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COINTEGRATION BETWEEN STOCK MARKET AND ECONOMIC GROWTH: EVIDENCE FORM NEPAL

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ABSTRACT

This paper examines the linkage between stock market development and economic growth in the context of Nepal using 33 annual observations from Mid-July 1988 to 2020 on economic and financial time series of real GDP, market capitalization and annual turnover. The study employs Engle-Granger(1987) and Johansen's (1988) cointegration test to examine the cointegration between economic growth proxied by log of real GDP and stock market development indicators, namely stock market size and liquidity, proxied by log of market capitalization and log of annual turnover, respectively. The results of cointegration show that both stock market size and liquidity can predict economic growth in Nepal. The results of cointegration test from both Engle-Granger procedures and Johansen's method suggests that economic growth is cointegrated with both stock market size and stock market liquidity, and hence they are interrelated with each other in the long run. The basic implication of study finding is that both stock market size and liquidity significantly predict the economic growth in Nepal over the sample period and hence there is a need for promoting secondary market trading both in terms of size and liquidity.

Keywords: ADF – cointegration - economic growth – liquidity - size.

INTRODUCTION

The relationship between financial development and economic growth has been an extensive issue of arguments since the contributions of Gurley and Shaw (1967), McKinnon (1973) and Shaw (1973). The level of financial development can be measured with two dimensions: development of financial intermediaries and development of financial markets. Banks and financial institutions act as financial intermediaries whereas

financial markets consist of both bond and stock markets. Financial intermediaries and markets facilitate the transformation of a nation's savings into productive investments. Thus, every economy should have efficient financial system to promote the rate of capital accumulation and investment for achieving the goal of sustainable and long-run economic growth.

Empirical investigations on the linkage between financial development and economic growth began from Goldsmith (1969), which documented a positive relationship between financial development and economic growth. However, this work did neither control for initial conditions and country characteristics, nor did it permit any conclusions on causality or the relative strength of the transmission channels. Recent periods have witnessed a brilliant interest in studies on the causal relationship between financial development and economic growth. The evidences deal with this causal relationship along three hypotheses. First hypothesis argues that financial development accelerates economic growth or is conducive to growth slowdowns. According to this hypothesis, the financial sector increases savings and allocates them to more productive investments, thereby spurring economic growth (King & Levine, 1993; Rousseau & Wachtel, 1998; Levine, Loyaza & Beck, 2000; Beck, Demirguc-Kunt & Levine, 2000; and Rousseau & Sylla, 2003). Second hypothesis asserts that economic growth promotes financial development. According to this hypothesis, financial development appears as a consequence of the overall economic expansion. It has a passive role and adapts itself to the financing needs of the real sector (Gurley & Shaw, 1967; Goldsmith, 1969). Third hypothesis argues about reciprocal relationship between financial development and economic growth. According to this, economic growth makes the development of financial system profitable and the establishment of an efficient financial sector contributes to stimulate economic growth. In this line, Luintel and Khan (1999) revealed evidence for bi-directional causality from a sample of ten developing countries. Shan, Morris and Sun (2001) confirmed this finding from a sample of nine OECD countries.

Indeed, banks dominate financing in several developing and even in most developed countries and so is the case of Nepal. Stock markets remain a small part of the overall financial system. Early studies emphasized the role of the banking sector in economic growth. King and Levine (1993) showed that bank development affects economic growth. Levine (1997), Levine and Zervos (1998), Beck, Demirguc-Kunt and Levine (2000) and Levine, Loayza and Beck (2000) confirmed this finding. Most of the

cited evidences used bank-based measures of financial development such as total lending by non-bank public per capita, bank credit to GDP (Shan, Morris & Sun, 2001) and broad money to GDP (Rousseau & Sylla, 2003) and omitted the role of the stock market. As a result, recent studies have begun to focus on the linkages between the stock markets and economic growth in the context of financial liberalization and global integration. Beck and Levine (2004), for example, documented that stock market development plays an important role in predicting future economic growth. Ajte and Jovanovic (1993) showed that trading volume has a strong incidence on economic growth while bank credit does not. Similarly, Singh (1997) observed the evidence on a positive relationship between stock market development and long-run economic growth. In addition, Levine and Zervos (1998) showed that stock market liquidity is positively and robustly associated with long-run economic growth after controlling for economic and political variables. In the same vein, Rousseau and Wachtel (2000) documented a positive relationship between the ratio of total value traded to GDP and economic growth. These studies have confirmed that development of a liquid and highly capitalized stock market accelerates economic growth.

There is a general consensus among scholars, academicians and policy makers that stock market plays important role for economic growth by making provision of capital and by encouraging its effective use for economic growth. Despite of this consensus, empirical debate among finance scholars focuses on the direction of causation between stock market development and economic growth. The debate is straight whether stock market development leads to economic growth (For example, King & Levine, 1993; Rousseau & Wachtel, 1998; Levine & Zervos, 1998) or real sector development contributes toward stock market development (For example, Gurley & Shaw, 1967; Goldsmith, 1969) or there is a bidirectional relationship between stock market development and economic growth (For example, Luintel & Khan, 1999; Shan, Morris & Sun 2001). However, empirical documentation of most of these studies (including Levine & Renelt, 1991; King & Levine, 1993; Levine & Zervos, 1998, among others) are based on cross-country regressions to establish a causal relationship between financial market development and economic growth. It can be argued that cross-country regression does not address causality issue satisfactorily because institutional structures of countries associated are different. This fact basically encouraged the study at individual country level. Even at individual country level, the previous studies have made use of data from the USA, European and advanced Asian countries. Research challenges remain to take into account peculiarities in developing stock markets like Nepal.

Nepal has already undergone with financial sector reforms and structural adjustment programs. However, it has not yet emerged as economic power, which may explain the lack of empirical efforts on Nepalese financial markets. Nepalese stock market is witnessing a developing stage. On the overall, equity culture is increasing among Nepali investors. Hence, the main purpose of this study is to examine the linkage between stock market development and economic growth in the context of Nepal using more recent dataset. The rest of this paper is organized as follows: second section deals with data and methodology employed in the study; third section describes the study results; and final section concludes the study.

RESEARCH METHODOLOGY

Data sources and variables

This study is based on aggregate data on financial and economic time series of Nepal to examine the linkage between stock market development (stock market size and liquidity) and economic growth. In the empirical analysis, the study makes use of data for the period mid-July 1988 through 2020. The study limits to the starting period as mid-July 1988 due to non-availability of data on stock market capitalization prior to this period. The economic growth is proxied by natural logarithm of annual real GDP series. Stock market development is a multi-dimensional concept. It is usually measured by stock market size, liquidity, volatility, concentration, integration with world capital markets, and the regulation and supervision in the market. This study has relied on the two popular measures of stock market development- stock market size and stock market liquidity. Stock market size has been proxied by stock market capitalization. It is measured as total number of outstanding shares of all listed companies in a particular year-end multiplied by corresponding closing market price per share of the listed companies. Stock market liquidity has been proxied by annual total value of shares traded. These two measures of stock market development are good proxies for such general development because they are less arbitrary than other individual measures and indexes of stock market development.

The data on real GDP series from mid-July 1988 to 2002 were derived from various issues of Macroeconomic Indicators published by Nepal Rastra Bank (NRB). GDP Series from mid-July 2003 to 2020 were derived from various issues of Economic Survey

Published by Government of Nepal, Ministry of Finance. Data on market capitalization and annual turnover were obtained from various issues of Quarterly Economic Bulletin of NRB and official websites of Nepal Stock Exchange (NEPSE). Other methodological processes are dealt as follows:

Empirical methods

Data analysis, in this study, begins with the unit root test to confirm the stationarity in time series data. The unit root test used in this study consists of Augmented Dickey-Fuller (ADF) test proposed by Dickey and Fuller (1979). This test detects the presence of unit root in a series by estimating Equation (1).

$$\Delta y_t = \beta_0 + (\alpha - 1) y_{t-1} + \alpha_1 \Delta y_{t-1} + e_t \quad \dots (1)$$

The coefficient β_0 is included in Equation (1) because it is believed that the time series data used in the study has a trend. The coefficient $(\alpha - 1)$ is the coefficient of interest in the Dickey-Fuller regression. It is tested with null hypothesis that the time series has a unit root and is not stationary. If this hypothesis is rejected then it is concluded that the series is stationary. The coefficient α_1 is the term that augments the Dickey-Fuller regression. It is included to eliminate autocorrelation in the model's errors, et. Selecting correct number of lags in ADF regression produces small autocorrelation coefficient. The notation on the left-hand side of Equation (1), Δy_t , makes use of the lag operator. The value of appropriate lag length has been determined using Akaike Information Criterion (AIC).

After confirmation of the stationarity in time series of the variables of interest, this study employs Engle-Granger (1987) cointegration procedures to explain the long-run relationship between stock market development and economic growth. The first step in using the Engle-Granger procedure is to determine the order of integration of each series. This has been done by employing AIC. The second step is to identify cointegration equation using OLS method. In third step, residuals from OLS regression are tested for stationarity at levels. For this purpose, following cointegration regression model has been estimated.

$$y_t = \beta_0 + \beta_1 x_t + z_t \quad \dots(2)$$

In the next step, ADF test on the residuals is applied using Equation (3) to check whether the residuals (z_t) are stationary or not.

$$z_t = \beta z_{t-1} + v_t \quad \dots(3)$$

If the ADF test on residuals rejects the null hypothesis of non-stationary, then the inference will be drawn that stock market development and economic growth are cointegrated and hence they are interrelated with each other in the long run.

One limitation of Engle-Granger procedures is that it relies on the OLS method, which may produce significant bias in estimation procedures. Hence, to check on the robustness of the results, this study also employs Johansen's (1988) method of cointegrating test. This method describes likelihood ratio test or trace test, which provides the cointegrating rank (r). The trace test is based on the stochastic matrix and is defined as:

$$\lambda_{\text{trace}}(r) = -T \sum_{i=r+1}^k \log(1 - \lambda_i) \quad \dots(4)$$

In Equation (4), $r = 0, 1 \dots k - 1$; T is the number of useable observations; and λ_i is the estimated value of the characteristic roots. The null hypothesis of this test is that the number of distinct cointegrating equations is less than or equal to r (that is, no cointegrating equation) against the alternative, $r > 0$ (one or more cointegrating equations).

STUDY RESULTS AND DISCUSSION

Results of stationary test

The ADF test has been conducted to confirm the stationarity in time series of log real GDP (l_RGDP), log market capitalization (l_MC) and log annual turnover (l_AT). Before employing this test, few preliminary decisions have been taken observing the time series plot of level and first difference series to confirm whether the series have linear or quadratic trend. This suggests that ADF test regressions for each of the series should contain a constant, but not a time trend.

The next decision is to pick up the number of lagged terms to include in the ADF regressions. This is a judgment call, but the residuals from the ADF regression should be void of any autocorrelation. Choosing only 1 lag and including constant in the ADF regression, the results of ADF test are reported in Table 1.

Table 1: ADF test results of stationarity of time series

Variables	Estimated coefficient ($\alpha - 1$)	Test statistic (tau)	p-value	First order autocorrelation coefficient
l_RGDP	-0.069	-2.007	0.284	-0.007
ld_RGDP	-0.964	-3.052*	0.030	-0.019
l_MC	-0.037	-0.869	0.798	0.100
ld_MC	-1.067	-4.285*	0.001	-0.047
l_AT	-0.095	-1.139	0.703	-0.012
ld_AT	-1.365	-3.991*	0.002	-0.059

Source: Author's calculation

In Table 1, l_RGDP, l_MC and l_AT are logarithm of real GDP, market capitalization and annual turnover respectively; and ld_RGDP, ld_MC and ld_AT are log difference of these series, respectively. The test results reported in Table 1 are quite informative. The first order autocorrelation coefficients reported in Table 1 for all variables have small values, which provide sufficient evidence to support that one lag included for all variables in ADF regression is the correct.

The estimated coefficients of l_RGDP, l_MC and l_AT are not significant as correct p-value of the test statistics for these series in Table 1 are greater than 5 percent level of significance. This implies that log series of real GDP, market capitalization and annual turnover each have a unit root and not stationary. However, estimated coefficient of ld_RGDP, ld_MC and ld_AT are all significant as correct p-value of the test statistics are less than 5 percent level of significance ($p\text{-value} < 0.050$). This provides sufficient evidence to believe that real GDP, market capitalization and annual turnover series are stationary in their log difference.

Results of cointegration test

This section reveals the results of cointegration test between stock market development proxied by stock market size (market capitalization) and liquidity (annual turnover), and economic growth proxied by real GDP. According to Engle-Granger (1987) cointegration approach, two nonstationary series are cointegrated if they tend to move together through time. In previous section, the results revealed that levels of log real GDP, log market capitalization and log of annual turnover are nonstationary, whereas their differences are stationary. Holding this condition may lead to the conclusion that stock market development and economic growth are cointegrated and hence they are interrelated with each other in the long run. In the language of time series literature, there

is evidence for cointegrating relationship if the unit root hypothesis is not rejected for the individual variables, but it is rejected for the residuals from the cointegrating regression. The results of cointegration test using Engle-Granger procedures are reported in Table 2 and Table 3.

Table 2 reveals the results of cointegration relationship between log of real GDP (Proxy of economic growth) as dependent variable and log of market capitalization (proxy of stock market size) as independent variable. The cointegrating regression coefficient of market capitalization is significant at 1 percent level, which implies that stock market size predicts economic growth in Nepal. The results of ADF test on the residuals from the cointegrating regression are reported in lower panel of Table 2. The null of non-stationary has not been rejected for each of the series individually, while the null of non-stationary has been rejected for residuals at 5 percent level. This implies that each of individual series of log real GDP and log market capitalization is $I(1)$ but some linear combination of log real GDP and log market capitalization series is $I(0)$. Thus, results suggest that stock market size and economic growth are cointegrated and hence they are interrelated with each other in the long run.

Table 2: Cointegrating regression (Engle-Granger Procedure)
Dependent variable: 1 RGDP

	Coefficient	Std. error	t-ratio	p-value
Constant	9.175	0.199	46.120	0.000
1 MC	0.330	0.019	17.410	0.000
ADF test for residuals (Including one lag)				
Estimated coefficient		-0.581		
Test statistics (tau)		-3.770		
Asymptotic p-value		0.015		
First order autocorrelation		-0.085		

Source: Author's calculation

Table 3 shows the results of cointegration relationship between log of real GDP as dependent variable and log of annual turnover as independent variable. The cointegrating regression coefficient of annual turnover is significant at 1 percent level. It implies that stock market liquidity can predict economic growth in Nepal. The results of ADF test on the residuals from the cointegrating regression are also reported in lower part of Table 3. The null of non-stationary has been rejected for residuals at 5 percent level. This implies that each of individual series of log real GDP and log annual turnover is $I(1)$ but some linear combination of these series is $I(0)$. Thus, results also suggest that stock market

liquidity and economic growth are cointegrated and hence they are interrelated with each other in the long run.

Table 3: Cointegrating regression (Engle-Granger Procedure)

Dependent variable: l_RGDP

	Coefficient	Std. error	t-ratio	p-value
Constant	10.759	0.136	79.280	0.000
l_AT	0.269	0.019	14.180	0.000
ADF test for residuals (Including one lag)				
Estimated coefficient	-0.745			
Test statistics (tau)	-3.827			
Asymptotic p-value	0.032			
First order autocorrelation	-0.061			

Source: Author's calculation

The Engle-Granger procedures of cointegration test, however, can produce substantial bias in the estimation method as it relies on the OLS method. Therefore, this study also employs Johansen method, which is based on the maximum likelihood method of estimation. Table 4 and 5 report the results of cointegration test from Johansen procedures. This test includes both Eigen-value and trace statistics.

The first row in Table 4 and 5 tests the hypothesis of no cointegration. The second row tests the hypothesis of one cointegrating relation. If hypothesis of no cointegration is rejected then test suggests that there is 1 cointegrating relation. Similarly, if both of these hypotheses are rejected then test suggests that there are two cointegrating relations between the variables of interest.

Table 4: Johansen cointegration test between l_RGDP and l_MC

Number of equations = 2, Estimation period: 1990 - 2020 (T = 31)

Eigen value	Trace Test	p-value	Hypothesized no. of cointegrating equations
0.427	18.103	0.018	None
0.179	4.720	0.030	At Most 1

Source: Author's calculation

In Table 4, the trace test indicates 2 cointegrating equations at 5 percent level since both hypotheses of no cointegration and one cointegrating relation have been rejected at 5 percent level. This implies that log of real GDP and log of stock market capitalization are cointegrated. Similarly, in Table 5, the trace test again indicates 2 cointegrating equation at 5 percent level, which implies that log of real GDP and log of annual turnover are also cointegrated.

Table 5: Johansen Cointegration test between l_RGDP and l_AT
 Number of equations = 2, Estimation period: 1990 - 2020 (T = 31)

Eigen value	Trace Test	p-value	Hypothesized no. of cointegrating equations
0.425	18.329	0.017	None
0.190	5.062	0.025	At Most 1

Source: Author's calculation

Hence, both Engle-granger procedures and Johansen's method produce same results. In both cases, stock market size and liquidity are cointegrated with economic development. The result simply implies that economic growth of Nepal has a stable long-run equilibrium relationship with stock market size and stock market liquidity.

CONCLUSION

This paper examined the long-run cointegrating relations between stock market development and economic growth in Nepal. Using 33 annual observations on the time series of real GDP, market capitalization, annual turnover from mid-July 1988 to mid-July 2020, the results of cointegrated regression showed that both stock market size and liquidity can predict the economic growth of Nepal over the sample period. Employing Engle-Granger procedures, the study also concluded that stock market size and liquidity are cointegrated with economic growth of Nepal and hence they are interrelated with each other in the long run. Besides, the Johansen's method of cointegration test also confirmed that there is a stable long-run equilibrium relationship between stock market development and economic growth. The basic implication of study finding is that both stock market size and liquidity significantly predict the economic growth in Nepal over the sample period and hence there is need for promoting secondary market trading both in terms of size and liquidity.

Before concluding it is necessary to mention one limitation of this study. The frequency of the time series data used in this study is annual. Although quarterly data are available for stock market capitalization and stock market turnover, Nepal has not yet adopted the practice of announcing quarterly GDP. Hence, this study is limited to 33 annual observations, and due to this fact, some loss of information might have taken place.

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