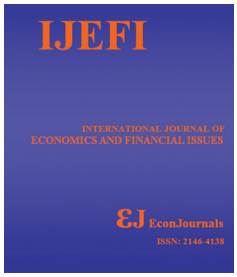


International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2018, 8(5), 131-141.

The Dynamic Relationship between Real Interest Rate and Investment: An Empirical Analysis for Selected Pacific Island Countries

Shabnam Sazma Bano*

Lecturer in Economics, School of Economics and Finance, College of Business, Hospitality and Tourism, Fiji National University, Fiji Islands. *Email: shabnam.bano@fnu.ac.fj

ABSTRACT

This study investigates the short run and long run relationship between real interest rate and investment for selected PICs using a pooled mean group (PMG) - panel autoregressive distributed lag approach for the period 1980–2016. The study reveals a significant negative relationship between real interest rate and investment in long run while a positive relationship in short run across all PICs, except for Samoa. The PMG results further show that economic variables such as growth rate, communication, foreign investment, aid and real exchange rate are investment creating in the long run while savings rate is investment reducing. In the short run only foreign direct investment and economic growth is investment creating while all other variables are investment reducing. The speed of adjustment is also a good predictor and reflected that stability will be restored across all countries in the long run. The achieved results have important policy implication for the PICs.

Keywords: Investment, Panel Autoregressive Distributed Lag, PICs, Real Interest Rate
JEL Classifications: E01, E22, E43, E61

1. INTRODUCTION

Economies today are moving away from convention economic growth approaches to a more inclusive growth approach. This means economies are directing policies to help the most vulnerable people of the societies; with work, resources, skills, consumption and with investment decisions. Of many sources of economic growth approaches, investment has been categorised as a key growth aspect which aims to eradicate poverty in a country (Thorat and Fan, 2007), create new opportunities for goods and employment (Checchi and Galeotti, 1993), improve productivity through introducing new and modern technologies and increase competitiveness in domestic as well as in foreign markets (Anderson, 1990).

Investment has been seen as a key aspect of growth from decades. Economists such as neoclassical and marxist have placed lot of emphasis on investment as an engine for growth. Other growth models such as Harrod (1939), Domar (1946), Solow (1956) and Romer (1986) has also established a positive link between investments and economic growth through capital accumulation, use of modern technologies, increased human capital, skills, training and creation of new knowledge through research and development.

Therefore, to sustain economic growth, an economy will have to foster investment but investment is a very volatile component of economic growth that is heavily dependent on various factors before passing any impact on the overall economy. The level of investment in an economy links the present to the future concerning issues such as business cycles, current and expected future profits, savings rate, infrastructure, financial institutions and most importantly the cost of investment reflected by interest rates (Griliches and Wallace, 1965; Amir et al., 2012).

To talk about investment or undertake any investment opportunities, the principal variable that concerns the investors are the real interest rate. Real interest rate is the core for stimulating investment as this represents the cost of capital accumulation (Coleman, 1997). Many theories have been developed to foresee the impact on investment when

real interest rate changes. The neoclassical theory with macroeconomic policies has derived a downward sloping relationship between real interest rate and investment demand. These theories reveal a straight forward intuition that a lower cost of capital through monetary policies stimulates large and profitable investments (Ekland, 2013).

Many theoretical literature has also outlined that real interest rate is considered to be the most influential variable for investment but the negative relationship as determined by the economists and theorist has started to weaken for some countries (Obamuyi, 2009; Ngouhouo and Mouchili, 2014).

Evidences from different countries as discussed in the next section show that relationship between real interest rate and investments cannot always be negative for all countries. Countries tend to differ in terms of resources, technologies, demands, production techniques and for this reason the researchers have criticized the initial relationship and revealed that there can be positive, negative, backward bending or even no relationship between investments and real interest rate.

The negative relationship has further started to weaken among economies due to increased volatility caused by inflationary expectations, risks of investments, taxes and market imperfections and therefore economist and theorists' will now have to implement appropriate policies to ensure that investment continues to prime sustained economic growth.

A number of studies have been carried out for developed and developing countries to find the exact relationship between real interest rate and investments and relevant policies has also been developed for continuous economic growth. Due to lack of studies undertaken for Pacific Island Countries (Jayaraman and Ward, 2004; Duncan and Nakagawa; 2014) and investment being a core determinant of economic growth; serious studies needs to be undertaken to ensure long term success and rapid economic growth for these small developing island countries.

Therefore, the major objective of this research is to find the true relationship between real interest rate and investment over the Pacific Island Countries in the long-run so that an appropriate decision can be reached on what more is required in the country to foster inclusive growth. An empirical study will be conducted for the period 1980–2016 and then the relationship will be defined for Fiji, Vanuatu, Papua New Guinea, Solomon Islands, Samoa and Tonga. Appropriate policies will also be determined to ensure that investment remains the staple contributor to inclusive economic growth.

2. LITERATURE REVIEW

Numerous studies have been done by most economies in finding the true causality between real interest rate and investment (Mallick and Agarwal, 2007). Economists and researchers has outlined that there can be negative, positive or no relationship between real interest rate and investment.

The important relationship between real interest rate and investments has been initiated by a number of theories. The accelerator theory introduced in 1900's is an important theory of investment which explains that investment in any period will depend on the output growth, prices of output and the cost of capital. The theory aims to help an economy establish appropriate policies through showing how investment can change when there is a change in demand, income or interest rate (Clark, 1917). This theory was then extended by the Keynesians as they dominated the economic fields in the later parts of 19th and 20th century.

Keynes (1936) revealed an inverse relationship between real interest rate and investment and elaborated that the relationship is depended on marginal efficiency of capital (MEC) and expected internal rate of return (IRR). The theory outlines that for productive investments and growth, interest rate should fall as long as MEC is higher and is increasing compared to the interest rate. Declining interest rate with declining MEC will not ensure any change in investment; rather will cause waste of monetary policies and will create risks of higher inflation in the economy. Likewise, IRR is another factor which measures and compares the profitability of investments and Keynesians highlight that a firm should continue to do investments as long as real interest rate is below IRR (Steven, 1989).

The Neoclassical theory then entered into the investment field and further explicated the Keynesian theory, outlining that investment is basically the change in capital between two periods where the optimal capital stock in a given period depends on output, prices, profits and the user cost of capital known as interest rate (Jorgenson, 1963; 1967 and 1971).

This was further supported and extended by Q theory of Investment which emphasised that a firm or economy can experience investment until the replacement cost of asset is equal to the market value of the asset. That is investment will be worthwhile and will be increasing as long as the MEC is greater than the opportunity cost of capital (Brainard and Tobin, 1968; Tobin, 1969).

Hence all the above theories outline that interest rate is a major determinant of investment but it is not the only variable. There are many other variables with interest rate that brings a change in investment and the effects of each variable may vary depending on economic situation and demand for investments.

Three possibilities have been suggested through empirical research concerning the relationship between real interest rate and investment. The first is the common monetary view which dictates that higher real interest rate leads to lower investments and growth. Secondly, higher real interest leads to higher investments achieved mostly through financial reforms and thirdly, higher real interest rate leads to lower or higher investment and growth depending on the relative rate equivalent to threshold level (Fry, 1997).

The unstable economic environment and investment volatility has continued to arouse interest in researchers to find the true relationship. Researchers like Haavelmo (1960) and Jorgenson (1963) had looked at the relationship between investment and real interest rate and found that interest rate raises cost of capital of a firm and thereby reduces investment, vetting a negative relationship between interest rate and investments.

On the other hand, the relationship between interest rate and investment can also resemble inverted U curve where low interest rates at first will show positive effects on investment but overtime continuous lower real interest rates would lead to financial dis-intermediaries, decline in investments as well as negative consequences on economic growth (Gregorio and Guidotti, 1995).

Consequently, interest rate and investment relationship can also be defined positively. The four Asian Tiger Countries has evidenced a positive correlation between interest rate and investment (Agarwal, 2001). However, in recent years, the importance of interest rate to stimulate long run investments is weakening and other variables such as higher credit availability in banks, economic environment and consumer demand is building up progressively to stimulate new investments; irrespective of whether the interest rate is set at high or low levels (Agarwal, 2004).

Interest rate also plays a key role on investment at firm level as small to large investors make their borrowing decisions based on the available interest rate. However, at firm level, the relationship between interest rates and investments can be analysed as back-ward bending due to irreversibility in investments and uncertain payoffs. That is, at low rates, increasing interest rate can stimulate investments as firms are in the process of learning the investment environment, but overtime, due to increasing cost of capital the level of investments will start to decline (Chetty, 2004; Geng and Diaye, 2012).

Similarly, interest rates and investments can also reveal a nonlinear relationship. In an uncertain context, a researcher elaborated that the relationship can only become positive if interest rate experiences high level of volatility (Beccarini, 2007).

A note can be undertaken from the research by McKinnon and Shaw (1973) who revealed that in order to stimulate higher savings and investments, real interest rate need to be determined in the market rather than government imposing interest rate ceilings for the market. The above researchers further pointed out that financial liberalization is another important policy that needs to be considered by economies for sustained growth and improvements. However, McKinnon and Shaw's (1973) results were reconsidered and reported that higher investments and growth can more successfully be generated through an open capital account with modest real interest rates (Pill and Pradhan, 1995).

Similarly, interest rate spread (IRS) also determines the creation of new investment in an economy (Jayaraman and Sharma, 2004) and a high IRS usually tends to have negative effect on private sector investment. Therefore, although a negative correlation may exist between interest rates and private investments, other investment determinants such as political instability, economic reforms, investor confidence and natural disasters should also be considered to reflect a fair effect on the aggregate investment (Singh, 2006).

Many country - specific studies have been conducted by numerous researchers throughout the world to show that the traditional negative relationship between real interest rate and investments does not always exists and that interest rate no longer remains the key factor in influencing either private or public investment.

A cross country study for 101 developing countries revealed that private investments will decline if the real interest rate is below the threshold of 5–6% while investments will increase if the real rates are within the threshold; thereby forming an inverted U relationship between real interest rates and private investments (Mehara and Karsalari, 2011).

On the contrary, a 100 basis points (bps) increase in the interest rate may decline the level of investments by 50 bps and GDP growth rate by 20 bps. Additionally, higher interest rate might also result in high inflation tolerance but in the long run, the harmful effect of inflation can be offset with positive effects from investments (Pattanaik et al., 2013).

A cross sectional analysis for 98 countries for the period of 1960–1985 further documented that changes in interest rates are unpredicted. That is even if real interest rate falls below -5%, investments and likewise economic growth rate can significantly remain low (Roubini and Martin, 1992). However, a research in the African context (Oosterbaan et al., 2000) revealed that if real interest rate ranges between -5 and 15%, a positive impact can be felt on investments and growth can also be maximized.

A recent highlight by IMF (2013) further explained that one fourth of fluctuations and slowdown in investment is basically caused by real interest rate than nominal interest. For this reason, it is very important to note how interest rates are determined in the economic environment and also to realize the difference between nominal and real interest rate.

Hence forth, the evidences revealed above outlines that although real interest rate is a key factor to influence and determine appropriate level of investment; other contributing factors also need to be considered to make decision about aggregate investment in an economy. Economies should also adopt appropriate interest rate rules to fairly report interest rate to the public so that more markets, businesses and investments can be created through well-established interest rate policy.

3. METHODOLOGY

Investment plays a pivotal role in the development of an economy and policy makers need to keep an outlook on all variables that either brings a positive or negative change in the overall investment level. Therefore, to define the relationship between real interest rate and investment and identify key determinants of investment in the Pacific Island countries, a pooled mean group (PMG) estimation technique based on panel autoregressive distributed lag (ARDL) is adopted for the period 1980–2016. Panel ARDL model is a commonly used model to study cross country specifications as it includes lagged dependent and independent variables that allows researchers to regress equation among variables which may be mutually co-integrated (Pesaran et al., 2001). Panel ARDL model also allows short run coefficients such as intercepts, error variances and speed of adjustments to be heterogeneous country by country while restricting homogeneity for long run slope coefficients across countries. This characteristic of Panel ARDL is very important as it can guide the policymakers on formulation of appropriate short and long term policies for investment in the PICs.

The Panel ARDL estimation technique also allows short run coefficients and error variances to be differentiated and the inclusion of lags for the short run coefficients further helps to correct for endogeneity in the regressors (Pesaran et al., 1999). More importantly, since the relationship between real interest rate and investment is unclear and may represent a mix of I(0) and I(1) variables, Panel ARDL estimation seems to be the best in this case as it will allow an ease in capturing dynamic long run relationship between the regress or and the regress and (Narayan and Narayan, 2006 ; Owusu, 2014) without creating any need for pre-tests or uncertainty tests as required in other co-integration methodologies.[1]

Therefore, to investigate the long run relationship between real interest rate and investments using the Panel ARDL model, the dependent variable is the total amount of investments at a given time period whereas the most important controlled variable, which has majority impacts on investment, is the real interest rate. A priori, the sign between real interest rate and investment cannot be determined for PICs but if the coefficient emerges to be positive, then a direct relationship can be confirmed. On the other hand, a negative coefficient would result in negative relationship between the variables. With real interest rate, other explanatory variables are also considered to capture the volatility in investments for a given time period. Incorporating all the explanatory variables and dependent variable into an empirical model, the model specification is as follows:

$$inv_t = \beta_0 + \beta_1 r\,\mathrm{int}\, r_t + \beta_2 credit_t + \beta_3 svr_t + \beta_4 grwr_t + \beta_5 \ln\_exchr_t + \beta_6 transcom + \beta_7 faid_t + \beta_8 fdi + \beta_9 pltclr + \beta_{10} kof + \varepsilon_t \quad (1)$$

And the panel ARDL (m, n, n,….) equation for investment can be presented as:

$$\mathrm{inv}_{it} = \beta_i + \sum_{j=1}^{n}\beta_{1,ij}\mathrm{inv}_{i,t-j} + \sum_{j=0}^{n}\beta_{2,ij}\mathrm{r\,int\,r}_{i,t-j} + \sum_{j=0}^{n}\beta_{3,ij}\mathrm{credit}_{i,t-j} + \sum_{j=0}^{n}\beta_{4,ij}\mathrm{svr}_{i,t-j} + \sum_{j=0}^{n}\beta_{5,ij}\mathrm{Grwr}_{i,t-j} + \sum_{j=0}^{n}\beta_{6,ij}\ln\_\mathrm{exchr}_{i,t-j} + \sum_{j=0}^{n}\beta_{7,ij}\mathrm{faid}_{i,t-j} + \sum_{j=0}^{n}\beta_{8,ij}\mathrm{transcom}_{i,t-j} + \sum_{j=0}^{n}\beta_{9,ij}\mathrm{fdi}_{i,t-j} + \sum_{j=0}^{n}\beta_{10,ij}\mathrm{pltclr}_{i,t-j} + \sum_{j=0}^{n}\beta_{11,ij}\Delta\mathrm{kof}_{i,t-j} + \varepsilon_{it} \quad (2)$$

Where $\boldsymbol{inv}_{it}$ is the dependent variable which represents total investment at US 2010 constant price converted as a percentage of GDP at time *t*.

The explanatory variables used in the above equation are $rintr_{it}$ which is the real interest rate adjusted for inflation as measured by the GDP deflator at time *t* (lending rate minus inflation). Since investment is mainly financed through borrowing, the cost of capital is the major element considered by the investors to decide whether the selected investment will be undertaken or not. A higher real interest rate will make investment to be more expensive and less profitable while a lower interest rate ensures profitable and productive investments due to associated low cost.

The second variable is $credit_{it}$ which refers to the availability of credits at bank and financial institutions as a percentage of GDP at time *t*. Higher bank credits ensures that investors are easily able to borrow funds to finance their investment projects provided interest rates on borrowings are controlled and available at below market clearing levels (Fry, 1995).

The third variable is svr_{it} which is the domestic savings rate as a percentage of GDP at time *t*. According to the growth models as discussed in the literature (Harrod, 1939; Domar, 1946; Frankel, 1962 and Romer, 1986), higher savings results in more capital accumulation and thus investment and growth. This independent variable is included to observe a similar effect in PICs.

$grwr_{it}$ is the growth rate measured annually for each country at time *t*. The real GDP growth rate is also an important determinant of investment in the PICs as higher growth rate demands more capital which results in an increase in investment. Furthermore, higher growth rate also implies prospective business environment, efficient policies and quality institutions which ensure profitable opportunities for new investments.

ln_exchr_{it} is the official exchange rate of local currency per US dollars converted into log form for each country at time *t*. The exchange rate usually affects investment negatively because when there is an appreciation of the domestic currency, foreign goods becomes cheaper resulting in a decline in domestic investments (Fry, 1995). On the other hand, depreciation of the domestic currency can boost investment in tradable goods although some decline may be experienced in the domestic goods (Wijenbergen, 1995). This variable is thus included to observe the effects of exchange rate on investments in PICs.

The next included variable is $\boldsymbol{faid}_{it}$ which represents the foreign aid as a percentage of GDP provided by official agencies of the members of the Development Assistance Committee (DAC) by multilateral institutions and by non-DAC countries to promote economic development at time *t*. Since Pacific Island Countries are developing countries and they often receive aid from other developed countries for development purposes, production of goods and services, maintenance of infrastructures and adoption of new technologies; the variable is thus included to observe whether the aid from other countries has positive impact on the investments in the PI economies.

$transcom_{it}$ refers to the transport, storage and communication as a percentage of GDP at time *t*, *transcom* are seen as key ingredient for investments. PICs are small economies and lacks appropriate facilities for communication and transport. This independent variable is included to see whether improvements in infrastructure and communication over the years have attracted investment in the PICs.

1 ARDL model can become in inappropriate when variables are an integrated order of two (I (2)) or more. Therefore, to overcome regression problems, a quick check on individual unit root test may help.

Another included important variable is fdi_t which refers to the foreign direct investment as a percentage of GDP at time t. Foreign direct investment (fdi) or capital inflow ensures a flow of funds in the domestic countries to increase economic activities and production of goods and services at friendly exchange rates, policies and regulations. FDI also promotes domestic investments and industries through the forward and backward linkages which could be experienced by PICs as experienced by Malaysia and Thailand (Agarwal et al., 2000).

The dummy variables included in the model to explain the effects on investments are $pltclr_{it}$ and kof_{it}. $pltclr_{it}$ is a dummy variable which measures a country's political regime ranging between -10 to +10 where scores closer towards -10 reflects presence of monarchy and weak political environment while scores closer towards +10 indicates democracy and strong political environment. kof_{it} is a dummy variable which looks at how globalized economies are in terms of social, economic and political regimes ranging within 1 to 100 where more globalized economies are closer to 100 and less globalized economies are closer to 1.

Other included variables in the equation are ε_t, which refers to the error term included to account for the effects of excluded variables in estimating the true relationship between the dependent and independent variables, i refers to the selected countries under study and t refers to the time period (1980–2016) for which the relationship is observed.

Once the panel ARDL model has been set up with the defined investment-related variables, the first step is to construct an error correction representation of the Panel ARDL model for equation (2) above as this will help up to examine the existence of long run relationship among the variables in the PICs. This follows as:

$$\begin{aligned}\Delta inv_{it} &= \beta_i + \sum_{j=1}^{m}\beta_{1,ij}\Delta inv_{i,t-j} + \sum_{j=0}^{n}\beta_{2,ij}\Delta rintr_{i,t-j} \\ &\sum_{j=0}^{n}\beta_{3,ij}\Delta credit_{i,t-j} + \sum_{j=0}^{n}\beta_{4,ij}\Delta svr_{i,t-j} \\ &+\sum_{j=0}^{n}\beta_{5,ij}\Delta Grwr_{i,t-j} + \sum_{j=0}^{n}\beta_{6,ij}\Delta ln\_exchr_{i,t-j} \\ &+\sum_{j=0}^{n}\beta_{7,ij}\Delta faid_{i,t-j} + \sum_{j=0}^{n}\beta_{8,ij}\Delta transcom_{i,t-j} \\ &+\sum_{j=0}^{n}\beta_{9,ij}\Delta fdi_{i,t-j} + \sum_{j=0}^{n}\beta_{10,ij}\Delta pltclr_{i,t-j} \\ &+\sum_{j=0}^{n}\beta_{11,ij}\Delta kof_{i,t-j} + \alpha_1 inv_{i,t-1} + \alpha_{2,ij} rintr_{i,t-1} \\ &+\alpha_{3,ij} credit_{i,t-1} + \alpha_{4,ij} svr_{i,t-1} + \alpha_{5,ij} Grwr_{i,t-1} \\ &+\alpha_{6,ij} ln\_exchr_{i,t-1} + \alpha_{7,ij} faid_{i,t-1} + \alpha_{8,ij} transcom_{i,t-1} \\ &+\alpha_{9,ij} fdi_{i,t-1} + \alpha_{10,ij} pltclr_{i,t-1} + \alpha_{11,ij} kof_{i,t-1} + \square_{it}\end{aligned} \quad (3)$$

From equation 3, the dependent and independent variables are defined as before; $\beta_{1,ij,\ldots\ldots,}\beta_{11,ij}$ represents the coefficients of the lagged dependent and independent variables as well as are the parameters for short run multipliers, $\alpha_{1,ij,\ldots\ldots}\alpha_{11,ij}$ represents the long run multipliers that determines the speed of adjustment, represents the fixed effects, Δ represents the first difference operator of the variables while ε_{it} represents the error term that accounts for all variables not included in the model.

The Panel ARDL model is also based on a null hypothesis of no co-integration against an alternative hypothesis of co-integration and the derived hypothesis (from equation 3) needs to be tested using the Panel Co-integration test.

The null hypothesis of no co-integration amongst variables is written as:
(H_0: α1=α2=α3=α4=α5=α6=α7=α8=α9=α10=α11=0).

Against alternative hypothesis of:
(H_1: α1≠α2≠α3≠α4≠α5≠α6≠α7≠α8≠α9≠α10≠α11≠0).

Once the co-integration test confirms the presence of co-integration among variables, the Panel ARDL model will then be used to estimate short-run parameters using the error correction model (ECM).

The ECM framework is as follows:

$$\begin{aligned}\Delta inv_{it} &= B_i + \sum_{i=1}^{h}\beta_i \Delta inv_{i,t-i} + \sum_{z=0}^{i}\varepsilon_z \Delta rintr_{i,t-z} \\ &+\sum_{j=0}^{j}\delta_j \Delta credit_{i,t-j} + \sum_{k=0}^{k}\Upsilon_k \Delta Grwr_{i,t-k} + \sum_{l=0}^{l}\Phi_l \Delta ln\_exchr_{i,t-l} \\ &+\sum_{m=0}^{m}\Psi_m \Delta faid_{i,t-m} + \sum_{n=0}^{n}\omega_n \Delta transcom_{i,t-n} \\ &+\sum_{t=0}^{q}\rho_t \Delta fdi_{i,t-t} + \sum_{w=0}^{r}\mho_w \Delta Pltclr_{i,t-w} + \\ &\sum_{p=0}^{s}\Omega_p \Delta Kof_{i,t-p} + \eta ECT_{i,t-1} + \varepsilon_t\end{aligned} \quad (4)$$

Where β, ξ, δ, ϒ, ϕ, Ψ, ω, ρ, ℧ and Ω are the short run coefficients while Ƞ represents the coefficient of speed of adjustment. The expected sign of the adjustment coefficient is negative.

4. RESULTS AND ANALYSIS

4.1. Stationarity Test

To examine the association between real interest and investments as well determine the significance of other chosen variables, the analysis began with a unit root test. The panel ARDL methodology cannot be used for estimating short run and long run effects if variables are not integrated of order one I (1) or zero I (0) and therefore it is necessary to conduct panel unit root test on all the regressors. The unit root tests can either be found for individual variables for each country or it can also be grouped for all selected countries.

The Eviews software presents five common types of unit root test that can be applied on a panel data (Griffith et al., 2012). The tests are Breitung (2002), Levin et al. (2002), Im et al. (2003), ADF and PP fisher types test (Maddala and Shaowen, 1999). Using all of these five tests, the unit root test is conducted so that results are consistent. However, the results are reported in different statistics. The Breitung et al. and Levin. method assumes a common unit root and their results are reported in t-statistics. The Im, et al. assumes individual unit root and their results are reported in W-statistics while ADF and Phillips Perron assumes individual unit root and results are reported in chi-square statistics. All results p-values are also reported and the level of significance is determined at level as well as in difference form.

The results are reported in Table 1 which shows that savings rate, foreign aid, real exchange rate, bank credits to domestic sector, transport, storage and communication, political environment and globalization of economies are strictly integrated of order one, I (1) while investment, real interest rate, economic growth rate and foreign direct investment are integrated of order zero, I (0), irrespective of the selected panel unit root tests. This reflects that none of the variables are integrated of order two I (2) and PMG based on panel ARDL model can be performed on equation (3) and equation (4) to observe the existence of long run and short run relationship between investment and its listed independent variables.

4.2. Panel Based Co-integration Tests

Having established the stationarity of all variables as integrated of order one, I (1); the next step is to perform co-integration test between investments, real interest rate and other controlled variables. There are many panel co - integration tests outlined by economic literature[2] but this study employs Kao residual co-integration test (1999) as this test produces results for large sample size by allowing more than one co-integrating relationship as well as specifies cross-section intercepts and homogeneous coefficients (Chirwa and Odhiambo, 2018).

The test involves no deterministic trend and lag length is based on Schwarz Bayesian criterion as well as Akaike information criterion.

The results from Table 2 show that the null hypothesis of no co-integrating relationship is rejected and thus there exists a co-integrating relationship between investment and its controlled variables at 1% significance level. The results therefore prove that a long-run level relationship exists between investments, real interest rate, savings rate, foreign direct investment, foreign aid, transport and communication, exchange rate and the status of the country in terms of how globalised they are and its political environment. This result allows us to further investigate the short and long run investment dynamics using the PMG panel ARDL estimation method.

4.3. PMG Panel ARDL Regression Results and Analysis

Real interest rate and investment associates a negative to positive linear and non-linear relationship and the determination of exact relationship between the two variables has remained ambiguous in pacific island countries. It is therefore important to reveal the short run and long effects that exists among the variables for outlining effective policies and growth-strategies in countries through considering individual economic conditions and international effects.

In this section, an analysis between real interest rate and investment is conducted on six Pacific Island countries and is extended to other factors that can also have a direct impact on Investments.

Table 3 summarises the PMG Panel ARDL estimation results across the selected six PICs for the sample period 1980–2016.

As illustrated in Table 3, the results show that in the long run real interest rate, savings rate, economic growth, exchange rate, transport, storage and communication facilities, foreign aid and foreign direct investment are statistically significant at 1% significance level in determining the total level of investment across the six Pacific Island Countries. It is also important to note that apart from statistically significant variables, the coefficient signs of almost all variables are realized as expected. More importantly, in the long run, there exists a negative relationship between real interest rate and investment across the PICs and a 1% increase in real interest rate will reduce investments by more than 1%. Likewise, as predicted, economic growth rate, exchange rate, foreign direct investment, foreign aid and appropriate transport and communication facilities shows a positive association with investment while exchange rate reveals a negative association in the long run. However, savings rate, although being a key significant determinant of investment in the long run, shares a negative association with investment. Conversely, the relationship between bank credit and total investment share the right positive sign as predicted but is statistically insignificant in explaining the total level of investment in the long run. The negative relationship between real interest rate and the noted effects of other included variables play a very important role in formulating appropriate policies for the PICs. This also signifies that the PICs should ensure output stability, interest rate stability and external stability to stimulate more investments and growth in the long run.

The short run results are revealed in panel 2 of Table 3 and the results are quite different from the long run. The PMG estimator for investment is investment-creating and a 1% increase in past investment on average led to 0.27% growth in short run investment, however, the results are statistically insignificant. Conversely, the results are not similar across the PIC groups as Vanuatu, Solomon Islands and Tonga experiences a 1% statistically significant and positive relationship while Fiji, Papua New Guinea and Samoa found to experience negative but statistically significant relationship at 1% significance level.

The short run relationship between real interest rate and investment is not negative as was predicted and the PMG reveals that a 1% increase in real interest rate on average led to 1.11% increase in investment. The short run positive relationship is consistent across the groups and is also statistically significant at 1% and 5%

2 Pedroni (1999 and 2004) and Kao (1999), Fisher (1932), Maddala and Wu (1999).

Table 1: Stationarity test result

Variable	Stationaritya of all variables in levels									Stationarity of all Variables at 1st difference							
	Breitung (2000)	Levin et al. (2002)		Im et al. (2003)		ADF		PP		Breitung (2000)	Levin *et al.* (2002)		Im *et al.* (2003)		ADF		PP
	With trend	Without trend	With trend	Without trend	With trend	Without trend	With trend	Without trend	With trend	Without trend	With trend	Without trend	With trend	Without trend	With trend	Without trend	With trend
Inv	−1.91**	−2.09**	−2.37*	−2.62*	−2.39*	32.35*	28.14*	25.56**	22.28**	−5.36*	−3.89*	−8.19*	−6.88*	85.7*	67.01*	173.1*	210.8*
	[0.028]	[0.018]	[0.009]	[0.004]	[0.008]	[0.001]	[0.005]	[0.012]	[0.034]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Rintr	−5.42*	−6.86*	−8.90*	−6.98*	−8.87*	72.32*	89.45*	122.5*	224.9*	−15.6*	−14.1*	−15.7*	−14.6*	168.8*	168.6*	125.0*	1580.3*
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Svr	−2.37*	−1.23	−1.07	−0.32	−2.11**	12.53	23.45**	11.76	24.93**	−6.42*	−5.07*	−8.79*	−7.72*	91.78*	74.65*	138.8*	184.7*
	[0.009]	[0.109]	[0.141]	[0.374]	[0.017]	[0.404]	[0.024]	[0.465]	[0.015]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Grwr	−3.15*	−4.64*	−3.61*	−6.90*	−5.32*	69.52*	49.68*	107.8*	91.72*	−9.60*	−7.97*	−12.6*	−11.54*	136.6*	53.96*	163.1*	941.1*
	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Fdi	−3.81*	−2.52*	−2.83*	−3.10*	−3.96*	30.60*	40.97*	50.08*	98.11*	−12.04*	−10.7*	−12.5*	−11.26*	137.0*	112.39*	158.3*	927.7*
	[0.000]	[0.006]	[0.002]	[0.001]	[0.000]	[0.002]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Faid	1.45	−3.61*	−0.16	−2.73*	1.35	26.88*	6.861	35.25*	14.58	−8.94*	−9.00*	−8.73*	−8.75*	91.11*	84.09*	165.6*	420.7
	[0.927]	[0.000]	[0.437]	[0.003]	[0.912]	[0.008]	[0.866]	[0.000]	[0.265]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Ln-exchr	0.65	−4.34*	−1.72**	−2.86*	−0.73	30.11*	16.369	38.89*	14.838	−4.36*	−3.89*	−5.17*	−4.57*	49.97*	42.18*	69.63*	68.49*
	[0.74]	[0.000]	[0.043]	[0.002]	[0.233]	[0.002]	[0.175]	[0.000]	[0.250]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Credit	−0.25	1.68	0.22	1.87	0.52	7.578	8.062	6.156	5.561	−4.44*	−3.35*	−5.19*	−3.92*	50.53*	37.26*	93.33*	77.1*
	[0.40]	[0.953]	[0.587]	[0.969]	[0.700]	[0.8171]	[0.780]	[0.908]	[0.936]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Transcom	−0.26	0.04	−0.26	0.75	−0.126	9.258	10.73	7.387	9.792	−8.35*	−7.52*	−7.64*	−6.40*	77.73*	59.78*	141.9*	161.8*
	[0.398]	[0.517]	[0.398]	[0.774]	[0.449]	[0.680]	[0.552]	[0.831]	[0.634]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Kof	2.64	0.68	0.94	2.73	1.05	2.771	7.422	2.452	3.005	−1.92**	−18.4*	−4.78*	−3.47*	46.68*	35.06*	98.58*	112.1*
	[0.996]	[0.751]	[0.827]	[0.996]	[0.853]	[0.997]	[0.828]	[0.998]	[0.995]	[0.027]	[0.010]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Pltclr	−1.18	−0.76	−0.15	−0.84	0.38	15.23	9.011	13.3	7.405	−4.12*	−5.50*	−7.07*	−5.87*	70.66*	53.96*	141.2*	140.56*
	[0.119]	[0.223]	[0.441]	[0.202]	[0.649]	[0.229]	[0.702]	[0.347]	[0.829]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

The number in the parentheses shows the P - values: *Significance at 1% level, **indicates significance at 5% level

Table 2: Kao (1999) panel co-integration test results

Dependent variable	Selection criteria	Lag-length	ADF (t-statistic)	Co-integration status
Investment (INV)	SBC	ARDL (2,1,1,1,1,1,1,1,1)	−2.600460 [0.0047]*	Cointegrated
Investment (INV)	AIC	ARDL (2,1,1,1,1,1,1,1,1)	−2.600460 [0.0047]*	Cointegrated

The numbers in the parenthesis are the P values which are significant at 1% significance level. SBC: Schwarz Bayesian criterion. AIC: Akaike information criterion

Table 3: PMG and ARDL estimation result for selected pacific island countries

Panel 1: Estimated long-run coefficients (dependent variable: Total investment as a % of GDP [INV])						
Regressor	**PMG**	**Standard error**	**T-statistic**	**Probability**		
RINTR	-1.007662*	0.044331	-22.73056	0.0000	Akaike info criterion	6.236681
SVR	-0.839768*	0.135384	-6.202839	0.0000	Schwarz criterion	6.481919
GRWR	1.150379*	0.072911	15.77784	0.0000	R-squared	0.449690
CREDIT	0.110425	0.073562	1.501111	0.1350	Adjusted R-squared	0.409619
LN_EXCHR	-5.067242*	1.704061	-2.973627	0.0033	S.E of regression	5.284250
TRANSCOM	3.339903*	0.134616	24.81052	0.0000		
FDI	0.319433*	0.051604	6.190097	0.0000		
FAID	0.357194*	0.106246	3.361954	0.0009		

Panel 2: Estimated short-run coefficients (dependent variable: Change in investments as a % of GDP [INVt])							
Regressor	**PMG**	**Fiji**	**Vanuatu**	**Papua new guinea**	**Solomon Islands**	**Samoa**	**Tonga**
ΔINV5−1	0.270353	−0.413173*	0.990919*	−0.083351**	0.392820*	−0.431626*	1.166527*
	[0.3456]	[0.0001]	[0.0000]	[0.0246]	[0.0089]	[0.0001]	[0.0000]
ΔRINTR5	1.117182	0.133979**	4.374560*	0.074499*	0.974091*	−0.066614*	1.212574*
	[0.1088]	[0.0478]	[0.0001]	[0.0033]	[0.0005]	[0.0005]	[0.0000]
ΔSVR5	1.479407	−0.614705*	6.262900*	−0.172084	1.644912	−1.338042*	3.093459*
	[0.2086]	[0.0028]	[0.0013]	[0.5694]	[0.2520]	[0.0000]	[0.0001]
ΔGRWR5	−0.712055***	−0.345709*	−2.493022*	−0.366395*	−0.378151**	−0.044771*	−0.644282*
	[0.0559]	[0.0010]	[0.0002]	[0.0003]	[0.0149]	[0.0023][	[0.0000]
ΔCREDIT5	0.001552	0.105896**	0.278431*	−0.144485	0.137344	−0.124627*	−0.243248*
	[0.9850]	[0.0310]	[0.0021]	[0.1930]	[0.1391]	[0.0020]	[0.0004]
ΔLN_EXCHR5	1.505929	4.254356	3.681087	−9.960914	2.249002	5.138957	3.673088
	[0.5180]	[0.9402]	[0.9569]	[0.7947]	[0.9825]	[0.8961]	[0.9388]
ΔFDI5	−0.485545*	−0.297907*	−0.995239*	−0.593117***	−0.890647*	−0.348055*	0.211695*
	[0.0094]	[0.0007]	[0.0008]	[0.0847]	[0.0036]	[0.0010]	[0.0000]
ΔFAID5	0.218370	−0.635926	0.407205*	1.193378	−0.017385	0.069195**	0.293752*
	[0.3738]	[0.5215]	[0.0000]	[0.1272]	[0.1738]	[0.0452]	[0.0044]
ΔTRANSCOM5	−2.641946	−5.531009**	−11.40530*	−1.948821	1.437613	1.366740**	0.229103
	[0.2038]	[0.0252]	[0.0006]	[0.2373]	[0.8186]	[0.0243]	[0.2139]
PLTCLR	−2.287820	−0.161848*	−2.525480	−9.904977	0.060617	−0.866364*	−0.328508*
	[0.1508]	[0.0001]	[0.2741]	[0.1931]	[0.4505]	[0.0000]	[0.0000]
KOF	0.174045	−0.496931	0.505691*	0.377251*	−1.199453*	0.893331*	0.964379*
	[0.6188]	[0.0005]	[0.0063]	[0.0001]	[0.0086]	[0.0002]	[0.0000]
ECM5-1	−0.952977***	−0.450220*	−3.263579	−0.232254*	−0.651661*	−0.150603*	−1.270748*
	[0.0622]	[0.0001]	[0.0000]*	[0.0001]	[0.0006]	[0.0000]	[0.0000]

The number in the parentheses shows the P - values. *indicates significance at 1% level, **indicates significance at 5% level and ***indicates significance at 10% level. ECM: Error correction model, PMG: Pooled mean group

significance level, except for Samoa which reflected a negative but statistically significant relationship at 1% significance level. This reflects that higher interest rate does not create any detrimental effects on investment in short run, except for Samoa, and this may be due to stable economic environment, favourable short term policies, rules and regulations and high demand of products in the domestic and foreign markets.

The estimated short run PMG results for other variables revealed statistically insignificant impact on the growth of investment except for economic growth and foreign direct investment which revealed significant impacts at 10% and 5% significance level. However, the relationship and significance level is different across the group.

The savings rate was found to be investment-supporting for countries such as Vanuatu and Tonga, being statistically significant at 1% significance level while investment-reducing for Fiji and Samoa.

The short run economic growth result was consistent across all country groups. In short run, economic growth rate results in reduction in investment and this is also statistically significant at 1% and 5% significance level.

The domestic credit provided for investment creation reveals mix result across the country groups. In short run, Fiji and Vanuatu experiences creation of new investment with availability of bank credits while Samoa and Tonga experiences reduction in investment with provisions of more bank credit. However, the

real exchange rate was found to have no significant impact in explaining new investments in the short run across all country groups.

Foreign direct investment was significant in influencing total investment in short run. However apart from Tonga, all other countries experienced a reduction in investment with the presence of foreign investors in short run.

Pacific Island countries are too much dependent on foreign aids to meet their growth policies as these are developing countries. However, although foreign aid provides a significant impact in long run, it is only able to influence investment growth in Vanuatu, Samoa and Tonga.

Similarly, transport, storage and communication provisions are very important for continuous investment creation. However, in short run, only Samoa experiences a positive association between provisions of appropriate infrastructure and investments while Fiji and Vanuatu experiences investment reduction with no significant impact upon Tonga, Solomon Islands and Papua New Guinea.

Political Instability is also a major hindrance for achieving continuous growth in a country and investment is a key variable that is frequently affected by this man-made disaster. Thus as predicted, Fiji, Samoa and Tonga experiences investment reduction with presences of weak economic environment and autocracy while Vanuatu, Papua New Guinea and Solomon Islands have no significant impact on investments in the short run.

Globalisation of economies also plays a key role in influencing growth policies in an economy. The more open an economy are, the more opportunities available to create new investments and market product in the domestic as well as in the foreign market. Thus as predicted, Vanuatu, Papua New Guinea, Samoa and Tonga experiences a positive and significant impact on creation of new investment while Fiji and Solomon Islands experiences investment-reducing effects in short run.

Table 4: Cross - section dependence test

Test	Statistic	d.f	Prob.
Breusch-pagan LM	44.40987	15	0.0001
Pesaran scaled LM	4.274038		0.0000
Bias-corrected scale LM	4.190704		0.0000
Pesaran CD	−2.195900		0.0281

The speed of the adjustment, the error correction term (ECM) is also an important variable in this model which determines the speed at which the equilibrium will be restored from the short run to the long run. Researchers have outlined that the value of the ECM should be negative, significant and range between 0 and −1 (Chirwa and Odhiambo, 2018) Looking at our result, there exists a negative and statistically significant value at 1% significance level across all countries. The PMG ECM coefficients of −0.953 implies that the short run adjustment for long run equilibrium can be restored at a speed of 95.3%.

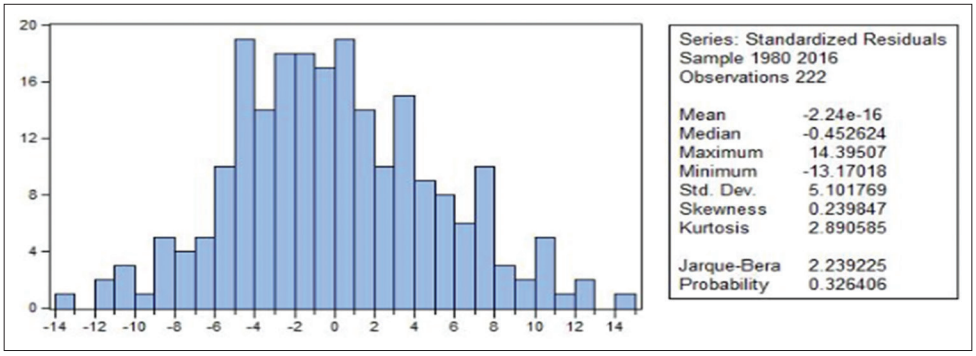
Finally, a Normality test and a cross dependence test for the pooled data is conducted to specify whether the estimated coefficients are efficient and unbiased. The normality test as shown in figure 1reveals that the residuals are normally distributed while the cross-section dependence test from Table 4 confirms that there are no cross dependence among the selected Pacific Island Countries at conventional significance level.

5. CONCLUSION AND POLICY IMPLICATIONS

Pacific Island countries are small nations and appropriate policies are the key to its continuous growth and success. Finding the right mix of policies with significant variables is quiet challenging for PICs as there are many other factors that always distort the desired outcomes. Since investment is a key component of the aggregate demand function which positively affects the output level; this study is undertaken to examine the relationship between real interest rate and investments in the long run as well as examine variables which can significantly impact investments. A PMG estimation as part of panel ARDL model was used to examine the impacts on investment across six Pacific Island Countries.

Both short run and long run results were generated and the long run result was consistent with many developed theories on real interest rate and investment. For all the six PICs, there exists a significant negative relationship between real interest rate and investments in the long run. This confirms that PICs investment are very susceptible to any changes in interest rate. Other included variables also presented pleasing results for long run. Variables such as economic growth rate, transport, storage and communication, foreign direct investment and foreign aid presents

Figure 1: Normality test for pooled data



a significant positive effect on investment while savings rate and real exchange rate showed negative effects on investments in the long run. However, the availability of bank credits reflected an insignificant impact on investment across the countries.

The short run results were quiet different form the long run as results showed that there exists a positive relationship between real interest rate and investment across the selected Pacific Island Countries, except for Samoa, which experienced a negative relationship in short run. For other included variables, the effects were different across the countries. Fiji experienced new investments with availability of bank credits while reduction in investment with savings, growth rate, foreign direct investment, foreign aids, transport facilities and political instabilities. This reflects that in Fiji, people are usually hesitant to invest in short run even economic environment is improved with appropriate policies and infrastructure.

Similarly, Solomon Island experiences positive effects on investment through interest rate while economic growth rate, foreign direct investment and openness reduces investment in short run. Investment creation in Papua New Guinea is only depended on how globalised PNG is among nearby countries and in the world while growth rate and foreign direct investment becomes a means for investment – reducing in short run.

Other countries such as Vanuatu experiences significant effects on investment through savings rate, availability of bank credits, foreign aid and through being more open and globalised while reduction in investment through growth rate, foreign direct investment, infrastructure and communications.

Subsequently, Samoa experiences new investment with better transports and communication facilities and engaging in the global market as well as with presence of foreign aids while reduction in investment with savings rate, economic growth rate, bank credits, foreign direct investment and political instabilities. Tonga's investment is depended on savings rate and better political environment while reduction in investments is experienced through growth rates, bank credits, foreign direct investments, foreign aid and being more open in the global environment.

Thus the short run analysis for the PICs reveal that short run investments are very volatile as factors such as savings rate, growth rate and better transport and communication facilities are investment reducing which otherwise should have been investment creating. The frequent experience of political instabilities as well as differing political nature of the economies, natural disasters and low levels of income may have been the underlying reasons for distortion in short run investments as businesses and individuals are usually afraid to rise and invest even though the economic environment may be improving with better services, law and order.

The differing results for short run and long run can create lot of difficulties in coming up to a uniformed and effective policy. However, to continue to sustain higher investments, appropriate measures will have to be ruled out so that economies as well as people are better off in the short run and in the long run. Therefore, to prime investments like the developed countries, Pacific Island Countries need to experience financial liberalisation policy. Financial liberalization policy can be effective to ensure higher investments in PICs as in this policy, interest rate is determined in the financial market which allows financial deepening, higher savings, investment and growth. On the other hand, the central banks in the PICs can also adopt appropriate interest rate policies such as Taylor Rule to observe a proper way of determining interest rate rather than relying on discretionary policies. Since PICs are very vulnerable to interest rate for new investment creation, a move from discretionary to Taylor rule based monetary policy will help experience positive investment growths and at the same time will lead economies towards output stabilities. In addition to this, advancement in technologies, accumulation of human capital and trade liberalization policies will further make PICs to be competitive and investment creating economies.

Finally, although the results presented may be influential; further work needs to be done in this area to lift the PICs at a new level. That is, more research needs to be undertaken to identify the mechanisms for insignificant variables so that these variables can also become significant and an important contributor towards growth and development. Further research also needs to be undertaken to identify and establish the country specific interest determination rules as well as defining growth policies so that higher benefits can be sustained in PICs.

REFERENCES

Agarwal, P. (2001), Interest Rates and Investment in East Asia: An Evaluation of Neo-Structuralist, Mc Kinnon and Stiglitz Hypotheses. Delhi: Institute of Economic Growth, University Enclave.

Agarwal, P. (2004), Interest rates and investment in East Asia: An empirical evaluation of various financial liberalization hypotheses. The Journal of Development Studies, 30(3), 142-173.

Amir, Z.B., Zaman, T., Ali, A.M. (2012), The Macroeconomic determinants of investment: Empirical evidence from Bangladesh. International Journal of Scientific and Engineering Research, 3(9), 1-13.

Anderson, D. (1990), Investment and economic growth. Journal of World Development, 18(8), 1057-1079.

Beccarini, A. (2007), Investment sensitivity to interest rates in an uncertain context: Is a positive relationship possible? Journal of Economic Change and Restructuring, 4(3), 223-234.

Brainard, W.C., Tobin, J. (1968), Pitfalls in financial model building. American Economic Review, 58(2), , 99-122.

Breitung, J. (2000), The local power of some unit root tests for panel data. In: Baltagi, B., editor. Advances in Econometrics. Vol. 15. Nonstationary Panels, Panel Co-integration, and Dynamic Panels. Amsterdam: JAI Press. p161-178.

Checchi, D., Galeotti, M. (2006), The relationship between employment and investment: Theoretical aspects and empirical evidence for Italy. Journal of Applied Economics, 25(1), 13-24.

Chetty, R. (2004), Interest Rates and Backward Bending Investment. Review of Economic Studies 74, National Bureau of Economic Research, Working Paper 10354, Cambridge. p67-91.

Chirwa, G., Odhiambo, N. (2018), The determinants of public debt in the Euro Area: A Panel ARDL Approach. UNISA Economic Research, working paper series, University of the South Africa.

Clark, J.M. (1917), Business acceleration and the law of demand: A technical factor in economic cycles. Journal of Political Economy, 25(1), 217-235.

Coleman, W.J.II (1997), Behavior of interest rates in a general equilibrium multisector model with irreversible investment. Macroeconomic Dynamics, 1(1), 206-227.
Domar, D. (1946), Capital expansion, rate of growth, and employment. Econometrica 14(2), 137-147.
Duncan, R., Nakagawa, H. (2014), Obstacles to Economic Growth in six PICs. Pacific Institute of Advanced Studies in Developement and Governance. Fiji. USP.
Ekland, J.E. (2013), Theories of Investment: A theoritical Review with Empirical Applications. Working Paper 22, Swedish Entreprenuership Forum.
Fisher, I. (1930), The Theory of Investment. New York: Macmillan.
Fisher, R. (1932), Statistical Methods for Research Works. 4th ed. Edinburgh: Oliver and Boyd.
Frankel, M. (1962), The production function in allocation and growth: A synthesis. American Economic Review 52, 995-1022.
Fry, M.J. (1997), In favor of financial liberalization. Economic Journal, 107(442), 1-16.
Geng, N., N'Diaye, P. (2012), Determinants of Corporate Investment in China: Evidence from Cross-Country firm Level Data. IMF Working Paper No. WP/12/80, International Monetary Fund.
Gregorio, D.J., Guidotti, P.E. (1995), Financial development and economic growth. World Development, 23(3), 433-448.
Griffith, W.E., Lim, G.C., Hill, R.C. (2012), Using Eviews for principles of Econometrics. 4th ed. USA: John Wiley and Sons.
Griliches, Z., Wallace, N. (1965), The determinants of investment revisited. International Economic Review, 6(3), 311-329.
Haavelmo, T. (1960), A Study in the Theory of Investment. Columbia: Columbia University Press.
Harrod, R. (1939), An essay in dynamic theory. Economic Journal 49, 14-33.
Im, K.S., Pesaran, M.H., Shin, Y. (2003), Testing for unit roots in heterogeneous panels. Journal of Econometrics, 115, 53-74.
Jayaraman, T.K., Sharma, R. (2004), Why is Interets Rate Spread High in Fiji? Results from a Preliminary Study. Fijian Studies (1), Fiji Institute of Applied Science. p76-103.
Jayaraman, T.K., Ward, D.B. (2004), Effeciency of investment in Fiji. The Empirical Economic Letters, 3(6), 321-332.
Jorgenson, D. (1967), The theory of investment behavior. In: Ferrber, R., editor. Determinants of Investment Behavior: Universities-National Bureau Conference Series No.18. New York: Columbia University Press.
Jorgenson, D. (1971), Econometric studies of investment behavior: A survey. Journal of Economic Literature, 9(4), 1111-1147.
Jorgenson, D.W. (1963), Capital theory and investment behavior. American Economic Review 53(2), 247-59.
Kao, C. (1999), Spurious regression and residual-based tests for cointegration in panel data. Journal of Econometrics, 90, 144.
Keynes, J.M. (1936), The General Theory of Employment. Macmillan: Interest and Money.
Levin, A., Lin, C.F., Chu, C. (2002), Unit root tests in panel data: Asymptotic and finite-sample properties. Journal of Econometrics, 108, 1-24.
Maddala, G., Shaowen, W. (1999), A comparative study of unit root tests with panel data and a new simple test. Oxford Bulletin of Economics and Statistics, 61, 631-652.
Mallick, H., Agarwal, S. (2007), Impact of real interest rates on real output growth in India: A long run analysis in a liberalized financial Regime. The Singapore Economic Review, 52(2), 215-231.
McKinnon, R. (1973), Money and Capital in Economic Development. Washington, D.C: Brookings Institute.
Mehara, M., Karsalari, A.R. (2011), The non-linear relationship between private investment and real interest rates based on dynamic threshold panel: The case for developing countries. Journal of Money, Investment and Banking, 21, 32-42.
Narayan, P., Narayan, S. (2006), Savings behaviour in Fiji: An empirical assessment using the ARDL approach to cointegration. International Journal of Social Economics, 33(7), 468-480.
Ngouhouo, I., Mouchili, E. (2014), Savings, investment and economic growth in Cameroun: A multivariate approach. International Journal of Economics and Finance, 6(9), 244-252.
Obamuyi, T.M. (2009), An investigation of the relationship between interest rates and economic growth in Nigeria, 1970-2006. Journal of Economics and International Finance, 1(4), 93-98.
Oosterbaan, M., Der, W.N., Steveninck, T. (2000), Determinants of Growth. Available from: http://www.books.google.co.uk/books.
Owusu, E.L., Odhiambo, N.M. (2014), Interest rate liberalisation and economic growth in Nigeria: Evidence based on the ARDL-bounds testing approach. International Journal of Sustainable Economy, Inderscience Enterprises Ltd, 6(2), 130-141.
Pattanaik, S.S., Behara, H., Kavediya, S.R., Dass, A., Shrivastava, A.K., Joshi, H. (2013), Real Interest Rate Impact on Investment and Growth - what the Empirical Evidence for India Suggests? DEPR Annual Research Conference. Kolkata: Department of Communication, Reserve Bank of India.
Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. Oxford Bulletin of Economics and Statistics, 61, 653-670.
Pedroni, P. (2004), Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. Econometric Theory, 20, 597-625.
Pesaran, M.H., Shin, Y., Smith, R.J. (2001), Bounds testing approach to the analysisof level relationships. Journal of Applied Econometrics, 16(3), 289-326.
Pesaran, M.H., Shin, Y., Smith, R.P. (1999), Pooled mean group estimation of dynamic heterogeneous panels. Journal of the American Statistical Association, 94(446), 621-634.
Pill, H., Pradhan, M. (1995), Financial Indicators and Financial Changes in Africa and Asia. IMF Working Paper No. WP/95/123, International Monetary Fund.
Romer, P. (1986), Increasing returns and long-run growth. Journal of Political Economy, 94(5), 1002-1037.
Roubini, N., Martin, X.S. (1992), Financial repression and economic growth. Journal of Development Economics, 39(1), 5-30.
Singh, R. (2006), An Investment Equation for Fiji. Working Paper, School of Economics, University of the South Pacific, Fiji Islands.
Solow, R.M. (1956), A contribution to the theory of economic growth. Quarterly Journal of Economics, 70(1), 65-94.
Steven, F. (1989), Keynesian Theories of Investment: Neo, Post and New. Revista De Economia Politica.Vol. 9(4). EUA: Washington University.
Ten, D.O. (1995), Savings, Investment and Real Interest Rates. A Study for Ministers and Governors.
Thorat, S., Fan, S. (2007), Public investment and poverty reduction: Lessons from China and India. Economic and Political Weekly, 42(8), 704-710.
Tobin, J. (1969), A general equilibrium approach to monetary theory. Journal of Money, Credit and Banking, 1(1), 15-29.
Wijnbergen, S.V. (1982), Stagflationary effect of monetary stabilization policies: A quantitative analysis of South Korea. Journal of Development Economics, 37, 133-169.