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Macroeconomic Activities and Stock Prices in a South Pacific Island Economy

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ABSTRACT

This paper investigates whether there is any causal relationship between capital stock prices and macroeconomic activities in Fiji. The empirical results show that all the time series data are nonstationary and cointegrated with a single vector. All the explanatory variables have been found to contribute to the long-run equilibrium relationship. The estimation of the error-correction model further confirms that the stock price index is cointegrated with real economic activities in the long run, and it adjusts rather fast from short-run deviations towards long-run equilibrium level. Except for interest rate, real output, M2 and exchange rate do Granger cause stock prices in the short-run.

Keywords: Stock Market, Macroeconomic Activities, Cointegration, Granger Causality, Fiji

INTRODUCTION

Fiji's experience in capital markets development is now a decade old. During this Period, the country went through a major political crisis brought about by a coup in 2000, which adversely affected the private sector investment climate. As a result, Fiji's economic growth rate plunged from a hefty 9.2% in 1999 to -2.8 percent in

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2000. However, this decline was not as dramatic as that witnessed in the late eighties following the previous two military coups in 1987. The decline was arrested because of countercyclical measures implemented in the budget in the next four years, from 2001 to 2004, with substantial increase in public investment to offset the fall in private investment. During the 2001-2004 period, the stock market rallied and economic growth revived. Average annual growth rate during this period was 3.5% with the highest recorded being 4.3% in 2002.

It will, therefore, be of interest to investigate the relationship between stock prices and real economic activities in Fiji. The objective of this paper is to examine whether the causality runs from fundamental forces to stock prices in the context of the small open economy in Fiji. The remainder of the paper proceeds as follows: section 2 provides a brief background of stock market developments in Fiji during the 1990-2004 period; section 3 discusses the model, data and methodology employed in the study; section 4 reports the empirical results and section 5 presents a summary and conclusions.

STOCK MARKET ACTIVITIES IN FIJI

With dominant subsistence agriculture prevailing in all South Pacific island countries (SPICs) combined with continuing economic isolation ofremote island groups in SPIC due to poor inter-island transport and other communication links, only the urban centres on the main islands, where the capitals and/or tourist resorts are situated, have flourishing economic activities. These distortions have created, in each SPIC, enclaves of cash economies with barter economies coexisting in rural areas of inaccessible groups of islands. Only two countries, Fiji with a population of 830,000 and Papua New Guinea (PNG) with a population of 5.1 million, have relatively large and significant manufacturing bases and active private sectors.

With their small number of banks, mostly foreign-owned, and a few non-bank financial institutions dominated by the national provident funds, only Fiji and PNG have some semblance of financial sector activities. As the financial sectors in these two countries have very few players and the financial assets are only government and government agencies issued treasury bills and bonds, with no secondary markets, the financial sectors in the two major SPICs are shallow and thin. Thanks to the presence of a commercial minded Indian community, Fiji has a more vibrant private sector than PNG, which has been the major reason for the notable presence of stock exchange market activities here, dating back to the 1970s. As Part of financial sector reforms, Fiji took a major step in 1996 towards regulating and encouraging the development of debt and capital markets in the country by establishing a capital market development authority. The listing rules were redrafted in 1999 with a view to enable listing of domestic Fiji companies while maintaining a liquid and transparent market. At present, there are 16 companies listed on the South Pacific Stock Exchange (SPSE), previously known as the Suva Stock Exchange (SSE), compared to only nine in 1999.

The SSE, the predecessor of the current SPSE was established in 1979 as a Wholly owned subsidiary of the state owned Fiji Development Bank (FDB). During the course of its normal activities, FDB had acquired a portfolio of equity shares in the companies operating in Fiji. The main purpose of establishing the SSE was to enable FDB to sell these shares to interested investors in Fiji. Thus, in the initial Years of the SSE, FDB operated a counter to execute buy-sell transactions in equity shares. The SPSE was established in 1996 to cater to the needs of the South Pacific region. As trading data from 1979 to 1996 is not available from either FDB or the Present-day SPSE, we therefore, have to rely on data from 1996 onwards for our Study.

As can be observed from Table 1, SPSE is a stock exchange at a nascent stage of its development. The numbers of trading activities, value of trade and market

Table 1 Trading Information

Year	**Market Capitalization (FS Million)**	**Number of Shares Traded (Million)**	**Value of Shares Traded (FS Million)**
1996	102.870	Not Available	0.374
1997	145.000	2.372	2.876
1998	174.835	4.598	9.699
1999	213.942	3.381	4.942
2000	242.822	2.527	8.106
2001	274.586	2.631	4.350
2002	768.655	6.824	7.058
2003	748.358	3.583	4.336
2004	881.998	7.785	12.652

Source. Fiji Island Bureau Statistics, various issues.

capitalization have significantly improved only since 2001. Given the smallness of Fiji's economy, SPSE is doing a remarkable job of providing opportunities to local companies and companies in other Pacific islands to get listed on its bourse and raise capital through Initial Public Offerings. It also provides a regulated market for the trading of existing stocks between investors. The SPSE which has a record of maintaining its independence in ensuring compliance to its rules by brokers and investors, operates in a transparent manner.

MODEL, DATA AND METHODOLOGY

In keeping with the findings of empirical studies (Chen *et al.*, 1986; Darrat and Mukherjee, 1987; Mukherjee and Naka, 1995, Naka *et al.*, 1998), our model is formulated on the following premises. The stock index is positively influenced by growth in real output represented by real gross domestic product (GDP) since cash flows of firms are directly related to economic growth. A change in nominal interest rates on the other hand is expected to move asset prices in the opposite direction.

Growth in nominal money stock would provide economic stimulus, resulting in increases in cash flows of firms, leading to rise in stock prices (Mishkin, 2003). However, as argued by Fama (1981) growth in nominal money supply, due to its positive association with inflation, would adversely affect stock prices. If firrns are not able to increase prices in response to higher costs, despite a rise in the growth rate of return, growth rate of dividends would be constant and stock prices would then decline; and the factors that cause interest rate [Ml]might also have negative impacts on earnings, resulting in an ultimate decline in stock prices. The relationship between nominal money supply and stock price, therefore, needs to be empirically tested (Naka *et al*, 1998).

In a small open economy as in Fiji, the exchange rate (FJD), defined as units of Fiji dollar domestic currency per unit of foreign currency, plays an important role. The country has adopted a fixed exchange rate regime under which the Fiji dollar is linked to a basket of currencies of its major trading partners in accordance with the proportion of trade with them. The monetary policy targets the exchange rate. Two decades of experiences have shown that such a policy directed towards maintenance of exchange rate stability have paid substantial benefits. Price stability is a major gain as most of the inflation is imported and stability in exchange rate has contributed to stability in price levels as well.

Fiji's major exports were until recently dominated by sugar, which was given special treatment of better prices and access by the European Union under a preferential trading arrangement scheme known as the Sugar Protocol signed with African, Caribbean and Pacific nations. By 2007, this special treatment will come to an end and Fiji will have to look to other commodities for its export earnings. Currently, emerging exports of importance are increasingly tourism and garments and other related activities. Depreciation of the Fiji dollar would promote investment 10export-oriented activities, including resort hotels and other services. It is therefore hyPothesized that a rise in the FJD would positively affect prices of stocks in service related industries.

The period for the study covers 1997Q2 to 2004Q4, utilizing quarterly data. This includes the stock price index (STOCK), Fiji's real GDP (RGDP), nominal broad money supply in million Fiji dollars (M2), nominal 3-month Treasury bill rates (TBR) which represent interest rates, and exchange rate (FJD) expressed as Fiji dollars per unit of US dollar. Stock price indices, being weekly at times and rnonthly at other times, provided by SPSE, were duly converted into average rnonthly prices for calculating quarterly indices (base: 1997Q2=100). Data relating to other variables were compiled from the Fiji Islands Bureau of Statistics and Various issues of the *InternationalFinancialStatistkspublished* by the International Monetary Fund (IMF). The annual figures of RGDP were split into quarterly figures by resorting to Gandolfo's (1981) interpolation technique. Except for interest rate, au data are transformed into natural logarithm form.

Accordingly, the functional relationship of stock price with the variables is represented as follows:

$$STOCK = f(RGDP, M2, TBR, FJD) \quad (1)$$

The hypotheses are: (i) STOCK and RGDP are positively related; (ii) STOCK and TBR are negatively associated; and (iii) STOCK and FJD are positively associated. The relationship between STOCK and M2 is ambiguous and will have to be empirically determined.

Equation (1) is estimated by using the vector error-correction model (VECM), Which incorporates the error-correction term (ECT) from the cointegrating equation to capture long-term deviation from the equilibrium relationship between macroeconomic variables and the stock price index. Following the Johansen procedure, maximum likelihood is applied to a vector autoregressive (VAR) representation as in Equation (2):

$$\begin{bmatrix} ALSTOCK, \\ ALROD£: \\ ALM2, \\ i1.TB \\ ALFJD, \end{bmatrix} = \mathbf{r}(L) \begin{bmatrix} ALSTOC/(_{-1} \\ ALRGD£:_{-1} \\ ALM2,\_I \\ i1.TB_{-1} \\ ALFJD,_{-1} \end{bmatrix} + 11 \begin{bmatrix} LSTOC/(_{-1} \\ LRGD£:_{-1} \\ LM2,\_I \\ TB_{-1} \\ LFJD,_{-1} \end{bmatrix} + \begin{bmatrix} ESTOCK \\ eRGDP \\ eM2 \\ eTBR \\ eFJD \end{bmatrix} \qquad (2)$$

where r(L) is a 5 x 5 polynomial matrix of coefficients to be estimated. L is the lag operator, and **r** represents short-run adjustments among variables across the five equations in the system. i1. denotes the first difference operator, 11 is the error-correction component in levels, and $e's$ are normally distributed with zero mean and constant variance.

Johansen (1988) shows that the coefficient matrix 11conveys the information concerning the long-run relationship between the variables in the VAR. Ifthe f1 has zero rank, $r=0$, the variables are not cointegrated. Ifthe 11has full rank, $r=5$, all elements are stationary in levels. Ifthe 11 has rank equal *to r*, in which $r<5$, then there will exist r possible stationary linear combinations among the elements in the VAR, and $5-r$ common stochastic trends.

There are two commonly used tests of cointegration, the maximum eigenvalue test and the trace test. The maximum eigenvalue test has a null hypothesis of "there is *ror* less cointegrating vectors", and its alternative hypothesis states that "there is $r+1$ cointegrating vectors". For the trace test, it has the same null hypothesis as the maximum eigenvalue test, but the alternative hypothesis is that the rank 11 $r+1$. Johansen and Juselius (1990) demonstrated that the maximum eigenvalue test produces more robust results and it is more powerful than the trace test. In view of that, we only present the results of the maximum eigenvalue test.

Before resorting to undertaking cointegration analysis, we investigated the time series properties of the variables by utilizing the Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979; 1981) and Phillips-Perron (PP) (Phillips and Perron, 1988) unit root tests.

Ifthe variables are nonstationary and not cointegrated, we have to follow the standard VAR in estimation. On the other hand, if the data is nonstationary and the stock price index is cointegrated with.the macroeconomic variables identified in this study, by the Granger representation theorem, we may proceed to estimate the vector error-correction mechanism model. The existence of a cointegrated relationship in the long run indicates that the residuals from the cointegration equation can be used as an error-correction representation as in Equation (3):

MSTOC =a+f f3/l.LSTOCJ<t, +f <t>iMRGD.f;_, +f o,.MM2,_,
+f 1tiTBJ?_1 + f y,.MFJ _1 + μECJ;_1 +e, (3)

l'=l l'=l

The coefficient (μ) in the error-correction term (ECT) measures a single period response of the stock price index to a departure from equilibrium. Granger (1988) Pointed out that in a VECM framework, there are two channels for detecting causality: one through the statistical significance of the *t-test* for the lagged ECT, and the other through the .F-tests applied to the joint significance of the sum of the lags of each explanatory variable in the system. The /-test of the lagged ECT indicates the "long-run" causal relationship of the model, whereas the .F-tests of the explanatory variables in their first differences show the "short-run" causal effects. In addition, the VECM can indicate econometric exogeneity of the variables, if both the /-statistic relating to ECT and .F-statistics relating to explanatory variables are insignificant.

EMPIRICAL RESULTS

lime Series Properties of the Data

We employ two different unit root tests to ensure the robustness of our results in determining the univariate properties of the data. The ADF and PP unit root tests results are presented in Table 2. The optimal lag lengths for the ADF test were chosen based on the Schwarz Information Criterion (SIC), while for the PP test, it is based on the automatic selection procedure of Newey-West (1994) for Bartlett kemel. In the levels form, results show that the null hypothesis of the existence of

Table 2 Unit Root Test Results

Variables	ADF	pp
	Level	
LSTOCK	-1.7692(1)	-1.7700(3)
LRGDP	-2.4655(5)	-2.1946(2)
LM2	-1.3612(0)	-0.9199(3)
TBR	-3.5121(1)	-2.5250(5)
LFJD	-1.9518(0)	-1.9559(4)
Critical Values		
1%	-4.2967	-4.2967
5%	-3.5684	-3.5684
	First Difference	
LiLSTOCK	-4.0261(0)***	-4.0061(2)***
LiLRGDP	-4.6405(7)***	-3.4035(2)**
LiLM2	-7.1728(0)***	-7.0938(3)'!'**
LiTBR	-5.1835(1)***	-4.7053(3)***
&FJD	-3.5112(0)**	-3.4804(2)**
Critical Values		
1%	-3.6793	-3.6793
5%	-2.9678	-2.9678

Notes: LSTOCK = natural log of stock index, LRGDP = natural log of real GDP at 2000 price, LM2 = natural log of broad money supply, TBR = 3-month Treasury bill rate, and LFJD = natural log of exchange rate. Asterisks (**) and (***) indicate significant at 5% and I% levels, respectively.

a unit root cannot be rejected at the conventional significance levels. Nevertheless, both tests clearly show that all data are stationary in their first differences, indicating that they are 1(1) processes. Our results are in line with the argument by Nelson and Plosser (1982) in which most of the macroeconomic variables are of different stationary processes. These results also imply that the analysis should be conducted in the first difference series instead of in their levels. The unit root test results satisfy the condition that all data should have the same order of integration for them to be cointegrated.

Multivariate Cointegration Test

Once the order of integration of each time series is determined, the next step is to test for the cointegration relationship among the variables in the model. The

Johansen maximum likelihood method from Johansen and Juselius (1990) is utilized to examine the number of cointegrating vector(s) in the model. Table 3 reports the Johansen-Juselius multivariate cointegration test results. Since the sample size in this study is relatively small, we do the degree-of-freedom correction adjustment for the maximum eigenvalue statistics. The optimal lag length for the VAR is equal to three, which was selected based on Schwert's (1987) formula. As shown in Table 3, the null hypothesis of zero cointegration *(r* = 0) is rejected by the maximum eigenvalue O"maJ statistics at the 5 percent significant level. However, We cannot reject the null hypothesis of at most one cointegrating vector. This implies that there is a single cointegrating vector in the model, and consequently there is a long run stable linear equilibrium relationship among the variables in the system.

Table 3 Johansen and Juselius Cointegration Test Results

a.		A.Dill	cv(....,5%)
Variables: LSTOCK, LRGDP, LM2, TBR, LFJD			
r= O	*r*= 1	45.802**	33.877
r s, 1	*r= 2*	18.983	27.584
rS,2	*r*= 3	18.366	21.132
r s, 3	*r= 4*	14.065	14.265
r s,4	*r= 5*	2.222	3.842

Notes: r is the number of cointegrating vectors. Asterisk (**) indicates significant at the 5% level. ag selection is based on Schwert's (1987) formula, f,=int{4(T/100) [114]}. The reported maximum eigenvalue statistics have been adjusted for small sample size correction using Reinsel and Ahn (198)'s formula: *(t-nlc)/t*lr,* where *t* = actual sample size used in the estimation, *n* = number of Vanables in the system, *le*= number of lags used and *Ir*= log likelihood ratio.

Normalized Cointegrating Vector and Test for Exclusion

Table 4 tabulates the normalized cointegrating vector and the likelihood ratio exclusion test results. The coefficient estimates of the cointegrating vector are given by *W* = (-1.00, 1.51, 0.90, 0.07, 1.48). All the estimated coefficients are Statistically significant at 1 percent level. These values are normalized with respect to the stock price index, and they reflect the long run elasticity measures of the Variables. Results indicate that the Fiji stock price index is elastic with respect to real output and exchange rate, but is inelastic with respect to money supply and interest rate. As hypothesized, the stock price is positively related to real output and monetary aggregate. The interest rate variable has the wrong sign, however, it has very little impact on the movement of stock prices. Results also confirm that the depreciation of the currency could stimulate the Fiji stock market.

We then test the significance of each variable in the cointegrating relation using the likelihood ratio test statistics provided by Johansen (1991). The likelihood ratio restriction test shows that all the variables in the model are correctly specified. The null hypotheses of restricting the coefficients of the identified variables to zero are rejected at the 1 percent level of significance. As such, all the variables under study belong to the cointegrating space and contribute to the long-run relationship, and therefore, should not be excluded from the VAR model.

Table 4 Johansen Cointegration Equation Parameter Estimates and Likelihood Ratio Restriction Tests

	Parameter Estimates Normalized	**Test for Exclusion** e,	**LR(l)**
Constant	13.08		
LSTOCK	1.00	bl	22.12***
LRGDP	1.51	b2	7.76***
LM2	0.90	bl	27.80***
TBR	0.07	b4	16.28***
LFJD	1.48	b5	44.52***

Note: Asterisk (***) indicates significant at the 1% level.

Estimation of Error-Correction Model

The next step is to examine the interaction among the variables in the system using the error-correction model. The estimation of error-correction model for the Fiji stock price index is summarized in Table 5. This model seems adequate as revealed by diagnostic tests. The residuals from the error-correction model are normally distributed with constant variances, and they are free from serial correlation as well as misspecification problems. In addition, the CUSUM of squares stability tests (Figures 1 and 2) fall inside the 5 percent critical lines, indicating that the

Table 5 Estimation of Error Correction Model for the Fiji Stock Price Index

Variables	Coefficients	Std. Errors	'-statistics	p-values
Constant	0.036	0.009	3.809	0.002
$L\backslash LSTOCK_{t-1}$	0.204	0.125	1.629	0.123
$L\backslash LSTOCK_{t-2}$	0.210	0.117	1.800	0.091
$L\backslash LRGDP_{t-1}$	-1.053	0.626	-1.684	0.112
$L\backslash LRGDP_{t-2}$	-0.616	0.537	-1.146	0.269
$L\backslash LM2_{t-1}$	-0.308	0.144	-2.135	0.049
$L\backslash LM2_{t-2}$	-0.279	0.168	-1.661	0.116
$L\backslash IBR_{t-1}$	-0.020	0.010	-2.055	0.057
$L\backslash IBR_{t-2}$	0.002	0.007	0.241	0.813
$L\backslash LFJD_{t-1}$	-0.122	0.140	-0.866	0.400
$L\backslash LFJD_{t-2}$	-0.301	0.113	-2.666	0.017
ECT(-1)	-0.575	0.130	-4.434	0.000
Diagnostic Tests:				
	0.715			
R_2	0.520			
DW-d	2.121			
JB	0.582(0.748]			
AR[4]	0.621[0.660]			
ARCH[4]	0.315[0.864]			
HETERO	0.388(0.944]			
RESET[4]	0.857[0.517]			

Notes: JB is the Jarque-Bera statistic for testing normality. AR[4] and ARCH[4] are the Lagrange Multiplier tests of 4"' order serial correlation and ARCH effects, respectively. HETERO and RESET refer to the White Heteroscedasticity test and Ramsey RESET specification test.

estimated model is stable within the period of study, although the country had Passed through political crisis in 2000.

The estimated coefficient of the ECT has the correct negative sign and it is significant at the l percent level, confirming further that the variables in the system are cointegrated. Also, it indicates that while stock prices may temporarily deviate from its long run equilibrium, the deviations are adjusting towards the equilibrium level in the long run. The estimated coefficient of ECT is -0.575, implying that about 57.5 percent of the short-run deviations of the stock prices would be adjusted each quarter towards the long run equilibrium level of stock values. This means that the stock prices have very fast adjustment to correct disequilibrium among the five variables in the system.

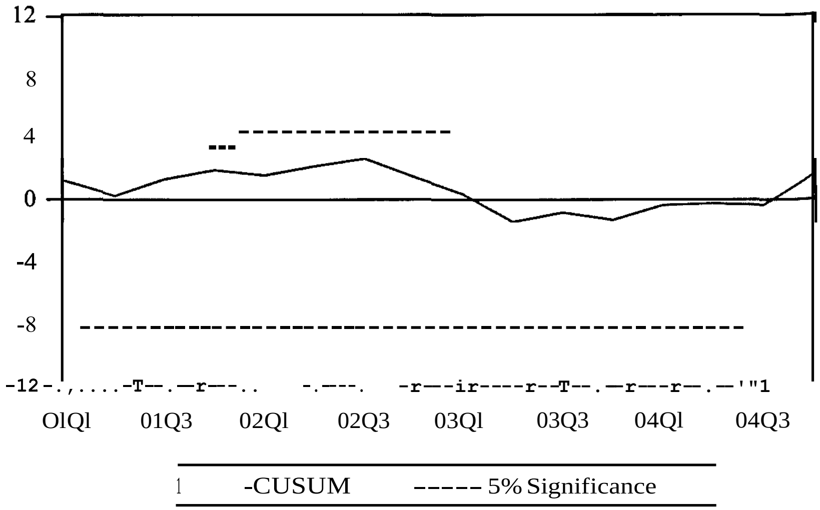

Figure 1 CUSUM Stability Test for Fiji Stock Market based on ECM Model

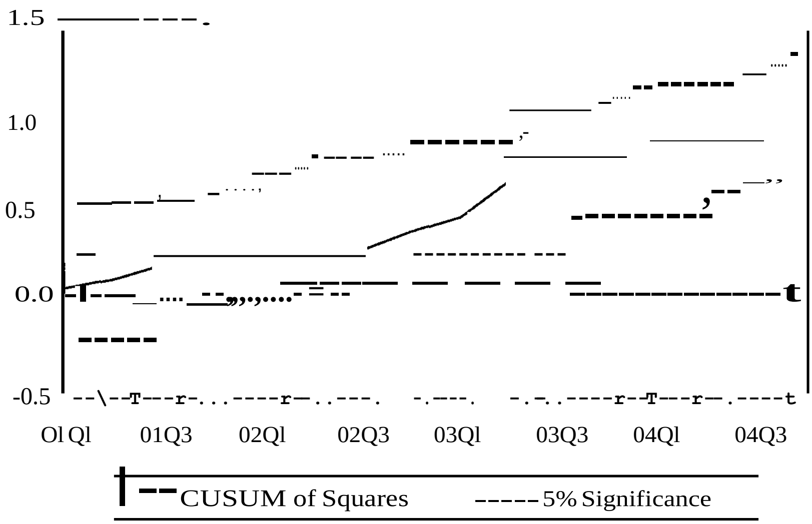

Figure 2 CUSUM of Squares Stability Test for Fiji Stock Market based on ECM Model

Short-run Granger Causality Relationship

Table 6 shows the short-run causality test results from the error-correction model. The short-run causality test can be conducted by applying the F-test of overall significance in the Wald test context to test the joint significance of the sum of the lags of each explanatory variable (in first difference) in the equation. The non-rejection of the null hypothesis of no causal effect implies that the tested variable does not Granger cause stock prices in the short-run. Empirical results show that short-run causal channels exist from real output, M2 and exchange rate to stock Prices, but not for the interest rate. The short-run impacts of real output, M2 and ex.change rate, which have the expected signs, are statistically significant either at the 5 percent or 10 percent levels. However, the interest rate variable, which is With wrong sign, is insignificant in the short run.

Table 6 Short-run Granger Causality Test Results

Null Hypothesis	**F-statistic of Wald Test [/>-value]** ***M.S'TOC***
2 *L,LV:STOCK,_I* *i=I*	7.020 [0.018]**
2 *L!!.LRGDP,_I* *i=I*	3.888 [0.066]*
$\sum_{i=1}^{2}\Delta LM2_{t-1}$	4.635 [0.047]**
$\sum_{i=1}^{2}\Delta TBR_{t-1}$	1.773 [0.202]
$\sum_{i=l}^{2}\Delta LFJD_{t-1}$	4.894 [0.042]**

Notes: Asterisks (*) and (**) indicate significant at 10% and 5% levels, respectively.

SUMMARY AND CONCLUSIONS

This study examines the causal linkages between the Fiji stock price index and the fundamental economic forces, which include real output, nominal money supply, nominal interest rate and exchange rate. In doing so, we first investigate the time series properties of the data using both the ADF and PP unit root tests. The unit root test results show that all the data series are of $I(1)$ processes. Hence, we utilize the Johansen-Juselius multivariate cointegration test to examine the long run equilibrium relationship among the variables in the model. Existence of a single cointegrating vector was detected and all the identified variables belong to the cointegrating space.

The normalized cointegrating vector shows that the Fiji stock prices index is elastic with respect to real output and exchange rate. However, it is inelastic with respect to money supply and interest rate. We found that except for interest rate, all the explanatory variables emerged with expected signs. Growth in real output level and an expansionary monetary policy help to stimulate the stock prices. Also, a depreciation of currency could lead to higher stock returns. Nevertheless, the fluctuation in the short-run interest rate does not seem to matter in its influence on the stock market as the value of its coefficient is negligible.

The estimation of error-correction model further confirms the existence of long run stable equilibrium among the variables in the model. It is confirmed that any disequilibrium is corrected by fast adjustment. The Granger causality test indicates that changes in past values in stock prices, real output, money supply and exchange rate could be used to predict the future movement of the stock prices. In other words, the Fiji stock market is informationally inefficient.

To sum up, it is of interest to note that potential macroeconomic variables could provide impetus to the emerging stock market in Fiji. By knowing the linkages between stock prices and macroeconomic variables, investors can obtain more information on changes in these variables to predict the movement in stock returns. On the other hand, the government can also play a more active role to stabilize fluctuations in the stock market.

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