



A re-examination of private investment in Fiji

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In this article, a neo-classical investment equation is estimated for Fiji. The results indicate that the long-run output elasticity is unity and the interest rate elasticity is around -0.4 . Elasticities of this order indicate that further interest rate increases by the Reserve Bank of Fiji may reduce investment levels in Fiji. Furthermore, the expected rates of inflation and political uncertainties appear to have had significant negative effects on private investment in Fiji.

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Investment is the most volatile component of aggregate demand and is therefore an important determinant of output fluctuations. It is also the primary link through which the interest rate (monetary policy) affects the economy. Therefore, sound estimation and analysis of investment equations are important. At a basic level, neo-classical economists argue that investment takes place up to the point where the marginal revenue equals the marginal cost of investment. The marginal revenues and costs are estimated using the expected future profits and costs associated with buying or renting additional capital, respectively. Thus, in the Jorgenson model—the basis for modern neo-classical investment theories (see Rao 1980 and Baddeley 2003 for specification details)—both the growth

rate of output and the user cost of capital (UC) play important roles. However, their importance depends on the elasticity of substitution between labour and capital.¹

In contrast, Keynesian economists emphasise the role of the growth rate of output in investment equations. For example, in accelerator theory, investment is seen as a periodic adjustment of the current stock of capital to the desired level. However, these models fail to account for the effects of important fiscal and financial factors such as the cost of funds and tax rates. Further, the accelerator model implicitly assumes technical rigidities in production, limiting the possibility of factor substitution due to relative factor price adjustments.

The appropriateness of these alternative theories for estimating investment functions



is an empirical question. While investment studies in industrial economies mostly use the neo-classical framework, in the developing economies simpler variants of the accelerator models have been popular. This is because it is hard to obtain reliable data on some of the components of UC (for a discussion of the components of UC, see Romer 2006). Baddeley (2003) tested the empirical support for the two theories using Ordinary Least Square (OLS) regression with quarterly data from the United Kingdom and the United States covering the period 1972(Q4) to 2001(Q1). In the accelerator model, Baddeley found an insignificant long-run output elasticity but the elasticity of the capacity utilisation variable was significant. This result may be due to the co-linearity between these two variables as they both measure scale effects. For the Jorgenson specification, she found an insignificant long-run elasticity for UC and obtained a unit output elasticity. Baddeley explains that her results are distorted due to structural changes that occurred during the review period but she made no attempt to introduce shift dummies.² Nonetheless, Baddeley's work contains a good exposition of investment theories.

Investment trends in Fiji

Low investment has been a major problem in Fiji with current levels well below what is needed for robust growth. The ratio of total investment to output declined from well above 20 per cent in the 1970s to around half that level in the mid to late 1990s and, while the investment ratio has increased recently, it remains well below 20 per cent. Government investment has averaged around 3.5 per cent of GDP but has been in decline since 1982. The ratio of private investment to output has been highly volatile, ranging from as high as 15 per cent in 1971 to below

10 per cent since 1987. Recently, however, there has been a slight pick-up in both public and private investment. Early in the current decade there were some commercial building activities and residential property developments.³ Lured by profit expectations in the growing tourism sector, private investment in major tourism resorts has also been evident.⁴

Nonetheless, the private investment trends indicate the various incentives adopted since 1987, such as the Tax Free Factory/Tax Free Zone scheme, Schedule 5 Export Tax Incentive, depreciation allowances, hotel investment incentives, and loss carry forward scheme have not succeeded in raising private investment to the high levels reached in the early 1970s and 1980s. This could be because investors place greater priority on factors such as macroeconomic stability, good governance, and secure property rights. Following controversy surrounding the level of investment required to sustain a 5 per cent output growth rate, Rao (2004) showed that the required investment ratio should be above 25 per cent. Using the growth accounting framework, he estimated that a 15 per cent investment ratio is consistent with an output growth rate of less than 3 per cent.⁵

Rao (2004) and other economists at the University of the South Pacific have suggested that a 5 per cent output target is unsustainable in the medium to long-term (see, for example, Prasad 2003 and Shah 2004). They argue that in order to improve the country's growth performance, important institutional changes such as improvements in the agricultural land tenure system, improved law and order and political stability are necessary. However, as Rao (2004) has noted, these require considerable time and political will to achieve. Further, the recent military takeover of the government has put on hold many

Against this background, it is interesting to evaluate the impact of the Reserve Bank of Fiji's interest rate increases on the level of investment in Fiji. The Reserve Bank of Fiji (RBF) rate is closely linked to the minimum lending rates of the commercial banks, which are quick to adjust their lending rates in order to pass the additional cost of funds to consumers/investors. Generally, borrowers in developing economies have a low time preference rate because of the high level of uncertainty about the future. In Fiji, where consumers and domestic investors are liquidity-constrained with volatile incomes, interest rates increases could depress aggregate demand because current spending will be postponed.

Murphy (1992) modeled private sector investment (as a ratio of capital stock) using OLS regression and annual data for Fiji from 1974 to 1986.⁶ The main explanatory variable was the difference between the actual and required rate of return on investment. His estimated investment function (with t-ratios below the coefficients) was as follows

where I_t and K_t are real private investment and stock of capital, respectively, T is a time trend, RET_t represents the actual rate

More recently, Jayaraman (2003) and Seruvatu and Jayaraman (2001) have estimated private sector investment equations for the periods 1977–94 and 1966–98, respectively. Both have good surveys of the literature and discuss some important trends in investment in Fiji. However, while some attention is paid to the time series properties of variables in Seruvatu and Jayaraman (2001), in Jayarman (2003) the investment equation is estimated using the standard OLS procedure without testing for the stationarity of variables. Therefore, the results have to be considered as unreliable and are not reported here. However, the estimates in Seruvatu and Jayaraman (2001) were obtained with the error-correction procedure and are as follows

where I_t and P_t are nominal private investment and the GDP deflator, respectively, TOT is the terms of trade



index, and COUP is a dummy for military coups. The t-ratios are in parentheses below the coefficients. For the chi-square summary statistics, the p-values are in parenthesis and * and ** indicate 5 per cent and 10 per cent significance levels, respectively. The summary statistics (in order of presentation in Equation 2) are for the null of first order serial correlation, functional form misspecification, non-normality in residuals and heteroscedasticity. (–) indicates that the statistic was not reported in their paper.

It seems that there are some problems in the interpretation of the unit root tests in Seruvatu and Jayaraman (2001).⁸ Further, the specification used to estimate Equation 2 appears to be inappropriate because there is no lagged error correction term. Therefore, it fails to capture the long-run relationship between the levels of the dependent and the explanatory variables.⁹ Consequently, it is doubtful that their results are useful. Nevertheless, the aforesaid studies are pioneering attempts; but, due to their limitations, it is necessary to start with a clean slate.

Specification and empirical results

Following the influential growth model of Solow (1956), very few growth economists now use the fixed coefficients production function, with the exception of the AK model. Therefore, our specification is based on the assumption that technology is flexible and investment depends on both output and the cost of capital. From neo-classical theory, we assume that the equilibrium stock of capital (K^*) can be given as

$$K_t^* = f\left(\frac{Y_t}{UC_t}\right) = \alpha \frac{Y_t}{UC_t} \quad (3)$$

where Y and UC are real output and cost of capital, respectively. We also assume that

$$I_t = \Delta K_t + \sigma K_{t-1} \quad (4)$$

where I is gross investment and σ is the effective rate of depreciation. Recall from the Solow model that in equilibrium the capital stock ceases to grow. This result implies that Therefore, the equilibrium specification of investment is

$$I_t^* = \sigma \alpha \frac{Y_t}{UC_t} \quad (5)$$

A log-linear dynamic specification of Equation 5, relaxing the assumption that output and user cost have the same elasticity and using LSE-Hendry's GETS formulation, Equation 5 can be specified as

$$\begin{aligned} \Delta \ln I_t = & -\lambda [(\ln I_{t-1} - (\beta_1 \ln Y_{t-1} - \beta_2 \ln UC_{t-1})) \\ & + \gamma_1 \sum_{i=0}^{n1} \Delta \ln Y_{t-i} + \rho_i \sum_{j=0}^{n2} \Delta UC_{t-i} + \phi_i \sum_{m=0}^{n3} \Delta \ln I_{t-m}] \end{aligned} \quad (6)$$

where β_1 and β_2 are the cointegrating coefficients measuring the elasticity of output and the semi-elasticity of the cost of capital.

Equation 6 was estimated using GETS and the Johansen (JML) cointegration procedures.¹⁰ However, since the investment ratio is a useful policy variable, we have used the ratio rather than the level of investment in our estimates. Further, unit root tests show that the change in the level of investment was $I(0)$ but the investment ratio was $I(1)$. Later we included the lagged growth of inflation rate to capture inflation expectation as part of the dynamics of Equation 6.¹¹ Annual observations covering the period from 1970 to 2002 were used in estimations. The description of the variables and sources of data are in the Appendix.

The results obtained using GETS and JML are reported below. The reasons for using two statistical techniques are two-fold. First, as Smith (2000) and Rao (2007) have pointed out, statistical techniques



are tools for preparing summaries of facts. If different techniques give similar summaries, confidence in the results can be higher. Second, since JML is based on a systems approach, endogeneity problems are minimised.¹²

In GETS the basic equation is estimated with a time trend and lags of up to four periods of the first difference of the included variables.¹³ Following the general-to-specific philosophy, a manageable parsimonious equation was first obtained (not reported here) to which lags of the growth rate of the expected inflation rate and the two dummy variables—(COUP) to capture the impact of the political instabilities in 1987 and 2000 and (DEV) which proxies the devaluation of the Fiji dollar in 1987 and 1997—were added.¹⁴ Following sequential deletion of insignificant variables, we obtained Equation 6a in Table 1. Note that all estimated coefficients are correctly signed and none of the summary residual-based test statistics are significant at the 5 per cent level. The implied long-run output elasticity is 1.38, which is only significant at 10 per cent level. The interest rate elasticity and the growth in expected inflation are significant and have the correct negative signs. The devaluation of the dollar seems to be insignificant (thus is not reported), but the COUP dummy has a strong negative impact.

We then tested for a unit output elasticity for which the Wald test statistic (p-value in parenthesis) was 0.09(0.76). Using the assumption of an output elasticity of one, Equation 6b was obtained, which is an improvement over Equation 6a. Incorporating some parameter restrictions, we obtained Equation 6c.¹⁵ However, there were only marginal improvements in the results in Equation 6c compared to Equation 6b, which is the preferred GETS estimates; although the null of no cointegration is rejected in all cases by the Ericsson and

MacKinnon (2002) tests at the 5 per cent significance level. Equation 6b also gives a good fit to the data.¹⁶

The Johansen procedure produced similar results when we subjected the investment ratio, real output and cost of capital, together with an intercept and a trend term, in a VAR (2) framework to Johansen's tests. $\Delta \ln P$ and COUP were treated as exogenous variables. Both the eigenvalue and the trace statistic rejected the null of no cointegrating vectors (CVs), but the eigenvalue accepted the alternative of at least one long-run relationship. The trace statistics, however, suggested that there were two cointegrating equations. Thus we tested for two CVs but found that the second was not meaningful. It had a large output elasticity and an incorrect sign for the elasticity of the real rate of interest.¹⁷

Therefore, the only cointegrating vector implied by the eigenvalue normalised on the investment ratio is

$$\ln \left(\frac{I_t}{Y_t} \right) = 1.095 \ln - 0.154 - 0.040T \quad (7)$$

The implied long-run output elasticity is 1.10 and is not significantly different from the GETS estimates of unity. The real interest rate elasticity at its mean rate of 2.8 per cent is -0.43, which is also plausible—although it is on the higher side compared to the GETS estimate.¹⁸ As is required, we subjected the above CV to further tests. The test for identification indicated that Equation 7 represents an investment equation since the ECM_{t-1} (residuals obtained by normalising the CV on the investment ratio) was only significant with the correct negative sign in $\Delta \ln(I_t/Y_t)$ equation. The one period lagged residuals obtained by normalising the CV on output and the interest rate, respectively, were insignificant in their respective regressions. The t-ratios for



Table 1 GETS and JML estimates

	Equation 6a	Equation 6b	Equation 6c	Equation 7a	Equation 7b
Intercept	-11.169 (1.29)	-8.563 (6.30) *	-7.564 (6.85) *	-6.665 (6.30) *	-6.693 (7.81) *
Trend	-0.053 (1.50)	-0.043 (3.79) *	-0.035 (3.80) *	0.041 (5.14) *	0.038 (7.00) *
λ	-1.006 (5.77) *	-1.020 (6.21) *	-0.893 (6.85) *		
ECM_{t-1}				-0.682 (6.19) *	-0.688 (7.75) *
$\ln Y_{t-1}$	1.382 (1.09)	1.000 ^c	1.000 ^c		
R_{t-1}	-0.047 (2.26) *	-0.046 (2.34) *	-0.061 (3.28) *		
$\Delta^2 \ln P_t$					
$\Delta^2 \ln P_{t-1}$	-8.344 (3.85) *	-8.423 (4.02) *	-7.738 (3.85) *	-7.943 (3.34) *	-7.898 (5.00) *
$\Delta^2 \ln P_{t-2}$	-4.147 (1.88) **	-4.351 (2.12) *	-4.200 (2.09) *	-13.296 (5.84) *	-13.374 (6.40) *
ΔR_t	-0.083 (3.14) *	-0.082 (3.21) *	-0.061 ^c	-7.862 (3.38) *	-7.898 ^c
ΔR_{t-4}				-0.118 (3.67) *	-0.119 (4.12) *
				0.050 (2.58) *	0.050 (2.93) *
$\Delta \ln(I_{t-2}/Y_{t-2})$	-0.240 (1.92) *	-0.298 (1.94) *	-0.214 (2.60) *	-0.266 (2.16) *	-0.261 (2.88) *
$\Delta \ln(I_{t-4}/Y_{t-4})$				-0.278 (2.07) *	-0.261 ^c



$\Delta \ln Y_t$	-1.616 (1.81) **	-1.781 (2.58) *	-1.917 (2.96) *	-2.544 (4.14) *	-2.589 (4.81) *
COUP	-0.268 (1.67) **	-0.298 (2.40) *	-0.214 ^c	-0.169 (1.53)	-0.123 (4.15) *
$\bar{R}^2$	0.657	0.673	0.679	0.718	0.761
SER	0.149	0.145	0.144	0.138	0.127
X^2_{sc}	3.370 (0.07)	0.885 (0.35)	1.015 (0.31)	4.529 (0.03)	2.590 (0.11)
X^2_{ff}	0.045 (0.83)	2.107 (0.15)	0.491 (0.48)	0.238 (0.63)	0.202 (0.65)
X^2_n	2.231 (0.33)	3.427 (0.18)	0.223 (0.90)	0.710 (0.70)	1.154 (0.56)
X^2_{ls}	0.430 (0.51)	0.184 (0.67)	0.030 (0.86)	0.051 (0.82)	0.161 (0.69)

^c indicates constrained estimates

Notes: The absolute t-ratios for the variables and the p-values for the chi-square tests are in parentheses. * and ** indicate significance at the 5 per cent and 10 per cent levels, respectively. λ in the one period lagged ECM term in GETS measures the speed of adjustment to equilibrium. The estimation period is 1972–2002.

Source: Author's calculations.



the respective lagged residuals when the dependent variables were $\Delta \ln(I_t/Y_t)$, $\Delta \ln Y_t$ and ΔR_t were -2.39 , 0.08 and -1.52 , respectively.¹⁹

Further, following Enders (2004), another set of three dynamic equations were estimated with the ECM_{t-1} term being included as one of the dependent variables in each of the three equations. The ECM_{t-1} term was only significant when the dependent variable was $\Delta \ln(I_t/Y_t)$. The t -ratios for the ECM_{t-1} in each of the three equations in order of $\Delta \ln(I_t/Y_t)$, $\Delta \ln Y_t$ and ΔR_t were, respectively, -2.39 , 0.91 and -1.25 . Since the disequilibrium in the investment ratio does not contribute significantly to the explanation of output and/or the rate of interest, these two variables can be treated as being weakly exogenous in the aforesaid investment equation. Therefore, it is reasonable to interpret Equation 7 as the implied investment equation under the assumption that the regressors are at least weakly exogenous.

In estimating the dynamics of Equation 7 we used the ECM_{t-1} term as one of the independent variables and applied the general-to-specific philosophy in the second stage of estimation. Starting with lags up to four periods and by sequentially deleting insignificant variables, we obtained the unconstrained parsimonious VECM model reported as Equation 7a in Table 1.

Note that the error correction term is highly significant, indicating that 68 per cent of the adjustments to equilibrium are completed within one year. As in the GETS estimates, the COUP dummy and the growth in expected inflation seem to have strong negative effects on investment. However, there are signs of first order serial correlation at 5 per cent, which is improved when we imposed the restrictions that $\Delta \ln(I_{t-2}/Y_{t-2})$ and $\Delta \ln(I_{t-4}/Y_{t-4})$ together with $\Delta^2 \ln P_t$ and $\Delta^2 \ln P_{t-2}$ had similar signs and magnitudes, respectively.²⁰ With these restrictions, we

obtained the most preferred VECM model given as Equation 7b. The standard error fell to 0.13 and none of the summary statistics are significant at the 5 per cent level. The stability tests for Equation 7b of JML and Equation 6b of GETS, based on CUSUM and CUSUM SQUARES, indicated temporal stability of these equations. The test results are not produced here but are available from the author upon request.

Conclusion

In this article a neo-classical investment equation is estimated for Fiji for the period 1970 to 2002. The preferred estimates imply that for the output elasticity is unity and the interest rate elasticity at its mean rate is -0.4 . Inflationary expectations and political instability appear to have strong negative effects on private investment in Fiji. Based on the widely used JML technique it can be concluded that each 0.5 percentage point increase in the rate of interest (assuming a constant inflation rate) will reduce the investment ratio by around 0.2 percentage points. Given that the economy desperately needs a higher rate of investment, the recent stance of the Reserve Bank of Fiji of raising interest rates is not supportive. The Reserve Bank of Fiji argues that the higher interest rates will curtail the growth in consumption. However, while it is shown here that increases in interest rates have a significant negative effect on investment, other studies show that increasing interest rates has only a mild impact on consumption (see Rao 2005 and Rao and Singh 2004). Therefore, the Reserve Bank of Fiji needs to reconsider its monetary policy instruments.



Notes

- ¹ If the production function is Cobb-Douglas, in which case the elasticity of substitution ($\sigma_{L,K}$) is unity, both factors receive the same weights in investment equations. However, if a fixed coefficients production function is used, where $\sigma_{L,K}$ is zero, the cost of capital has no effect on investment.
- ² Baddeley (2003) also tested other models such as the Keynesian-Kaleckian and q-theory models using the US data. These results have not been reported since our interest is in the two major investment theories. However, Baddeley's results from tests of these theories are satisfactory.
- ³ For example, the Rewa Bridge, Fiji Medical School Campus, Prouds Gallery, Colonial Building, Fiji Islands Revenue and Customs and Great Council of Chiefs buildings, and the Maritime and Ports Authority Complex.
- ⁴ However, since the military takeover in late 2006, some of these projects have been placed on hold.
- ⁵ Although Rao's framework is based on the Solow (1957) growth accounting approach, there is support for his approach in Bosworth and Collins (2003). In personal communication Professor Rao informed me that he was unaware of their work at the time he wrote his paper. Subsequently, he has justified his approach with simulations based on the Sato (1963) closed form solution of Solow (1956).
- ⁶ Murphy's investment equation (Murphy 1992) was estimated as part of a macro-econometric model for Fiji without testing for unit roots although the equation was estimated singly.
- ⁷ Murphy (1992) estimated the real returns, using an optimisation model, as the weighted average of relative prices determined by the corresponding proportion of the quantities to total output. Unfortunately, we did not get any meaningful estimates of real returns for our sample. Communications with Murphy for clarification were not fruitful.
- ⁸ Their test results (not reported here to conserve space) imply that the logs of real private investment, real GDP and real private sector credit are stationary. It is doubtful that these variables are stationary since it is now well accepted that GDP and several other macroeconomic variables are non-stationary.
- ⁹ It is not clear how they obtained the ECM. It seems that they simply regressed the first difference of the dependent variable on the first differences of the explanatory variables and their lagged values; although they argue to have done the unnecessary Bewley transformation.
- ¹⁰ While in GETS, Equation 6 is estimated in one step, in the JML the cointegrating coefficients and the dynamics are estimated in two steps.
- ¹¹ $\Delta \ln P_t$ and its lags were insignificant and therefore was included. The details of the unit root tests, based on ADF and PP, except for those for investment and its ratio, are avoided for brevity but are available from the author upon request. In all cases, the variables were found to be I(1) in levels but their first differences were I(0). The order of lags was selected using the SBC criteria and, in all cases, the first order was adequate. The absolute ADF statistics with 95 per cent critical values in parenthesis for $\Delta \ln(I) = 6.17(2.97)$ and $\ln(I/Y) = 0.89(3.58)$. The PP test also gave consistent results.
- ¹² Since the equilibrium estimates of Equation 6 from the two techniques are close, endogeneity problems are assumed to be minimised. Nonetheless, endogeneity tests were conducted later in JML.
- ¹³ The trend term was included because the level variables were found to be highly trended, except for the UC; and for consistency between the two methods of estimation.
- ¹⁴ The variables related to business risks are expected to be closely associated with investment. The first difference of $\ln P$ and its lags were found to be insignificant and thus are not included.
- ¹⁵ The Wald test statistics for the null that coefficients of R and ΔR_t and $\Delta \ln(I_{t-2}/Y_{t-2})$ and COUP were similar in signs and magnitudes were 1.793(0.18) and 0.161(0.69), respectively. Therefore these restrictions are adopted in Equation 6c.
- ¹⁶ The Ericsson and MacKinnon (2002) finite sample adjusted test statistics at 1 per cent and 5 per cent, respectively, are -4.4 and



–3.62. Plots of actual and fitted values of the growth rate of investment ratio indicate that the model tracks reasonably well. An OLS fit of the actual and predicted values gives an $\bar{R}^2$ of 0.74 and the SER is 0.13. The regression has a slope of unity and the constant term is zero. The graph is not reported to conserve space.

- ¹⁷ The Akaike Information Criteria (AIC), implied that two lags were adequate. The eigenvalues test statistics (with critical value in parenthesis) were 28.84 (25.42) for the null of no cointegrating vectors and 18.42 (19.22) for the null of at least one CV. The trace statistics were 55.64 (42.34) for the null of no long-run relationship and 8.38(12.39) for at least two CVs.
- ¹⁸ These estimate are comparable to those of Hall and Jorgenson (1967) and Jorgenson and Stephenson (1967) who estimated an output elasticity of unity for developing economies. Eisner and Nadiri (1968) estimated an output elasticity of 0.7 and cost of capital elasticity of –0.2. Bean (1981) found an output elasticity of 0.91 and the elasticity of UCK was –0.05. These results are cited from Baddeley (2003).
- ¹⁹ Although it has the correct sign in ΔR_t equation, it is insignificant at conventional levels.
- ²⁰ The validity of these paired restrictions was confirmed by the Wald tests at 5 per cent level. Details can be obtained from the author. The graph of actual and fitted values of the growth of investment ratio (not reported here) indicates that Equation 7b predicts changes in the ratio reasonably well. The OLS fit gives an R^2 of 0.83 and the SER is 0.11. The slope is unity and the constant term is zero. These are close to but preferred over Equation 6b results obtained with GETS.

References

- Baddeley, M., 2003. *Investment Theories and Analysis*, Macmillan, Hampshire.
- Bean, C., 1981. 'An econometric model of the manufacturing investment in the United Kingdom', *The Economic Journal*, 91(361):106–21.
- Bosworth B. and Collins, S., 2003. 'The empirics of growth: an update', *Brookings Panel on Economic Activity*, 2:189–99.
- Ericsson, N. and MacKinnon, J., 2002. 'Distributions of error correction tests for cointegration', *Econometrics Journal*, 5:285–318.
- Eisner R. and Nadiri, M., 1968. 'Investment behavior and the neo-classical theory', *Review of Economic Statistics*, 50(3):369–82.
- Enders, W., 2004. *Applied Econometric Time Series*, Second Edition, John Wiley & Sons, Hoboken.
- Hall, R. and Jorgenson, D., 1967. 'Tax policy and investment behavior', *American Economic Review*, 57(3):391–414.
- International Monetary Fund (IMF), 2003. *International Financial Statistics*, 2003 CD-ROM, International Monetary Fund, Washington, DC.
- Jayaraman, T., 2003. 'Private sector investment in Fiji: did government investment have any crowding-out effect?', *Issues in Monetary Economics of the South Pacific Island Countries*, University of the South Pacific, Suva.
- Jorgenson, D. and Stephenson, J., 1967. 'Investment behavior in US manufacturing 1947–1960', *Econometrica*, 35(2):169–220.
- Murphy, C., 1992. *Macroeconometric model for Fiji*, Staff Working Paper 04/1992, The Australian National University, Canberra.



- Prasad, B., 2003. 'Institutional economics and economic development: the theory of property rights, economic development, good governance and the environment', *International Journal of Social Economics*, 30(6):741–62.
- Rao, B.B., 1980. 'The specification of the neoclassical investment equation in the macroeconomic models', *Indian Economic Journal*, 28(2):73–76.
- , 2004. 'The relationship between investment and growth', *Pacific Economic Bulletin*, 19(3):64–73.
- , 2005. 'Testing Hall's permanent income hypothesis for a developing country: the case of Fiji', *Applied Economics Letters*, 12(4):245–48.
- , 2007. *Estimating short and long run relationships: a guide to the applied economist*, Staff Working Paper 2005/15, University of the South Pacific, Suva.
- Rao, B. and Singh, R., 2004. 'A consumption function for Fiji', *The ICEAI Journal of Applied Economics*, 4(3):7–14.
- Reserve Bank of Fiji (various issues). *Quarterly Review*, Reserve Bank of Fiji, Suva.
- Romer, D., 2006. *Advanced Macroeconomics*, 3rd Edition, McGraw-Hill, New York.
- Sato, R., 1963. 'Fiscal policy in a neo-classical growth model: an analysis of time required for equilibrium adjustment', *Review of Economic Studies*, 30a(1a):16–23.
- Seruvatu, E. and Jayaraman, T., 2001. *Determinants of private sector investment in Fiji*, Reserve Bank of Fiji Staff Working Paper (02/2001), The Reserve Bank of Fiji, Suva.
- Shah, S., 2004. 'Raising the investment levels in Fiji', paper presented at the Economic Association of Fiji Forum organised by the Reserve Bank of Fiji, Suva, 7 June.
- Smith, R.P., 2000. 'Unit roots and all that: the impact of time-series methods on macroeconomics', in R. Backhouse and A. Salanti (eds), *Macroeconomics and the Real World, Vol. 1, Econometric techniques and macroeconomics*, Oxford University Press, Oxford.
- Solow, R., 1956. 'A contribution to the theory of economic growth', *Quarterly Journal of Economics*, 70:65–94.
- , 1957. 'Technical change and aggregate production function', *Review of Economics and Statistics*, 39(3):312–20.

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Appendix

I = Nominal private investment deflated by GDP deflator. Investment includes investment expenditure of statutory bodies (Reserve Bank of Fiji, various issues).

Y = Nominal GDP at factor cost deflated by GDP deflator (Reserve Bank of Fiji, various years; International Monetary Fund 2003)

R = Real long-term (5-year) interest rate computed as the difference between the nominal long-term interest rate and the GDP deflator (Reserve Bank of Fiji, various years; International Monetary Fund 2003).

P = Real GDP deflator (1995=100) (International Monetary Fund 2003).

COUP = Dummy variable for the two political coups in Fiji. Data constructed as 1 from the first coup in 1987 to 2002 and 0 for all other periods.

DEV = Dummy variable for the two devaluations of the Fiji dollar. Data constructed as 1 for 1987–88 and 1997–98 and 0 for all other periods.