IIUC Business Review, Vol.-13, Issue-1, Dec. 2024
DOI: https://doi.org/10.3329/iiucbr.v13i1.88358

Interest rate impacts on investment: Evidence from Bangladesh

Nair Sultana
Department of Economics and Banking
International Islamic University Chittagong (IIUC), Bangladesh
Farzana Rahman
Centre for Research on Islamic Management and Business (CRIMB), Bangladesh.

Abstracts
Beginning in the early 1990s, Bangladesh implemented the Financial Sector Reform Programs (FSRPs), offering greater earnings on funds and effectively allocating loans in the financial sector by switching from a managed to a market-oriented interest rate system, which was one of the main goals of this extensive scheme. This would encourage expenditures on investment and support the growth of the economy. The main objective of this research is to examine how Bangladesh's interest rate affects the amount of investment made there. The ARDL approach was employed to assess the analysis for the period 1986-2023. The results reveal that the real interest rate has a more pronounced negative impact on investment, with a coefficient of -0.4882 and a p-value of 0.0002, indicating a statistically significant effect. The findings provide important insights for evaluating the outcomes of the Financial Sector Reform Programs (FSRPs) and informing the formulation of future policy strategies. The results are especially valuable for both domestic policymakers and international partners in shaping effective strategies for long-term economic development.

Keywords Investment, Interest rate, ARDL approach, Income level, Bangladesh.

Paper type Research paper

1. Introduction

The real economy is impacted by variations in investment spending, which is directly impacted by movements in nominal or real interest rates, according to economic theory (Ahmed & Islam, 2004). The Rate of interest changes have an impact on all macroeconomic variables, including GDP, prices, employment, the world's balance of payments, and the growth rate in the economy. They can also reflect alterations in the fundamental circumstances surrounding the macroeconomic system (Khurshid, 2015). "Buying goods that are not utilized now but will be utilized for creating wealth in the future" is the definition of an investment in the field of economics (Muhammad, Lakhan, Zafar, & Noman, 2013). Additionally, they argued that "what it costs to borrow money" is

IIUC Business Review
Vol.-12, Issue-1, Dec. 2023
pp. 101-116
IIUC ©
ISSN 1991-380X

known as the interest rate. There is a reduction in total investment as interest rates rise. "The total monetary value of all the goods and services generated in an economy, usually in a given year", is called income. Furthermore, all of the economy's producing elements generate this money.

The importance of rates of interest in generating deposits to provide sufficient cash for spending on investments and, ultimately, correctly distributing credits was undermined by the multifaceted nature and tightness of regulated lending rates. Additionally, because the state was unable to manage inflation properly, its efforts to give depositors higher returns were unsuccessful, and as a result, the incentives designed for attracting funds were harmed by the adverse and unstable actual rate of reserves. As a result, reduced financial intermediary costs, along with fair rates for deposits and loans are necessary to offset the effects of large savings organizing, spending on investments, and, ultimately, faster national economic growth. Specifically, according to the conventional Keynesian paradigm, a decline in the loan rate lowers the cost of capital and, consequently, lowers the cost of investment, increasing investors' profitability. Because investors respond favorably to this decline in lending rates, investment spending rises as a result, ultimately accelerating economic development. However, mobilizing savings is required to provide potential investors with sufficient capital for spending, and this is dependent primarily on deposit rates (Ahmed & Islam, 2004). According to Mckinnon (1973) and Shaw (1973), for example, an increase in deposit rates encourages depositors, or savers, to amass sufficient funds to finance expenditures on investments in a country's economy, and vice versa.

According to economic theory, businessmen fund initiatives when the anticipated returns outweigh the outlay of funds. Larger spreads are usually associated with least developed countries (LDCs) with defective financial markets. These defects can be attributed to a variety of causes, including a lack of competition, the weight of non-performing loans (NPLs), excessive overhead costs, etc. (Islam & Begum, 2005). There is an inverse relationship between investment and the rate of interest. For example, a high rate of interest causes a fall in investment decisions since taking out a loan for money is costlier than expected and vice-versa. Besides, a positive relationship between investment and income level accelerates high investment if the interest rate rises. The potential expense of investing in total investment determines how much of an impact interest rates have on the size of investments. Even so, when interest rates reduce, investment costs decrease, encouraging more investment and leading to a rise in total investments in social issues (Khurshid, 2015). When the high loan rate continues, there will be less demand for investments, which will eventually result in slower growth. As a result, Bangladesh, like other emerging economies, needs a decent interest rate to encourage savings, the accumulation of wealth, and the expansion of the economy. Savings, investment, and eventually economic development are all determined by interest rates, which are the cost of the time-varying distribution of products (Upper, Worms, & Bundesbank, 2003).

This paper analyzes the effects of interest rates on investment and income levels in Bangladesh from 1980 to 2022. It looks into whether high interest rates have made it more difficult for individuals to invest during this period.

2. Literature review

Numerous academics (Ingersoll Jr. & Ross, 1992; Hyder & Ahmed, 2003; Larsen, 2004) come to different findings regarding the connection between investment and interest rates based on a wealth of empirical analyses. A rise in real interest rates drives up the true cost of borrowing, which lowers investment levels. A multitude of empirical investigations (Baillie & McMahon, 1981; Greene & Villanueva, 1990) have been carried out, and in these investigations, scholars have employed diverse statistical techniques to evaluate the correlation between investment and real rate of interest, such as Johansen Cointegration Analysis, Granger Causality Analysis, ARDL, Decomposition of Variance, Impulse Response Function, VAR Granger Causality Analysis, etc. These empirical researches are compiled in this section in Table I.

Table I
Literature review in summarized

Author(s)	Study Method(s)	Findings
Baillie & McMahon, 1981	Three rate increases in West Germany between 1960 and 1978 are examined.	As different policies apply at two different times, the impact of interest rates on investments varies.
Greene & Villanueva, 1990	Determinants of private investment in Less Developing Countries (LDCs) based on 23 less developing countries for the span 1975 to 1985.	Investment and the real interest rate have an inverse relationship.
Ingersoll Jr. & Ross, 1992	Consider a real option model where the discount rate was swapped out for a stochastic interest rate.	Uncertainty surrounding interest rates obviously affects investment.
Hyder & Ahmed, 2003	This study examines the underlying causes behind the decline of private investment in Pakistan and explores potential strategies for its restoration.	A rise in real interest rates reduces the amount invested.

Author(s)	Study Method(s)	Findings
Larsen, 2004	To analyze the effect of loan interest rates on holding period returns for direct real estate investments in the United States, a quantitative research approach was employed.	Interest rates and investing in assets have negative associations.
Meng & Yip, 2004	In the event that investment was included in a monetary utility function model as an endogenous variable.	Investments do, in fact, have some effect on interest rates.
Aysan, Gaobo, & Marie-Ange., 2005	Explored the factors behind the slow growth of private investment in the Middle East and North Africa (MENA) during the 1980s and 1990s.	Real interest rates have an adverse effect on business investment initiatives.
Hata & Sekine, 2006	Regarding the best way to make long-term investing decisions while taking rate risk.	The interest rate significantly affected the income from investments.
Sax, 2006	Reviewed the short-term investments made on long-term bonds.	Interest rate fluctuations and investment were not strongly correlated in Switzerland. Furthermore, the interest rate parity theory in the US better fits with the correlation curve.
Wang & Yu, 2007	Investigate the role of interest rate in investment decisions for firms in Taiwan.	An essential component in deciding what to invest in is the interest rate.
Beccarini, 2007	In order to investigate the relationship between investment and interest rate in an unpredictable setting, the GMM estimation method was utilized, and the investment variable was represented by the value of the discount factor.	Investment and interest rates positively correlated with each other.
Alvarez, 2010	Short-term rate diffusion model.	The best investment and enterprise expansion may be constrained by rate uncertainty.
Bader & Malawi, 2010	The cointegration analysis was employed to examine the impact of investment on interest rates in Jordan.	Real interest rates and investments are adversely correlated, according to economic theory and several research; in addition, there is a positive correlation between income and investments.

Author(s)	Study Method(s)	Findings
Ibicioglu & Kapusuzoglu, 2012	Impulse response was employed to examine the impact of rate policy on investors using data from the ISE national 100 index and interest rates between 2002 and 2010.	Investors are unable to handle the short-term effects of interest rates.
Dore, 2013	The VAR model was employed to examine the causal link between investment and interest rates.	Instead of interest rates, the macroeconomic demand level determined investment.
Muhammad, Lakhan, Zafar, & Noman, 2013	Examine how the rate of interest impact on investment to the extent of Pakistan.	There is a substantial inverse correlation between investment and the real interest rate in Pakistan.

According to their findings, interest rates are a significant factor when making investments. The investment responds inversely to the real interest rate is supported by practically most of the research, mentioned in the above table.

2.2 Hypothesis

The hypothesis considered in this study is as follows

H_1: Real interest rates and investments are inversely correlated.

3. Data, model and methodology

3.1 Data and model

Real interest rates and income levels are the two key elements that are thought to determine the degree of investment, according to mainstream economic theory (Bader & Malawi, 2010).

This research was conducted with consideration for the years 1986–2023 based on annual data. The data were collected from World Development Indicators (WDI). The investment level, which is represented by the Gross Fixed Capital Formation (GFCF), is the dependent variable taken into consideration in this research. Besides, the real interest rate (R), the level of income, which is represented by the Gross Domestic Product (GDP), the inflation rate, which is presented by the consumer price index (CPI), savings (SAV), trade (TRA), and population growth (POPG), are the independent variables. R is determined using the Fisher equation, which requires deducting the inflation rate from the lending nominal interest rate, i.e. $R = i - \pi$.

Econometric model:

$$GFCF_t = \alpha_0 + \beta_1 R_t + \beta_2 GDP_t + \beta_3 LNCPI_t + \beta_4 SAV_t + \beta_5 TRA_t + \beta_6 POPG_t + \varepsilon_t$$

In this model-

GFCF = Investment level
R = Real interest rate
GDP = Level of income
CPI = Inflation
SAV = Savings
TRA = Trade
POPG = Population growth
LN=Natural Logarithm
α_0 = Intercept
β_1 to β_6 = Slope coefficient
t = Time
ε = Error term

This context uses the data of the "real interest rate" because lenders and borrowers are more concerned with real interest rates than nominal ones when making investment decisions.

3.2 Methods

Unit Root Test

The appropriate estimation technique is specified by the variables' integration order. The paper has applied two tests namely, the Augmented Dicky-Fuller (ADF) test and the Phillips-Perron (PP) test to define the sequence in which the variables are integrated and to check the stationarity of the variables.

I. Augmented Dicky-Fuller (ADF) Test

The Augmented Dicky-Fuller test results are depicted in Table 1. The following is the model's equation:

$$\Delta GFCF_t = \alpha_1 + \alpha_2 T + \delta GFCF_{t-1} + \beta_i \sum_{i=1}^{m} \Delta GFCF_{t-1} + \varepsilon_t$$

Here,

$\Delta GFCF_t = (GFCF_{t-1} - GFCF_{t-2})_t$ is a time trend,

m = the dependent variable's number of lags, and

ε = error term.

II. Phillips-Perron (PP) Test

Phillips and Perron test further justified the results of the ADF test in Table III. The equation of this model is expressed as:

$$\Delta GFCF_t = \alpha_1 + \delta GFCF_{t-1} + \varepsilon_t$$

Furthermore, to conclude, the study used the ARDL technique, diagnostic tests, and the Granger causality test.

4. Results and analysis

Table II
Unit root test's results

Variables	Tests	Exogenous	Level		1st Difference		Decisions
			T-statistic	P-values	T-statistic	P-values	
GFCF	ADF	Constant	-1.0289	**0.7327**	-4.5906	**0.0008**	I (1)
		Constant with trend	-1.0053	**0.9310**	-4.7253	**0.0029**	
		None	3.8167	**0.9999**	-3.2231	**0.0020**	
	PP	Constant	-1.0054	**0.7413**	-4.6107	**0.0007**	
		Constant with trend	-1.3133	**0.8689**	-4.7217	**0.0029**	
		None	3.2087	**0.9994**	-3.2361	**0.0020**	
R	ADF	Constant	-4.4241	**0.0012**	-9.0709	**0.0000**	I (0)
		Constant with trend	-5.2434	**0.0007**	-8.9871	**0.0000**	
		None	-2.5096	**0.0135**	-9.2005	**0.0000**	
	PP	Constant	-4.4081	**0.0012**	-20.8446	**0.0001**	
		Constant with trend	-5.8446	**0.0001**	-27.2582	**0.0000**	
		None	-2.5096	**0.0135**	-19.7308	**0.0000**	
GDP	ADF	Constant	18.4056	**1.0000**	1.5511	**0.9991**	I (1)
		Constant with trend	4.8149	**1.0000**	-4.3786	**0.0070**	
		None	30.2902	**0.9999**	3.5555	**0.9998**	
	PP	Constant	21.1553	**1.0000**	-0.3135	**0.9131**	
		Constant with trend	4.8149	**1.0000**	-4.4939	**0.0052**	
		None	28.5445	**0.9999**	0.7925	**0.8797**	
LNCPI	ADF	Constant	0.8970	**0.9944**	-4.2228	**0.0021**	I (1)
		Constant with trend	-1.5958	**0.7748**	-4.3985	**0.0066**	
		None	17.1695	**1.0000**	-0.3400	**0.5552**	
	PP	Constant	0.7601	**0.9919**	-4.2614	**0.0019**	
		Constant with trend	-1.2187	**0.8918**	-4.4135	**0.0064**	
		None	13.9885	**1.0000**	-0.8626	**0.3354**	
SAV	ADF	Constant	-1.0453	**0.7266**	-5.1489	**0.0002**	I (1)
		Constant with trend	-0.4732	**0.9805**	-5.2259	**0.0008**	
		None	1.3453	**0.9524**	-4.8895	**0.0000**	
	PP	Constant	-1.0660	**0.7188**	-5.1563	**0.0001**	
		Constant with trend	-0.7834	**0.9581**	-5.2243	**0.0008**	
		None	1.0969	**0.9261**	-4.9665	**0.0000**	
TRA	ADF	Constant	-1.7199	**0.4132**	-5.3809	**0.0001**	I (1)
		Constant with trend	-1.3106	**0.8696**	-3.6179	**0.0463**	
		None	0.1456	**0.7224**	-5.4000	**0.0000**	
	PP	Constant	-1.7199	**0.4132**	-5.3857	**0.0001**	
		Constant with trend	-1.3106	**0.8696**	-5.4807	**0.0004**	
		None	0.1456	**0.7224**	-5.4051	**0.0000**	
POPG	ADF	Constant	-1.2970	**0.6204**	-3.6112	**0.0104**	I (1)
		Constant with trend	-2.7211	**0.2346**	-3.5395	**0.0501**	
		None	-1.3965	**0.1484**	-3.4453	**0.0011**	
	PP	Constant	-1.5705	**0.4873**	-3.7012	**0.0083**	
		Constant with trend	-2.0930	**0.5325**	-3.5555	**0.0484**	
		None	-2.1665	**0.0308**	-3.5207	**0.0009**	

Table II represents the unit root tests, which were conducted using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods, to evaluate the stationarity of the time series data under three specifications: constant, constant with trend, and none. The results indicate that most variables are non-stationary at their levels, as reflected by insignificant p-values and t-statistics below critical thresholds. However, stationarity is achieved for these variables after first differencing, with significant p-values and t-statistics exceeding the critical values. This suggests that the majority of the variables are integrated of order one, I (1). However, an exception is the variable R (real interest rate), which is stationary at the level, I (0), which consistently shows significant results across all specifications in both tests. Conversely, variables like GFCF (investment level), GDP (income level), LNCPI (inflation), SAV (savings), TRA (trade), and POPG (population growth) require first differencing to become stationary. These findings support the suitability of ARDL modeling for subsequent analyses, as it accommodates the mixed integration orders [I (0) and I (1)] and facilitates the investigation of potential long-run relationships among the variables.

Table III

Var lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1241.314	NA	3.10e+21	69.35077	69.65868	69.45824
1	-891.5512	544.0753	1.81e+14	52.64173	55.10499*	53.50148
2	-810.9453	94.04021*	4.33e+13*	50.88585*	55.50445	52.49787*

[NOTE: * represents lag order selected by the criterion, LR = sequentially modified LR test statistic (each test at the 5% level), FPE = final prediction error, AIC = Akaike information criterion, SC = Schwarz information criterion, HQ: Hannan-Quinn information criterion.]

The ideal number of lags for this model, which is displayed in the accompanying Table III, is ascertained using the lag-length criterion technique. Lag-2 was found to be appropriate and optimal when the AIC lag selection criterion was applied to pick the proper lag.

Table IV

Bound test for cointegration's results

Test-statistic	Value	Significance	I (0)	I (1)
F-statistic	13.02705	10%	1.99	2.94
		5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

The bounds test for cointegration results, presented in Table IV, confirms the existence of a long-run relationship among the variables. The computed F-statistic of 13.02705 exceeds the upper bound critical values [I (1) bound] across all standard significance levels (10%, 5%, 2.5%, and 1%). Notably, the F-statistic surpasses the highest critical value at the 1% significance level (3.99), providing strong evidence of cointegration. These findings validate the presence of a stable long-term relationship among the variables, justifying further exploration of their long-run dynamics.

Table V
Estimated long-run coefficients results

	Dependent variable: GFCF		
Variables	**Coefficients**	**t-Statistic**	**P-values**
R	-0.488215	-4.661481	0.0002
GDP	-1.97E-10	-6.018624	0.0000
LNCPI	30.07980	7.557543	0.0000
SAV	-0.202119	-1.726199	0.1005
TRA	-0.172177	-2.997854	0.0074
POPG	3.577151	3.474012	0.0025
C	-69.25092	-6.534366	0.0000

The long-run coefficients for the dependent variable of GFCF (investment level), shown in Table V, reveal the relationships between the dependent variable and its explanatory variables. The variable R (real interest rate) has a significant negative effect on GFCF (investment level), with a coefficient of -0.488215 and a p-value of 0.0002, indicating that increases in R (real interest rate) lead to a reduction in GFCF (investment level) over the long term. Similarly, GDP (income level) demonstrates a negative and significant relationship with GFCF (investment level), with a coefficient of -1.97E-10 and a p-value of 0.0000, implying that higher income level is associated with lower investment in the long run. In contrast, the LNCPI (inflation) has a notable positive impact on GFCF (investment level), with a coefficient of 30.07980 and a p-value of 0.0000, suggesting that inflationary pressures may stimulate investment over time. The savings variable (SAV) has a negative coefficient of -0.202119, but its p-value of 0.1005 suggests that this effect is not statistically significant. Trade (TRA) also negatively impacts GFCF (investment level), with a coefficient of -0.172177 and a significant p-value of 0.0074, indicating that trade activities may limit investment in the long run. Population growth (POPG), on the other hand, has a positive and statistically significant effect, with a coefficient of 3.577151 and a p-value of 0.0025, suggesting that population growth positively influences investment. Lastly, the constant term (C) is negative, with a coefficient of -69.25092, and highly significant, reflecting other underlying factors that are not captured by the explanatory variables. These findings provide valuable insights into the long-term drivers of GFCF (investment level), emphasizing the roles of economic output, inflation, trade, and population growth in shaping investment.

Table VI
Estimated short-run coefficients results

	Dependent variable: GFCF		
Variables	**Coefficients**	**t-Statistic**	**P-values**
D (R)	-0.062924	-8.292360	0.0000
D(GDP)	1.25E-10	8.389256	0.0000
D (LNCPI)	-9.988116	-6.440436	0.0000
D (SAV)	0.138106	1.694542	0.1009
D (TRA)	0.052907	4.059360	0.0006
D(POPG)	0.199800	0.446519	0.0004
ECT (-1)	-0.026773	-12.53624	0.0000
	$R^2 = 0.8919$		

The short-run dynamic analysis of GFCF (investment level), detailed in Table VI, shows that the model accounts for 89.19% of the variation in the dependent variable, reflecting strong explanatory power. The error correction term (ECT) is both negative and highly significant, with a coefficient of -0.026773 and a p-value of 0.0000. This indicates the model's effectiveness in addressing deviations from long-run equilibrium, with approximately 2.68% of the imbalance corrected in each period, ensuring a gradual reversion to equilibrium. On the other hand, several variables significantly influence GFCF (investment level) in the short run. The variable R (real interest rate) has a negative and significant impact, as reflected by its coefficient of -0.062924. In contrast, GDP (income level) positively affects GFCF (investment level), with a significant coefficient of 1.25E-10, underscoring its key role in fostering investment. The LNCPI (inflation) exerts a significant negative influence, with a coefficient of -9.988116. While SAV (savings) has a positive coefficient of 0.138106, it is not statistically significant at conventional levels, suggesting a limited role in the short term. Trade (TRA), however, positively and significantly contributes to GFCF (investment level), as indicated by its coefficient of 0.052907, highlighting its importance in supporting investment. Population growth (POPG) also has a positive and significant effect, as shown by its coefficient of 0.199800. In summary, the findings underscore the model's reliability and offer meaningful insights into the short-run determinants of GFCF (investment level). The significance of the error correction term further supports the existence of a long-term equilibrium relationship, with adjustments occurring over time to maintain stability.

Table VII
Diagnostic test's outcomes

Diagnostic test	**Test statistic**	**Probability**
Heteroskedasticity (Breush-Pagan Godfrey)	1.518251	0.1912
Serial Correlation	0.238473	0.7897
Ramsey Reset	0.746236	0.3990
Normality (Jarque-Bera)	-----------	0.557807

The diagnostic test results shown in Table VII indicate that the model satisfies key econometric assumptions. The Breusch-Pagan Godfrey test for heteroskedasticity provides a test statistic of 1.518251 with a probability of 0.1912, suggesting that there is no significant issue with heteroskedasticity, meaning that the error variance is stable across observations. Besides, the serial correlation test gives a test statistic of 0.238473 and a p-value of 0.7897, indicating no significant autocorrelation in the residuals, and confirming that the error terms are not correlated. Additionally, the Ramsey RESET test, with a test statistic of 0.746236 and a p-value of 0.3990, shows that the model is correctly specified, with no evidence of functional form issues. Lastly, the Jarque-Bera test for normality produces a p-value of 0.557807, suggesting that the residuals follow a normal distribution. Overall, these diagnostic tests support the reliability of the model and its assumptions.

Table VIII

Granger causality test's results

Null hypothesis	Obs.	F-statistic	Prob.	Causal relationship
R does not Granser Cause GFCF	36	0.41675	0.6628	Uni-directional
GFCF does not Granser Cause R		2.84913	0.0731	
SAV does not Granser Cause GFCF	36	0.71592	0.4966	Uni-directional
GFCF does not Granser Cause SAV		2.53112	0.0959	
POPG does not Granser Cause GFCF	36	1.88969	0.1681	Uni-directional
GFCF does not Granser Cause POPG		2.655283	0.0864	
GDP does not Granser Cause R	36	3.15843	0.0564	Uni-directional
R does not Granser Cause GDP		0.59049	0.5602	
LNCPI does not Granser Cause R	36	5.23249	0.0110	Uni-directional
R does not Granser Cause LNCPI		0.14571	0.8650	
SAV does not Granser Cause R	36	3.15823	0.0564	Uni-directional
R does not Granser Cause SAV		0.78449	0.4652	
POPG does not Granser Cause LNCPI	36	174355	0.1916	Uni-directional
LNCPI does not Granser Cause POPG		4.41205	0.0206	
POPG does not Granser Cause SAV	36	0.92026	0.4090	Uni-directional
SAV does not Granser Cause POPG		2.57101	0.0927	

[Note: **, *** indicate the 5% and 10% significance levels respectively. Here, GFCF = investment level, R = real interest rate, GDP = income level, LNCPI = inflation, SAV = savings, TRA = trade, and POPG = population growth.]

The results from the Granger causality test, as shown in Table VII, indicate several unidirectional causal relationships between the variables. Specifically, GFCF Granger causes R, with a. F-statistic of 2.84913 and a p-value of 0.0731, suggesting a weak causal influence from GFCF to R, while R does not Granger cause GFCF. Similarly, GFCF Granger causes SAV, as indicated by an F-statistic of 2.53112 and a p-value of 0.0959, implying a weak but significant impact from GFCF to SAV, while SAV does not Granger cause GFCF. Additionally, the test reveals that the GFCF Granger causes POPG (F-statistic = 2.655283, p-value = 0.0864), while POPG does not Granger cause GFCF, demonstrating a unidirectional relationship from GFCF to POPG. For the relationship between GDP and R, GDP Granger causes R, with a F-statistic of 3.15843 and a p-value of 0.0564, showing a weak causal effect from GDP to R, while R does not Granger cause GDP. In the case of LNCPI and R, R Granger causes LNCPI (F-statistic = 5.23249, p-value = 0.0110), while LNCPI does not Granger cause R, indicating a strong causal influence from R to LNCPI. Similarly, for SAV and R, R Granger causes SAV (F-statistic = 3.15823, p-value = 0.0564), but SAV does not Granger cause R, suggesting a weak unidirectional causal relationship from R to SAV. Regarding POPG and LNCPI, LNCPI Granger causes POPG (F-statistic = 4.41205, p-value = 0.0206), but POPG does not Granger cause LNCPI, confirming a uni-directional relationship from LNCPI to POPG. Finally, POPG Granger causes SAV (F-statistic = 2.57101, p-value = 0.0927), while SAV does not Granger cause POPG, indicating a weak causal relationship from POPG to SAV. In conclusion, these results demonstrate that the variables are influenced by others in a one-way manner, with some variables exerting a more pronounced effect on others over time.

5. Discussion and findings

In the context of the Bangladeshi economy, the main goal of this study is to examine the hypotheses that investment is negatively impacted by real interest rates, and that investment is favorably correlated with income levels. An ARDL technique in particular, as well as time series analysis in general, is used to evaluate this hypothesis. The study discovered that real interest rates have a negative effect on investment. Hyder and Ahmed (2003), and Greene and Villanueva (1990) also support these conclusions. It is also evident from the results that real interest rates have a greater impact on investments than income does.

From the above analysis, there are three major findings which are-

i) The real interest rate (R) has a negative impact on investment (GFCF).

ii) Additionally, income level (GDP), savings (SAV), and trade (TRA) negatively affect investment and inflation (LNCPI), and population growth (POPG) positively impacted the investment (GFCF) in the long-run.

iii) From Bangladesh's point of view, investment (GFCF) is more affected by the real interest rate than by GDP (income level).

6. Conclusion

This study aims to empirically explore interest rate sensitivity to investment spending in light of shifting interest rate regimes and the ongoing policy discussion about interest rates in Bangladesh. The research has shown that the real interest rate (R) has a significant negative impact on investment. As real interest rates increase, firms tend to reduce their investment, emphasizing that lower interest rates encourage more capital formation. This finding indicates that interest rate policy can directly affect investment levels in an economy. Furthermore, the study identified that income level (GDP), savings (SAV), and trade (TRA) negatively influence investment, while inflation (LNCPI) and population growth (POPG) exert a positive effect on investment in the long run. This complex interaction of macroeconomic variables suggests that while higher income and trade may reduce investment, factors like inflation and population growth tend to encourage it. In addition, the research revealed that, particularly in the context of Bangladesh, the real interest rate has a more significant influence on investment decisions than does the income level (GDP). This highlights the importance of interest rates in shaping investment behavior in Bangladesh, as changes in the cost of capital have a more direct impact than fluctuations in income.

From a policy perspective, these findings suggest that lowering interest rates can stimulate investment by making capital more affordable for firms. However, the study also points out that other factors, such as GDP, savings, and trade, must also be considered when crafting economic policies. Notably, the crowding-out effect, caused by higher government spending, appears minimal in Bangladesh, as investment does not show strong responsiveness to interest rates. Therefore, the study recommends that government policies focus on fostering a stable regulatory environment and promoting investment through fiscal measures rather than relying solely on monetary policy to boost investment. While fiscal policies can be used to stimulate output during economic downturns, simply adjusting interest rates may not be sufficient to drive significant growth in investment.

References

Ahmed, S., & Islam, M. E. (2004). Interest rate responsiveness of investment spending in Bangladesh. *The Bangladesh Development Studies*, *30,* 65-109.

Alvarez, L. H. (2010). Irreversible capital accumulation under interest rate uncertainty. Mathematical Methods of Operations Research, 72(2), 249-271.

Aysan, A., Gaobo, P., & Marie-Ange, V. (2005). How to boost private investment in the mena countries: the role of economic reforms. Topics in Middle Eastern and North African economics. *MEEA, Online Journal, 7*, 1-15, Retrieved April 25, 2017.

Bader, M. & Malawi, A.I. (2010). The Impact of Interest Rate on Investment in Jordan: A Cointegration Analysis. *Journal of King Abdul Aziz University: Economics and Administration, 24*(1), 199-209.

Baillie, R. T., & McMahon, P. C. (1981). Interest rates and investment in West Germany. *Empirical Economics*, *6*, 1-9.

Beccarini, A. (2007). Investment sensitivity to interest rates in an uncertain context: is a positive relationship possible? *Economic Change and Restructuring*, *40*, 223-234.

Upper, C., Worms, A., & Bundesbank, D. (2003). Real long-term interest rates and monetary policy: a cross-country perspective. *BIS Papers*, *19*, 234-257., D. (2003). Real long-term interest rates and monetary policy: a cross-country perspective. *BIS Papers*, *19*, 234-257.

Dore, M., Makken, R., & Eastman, E. (2013). The monetary transmission mechanism, non-residential fixed investment and housing. *Atlantic Economic Journal*, *41*, 215-224.

Greene, J., & Villanueva, D. (1990). Determinants of private investment in LDCs. *Finance and Development*, *27*(4), 40.

Hata, H., & Sekine, J. (2006). Solving long-term optimal investment problems with Cox-Ingersoll-Ross interest rates. *Advances in Mathematical Economics*, *8,* 231-255.

Hyder, K., & Ahmed, Q. M. (2003). Why private investment in Pakistan has collapsed and how it can be restored.

Ibicioglu, M., & Kapusuzoglu, A. (2012). An empirical analysis of impact of central bank policy interest rate on the decisions of share investors: evidence from Turkey. *Procedia-Social and Behavioral Sciences*, *62*, 489-493.

Ingersoll Jr., J. E., & Ross, S. A. (1992). Waiting to invest: Investment and uncertainty. *Journal of Business*, 1-29.

Islam, M. E., & Begum, M. N. (2005). Is Investment Demand Sensitive to Interest Rate in Bangladesh? An Empirical Analysis. *Bank Parikrama*, *30*(1), 69-86.

Khurshid, A. (2015). The effect of interest rate on investment; Empirical evidence of Jiangsu Province, China. *Journal of International Studies*, *8*(1), 81-90.

Larsen, J. E. (2004). The impact of loan rates on direct real estate investment holding period return. *Financial Services Review*, *13*(2), 111-121.

Mckinnon, (1973). *Mon d Capital economic De*. Wash, D. C.: Brookings Institution.

Meng, Q., & Yip, C. K. (2004). Investment, interest rate rules, and equilibrium determinacy. *Economic Theory*, *23*, 863-878.

Muhammad, S. D., Lakhan, G. R., Zafar, S., & Noman, M. (2013). Rate of Interest and its Impact on Investment to the Extent of

Pakistan. *Pakistan Journal of Commerce and Social Sciences (PJCSS)*, *7*(1), 91-99.

Sax, C. (2006). Interest rates and exchange rate movements: analyzing short-term investments in long-term bonds. *Financial Markets and Portfolio Management*, *20*(2), 205-220.

Shaw, E. S. (1973). *Financial Deepening in Economic Development*. New York: Oxford University Press.

Wang, D. H. & Yu, T. H. (2007). The Role of Interest Rate in Investment Decisions: A Fuzzy Logic Framework. *Global Business and Economic Review, 9*(4), 448-457.

Corresponding author
Nair Sultana can be contacted at: sultana_nair@yahoo.com