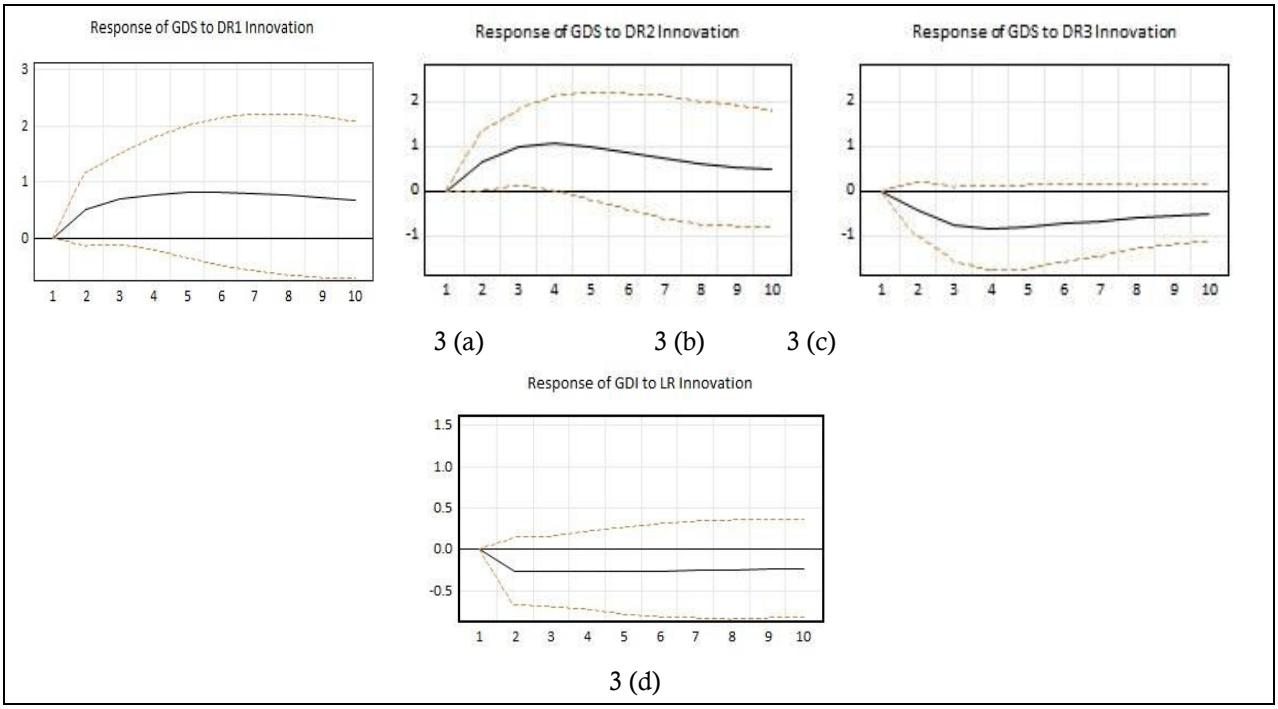

Figure 3: **Response to Cholesky One S. D. Innovations ±2 S. E**

The graphical representation of the impulse response function is used to analyse how deposit interest rates (DR) and lending interest rates (LR) affect the future behaviour of GDS and GDI in the system. The outcome of this impulse response is displayed in Figure 3. According to Sims (1987), the degree to which functions are constrained away from zero can be used to determine the significance of impulse response. For equations 3 and 4, GDS and GDI are represented as dependent variables, and deposit interest rate and lending interest rate are independent variables, respectively. The average response of GDS to DR_1 is 0.65374, GDS to DR_2 is 0.70503, and GDS to DR_3 is -0.57081. The DR_1 and DR_2 have a significant positive impact on GDS, while the DR_3 has an insignificant negative impact on GDS. Similarly, the response of GDI to LR is -0.20537. The LR has a negative impact on GDI. In conclusion, the outcomes of DR_1, DR2, and LR support the classical theory of interest rate.

5.2 Robustness Results

Table: 4

Robustness Results for Equation 3				
	FMOLS		**CCR**	
Variable	**Coefficient**	**Prob.**	**Coefficient**	**Prob.**
DR_1	3.1440	**0.0294**	2.9144	**0.0584**
DR_2	6.6981	**0.0350**	6.9242	**0.0490**
DR_3	-9.4497	0.0001	-9.5042	0.0002
Robustness Results for Equation 4				
LR	-1.2873	**0.0000**	-1.2930	**0.0000**

Source: Author`s Calculations

The results of the robustness tests, as shown in Table 4, using the FMOLS and CCR approaches are almost identical to the findings obtained from the DOLS technique. Therefore, these results validate and strengthen the conclusions derived from the dynamic ordinary least-squares method (DOLS).

5. Conclusion

The study examined the classical theory of interest rates in India using dynamic ordinary least squares (D-OLS) comprising four variables, namely, gross domestic saving, gross domestic investment, deposit rate, and lending rate. The empirical investigation of the residual-based Granger cointegration revealed that both equations confirm the long-run relationships, whereas the findings of dynamic ordinary least squares (D-OLS) demonstrated that the associations of DR_1 and DR_2 with saving are positive while DR_3 is negative. The negative association between DR_3 and saving in India may be due to the fact that the majority of people in India fall under the category of middle-income groups (NSO Report, 2020–21**).** They lack the income to save in banks and wait for a long time. Further, those who have more money and are able to invest for a long period of time avoid keeping their money in banks because of the low returns. They may have invested their money in real estate or the stock market to get a higher return within a very short time. On the other hand, the finding of the investment and lending rates is negative, confirming the idea of classical economists. The IRFs results corroborate the results obtained through the DOLS model whereas; the robustness tests seem to be very much consistent with our earlier findings. Overall, the study concluded that the classical theory of interest rates provides a useful framework for understanding interest rate dynamics; however, its application in India should be viewed in conjunction with the country's unique economic circumstances, policy objectives, and evolving financial landscape.

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