

The Sensitivity of Investment to the changes Rate of Interest: Evidence from Iraq

SazanTaher Saeed

Faculty of Economics and Administration,
 Department of Economy, University of Sulaimania,
 Sulaimani-New capm-Tasluja-Street 1-Zone 501, Iraq

Abstract

Iraq has great potential of different resource that may not be obtainable in other countries. Iraq is one of the geographical locations that have diversity in terms of natural resources and investment components; that date back to thousands of years. A continually decreasing trend in investment and the growth of economy are the key problems that adversely affect Iraqi economy. Despite an increase in income promotes high investment, increase in the rate of interest might decrease the level of investment because it turns out to be extra expensive to have a loan of money. The importance of the study comes from estimate how the changes interest rate has impact on the level of investment of Iraq. Investment is the most important element of any economy and it is a key factor for growth in every epoch. Current paper tries to identify and analysis the impacts of interest rate on investment currently and in the future in the case of Iraq. To achieve this objective of fulfilling its full potential, present paper adopts OLS approach, and the secondary data was used for the period of (1980-2010). The results of this study were investigated to be in line with the economic theory and some other studies in the sense that interest rate has a negative impact on investment, where it is found that an increase in the interest rate by 1% decreases the level of investment by -9.98 %. Current study efforts to present a clear picture of the investment and interest rate of Iraq. The study also identifies the problems that facing the Iraqi economy and selects the necessary policy to solve the problem.

Keywords: interest rate, investment, GDP, economic analysis, OLS approach, Iraq

INTRODUCTION

Investment has a very important role in the growth of economy in a country. Countries depend on investment to reduce economic problems such as unemployment, poverty etc. (Ojima, and Fabian M. 2015). In economics, the definition of investment is the purchase of goods which are not used at present but are used in the future to generate wealth. For example include machinery, railroad, factory construction etc.(Muhammad et al. 2013). Besides, Hussein and Benhin (2015) define investment is a vital for economic development, as it increases productivity, the employment and technological progress. Moreover, according to Ferdousi, S. A. (2009) investment is a spending dedicated to boosting or maintaining the existing stock of capital in the economy provides goods and services needed for better living standard. In addition, it has greater importance as a policy tool. Target growth in GDP is made possible by influencing investment level. This is done through policies that affect interest rate, where the underlying assumption is that interest rate has a negative impact on investment. The major determinants of investment empirically are the interest rate and income. Out of the above determinants of investment, interest rate is viewed as the strongest factor because investment level in the

economy is sensitive to changes in the prevailing interest rate. Interest rate is the price paid for using money. It is the opportunity cost of borrowing money from a lender (Ojima, and Fabian M. 2015). Muhammad et al. (2013) explain that the overall investment will reduce when interest rate increases. Most of the businesses invest partially or wholly is credited. When the interest rate increases, companies must put more resources to pay off the cost of investment. "Income is the monetary worth of the entire goods and services produced generally within a year in an economy. This income is as well the earning of all factors of production of the economy (Muhammad et al. 2013)."Investment is often said as a function of interest rates and income, which are as follows:

$$I = f(r, Y), (negative-, positive+) \quad (1)$$

Where:

r= interest rate (negative sign).

Y = income(positive sign) .

Increase in interest rate might reduce the level of investment because it turns out to be extra expensive to have a loan of money, while an increase in income promotes high investment. "Still if a firm decides to

employ its personal finance in an investment, the interest rate in this stands for an opportunity cost of investing those finances rather than providing out that quantity of money for interest rate (Muhammad et al. 2013)”

Some studies confirm that interest rate has a significant effect on economy in general and investment specifically. In this regard, the current study analyzes the sensitivity of investment to the changes rate of interest in Iraq, using time series data for the period (1980-2010). This study assumes that interest rate has a negative impact on investment in Iraq. Here, it examines this assumption using econometrical tools. To the best of our knowledge, there are only few studies that deal with the case for Iraq. Thus, the current study aims to fill up this gap by adding at least one more empirical study to the existing number of articles. The expected empirical results enable policy makers to find out how much the investment is influenced by interest rate in Iraq.

Theoretical framework

The current section focuses on theoretical framework by present some conceptual which related investment. Hence; the present study focuses on the macro level and examines how the interest rate affects investment. According to Ahmed (2004), economic theories have suggested inverse relationship between investment level and the rates of interest. Changes in nominal or real interest rates transfer a direct impact on capital investment which, in turn, affects the real economy.

The classical theory of interest rate defined the interest rate as the element that equates savings and investment. The theory holds the proposition depend on the general equilibrium theory of interest rate determined by the demand for and supply of capital. The demand for

capital stems from the decision of investment while the supply of capital outcomes from savings in the community.

The Keynesian theory suggests that low interest rate as a component of cost administered is detrimental to increase savings and hence the demand for investment. They argue that higher real interest rate will have strong positive effects on savings which can be used in investment, because those with excess liquidity will be promoted to save because of increase in the rate of interest, thus banks will have excess money to lend to investors for the purpose of investment thereby raising the volume of productive investment (Ojima, and Fabian M. 2015).

The Financial Liberalization Theory put forth by Mckinnon and Shaw (1973) assume that the regulations of interest rate usually cause low and negative real interest rates, which stunts economic growth of developing countries. The financial repression which leads to low interest rate discourages savings and therefore, shrinks investment. They supported that interest rate deregulation would increase interest rate rise which will promote both savings and investment thus enhancing the economic growth. Both Mckinnon and Shaw supported that interest rates deregulation was required to remedy the problems caused by financial repressive policy of developing countries.

To sum up, most theoretical studies on the impact of interest rate on the investment are negative. This means that a higher interest rate might lower investment. Additionally, this function of Investment is general and simple. Further specifics are discussed in methodology.

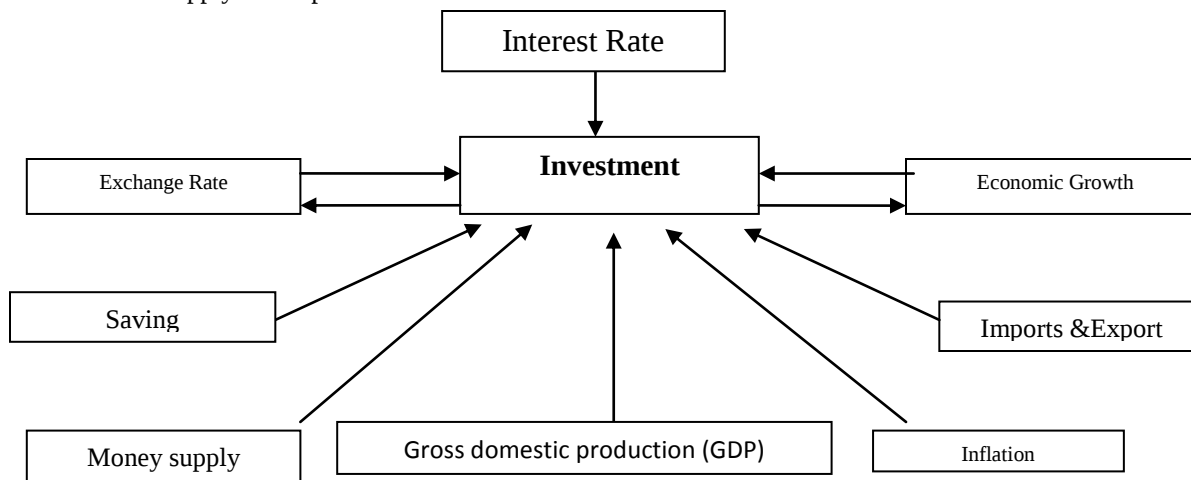


Figure 1: Theoretical Framework for Investment and Interest Rate

In the standard economic theory the level of investment depends on two main aspects: the level of income and interest rate. In the above diagram, we showed some of the relevant factors that affecting investment.

LITERATURE REVIEW

Empirical evidences from different countries confirm the sensitivity of investment to the changes rate of interest. It reviews previous studies in field of the sensitivity of investment to the changes rate of interest in general and on Iraqi economy in specific. High interest rate level raises the real cost of capital, thus the level of investment is decreasing. This negative effect has been confirmed by a number of studies, for instance, Muhammad et al. (2013) examined the relationship between interest rate and investment of the Pakistan for the period (1964-2012). The results confirm economic theory that investment has significantly inverse relationship with real interest rate in Pakistan. This result is in line with the results of Larsen (2004) has found that real estate investment and interest rate are inversely related for the United States.

Hence, Aysan et al. (2005), find “the determinants of unsatisfying private investment growth in the Middle East and North Africa (MENA)” during the 1980s and 1990s. The outcome illustrates that real interest rate negatively affect on a firm investment projects. Additionally, Bader and Malawi (2010) find the impact of real interest rate on the level of investment in Jordan during the 1990 and 2005. A cointegration analysis with three variables (investment level, real interest rate, and income level) is used. The results showed that real interest rate has a negative impact on investment; by contrast, the level of income has a positive impact on investment.

Another study is conducted by Green and Vilanueva (1991) examined the determinants of private investment in 23 less developing countries for the time period 1975-1987 and investigated that the real interest rate and private investment is inversely associated. A similar result found by Hyder and Ahmed (2003) who were investigated that “why private investment in Pakistan has collapsed and how it can be restored”. They investigated that increase in real interest reduces the level of investment.

In sum up, all these studies confirm that the investment is negatively responding to interest rate.

METHODOLOGY, VARIABLES AND DATA DESCRIPTION

The econometric model identifies functional relationships between investment and its determinants

using Ordinary Least Square Model. The OLS approach to multiple linear regressions was familiarized by Gauss in 1794. The technique of OLS is the simplest type of estimation procedure used in statistical analyses (Burke, 2010). OLS is done in economics (econometrics), political science, and electrical engineering (signal processing and control theory), among many areas of application. The OLS model comprises dependent, independent variables. Moreover, each of these variables must be estimated; consequently, the accuracy of the estimation depends on the reality and precision of each data sample (Witt & Witt, 1995). However, to benefit from the refined properties of an OLS estimate, many assumptions must be satisfied. OLS computational techniques are generally employed to test hypotheses on differences among factor level means in repeated measures data and are available in numerous commercial statistical software packages, commonly under the rubric of general linear model. Furthermore, OLS regression is one of the main techniques employed to analyze data. It helps as the basis of many other techniques. (Lim, 1997; Abdullah et al, 2010 ; Ishikawa and Fukushima, 2007; Hutcheson, 2011). Many types of samples have been employed (e.g., OLS) to estimate the elasticity of variables that explain investment.

There are several different frameworks in which the model of linear regression can be cast in order to make the OLS technique appropriate. The same formulas and same results were produced by each of these settings. The only difference is the assumptions and the interpretation which have to be imposed in order for the method to provide meaningful results. The choice of the applicable framework relies frequently on the nature of data in hand, and on the inference task which has to be performed (Lim, 1997; Abdullah et al, 2010 ; Ishikawa and Fukushima, 2007; Hutcheson, 2011). According to the economic theory, investment is the function of real interest rate and level of income as following:

$$CI_t = B_0 + B_1 r_t + B_2 Y_t + U_t \quad \text{..... (2)}$$

where:

CI_t = is the capital investment in year t;

r_t = is the compound interest in year t;

Y_t = is the level of income (GDP) in year t;

U_t = is the error term (Or other factors that affect investment).

t= is the time

In sum, in this study the following steps are performed to estimate the sensitivity of investment of the changes rates of interest for Iraq for time period 1980 to 2010:

First: Using Unit root test for Stationary

Second: Using OLS approach for Estimation Coefficients

Third: Using Diagnostic Checking for Accurate Estimation

Using Unit Root Test for Stationary

According to Dickey and Fuller (1979), the ADF test can be employed to check the stationarity of the data. Hence, this study will continue with these writers and

do the ADF test for all the data. The null hypothesis shows that there is a unit root (not stationary) against the alternative, which shows no unit root (stationary).

H_0 : there exists a unit root (not stationary) H_1 : there is no unit root (stationary)

Table 1: Augmented Dickey-Fuller Test

Augmented Dickey-Fuller tests (Level)										
Intercept						Intercept and Trend				
Variables	Calculated Value	Critical Value (1%)	Critical Value (5%)	Critical Value (10%)	Probability	Calculated Value	Critical Value (1%)	Critical Value (5%)	Critical Value (10%)	Probability
Investment	-1.6781	-3.6701	-2.9639	-2.6210	0.4317	-1.4077	-4.2967	-3.5683	-3.2183	0.8379
Interest rate	-2.0958	-3.6701	-2.9639	-2.6210	0.2476	-3.6293	-4.2967	-3.5683	-3.2183	0.0440
GDP	0.6477	-3.6701	-2.9639	-2.6210	0.9887	-0.1117	-4.2967	-3.5683	-3.2183	0.9922
Augmented Dickey-Fuller tests (First Difference)										
Intercept						Intercept and Trend				
Variables	Calculated Value	Critical Value (1%)	Critical Value (5%)	Critical Value (10%)	Probability	Calculated Value	Critical Value (1%)	Critical Value (5%)	Critical Value (10%)	Probability
Investment	-5.6747	-3.6793	-2.9677	-2.6229	0.0001	-7.1445	-4.3239	-3.5806	-3.2253	0.0000
Interest rate	-4.5823	-3.6998	-2.9762	-2.6274	0.0012	-4.4441	-4.3393	-3.5875	-3.2292	0.0079
GDP	-4.7932	-3.6793	-2.9677	-2.6229	0.0006	-5.5478	-4.3098	-3.5742	-3.2217	0.0005

Notes: Source: Author's Compilation from E-views.

The results show that all variables (Investment, Interest rate and GDP) are non-stationary at levels in ADF test which means that they do not have the ability to reject the null hypothesis of unit root (H_0 = Unit root exists) because in absolute value its (t) statistic is smaller than the critical DF value. Thus, then taking first difference for all variables become stationary at (1%, 5% and 10%) level of significant.

Using OLS Approach for Estimation Coefficients

This study used the Ordinary Least Square (OLS) method in the regression, which is the method that has

been used commonly by researchers who use time series data. The main idea of the Ordinary Least Square regression is that using this model in order to estimate the coefficients (Murray, 2006).

This section applies the macroeconomic view to relate interest rate with investment. Thus, based on Equation (2), can investigate study objectives, which is to identify the sensitivity of investment to the changes rates of interest in Iraq by applying data from 1980 to 2010. The results of the OLS estimation are reported in Table 2.

Table 2: Estimates for Investment of Iraq by applying Ordinary Least Squares

Regressors	Coefficient	p.value	t-test	Standard Error	Decision
Constant	2.1257	0.7090	0.3775	5.6307	-
Interest rate	-9.98	0.6751	-0.4241	2.35	Accept H_0
LGDP	0.3632	0.3906	0.8736	0.4157	Accept H_0
LEX	-0.3490	0.0799	-1.8257	0.1911	Accept H_1
Lag investment	0.5729	0.0002	4.2712	0.1341	Accept H_1

(*), (**), (***) denotes Significance at 1%, 5% and 10% respectively.

Table (2) illustrates that the coefficient of interest rate is (-9.98), which indicates 1% increase in interest rate would result decreases(9.98) of investment of Iraq; this result further shows that the p-value of interest rate is not significant that is consequently higher than % 5. Moreover, the coefficient of GDP is (0.36) which implies a positive relationship between GDP and investment, which means that a (1%) increase in GDP

would result, in increase investment by(0.36). In contrast, the coefficient of exchange rate is (-0.34),

which shows a negative and significant relation between exchange rate and investment, which means that a (1%) increase in exchange rate, would result in decrease investment by(0.34). Additionally, the p-value of exchange rate is significant that is consequently lower than 10%.The coefficient of lag investment is (0.57),

which shows a positive and significant relationship between lag investment and investment in the case of Iraq, and the p-value of lag investment is significant that is consequently lower than 5%.

Using Diagnostic Checking for Accurate Estimation

The next step in our model estimation, the diagnostic checking is conducted using (Microfit 4.1. and E-views 7.0). The main objective of diagnostic checking is to

check the adequacy of the estimation. In current study, diagnostic test is applied to ensure the appropriateness of the OLS estimation depended on both theory and statistics tools; this study used several diagnostic tests, including serial correction test, heteroscedasticity test, normality test and function form. The F-statistics and critical values are described in Table 3.

Table 3: Diagnostic Checking and accurate estimation of OLS model

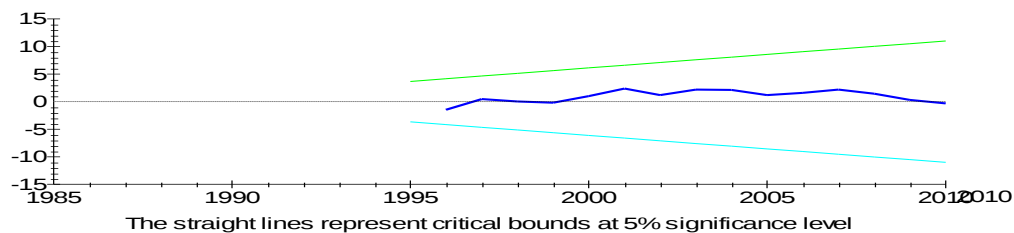
Diagnostic Test			
Test statistics:	LM version	F version	Decision
Serial Correlation / LM test	CHSQ(1)= .17846[.673]	F(1, 15) = 0.1036[0.752]	Accept H0
Heteroscedasticity /ARCH test	CHSQ(1)= .25887[.611]	F(1, 24) = 0.2413[0.628]	Accept H0
Normality /Jarque-Bera	CHSQ(2)= .75243[.686]	Not applicable	Accept H0
Functional Form	CHSQ(1)= 2.2887[.130]	F(1, 15)= 1.4479[0.248]	Accept H0
R-Squared	0.82	S.E	0.45
Adjusted R-squared	0.79	F-statistic	28.49(0.0000)
Notes: t-value in the parentheses (...) and p-value for diagnostic test in parentheses (*), (**), (***) denotes Significant at 1%, 5% and 10% respectively.			

Table 3 the Breusch-Godfrey Serial Correlation LM Test shows that the test does not reject the null hypothesis at the 5% level of significance, then we can accept the model and we can assure that the model has not serial correlation. It means that the model is statistically fit to be estimated. The OLS tests suggest that the errors are homoscedastic and independent of the repressors. The model passes the normality tests. Therefore, the OLS model is correctly specified. Furthermore, table 3 also illustrates the value of S.E

regression given its minimal value, is small. The R^2 indicates that the model is well fitted.

The above discussion associated the diagnostic test, and for stability test, the figures illustrate that the statistic plots of CUSUM and CUSUMSQ are within the critical range. Consequently, there is no evidence of any significant structural instability. The model can be employed for policy decision making. The stability tests are offered as follows:

Plot of Cumulative Sum of Recursive Residuals



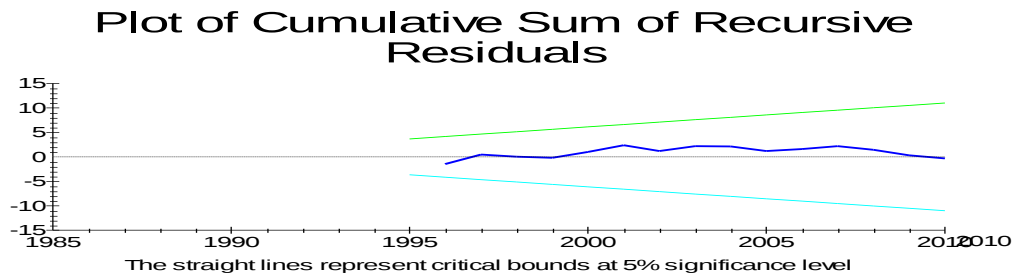


Figure2: Cumulative sum of Recursive Residuals, Investment for Iraq

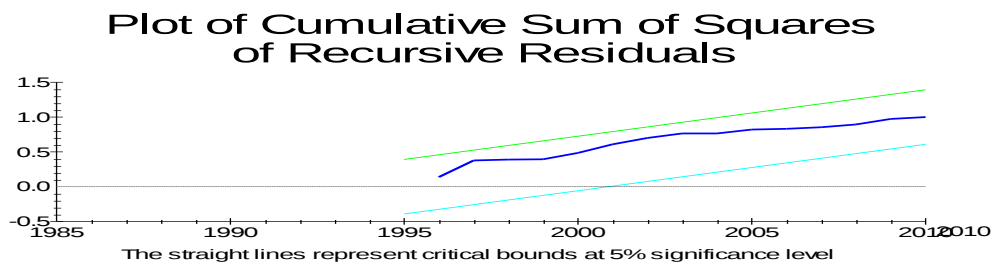


Figure 3: Cumulative sum of Squares of Recursive Residuals, Investment for Iraq

SUMMARY AND CONCLUSION

The purpose of this study is to confirm economic theory that investment and interest rate is negatively related, however investment and income is positively related. Selected variables are investment as a dependent variable while interest rate and income were independent variables for Iraq for time period 1980 to 2010. The results of this study were found to be in line with the economic theory and some other studies in the sense that interest rate has a negative impact on investment, where it is investigated that an increase in the interest rate by 1% decreases the level of investment by (9.98 %).

The main limitation of this study and makes suggestion for future research, study focused on the sensitivity of investment on the changes rate of interest in Iraq. Therefore, for future research in this subject, it would be appropriate and interesting to expand the study by including more variables such as exchange rate and tax. Moreover, this study used the Ordinary Least Square (OLS) method in the regression. Thus, a future study can formulate and apply different.

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