Stock Returns and Gross Domestic Product in Nepal

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ABSTRACT

This study investigates the relationship between stock returns and gross domestic product (GDP) in Nepal for the period 1994 to 2017 using annual data. The objective of the study is to analyse the association of GDP with stock market performance. The finding of the study reveals the significant univariate relationship between stock market returns and GDP growth in Nepal, though it is not strong enough as in emerging and developed markets. The long-run and equilibrium has been estimated using the autoregressive distributed lag (ARDL) model. The relationship between GDP growth and stock market returns has been controlled by variables like population growth, fixed capital investment, domestic savings, and government total expenditure and banking credit to the private sector. The results indicate that the stock market has a very weak, but significant impact on the GDP growth of the country. The large, negative, and significant error correction term signals the speedy correction of disequilibrium and shocks. The non-conventional error correction term also suggests the structural and institutional problems in the Nepalese stock markets implying that stock prices are not capable enough to contain valuable information to forecast GDP.

I. Introduction

There are several empirical evidences that explain correlation between the economic growth and stock returns. Morck, Shleifer and Vishny (1990), one of the proponents of the hypothesis behind this link summarise the empirical studies and grouped into five hypotheses namely: passive informant hypothesis, accurate active informant hypothesis, faulty active informant hypothesis, financing hypothesis, and stock market pressure on managers' hypothesis. The core theoretical underpinnings of the hypotheses are the valuation principle of stock and its underlying relationship with economic growth.

While expanding business opportunities, entrepreneurs have many options to finance such expansion. The *financing hypothesis* suggests that an entrepreneur's issue new shares at the time when stock prices are high compared to the replacement cost of capital (Mauro, 2000). New physical capital, thus, added in the existing capital stock will boost investment and economic growth. Based on this Tobin's Q theory, this hypothesis argues that high stock returns will tend to be followed by high output growth. However, Fischer and Merton (1984) is against this hypothesis citing an argument that the mechanism allows scope for irrational movements in stock prices to affect real economic activity.

Macroeconomic activity affects future consumption (Chen, 2009) and may also induce a variability of the quantity and different kinds of available real investment opportunities (Flannery & Protopapadakis, 2002). Macroeconomic indicators are statistical measurements that try to inter-alia

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capture these aspects. In general, macroeconomic indicators measure the condition of the economy from a certain aspect and are often concerned with the behaviour and performance of an economy instead of specific markets. As they measure economic activity, they are connected to the economic growth as proposed by Chen (1997) who studied the relationship between macroeconomic indicators such as lagged production growth rate, the term premium, short-term interest rate and market dividend price ratio and the US growth rate. Due to their connection to the economy, macroeconomic indicators have been used in the financial analysis to predict and assess the economic development. One of the most prominent studies in this field is the early work by Fama (1990). The study found evidence for a positive correlation between real stock returns and the economic measures such as capital expenditures and an average rate of return on capital. Building on the previous research, Fama (1990) found that annual stock returns are highly correlated with future expected production growth rates. Sirucek (2012) concluded that S&P 500 and Dow Jones are affected by economic activity. It seems that the connection between the economic growth and the stock market is evident. However, in contrast to previous studies, Chen (2009) found conflicting results by utilising multiple regression analysis to conclude that the expected excess market return is negatively related to the recent GNP growth albeit it is positively related to the future expected GNP growth. This suggests that indicators can affect the stock markets not only by providing a current overview of the economy but also by providing insights into the future economic development. The relationship between the stock markets and the future performance of the economy can be explained by the fundamental usage of discounted cash flow models for corporate valuations and by the interpretation of systemic risk.

Within the framework of economic growth theory, there have been two important novelties that have spearheaded much of the existing discussion on economic growth. This includes the neoclassical growth theory and endogenous growth theories. Their main focus has been on the importance of state factors such as accumulation of physical capital and human capital development (e.g., Solow, 1956; Romer, 1986). However, there has been other equally important contributors to economic growth that focus on the impact of efficiency factors (e.g., Barro, 1990; World Bank, 1990).

Studies that are directed to identify the association of stock market performance and economic growth used proxies of macroeconomic determinants of growth as control variables. While reviewing the macroeconomic determinants of the economic growth, physical capital (capital formation) is largely positive and significantly associated with economic growth (e.g., Fischer,1992; Dollar,1992; Beck, Levine & Loyaza, 2000; Bayraktar, 2006; Fetahi-Vehapi, Sadiku & Pekovski, 2015). Fiscal policy variables commonly used and found significantly associated with economic growth in the empirical literature includes budget surplus, tariffs, government expenditure, institutional quality, and state-owned enterprises (e.g., Easterly & Levine, 1997; Ananywu, 2014). The proxies that have been included to investigate the relationship between trade-related variables and economic growth, and found significant are real exchange rate, black market exchange rate premiums, trade openness, exports, imports, and terms of trade (e.g., Chen & Feng, 2000; Bhaskara-Rao & Hassan, 2011; Checherita-Westpal & Rother, 2012). The financial indicators investigated include financial depth, credit to the private sector, and real interest rates. The results reveal that financial depth was positively and significantly associated with economic growth (Easterly & Levine, 1997), while credit to the private sector and real interest rates were negatively and significantly associated with economic growth (e.g., Checherita-Westphal & Rother, 2012; Anyanwu, 2014). However, a meta-analysis on the relationship of financial indicators and economic growth, though positive, has been found to be statistically weak (Bumann, Hermes & Lensink, 2013).

Demographic factors studied in the empirical growth literature include population growth, growth of the working-age population, labour employed, labour force, and fertility rate. Some studies found population, population growth, and labour employed to be positively and significantly associated with economic growth (e.g., Sachs & Warner,1997; Chang & Mendy, 2012). Others, however, have found a negative and significant relationship between population, population growth, and the fertility rate (e.g., Most & Vann de Berg, 1996; Hamilton & Monteagudo, 1998). Most and Vann de Berg (1996) investigated the determinants of economic growth in eleven sub-Saharan African countries using country- specific time series models. The study reveals domestic savings be positively and significantly associated with economic growth in Togo, Senegal, Ivory Coast, Nigeria, Cameroon and Kenya, but negatively and significantly associated with economic growth in Mauritius and Zambia. Banking credit to private sector reflects the ability of the financial system to channel savings into investment opportunities (Levine & Zervos, 1998). This proxy has been used in other studies such as Levine *et al.*, 2000; and Boyd *et al.*, 2001.

While theories analysing macroeconomic and institutional factor have reached general consensus on how these factors along with stock market performance influence economic growth in the context of developed and emerging economies, such evidences are not available in the context of Nepal. Existing studies that investigate this have employed panel data analysis, under which country-specific information may be lost due to the lumping of countries (Hsiao, 2005). Time-series techniques may be very useful to capture the country specific information. In addition, most of the existing studies examine the long-run relationship between stock market developments and their determinants, with no attention paid to the short-run relationship between them. Moreover, studies on stock market-growth nexus mostly in developed markets are focused to identify the determinants of stock market development using economic growth as a driving indicator. Thus, the empirical question of the magnitude of change in economic growth associated with the magnitude of change in stock market performance remains unresolved in developing economies with nascent stock markets.

In the context of Nepal, GC and Neupane (2006) revealed a long-run integration and causality of macroeconomic variables and stock market indicators. The causality has been observed only in real terms but not in nominal variables, depicting that the stock market plays a significant role in determining economic growth. In addition, this causality was evident with a lag of three to four years. Similarly, Regmi (2012) found a significant contribution of stock market development to economic growth for the period of 1994-2011. Similarly, the long-run cointegrating relationship between stock market development and economic growth has been observed by Rana (2014) using Engle-Granger and Johansen's cointegration test on the time series data from 1988 through 2013.

Dewan Muktadir-Al-mukit *et al*. (2014) found that market capitalisation is highly associated with the real economic growth of Nepal. Bista (2017) employing the data from 1993 to 2014 estimated the long-run and short-run elasticity using the autoregressive distributed lag (ARDL) approach for cointegration analysis. The study measured economic growth by real GDP per capita and stock market development by stock market capitalisation. Further, the study reveals that economic growth, market capitalisation, gross capital formation, and inflation shared a stable long-run relationship in Nepal.

Bhatta (2009) and Pradhan and KC (2010) conclude that Nepalese stock market prices are not the efficient enough to incorporate even historical information. However, most of the studies identified the relationship between macroeconomic variables and stock market development in Nepal. Shrestha and Subedi (2014) examines the determinants of the stock market performance in Nepal and found availability of liquidity and low-interest rates stimulate the performance of the Nepalese stock markets. Further, a study on the relationship between long-term stock market movements and macroeconomic variables has been conducted by Phuyal (2016). Using the vector autoregression (VAR) model, the study reports a long-run equilibrium relationship with a set of macroeconomic variables, like inflation rate, interest rate, and remittance flow with the short-term disequilibrium corrected by 1.79 percent on monthly basis.

Devkota and Dhungana (2019) examines the relationship between the stock market index and four macroeconomic variables in Nepal. The study has employed ARDL bound test approach using time-series data from 1994 to 2018 and claimed that there is a long-run association between macroeconomic variables and the stock market in Nepal, especially money supply and interest rates have a positive and gold price and exchange rate have no impact on the stock markets in Nepal. Similarly, Panta (2020) examines the linkages between stock market prices (NEPSE index) and five macroeconomic variables, namely, real GDP, broad money supply, interest rate, inflation, and exchange rate using the ARDL model. The results indicate that the fluctuation of the NEPSE index in long run is strongly related to broad money supply, interest rate, inflation, and exchange rate.

Most of the studies conducted in Nepal used time series data to identify the causal relationship between stock market performance and selected macroeconomic variables. Most of the proxies of macroeconomic determinants as control variable are real GDP, broad money supply, interest rate, inflation, exchanges rate, consumer's price index, gold price, liquidity, Treasury bill rate and gross fixed capital formation. However, the studies did not pay much attention to address the empirical questions: what magnitude of a change in economic growth is accounted for by a given magnitude of change in stock market returns? Is the interaction between the magnitudes in terms of their contemporaneous or the presence of lagged effect? Is there any long-run cointegrating relationship between economic growth and stock market performance along with macroeconomic determinants? In this connection, this study aims to identify the impact of stock market return (in lagged terms) on GDP growth of Nepal controlled by broad array of macroeconomic variables.

This study mainly analyses the relationship between stock returns and GDP growth with the methodologies applied for analysing such relationship in emerging and developing economies. By doing so, it seeks to fill up the gaps in the existing literature. This study attempts to provide empirical evidence on the predictability of GDP growth using real stock market returns. It uses lagged real stock return rather than market capitalisation as a proxy of the financial market variable. It also attempts to explore the association of GDP growth on its lag and lagged stock returns.

The remainder of this study is organised as follows. Section II describes the data on stock market returns and economic growth and discusses estimation methodology. Empirical results are reported in section III. Section IV provides summary and conclusion.

II. Data and Methodological Issues

The study involves estimating a model that relates economic growth with the real stock market return and other variables. The dependent variable, thus, is gross domestic product (GDP) growth. Along with stock market return (NEPSE) as main independent variable, other control variables are included to examine the linear impact of the equity market performance on the economic growth of Nepal.

The lagged stock return and growth relationship have been estimated with ordinary least square (OLS) regression with several specifications that differ in the incorporated control variables and estimation techniques. The baseline model is specified in equation 2.1.

$$rgdp_t = \beta 0 + \beta_1\, realnepse_{t-i} + control\ variables + \varepsilon_t \quad \text{-------------- (2.1)}$$

Where $rgdp_t$ is the equation's dependent variable and reflects the economic growth rate expressed in term of real GDP and is lagged real stock market return expressed as the difference between percentage change in NEPSE index and consumer's price index (CPI). Other control variables such as gross fixed capital investment (GFCI), trade openness (TROPEN), government total expenditure (GTE), broad money supply (M2) and inflation (INF) are included to improve the model diagnostics. The explanatory variables are expressed in terms of their growth ratios.

The control variables used in this study are standard variables found to be statistically significant drivers of economic growth in the literature (Checherita-Westpal & Rother, 2012). The inclusion of these variables enables to determine whether stock market return affects economic growth while taking into account the alternative growth affecting factors. The control variables included in the study for estimating model are presented in Table I.

Table I

Control Variables: Specifications and Sources

Variables	Specification
Gross fixed capital formation, Domestic savings, and population growth	Primary drivers of economic growth according to prominent study of Solow
Trade openness	The beneficial character of trade and international competitiveness of a country
Government total expenditure	Government size to express fiscal policy of the federal government
Private sector credit ratio, Broad money supply (M2) Inflation	Financial indicator to measure banking sector development, NRB's monetary policy direction and stability in economy

It should, however, be noted that the purpose is not to assess the drivers of economic growth but to use the link between stock market return and growth to determine the linkages between financial and real sector in the context of Nepal.

Nepal Stock Exchange started to trade on the floor of the exchange and disseminate the index from the year 1994. Therefore, time-series data of both GDP and NEPSE index from the year 1994 through 2017 collected from various issues of Economic Survey's published by Ministry of Finance (MoF) and Quarterly Economic Bulletin (QEB) published by Nepal Rastra Bank (NRB).

Data on real stock returns (obtained as the difference between nominal stock returns and consumer price inflation) and GDP growth are available at an annual frequency for the period of 24 years. The stock market return has been derived from the all-equity market value-weighted index of Nepal Stock exchange, i. e., NEPSE index.

The annual time-series data have been collected from national and international sources. Most of the data (nominal and real GDP, domestic savings, gross fixed capital investment, total import and export of goods and services total government expenditures) has been collected from annual issues of "Economic Surveys published by the MoF, GoN (1986-2019)" and from "A Handbook of Government Finance Statistics (volume IV, June 2016)" published by NRB. Data on broad money supply, consumer's price index inflation, and banking credit to private sector has been taken from "Quarterly Economic Bulletin (Volume 53, Number 2, Mid-January 2019)" published by NRB. Yearly population data has been collected from World Bank database. E-views 10.0 software has been employed in the analysis of the dataset. Table II reports the applied symbols, descriptions and data sources.

Table II
Abbreviations, Descriptions and Sources of the Included Variables

Symbol	Variable name	Description	Source
RGDP	GDP growth	Yearly growth rate of real GDP	Economic survey
nepse	Real stock market return	Nominal stock market return in terms of changes in annual NEPSE index minus inflation rate	Nepal Stock Exchange publication Economic Survey, NRB publication
GFCI	Investments	Gross fixed capital investment, percent change (Y-o-Y)	Economic Survey
TROPEN	Trade Openness	Imports of goods and services plus exports of goods and services, percent change (Y-o-Y)	Economic Survey, NRB Publication
POP	Population growth	Yearly population growth rate	World Bank
DSAV	Savings	Domestic savings, percent change (Y-o-Y)	Economic Survey
GTE	Government size	Government total expenditure percent change (Y-o-Y)	Economic Survey
M2	Monetary policy indicator	Broad Money Supply, percent change (Y-o-Y)	NRB Quarterly Economic Bulletin
Inf	Economic stability indicator	Yearly growth rate of the changes in the price level of the total economy	NRB Quarterly economic Bulletin
PSCR	Banking sector development indicator	Banking credit to private sector, percent change Y-o-Y	NRB Quarterly economic Bulletin

This study employs ordinary Least Square (OLS) model to assess the impact of lagged stock return on GDP growth. Further, the effect of lagged GDP on lagged stock market return along with other control variables on GDP has been estimated. An attempt has been made to identify the existence of long-run relationship between stock market return and GDP growth in Nepal. For this, stationarity tests of the series with an Augmented Dicky Fuller test (ADF) have been conducted. Further, the Autoregressive Distributed Lag (ARDL) model has been applied to estimate the long-run and short-run equilibrium between the variables.

III. Empirical Results

As presented in Table III, the univariate regression coefficient between economic growth and stock returns (lagged by one year) is positive that is consistent with the results as reported by Mauro (2000). However, the coefficient is not significant and R^2 is also 0.11 which is not adequately explaining the relationship between growth and lagged stock market return in the case of Nepal. Mauro (2000) observed the slope coefficient typically ranges between 0.01 to 0.09 and the amounts 0.034 averaging overall countries in the sample. The R^2 coefficient is 0.11, quite below than the average R^2 as found by Mauro (2000) for all countries taken as a sample which was 0.17.

Table III
GDP Growth and Lagged Returns, 1995-2017

*This table presents the regression results of five specifications of the OLS estimates. The dependent variable in each specification is GDP growth rate. Stock market return has been computed using year-end closing Nepal Stock Exchange index return minus changes in yearly consumer's price index. Model one through Model four provides the regression results of OLS estimates including lagged values of NEPSE returns without including control variables. Model five reports the regression result of NEPSE return along with control variable included in the specification. The coefficients in each column represent the beta value of specification included in the OLS estimates. The significance of the coefficients is denoted by the * sign. Any coefficient with the * indicates significant at 10 percent level, ** significant at 5 percent level and *** significant at 1 percent level. Numbers in the parentheses represents t-value of respective coefficient. The R^2 value measures the goodness of fit of the fitted sample regression line.*

Variable	Model 1	Model2	Model 3	Model 4	Model 5
$nepse_{t-1}$	0.015 (1.64)	0.014 (0.97)	0.024*** (3.02)	0.025***(3.19)	----
$rgdp_{t-1}$	------	0.85*** (6.38)	-----	-0.26 (-1.34)	-----
$nepse_{t-2}$	-----	------	-0.029*** (-3.37)	-0.027*** (-3.14)	------
nepse	-----	------	------	------	-0.000006 (-0.07)
gfci	----	----	----	-----	0.000002 (0.003)
gte	-----	-----	-----	------	-0.0001 (0.32)
pop	-----	------	-----	-----	1.03*** (257.11)
M2	-----	-----	-----	-----	-0.0003 (0.43)
INF	-----	-----	-----	-----	-0.003 (-2.86)
tropen	-----	-----	-----	-----	1.01*** (433.95)
R^2	0.11	-1.10	0.47	0.52	0.99
D/W	2.03	2.02	1.93	1.62	1.70

Following the existing literature, this study also focuses on the stock return and economic growth by regressing GDP growth in year '*t*' on GDP growth and stock return on t-1. Controlling for lagged economic growth, the economic growth and stock returns (lagged by one year) are positively associated. However, the lagged GDP growth has a significant coefficient of 0.85 suggests that economic growth in Nepal can be predicted by lagged growth alone rather than by lagged stock returns (Model two).

Interestingly, the slope coefficients are significant while estimating GDP growth with lagged values of NEPSE return for lag one and lag two. This implies that economic growth in Nepal is positively associated with lagged NEPSE return of one-year lag and negatively associated with two-year lag (Model three). Model four yields similar results while adding lagged values of GDP growth with lagged values of NEPSE return with one and two lags.

Controlling the values of other leading indicators, most of the coefficients included in the model are found to be insignificant except the coefficient of population and trade openness (Model five). The slope coefficient of the stock return is, once again, marginally negative (i.e., -0.00004) and not significant. This further implies that economy in Nepal is not integrated with stock markets. The R^2 of the model is 0.99 implying that the model is sufficiently capturing the variables that help to predict economic growth. However, the marginally insignificant slope coefficient of stock return indicates that equity market performances are not providing useful information to predict GDP growth in the context of Nepal.

The stability of model five as revealed by the high R^2 value has further been confirmed using the various diagnostic tests. To avoid the possibility of multicollinearity, variance inflation factor (VIF) for each independent variable has been computed and the results are presented in Table IV. The centred VIF from the table confirms that there is no multicollinearity problem among the independent variables.

Table IV

Variance Inflation Factor

This table reports results of the uncentered and centred variance inflation factor to confirm the possibility of multicollinearity among the independent variables. A VIF for each independent variable is computed, which is defined as $VIF_k = 1 / (1 - R^2_k)$. The VIF values mirrors the interpretation of coefficient of multiple determination that implies If $VIF_k = 1$, variable K is not correlated with any independent variable. As a rule of thumb, multicollenarity is a potential problem when VIF_k is greater than four and a serious problem when it is greater than 10 (Hair et al., 1995).

Variable	Uncentred VIF	Centred VIF
REALNEPSE	1.37	1.32
POP	4.88	1.51
GFCI	26.61	3.42
GTE	8.98	3.17
TROPEN	10.11	2.77
INF	14.60	1.80
M2	26.51	2.70

Further, sensitivity analysis has been conducted to make sure that there is no serial correlation among the regressors, and that it is free from heteroscedasticity. The stability test is conducted by employing the cumulative sum of recursive residuals (CUSUM) confirmed that the model is stable. The diagnostic test results of the model are presented in Table V and Figure 1.

Table V
Results of Diagnostic Test

*This table provides the results of diagnostic test to confirm the stability of the OLS estimate (Model Five). The null of no serial correlation and no heteroskedasticity are tested using Breusch-Godfrey serial correlation test and Breush-Pagan- Godfrey test respectively. Any significant chi-square and F-statistic denoted by the * provides no statistical reason to accept null hypothesis. P-values of the statistic are provided in the parentheses.*

Diagnostic test	Chi-square	F-Statistic
Breusch-Godfrey Serial Correlation LM Test	0.07	0.02
	(0.96)	(0.92)
Heteroskedasticity Test Breush-Pagan-Godfrey	3.8	0.42
	(0.80)	(0.87)

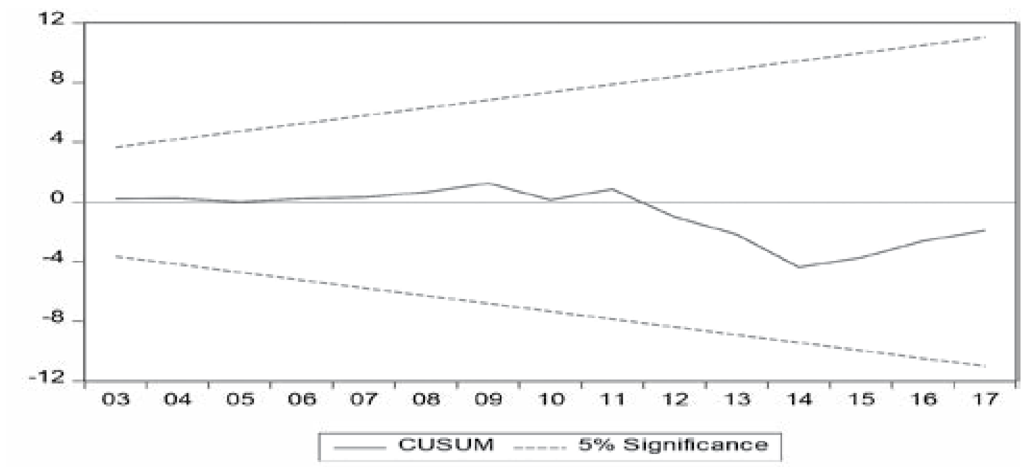


Figure I: Results of CUSUM Test

The OLS estimates reveal that both stock market return and stock return lagged by one year do not significantly influence economic growth in three out of five specifications. The coefficients of the control variables included in the specification do have appropriate signs except for population and NEPSE return. Thus, additional research is required to examine the relationship between the stock market indicator and economic growth as the OLS reports an insignificant relationship. However, the R^2 of model five signal that the variables included in the model have adequate explanatory power.

Time series data are often non-stationary and in the case of non-stationary in variables, OLS estimations become spurious. Thus, to avoid spurious results this study applies a unit root test to check whether every variable is stationary or not.

Test for Stationarity

An important concern in data analysis is to know whether the series is stationary (does not contain unit root) or not stationary (contains a unit root). This concern is important because it needs to balance both the left-hand side and right-hand side variables of the regression equation. It is assumed that time-series data are non-stationary at the level. Thus, it is necessary to perform a pre-test to ensure the stationary co-integrating relationship among variables in order to avoid the problems of spurious regression.

Augmented Dicky-Fuller (ADF) test has been carried out which is the modified version of the DF test. This test makes a parametric correction in the original Dickey-Fuller (DF) test for the higher-order correlation. The model is expressed as:

$$\Delta Y_t = b_0 + \beta Y_{t-1} + \mu_1 Y_{t-1} + \mu_2 Y_{t-2} + \ldots + \mu_p Y_{t-p} + \varepsilon_t \text{ -------- } (3.1)$$

Where y_t represents the time series to be tested, b_0 is intercept term, β is the coefficient of interest in the unit root test, μ is the parameter of the augmented lagged first difference of Y_t to represent the p_{th} order autoregressive process and $\square_t$ is the white noise error term.

In carrying out the unit root test, this study seeks to test the following hypothesis:

H_0:β = 0 (non-stationary)

H_1:β ≠ 0 (stationary)

It has been observed from the Table V that the level series of one of the seven variables understudy: namely population growth is non-stationary, i.e., it contains unit root at level data. The other remaining six variables do not contain a unit root as indicated by the fact that their respective critical values are all higher (in absolute terms) than the calculated ADF statistics and hence we reject the null hypothesis: that the time series data variables are non-stationary.

Table VI

Results of Augmented Dickey Fuller (ADF) Stationarity Test at Level and First Difference (Trend and Intercept)

*This table provides the results of the unit root test of variables selected for the study using the ADF statistic at level data (trend and intercept) and first difference. The decision criteria involve comparing the computed Tau values with the MacKinnon critical values for the rejection of a hypothesis for a unit root. If the computed tau (ADF) statistic is less negative (i.e., lies to the right of the MacKinnon critical values) relative to the critical values, the null hypothesis of non-stationarity in time series variables is not rejected. The significance of the coefficients is denoted by the * sign. Any coefficient with the * indicates significant at 10 percent level, ** significant at 5 percent level and *** significant at 1 percent level.*

	Level			First Difference	
Variable	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Decision
RGDP	-5.63***	-5.43***	-----	----	I(0)
NEPSE	-3.93***	-3.97***	-----	-----	I(0)
GTE	-4.55***	-4.81***	------	------	I(0)
PSCR	-5.12***	-5.38***	------	------	I(0)
GFCI	-1.78	-4.21***	------	------	I(0)
DSAV	-4.72***	-4.88***	------	------	I(0)
POP	-1.88	-2.42	-7.63***	-8.29***	I(1)

The unit root test, thus, confirmed that out of seven variables, six variables are integrated of order zero, I (0), and one of the important variables that represents growth predictor, population growth rate, is non-stationary at level, i.e., integrated of order one, I (1). In this case, there raises the question of whether there is any possibility for the existence of a long-run equilibrium relationship among the given set of variables.

Engle and Granger (1987) state that test for cointegration can be thought of like a pre-test to avoid spurious regression situation. Cointegration involves a certain stationary linear combination of variables that are individually non-stationary but integrated to order, I(d). Thus, cointegration establishes a stronger statistical and economic basis for the empirical error correction model, which brings together short-run and long-run information in modelling variables. Pesaran and Shin (1995) and Pesaran *et al*. (1996) proposed an autoregressive distributed lag (ARDL) approach to cointegration or bound procedure for long-run relationships, irrespective of whether the underlying variables are I (0), I (1), or a combination of both. In such a situation application of the ARDL approach to cointegration will give realistic and efficient estimates.

ARDL Approach for Co-integration

This study applies the recently developed autoregressive distributed lag model (ARDL) approach introduced in Pesaran *et al*. (2001) in order to investigate long-run relationship between stock market return and output growth in Nepal. Traditionally, the cointegration approach has widely been used to establish long-run relationship among certain variables. The method of cointegration requires that variables be integrated of the same order. If the order of integration among variables is not the same, then long-run relationship among them cannot be established. The order of integration is, however, established by using unit root tests which might suffer from low powers failing to reject the null of non-stationarity. Moreover, the results of these tests largely depend on the choice of optimal lag length, which cannot be conclusively determined. The ARDL model overcomes this problem by introducing the bounds testing procedure to establish long-run relationships among variables. It does not require, as such, that variables of interest have the same order of integration to the model long-run relationships.

The first advantage of ARDL is that it can be applied irrespective of whether underlying repressors are purely *I(0)*, purely *I(1),* or mutually co-integrated (Pesaran & Shin, 1999). The second advantage of using the bounds testing approach to cointegration is that it performs better than Engle and Granger (1987), Johansen (1991), and Philips and Hansen (1990) co-integration test in small samples. The third advantage of this approach is that, the model takes a sufficient number of lags to capture the data generating process in a general-to-specific modelling framework. Fourthly, ARDL is also having information about the structural break in time series data. The fifth advantage is unlike other cointegration techniques that are sensitive to the size of the sample; the ARDL test is suitable even if the sample size is small. Finally, the ARDL approach generally provides unbiased estimates of the long-run model and valid statistics even when some of the regressors are endogenous (Pegas, 2018). Accordingly, the ARDL model for this study has been estimated as specified in equation 3.2.

$$\Delta rgdp_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta rgdp_{t-i} + \sum_{i=1}^{q1} \beta_2 \Delta realnepse_{t-1} + \sum_{i=0}^{qi} \delta_i \Delta X_{t-1} + \gamma_1 rgdp_{t-1} + \gamma_2 realnepse_{t-1} + \gamma_i X_{t-1} + \varepsilon_t \text{------------------------------------} (3.2)$$

Where, Δ denotes the first difference operator, is the drift component and is assumed to be the white noise process. Note that *p* is the lags of dependent variable and q_i is the number of lags of the i^{th} explanatory variables.

The selection of lag is important to conduct the ARDL model as this model is very sensitive to the choice of an optimum lag length. Accordingly, this study has applied Eviews 10 for generating lag length of the variables included in the model which are presented in Table VII.

Table VII
Coefficients of Variable and t-statistics of ARDL Model

*This table reports the optimum lag length selected by ARDL model to estimate long-run coefficients. The dependent variable is GDP growth rate. Stock market return has been computed using year-end closing Nepal Stock Exchange index return minus changes in yearly consumer's price index. The control variables included in the model are population growth (POP), gross fixed capital investment (GFCI), banking credit to the private sector (PSCR), government total expenditure (GTE), and domestic savings (DSAV). Altogether 729 models have been evaluated and optimum lag length of (1, 1, 2, 1, 2, 1, 2) has been selected using Schwarz-Bayesian Information Criteria (SIC). The significance of the coefficients is denoted by the * sign. Any coefficient with * indicates significant at 10 percent level, ** significant at 5 percent level and *** significant 1 percent level.*

Variable	Coefficient	T-statistic	Variable	Coefficient	T-statistic
RGDP(-1)	-0.82***	-12.16	PSCR(-1)	-1.06***	-6.00
NEPSE	-0.004	-2.01	PSCR(-2)	0.03***	3.44
NEPSE(-1)	0.04***	11.03	GTE	-0.81***	-9.53
POP	12.21***	7.88	GTE(-1)	-0.57***	-6.06
POP(-1)	-28.48***	-9.63	DSAV	0.03***	8.49
POP(-2)	18.97***	11.47	DSAV(-1)	0.01**	3.77
GFCI	2.51***	9.80	DSAV(-2)	-0.008	-1.72
GFCI(-1)	1.78***	6.52	C	-1.37**	-3.07
PSCR	-1.60***	-9.65			

R^2 =0.99, D/W = 2.76

Further, in light of the evidence of the time series being either stationary or first differences stationary variables, a bound test has been conducted to examine the asymptotic distribution of the F-statistic is non-standard under the null hypothesis of the no-cointegrating relationship between the examined variables. The estimated F-statistic is obtained from the estimates mange to reject the joint hypothesis of no cointegration since it exceeds the lower and upper critical bound at one percent significance level. This evidence permits us to proceed with estimating our empirical ARDL model. The results of the bound test are presented in Table VIII.

Table VIII
Bounds Test for Co-integration

This table reports the results of the calculated F-statistics of the null of no levels (no cointegrating) relationship for selected ARDL (1, 1, 2, 1, 2, 1, 2) model. The lag length was selected based on Schwarz-Bayesian criterion. Bound critical values are cited from Peasran et al. (2001) and Narayan (2005) table. The number of regressors is six. The decision criteria prescribed by Peasran et al. (2001) is: (i) if the calculated value of F-statistic is greater than the upper bound of the critical values, the null-hypothesis is not accepted, that there exists cointegration; (ii) if the calculated value of F-statistic is less than the lower bound of the critical values, the null-hypothesis is accepted, that there exists no cointegration; and (iii) if the calculated value of F-statistic lies between the upper and lower bound of the critical values, there is inconclusive cointegration, i.e., it is not confirmed whether there is cointegration or not.

F-Statistic	K	Significance Level	Bound Critical Values	
			I(O)	I(1)
115.79	6	10%	2.334	3.515
		5%	2.794	4.148
		1%	3.976	5.691

Thus, with the help of bound test value, it has been concluded that there exists cointegration among the variables and long-run and short-run coefficients can be estimated.

Long-run and Short-run Estimates

Table IX presents the empirical results of the ARDL model. It presents both the long-run and short-run estimates of the model. The calculation of the estimated long-run coefficients is given by equation 3.3.

$$rgdp_t=\delta_1+\delta_2 nepse_t+ \delta_3\, pop_t+\delta_4\, gfci_t+\delta_5\, pscr_t+\delta_6\, gte_t+\delta_7 dsav_t+\square_t \quad \text{----------------------(3.3)}$$

Finally, after confirming the long-run relationship, an error correction representation exists which is estimated from the following reduced form equation 3.4.

$$\Delta rgdp_t = \sum_{i=1}^{p} \theta_1 \Delta rgdp_{t-1} + \sum_{i=1}^{q1} \varpi_i \Delta nepse_{t-1} + \sum_{i=0}^{q2} \pi_i \Delta pop_{t-1} + \sum_{i=1}^{q1} \tau_i \Delta gfci_{t-1} +$$
$$\sum_{i=1}^{q1} \varkappa_i \Delta pscr_{t-1} + \sum_{i=1}^{q1} \phi_i gte_{t-1} + \sum_{i=1}^{q1} \psi_i \Delta dsav_{t-1} + \eta ECT_{t-1} \text{---------------------------- (3.4)}$$

The long-run coefficients of the model conform that stock return has a statistically significant positive effect on the economic growth of Nepal, though the coefficient is marginally insignificant, i.e., 0.02. A one percent increase in NEPSE return results in an increase of economic growth by about 0.02 percent. This sign of the coefficient of the stock price is positive and in accordance with the theory which is also confirmed by the studies of Cole *et al.* (2008), Beck and Levine (2004), and Zhou *et al.* (2012). A 1 percent increase in gross capital investment results in an increase in economic growth by about 2.35 percent. However, the long-run coefficient of government total expenditure is negative and significant as expected. The increase in government size would harm economic growth through higher tax burden and high reliance on public debt that might ultimately result in a "crowding out" effect. The significant negative coefficient of banking credit to the private sector implies structural and governance issues in the transmission mechanism of monetary policy through the credit channel in Nepal.

Table IX
Long-run and Short-run Estimation Results

*This table presents empirical estimates of ARDL model. Panel (A) of the table reports long-run coefficients and panel (B) reports short-run coefficients of the ARDL (1, 1, 2, 1, 2, 1, 2) model. The dependent variable is GDP growth rate. The significance of the coefficients is denoted by the * sign. Any coefficient with the * indicates significant at 10 percent level, ** significant at five percent level and *** significant at one percent level. The CointEq(-1) in short run estimates represent error correction term (ECT) indicates the speed of recovery in the short-term if there is a divergence in the long-run equilibrium.*

Panel (A) Long-run estimates ARDL lag selection (1, 1, 2, 1, 2, 1, 2)			Panel (B) Short-run estimates ARDL lag selection (1, 1, 2, 1, 2, 1, 2)		
Variable	Co-efficient	t-Stat	Variable	Co-efficient	t-Stat
NEPSE	0.02***	9.68	D(NEPSE)	-0.004***	-5.064773
POP	1.47***	13.96	D(POP)	12.21***	29.12314
GFCI	2.35***	10.61	D(POP(-1))	-18.97***	-35.37430
PSCR	-1.44***	-9.97	D(GFCI)	2.51***	34.58765
GTE	-0.76***	-9.76	D(PSCR)	-1.60***	-33.68774
DSAV	0.02**	3.95	D(PSCR(-1))	-0.03***	-8.643996
C	-0.74**	-3.12	D(GTE)	-0.81***	-33.19437
			D(DSAV)	0.03***	30.30048
D-W stat	2.76		D(DSAV(-1))	0.008***	5.746367
			CointEq(-1)*	-1.82***	-50.47316
			R^2	0.99	

After the confirmation of the long-run relationship, the next step is to estimate the confirmation of the error correction term, which must be smaller than the unity in absolute term and should be negative and statistically significant. As it has been observed from Table VII, the error correction term (-1.82) satisfies only two conditions, i.e., non-positive and statistically significant. However, the term is not less than unity in the case of Nepal.

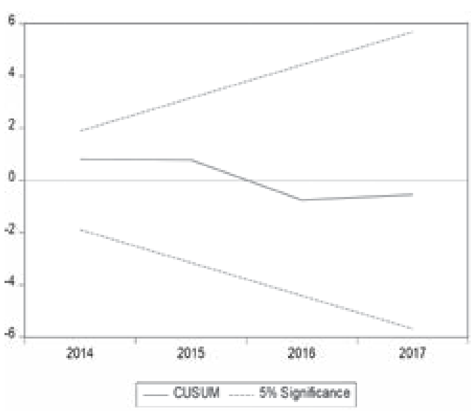
The error correction term indicates the speed of adjustment in the short-term if there is a divergence in the long-run equilibrium. Though the term is significant and negative, there are arguments about the size of the coefficient. Some argue that the coefficient in a small sample size with annual data has a normal tendency of greater than one negative value. A similar finding has been reported by Ashfaq and Padda (2019) in the public debt-growth relationship where the ECT coefficient is -2.48. The coefficient of ECT, -1.82, suggests that the system corrects its previous period disequilibrium at a speed of 182 percent. In this case, the findings indicate that the speed of adjustment of disequilibrium correction for reaching long-run equilibrium steady state.

To establish the stability of the ARDL model, sensitivity analysis conducted to make sure that there is no serial correlation among the regressors, the model is properly specified, and that it is free from heteroscedasticity. The stability test is conducted by employing the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUM squares) confirmed that the model is stable. The diagnostic test results of the model are presented in Table X and Figures II and III.

Table X
Results of Diagnostic Test

*This table provides the results of diagnostic test to confirm the stability of the OLS estimate (Model Five). The null of no serial correlation and no Heteroskedasticity are tested using Breusch-Godfrey serial correlation test and Breush-Pagan- Godfrey test respectively. Any significant chi-square and F-statistic denoted by the * provides no statistical reason to accept null hypothesis. P-values of the statistic are provided within the parentheses.*

Diagnostic test	Ch-square	F-Statistic
Breusch-Godfrey Serial Correlation LM Test	17.99	5.98
	(0.001)	(0.14)
Heteroskedasticity: Breuch-Pagan-Godfrey test	15.66	0.73
	(0.47)	(0.70)



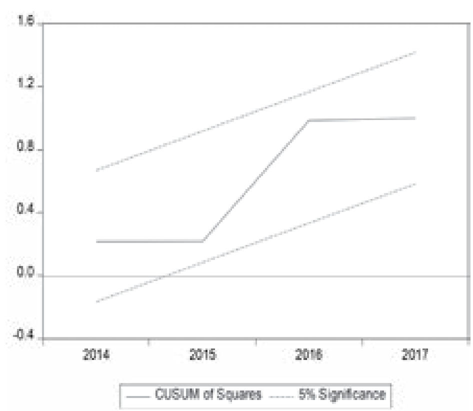


Figure II: Results of CUSUM test Figure III: Results of CUSUM of squares test

It is clear that there is no serial correlation among the residuals if the F-statistic of the Breusch-Godfrey Serial Correlation LM Test has been taken into consideration. However, observed Chi-square value implies the serial correlation in the residual of the model. The test for heteroscedasticity confirms that residuals are homoscedastic.

While this functional form is intuitively appealing, it might seem somewhat restrictive, raising number of issues involved in the econometric estimation. In most countries, the test of whether there is a long-run relationship between GDP and stock prices (based on cointegration using the Johansen approach or on the estimation of parameters in an autoregressive distributive lag regression) failed to yield a clear cut long-run relationship with sensible coefficients (Mauro, 2000). In this study, the error correction term also shows greater than one value and signifies the inherent serial correlation in residuals.

IV. Summary and Conclusion

This study examines the nature of the relationship between stock market returns and the annual GDP growth rate in Nepal. The results show that there is a univariate positive and significant relationship between output growth and one-year lagged stock returns in Nepal. This result is consistent with Mauro (2000) that observes this association in a variety of countries at different stages of economic and financial development. However, the non-significant coefficient of stock market returns with control variables in OLS estimates shows that the Nepalese stock market is not yet totally aligned with the economy to predict the output growth with current market performance.

This study also provides evidence of the long-run equilibrium relationship between stock returns and GDP growth using the ARDL estimation technique. The model indicates two important implications: First, the current year's stock return can be useful to predict GDP growth of next to the coming years. Though the long-term coefficient is marginally very small, it gives an indication of the alignment of the Nepalese economy with stock market performance. The speed of adjustment, while violating the short-term equilibrium, is quite high in magnitude and statistically significant. The results confirm the structural problems in the stock markets in Nepal. One of the major issues is the absence of high-frequency data, especially in the real sector. The relationship between quarterly GDP and stock returns could provide more robust estimation with the availability of such high-frequency data. Second, the motivation and institutional mechanism of entering real sector entities into the stock markets for mobilisation of capital is not appealing. This further implies that there is a need of reforms and improvements in the area of the institution, legal and regulatory fields, and technology to develop an efficient stock markets by increasing the participation of real sector public limited companies capable to have a predictive power of output performance in the economy as a leading indicator.

REFERENCES

Anyanwu, J. C. (2014). Factors affecting economic growth in Africa: Are there any lessons from China? *African Development Review 26 (3)*, 468-493.

Barro, R. (1990). The stock market and investment. *The Review of Financial Studies, 3*(1), 115-131.

Bayraktar, B. (2006). Investigation on sources of growth for Turkey. *Canadian Journal of Devel opment, 27 (1)*, 25-38.

Beck, T., & Levine, R. (2004). Stock markets, banks and growth: Panel evidence. *Journal of Banking and Finance, 28(3)*(28), 423-442.

Beck, T., Levine, R., & Loyaza, N. (2000). Finance and the sources of growth. *Journal of Financial Economics, 58(1-2)*, 261-300.

Bhaskara-Rao, R., & Hassan, G. (2011). Determinants of the long-run growth rate of Bangladesh. *Applied Economics Letters 18*, 655-658.

Bhatta, G. P. (2009). *Stock market efficiency in Nepal.* Unpublished PhD Thesis: Tribhuwan University, Nepal.

Bista, J. P. (2017). Stcok market development and economic growth in Nepal: An ARDL representation. *Journal of Finance and Economics, 5*(4), 164-170.

Blanchard, O., Rhee, C., & Summers, L. (1993). The stock market, profit and investment. *Quarterly Journal of Economics, 108(1)*, 116-136.

Boyd, J., Levine, R., & Smith, B. (2001). The impact of inflation on financial sector performance. *Journal of Monetary Economics, 47(2)*, 221-248.

Bumann, S., Hermes, N., & Lensink, R. (2013). Financial liberalization and economic growth: A meta-analysis. *Journal of International Money and Finance, 33*, 255-281.

Chang, C., & Mendy, M. (2012). Economic growth and openness in Africa: What is the empirical relationship? *Applied Economics Letters, 19 (18)*, 1903-1907.

Chen, B., & Feng, Y. (2000). Determinants of economic growth in China: Private enterprise, education, and openness. *China Economic Review, 11*, 1-15.

Chen, N. (1991). Financial investment opportunities and the macroeconomy. *Journal of Finance, 46(2)*, 529-554.

Chen, S. (2009). Predicting the bear stock market: macroeconomic variables as leading indicators. *Journal of Banking and Finance, 33(2)*, 211-223.

Cole, R., Moshirian, F., & Wu, Q. (2008). Bank stock returns and economic growth. *Journal of Banking and Finance, 32(6)*, 995-1007 DOI: 10.1016/j.jbankfin.2007.07.006.

Devkota, T., & Dhungana, A. (2019). Impact of macroeconomic variables on stock market in Nepal: An ARDL approach. *NECS, The Journal of Economic Concern, 10(1)*, 47-64.

Dewan Muktadir-Al-Mukit, M., Uddin, M., Islam, M. T., & Arif, M. Z. (2014). Stock market development and economic growth: An evidence from SAARC countries. *International Journal of Management, 3*(1), 45-60.

Dollar, D. (1992). Outward-oriented developing economies really do grow more rapidly: Evidence form 95 LDCs, 1976-1985. *Economic Development and Cultural Change, 40 (3)*, 523-544.

Engle, R. F., & Granger, C. W. (1987). Cointegration and error correction: Representation, estimation and testing. *Econometrica, 55(2)*, 251-276.

Fama, E. F. (1990). Stock returns, expected returns and real activity. *Journal of Finance, 45(4)*, 1089-1108.

Fetahi-Vehapi, M., Sadiku, L., & Petkovski, M. (2015). Empirical analysis of the effects of trade openness on economic growth: An evidence of South East European countries. *Procedia Economics and Finance, 19*, 17-26 .

Fischer, S. (1992). Macroeconomic stability and growth. *Cuadernos de Economía, 29 (87)*, 171-186.

Fischer, S., & Merton, R. C. (1984). Macro economic and finance: The role of the stock market. *Carnegie-Rochester Conference Series on Public Policy, 21*, 57-108.

Flannery, M. J., & Protopapadakis, A. A. (2002). Macroeconomic factors do influence aggregate stock returns. *Review of Financial Studies, 15(3)*, 751-782.

GC, S. B., & Neupane, S. (2006). Stock market and economic development: A causality test. *The Journal of Nepalese Business Studies, 3*(1), 36-44.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate data analysis (3rd ed).* New York: Macmillan.

Hamilton, J. D., & Monteagudo, J. (1998). The augmented Solow model and the productivity slowdown. *Journal of Mon*

Hsiao, C. (2005). Why panel data. *Singapore Economic Review, 50(2)*, 143-154.

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica, 59(6)*, 1551-1580.

Levine, R., & Zervos, S. (1998). Stock markets, banks, and economic growth. *American Economic Review, 88(3)*, 537–58.

Levine, R., Loayza, N., & Beck, T. (2000). Financial intermediation and growth: causality and causes. *Journal of Monetary Economics, 46 (1)*, 31-77.

Mauro, P. (2000). *Stock returns and output growth in emerging and advanced economies.* IMF Working Paper. Washington: IMF.

Most, S. J., & Vann de Berg, H. (1996). Growth in Africa: Does the source of investment financing matter? *Applied Economics 28 (11)*, 1427-1433.

Narayan, P. K. (2005). The saving and investment nexus in China: evidence from cointegration tests. *Applied Economics, 37(17)*, 1979-1990.

Panta, B. P. (2020). Macroeconomic determinants of stock market prices in Nepal. *Quest Journal of Management and Social Sciences, 2(1)*, 64-79 .

Pesaran, M. H., & Shin, Y. (1995). *An Autoreressive Distributed Lag Modeling Approach to Cointegration Analysis.* University of Cambridge: DAE Working Paper No.9514.

Pesaran, M. H., Shin, Y., & Smith, R. J. (1996). *Testing for the Existence of a long-run Relationship.* Cambridge: Cambridge Working Papers in Economics, 9622.

Pesaran, M., Shin, Y., & Smith, R. J. (2001). Bound testing approach to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326.

Phuyal, N. (2016). Can macroeconomic variables explain long term stock market movements? A study of Nepali capital market. *Journal of Business and Management Research, 1(1)*, 26-38.

Pradhan, R. S., & KC., S. (2010). Efficient market hypothesis and behaviour of share prices: The Nepalese evidence. *SEBON Journal, 4*, 104-117.

Rana, S. B. (2014). Stock market size, liquidity and economic growth in Nepal. *The KIC Journal of Management and Economic Review, 1*(2), 1-13.

Regmi, U. R. (2012). Stock market development and economic growth: Empirical evidence from

Nepal. *Administration and Management Review, 24*(1), 1-28.

Romer, P. (1986). Increasing returns and long-run Growth. *Journal of Political Economy, 94 (5)*, 1002-1037.

Romer, P. (1990). Endogenous technological change. *Journal of Political Economy, 98 (5)*, 71-102.

Sachs, J. D., & Warner, A. M. (1997). Fundamental sources of long-run growth. *The American Economic Review, 87 (2)*, 184-188.

Shrestha, P., & Subedi, B. (2014). Determinants of stock market performance in Nepal. *NRB Economic Review 26 (2)*, 25-40.

Sirucek, M. (2012). Macroeconomic Variables and Stock Market: US Riview. *Munich Personal RePec Achive (MPRA)*, 1-9.

Solow, R. (1956). A contribution to the theory of economic growth. *Oxford Review of Economic Policy 23 (1)*, 3-14.

World Bank. (1990). Adjustment lending policies for sustainable growth. *Policy and Research Series, Washington D. C., World Bank*.

Zhou, C., Wu, C., Li, D., & Chen, Z. (2012). Insurance stock returns and economic growth. *The Genewa Papers on Risk and Insurance-Issue Practice, 37*, 405-428.