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An Exploration of the Finance -Growth Nexus: Long Run and Causality Evidences from Selected Countries of SAARC Region

Abdur Rehman[1] and Dr.Ahmed Raza Cheema[2]
rehmansargodha@yahoo.com , cheemaahmed_raza@yahoo.com
[1] Researcher is working with a leading financial institution in Pakistan.
[2] Assistant Professor at Department of Economics University of Sargodha, Sargodha, Pakistan.

Abstract
The debate on direction of Granger causality between financial development and real sector growth has been growing issue since 1980's. Researchers are fanatical to empirically discern long run and casual relationship for devising economic policies. This study empirically investigated the finance growth nexus and Causality in the selected countries of SAARC region (Pakistan, India, Nepal and Sri Lanka) using the yearly data set from 1975-2009. The study employed the variables of banking sector as a proxy to financial development. Results of Maddala & Wu and Kao co-integration tests confirm that long run relationship exists between the financial and real sector variables. Result of Causality shows that it runs from real sector growth to financial sector development through proxy of Ratio of Liquid Liabilities to GDP per capita, Ratio of Private Credit by Deposit Money Banks and Financial Institutions to GDP per capita, Ratio of Bank deposits to GDP per capita and Ratio of commercial bank assets to sum of commercial banks plus central bank assets in the SAARC region.
Keywords: Financial Sector Development, Real Sector Growth, Panel Co-Integration, VECM, Granger Causality, SAARC region

I-Introduction

Financial development is a process that extends & augments the financial services of banks and other financial institutions. With the sophistication of technology the role of financial intermediaries has become more important than before. Every government desires a well established and sophisticated financial sector since a strong and efficient financial system is a prerequisite of a state. It enables swift transfer of money from one destination to the other; offer more competitive products thereby increasing the flow of capital within the economy that results in augmenting real sector growth. Thus a more efficient and robust financial system provide proficient services that help to boost GDP per capita income.

In pursuit of a developed nation, developing countries join their hands together and establish regional associations with the objectives to enhance financial and real sector performance. A number of economic organizations & regions like SAARC, ASEAN, OECD, MENA, OIC, etc. were set up with one of the objective of economic growth and development. Following the triumphant practices of regional associations, SAARC organization was established on Dec 08, 1985. The founder members of the organization were India, Pakistan, Nepal, Sri Lanka, Bhutan and Maldives. Later on Afghanistan joined the regional association in April 2007. The prime objective of the SAARC region was to accelerate economic and social development. The other objectives were to improve quality of life, self-reliance and mutual economic assistance.

SAARC countries in the late 1980's and early 1990's had implemented reforms to restructure their financial sector proposed by the international financial institutions and in line with financial steps taken by industry. The main reforms were based on privatization of government owned financial institution to reduce the state intervention in financial decisions (Qayyum: 2007, Khan and Khan: 2007, Lawrence & Longjam: 2003, Ghatak: 1997, Gajurel & Pradhan: 2012).

In this context a number of researchers probed the linkage between financial development and economic growth on the basis of regions, both in time series and cross sectional context. Naceur and Ghazouani (2007), Abu - Bader and Abu -Qarn (2008) investigated the MENA region, Ramlal and Watson (2005) CARICOM region, Akinlo and Egbetunde (2010) sub Saharan African region, Shan and Morris (2002), Hassan *et al* (2011) OECD countries, Fase and Abma (2003) South East Asia ,Atindehou *et al* (2005) West African states are few among others. But a very little work has been found in the literature that traced the finance growth nexus in the SAARC region. The main economic indicators of SAARC selected countries are given in Table 1.

Table 1 Real Sector Indicators of Selected Countries of SAARC

Real Sector Indicators				
Indicator	**India**	**Nepal**	**Pakistan**	**Sri Lanka**
Population(In Millions)	1214.5	29.9	184.8	20.4
GDP US$(Billion)	1538	15.8	174.9	49.7
GDP/Capita (US$)	1265	562	1050	2435
GDP(PPP) as share of % world total	5.40	0.05	0.63	0.14

Source The World Competitive Report 2011-2012, The World Economic Forum Geneva, data has been compiled by the Author.

The above data shows main economic indicators of the countries selected for empirical analysis. India is the most populated country and hence her GDP in $ amounts is higher among other countries. Gross domestic product per inhabitant is higher in Sri Lanka and that of Nepal is lowest among these countries.

Strengthening the banking sector is pivotal issue in developing and emerging economies as financial sector leads economic growth through one of banking channel i.e. mobilization of savings (King and Levine, 1993; Rajan and Zingales, 1998). This study investigates finance growth nexus in selected countries of SAARC region. The study empirically probed the following research questions.

RQ_1: *Is there any Long Run relationship between financial development and real sector growth in selected countries of SAARC Region?*

RQ_2: *Is there any Granger Casual relationship between financial development and real sector growth in selected countries of SAARC Region?*

The rest of the paper is organized as follows; Section-II deals with literature review on finance growth nexus, Section-III with variables, data sources, Section-IV deals with econometric methodology & economic framework and last section deals with discussion on outcome of empirical research and conclusion of study.

II-Literature Review

Financial sector plays an important role in the real sector development of a country. A large body of research investigated the sources of financial development that pave the path for real sector growth. The studies that traced the finance growth relationship through banking sector proxies, few among others are Demetriades and Hussein (1996); Arestis and Demetriades, 1997 King and Levine (1993) Beck *et al* (2000) Christopoulos and Tsionas (2004); Apergis *et al* (2007), Ramlal and Watson (2005), Lartey and Farka (2011), Fase and Abma (2003), Habibullah and Eng (2006) and Acharya *et al* (2009). The results of empirical research showed that there exists a positive relationship between financial development and real sector growth. At the same time few suggested a weak relationship between financial development and economic growth Atindehou *et al* (2005).

Demetriades and Hussein (1996) probed causal relationship between financial development and economic growth. The co-integration technique and Maximum likelihood methods were employed on banking sector variables. The result showed that financial sector was a leading sector in Sri Lanka, Honduras and Spain. In Venezuela, Guantemala, Thailand, Honduras, Korea, India and Mauritius causality suggested a bi-directional relationship between financial and real sector growth. The result suggested that financial sector is not a leading sector in countries i.e. Grace, Turkey, Pakistan, South Africa, El Salvador and Portugal. Furthermore, Korea and Thailand exhibited a bi-directional causation, reflecting that both real and financial sector contributed in the growth process.

Ram (1999) investigated the relationship on 95 countries data set for the period from 1960-1989. The result showed an existence of positive correlation between financial development and real sector growth in 39 countries and negative in remaining 56. The study concluded a weak relationship. Furthermore, result showed that if liquidity is increased in low and medium income countries growth rate shall also increase.

Shan and Morris (2002) investigated the relationship between indicators of financial development and real sector growth. The authors used sample of 19 OECD countries along with China & South Korea by taking time series data from 1985-1998. The results of VAR Model suggested that i) uni-directional causality in Finland and Portugal from total credit to real sector growth. ii) China, Italy, South Korea and Canada depicted causality from real sector to credit iii) Bi-directional causation in USA, Japan, Australia and Denmark. Christopoulos and Tsionas (2004) investigated long run relationship between financial development and economic growth by using both time series and cross section data over the period from 1970-2000 on ten developing countries. Both cross section and time series test provided a unique co-integration vector. The uni-directional causality was observed from financial depth to economic growth. The test inferences provide evidence in favor of existence of long run relationship between output and financial depth. A causal relationship was found from financial depth to output, which is uni-directional. Moreover, a short run relationship was observed between output and financial depth.

Arestis *et al* (2004) probed whether financial structure of a country influence real sector growth or not. The

result suggests the existence of a long run relationship among the variables. The financial structure explains real growth process. Ramlal and Watson (2005) examined the relationship on quarterly data for the period 1970-2002 for Barbados, Trinidad & Tobago and Jamaica. The variables used in study were Broad Money divided by GDP, domestic credit to private sector divided by GDP and Per capita growth in real GDP. The causality inferences showed a bi -directional causation between financial development and economic growth.

Liu and Hsu (2006) probed the relationship for Japan, Taiwan and Korea on quarterly data set from 1971 to 2001. Results suggest that financial sector played significant effects on the real sector growth of Taiwan whereas no role was observed in economic growth of Japan and Korea. Acharya *et al* (2009) examined the relationship on panel data set of nine Indian states. The study found that a long run relationship exists between real sector growth and financial development. The direction of casualty runs from real sector growth to credit. Hassan *et al* (2011a) probed the relationship on time series pattern of 68 countries from 1980-2007. The results suggested a long run linkage between economic growth and financial development in developing countries. OECD countries with highest values showed the existence of larger financial system. Whereas indicators of credit available to private sector and availability of liquid liabilities in south Asia and sub Saharan African region showed low financial depth. Both domestic credit to private sector and domestic credit to banking sector were positively linked with real sector growth. The Granger results showed bi-directional causality between financial development and economic growth in all the regions except East Asia and Sub Saharan African, where uni – directional causality from finance to growth exists.

Fukuda and Dahalan (2011) studied the finance growth nexus on Mexico, India and Indonesia. The study used proxies of Money supply, private credit by deposit money banks assets to measure financial development. Furthermore, causal relationship between finance and growth was bi-directional in India, unidirectional in Indonesia from finance to growth and a complex relationship exists in Mexico as both variables behaved negatively. Ellahi and Khan (2011) investigated the possible relationship in selected countries of SAARC region. The study employed Autoregressive distributive lag (ARDL) approach to find the long run relationship. The results suggest that financial reforms impacts positively in Pakistan, India and Sri Lanka. The one way causality runs from real sector growth to financial development.

Many authors attempted to trace the relationship through various techniques that empirically probed on different countries & regions. The literature on finance growth nexus showed that researchers used both time series and panel data techniques to investigate the linkage. The researcher that based their work on time series techniques are, Demetriades and Hussein (1996), Rousseau and Wachtel (2000),Rousseau and Xiao(2007) and those who applied cross section data examination techniques were King and Levine(1993), Levine (1997),Levine *et al* (2000),Beck *et al* (2000),Christopoulos and Tsionas(2004) ,Beck *et al* (2009),Naceur and Ghazouani(2007),Beck and Levine (2004),Jamil (2010),Jude (2010),Handa and Khan (2008),Shan and Morris (2002),Cole *et al* (2008). However, the general consensus of the researchers is that there exists a long run relationship between financial and real sector.

III-Proxies of financial development and real sector growth, Data Sources

3.1 Data and its Sources

This study found the relationship between financial development and economic growth on the selected countries of South Asian Association for Regional co-operation (SAARC). The data on selected variables was obtained for 35 years from 1975-2009 on Pakistan, India, Sri Lanka and Nepal. Since said study combines the Time Period (T) and Cross Section (N) , it was difficult to find the data for a period of study resultantly study constrained to analyze on four countries due to unavailability of data for the rest. Following the practices in literature of Luintel *et al* (2008), Jamil (2010), data has been obtained from the World Banks Beck *et al* (2009) Financial Structure Dataset .Whereas the data on Ratio of GDP to per capita on Current US $ has been obtained from World Bank development indicators database. Only GDP is taken in the logarithmic form.

3.2 Indicators of financial development and real sector growth

In this study, financial development role is measured by employing banking sector indicators and that of real sector through GDP per capita (Current US $). This study used indicators that represent financial sector size, activity, credit distribution and efficiency. These are **1)** - Ratio of Liquid Liabilities to GDP per capita (LL), which captures the absolute size of financial intermediation. This indicator measures the relative size of the financial sector with that of economy and hence indicator of financial depth of the economy. **2)** -Ratio of Private Credit by Deposit Money Banks and Financial Institutions to GDP per capita (PRVCR) captures the activity of financial intermediation. It highlights the role of financial intermediaries in credit disbursement within the economy (it excludes credit extended to central, provisional and local governments and other public sector entrepreneurs). **3)** -Ratio of Commercial Bank Assets to Central Bank Assets plus Commercial Bank Assets (DMBCBA), this indicator is a symbol of society's allocation of savings in the banking channels. It separates the role of monetary authorities with that of commercial banks to channelize the assets for economic growth and

measures comparative magnitude of in financial sector. **4)** -Ratio of Bank Deposits to GDP (BD) shows the availability of resources with commercial banks for extending loans to private sector and finally **5)** - Ratio of GDP per Capita Income **(GDP),** used to measure real sector growth. The expected signs of these indicators are positive with GDP growth as all these variables augment it. The descriptive statistics on yearly data set from 1975-2009 used in this research is given below in table No.2.

Table 2 Descriptive Statistic of Sample

	GDP	LL	PRVCR	DMBACBA	BD
Mean	5.894625	0.388969	0.222691	0.761462	0.294815
Maximum	7.629059	1.007257	0.653153	0.984048	0.826217
Minimum	4.591338	0.123428	0.037150	0.492064	0.064662
Std. Dev.	0.62549t5	0.137003	0.095323	0.119491	0.121750
Observations	140	140	140	140	140

As far as SAARC region is concerned a little attention has been paid to find the long run relationship and causality among the variables of financial and real sector growth. Therefore, this paper wants to trace the co-integration and Granger causality between financial intermediaries and real sector growth variables in the selected countries of SAARC region.

IV-Econometric Methodology and Framework

Study is based on Panel data technique to find the relationship between economic growth and financial development. This study estimated relationship by using the following model.

$$ESG = f(FSD)$$

Where, ESG = Economic Sector Growth & FSD = Financial Sector Development.

Equation can be written as

$$GDP_{it} = f(PRVCR_{it}, LL_{it}, BD_{it}, DMBCBA_{it,})$$

Where

GDP_{it} =Gross Domestic Product per Capita

$PRVCR_{it}$ =Ratio of Private Credit by Deposit Money Bank and Other Financial Institutions to GDP per Capita

LL_{it} = Ratio of Liquid Liabilities to GDP per Capita

BD_{it} = Ratio of Bank Deposits to GDP per Capita

$DMBCBA_{it}$ = Ratio of Commercial Bank Assets to sum of Deposit Money Bank Assets plus Central Bank Assets

The economic relationship can be expressed in the form of econometric equation as

$$GDP_{it} = \beta_0 + \beta_1 PRVCR_{it} + \beta_2 LL_{it} + \beta_3 BD_{it} + \beta_4 DMBCBA_{it} + e_{it}$$

In the above Model $i = 1...4$ **&** $t = 1...35$ i.e. i is cross sections i.e. India (IND), Nepal (NPL), Pakistan (PAK) and Sri Lanka (LKA) and the time period (t) is from 1975-2009.

The objective of study is to find the Casual long run relationship between variables of economic growth and financial intermediation .It revolve around three steps i.e., First, stationarity of the variables checked with various Panel unit root methods namely Im, Pesaran & Shin (2003), ADF Fisher Chi Square, Phillips-Perron Fisher Test (1999).Second, as variables are stationary at first difference, study tested for co-integration using Maddala and Wu (1999) Johansen methodology of Fisher type and Kao (1999) approach. Third, Granger causality test applied through Vector Error Correction Model (VECM) to find the direction of causation between financial development and economic growth.

4.1 Panel Unit Root

It is a standard practice in literature to check stationarity of time series data to be investigated. The literature suggests that panel based unit root tests have higher power than that of time series, see Breitung (2000), Levin, Lin and Chu (2002), Im, Pesaran and Shin(2003),Baltagi(2005),and Wang (2009) . Granger and Newbold (1974), Stock and Watson (1988) found that estimation with non-stationary data provides spurious regression and produce usual test statistic as unreliable and unauthenticated. No economic meaning among the variables can be concluded in the presence of Unit root. Further the Mean, variance and co-variance of non-stationary series are time variant thus provide ambiguous results. Dickey *et al* (1991) found that trended series creates problems for econometric interpretations that conclude spurious relationship among variables and provides inconsistent results on regression of one variable on another. Granger (1986) suggested that non-stationary series can be made stationary if differenced properly and such procedure is known as Order of Integration.

Study employed Panel unit root tests proposed by 1) -Im, Pesaran & Shin W -stat 2) -Maddala and Wu ADF Fisher Chi Square Test and 3) - Maddala and Wu Phillips-Perron Fisher Chi Square Test. These tests are known as first generation panel unit root tests and are based on cross sectional independence assumption (Hurlin and Mignon 2006). The Null Hypothesis in ADF Fisher Chi Square, PP Fisher Chi square and Im, Pesaran & Shin test is of No unit root against alternative that some cross sections without unit root .These tests are based on individual unit root process that allow for different auto regressive coefficient in the series. Study employed above tests on individual intercept, individual intercept & trend.

4.1.1 Im, Pesaran and Shin W statistic

IPS test is named after the contribution of Im, Pesaran and Shin (2003). This test is based on the assumption of Null Hypothesis that series contains a unit root for all countries with alternative that a fraction of panel series is stationary i.e. it allows heterogeneous co-efficient. The said test assumes balanced panel and have following specific equation

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{i,t\ j} + \varepsilon_{it} \quad \text{Where i} = 1. . .N \text{ and } t = 1. . .T$$

The said test allows separate non-stationary test for each cross section unit. It is also based on the Augmented Dickey-Fuller test averaged on cross sections of panel. In IPS test *"t"* is nothing than average of individual cross sections ADF *t* statistic. The specific equation is as follows

$$\bar{t}_{NT} = \frac{1}{N} \sum_{i=1}^{N} t_{iT} \ (p_i \beta_i)$$

In IPS test, study shall reject the null hypothesis when *t –bar* is smaller than critical value from lower tail of a standard normal distribution. If *t-bar* is significant then study concludes to reject null hypothesis or panel data is stationary. Otherwise, if *t-bar* is not significant then conclude to accept null hypothesis or panel data has unit root.

4.1.2 ADF Fisher Chi Square and PP Fisher Chi Square

Maddala and Wu (1999) type *ADF* Fisher *Chi-square panel unit root* test and Fisher *PP Chi-square panel unit root* tests are based on the R.A Fisher (1932) type tests. The assumption behind the test is cross sectional independence and has the following specific equation

$$P\lambda = -2 \sum_{i=1}^{N} \log_e p_i \text{ , Where}$$

p_i = panel unit root Fisher Type test

N = all cross-section N

$$-2 \sum_{i=1}^{N} \log_e p_i = \chi 2 \text{ distribution with d.f } 2N$$

The said test is based on Chi Square ($\chi 2$) distribution with 2N degree of freedom. The test is based on Augmented Dickey Fuller test. Benerjee (1999) found that said test is attractive due to choice of lag length and sample size.

4.2 Panel Co-integration

Granger (1988), Dickey *et al* (1991), Wang (2009) states that if there exists a stationary linear combination between the variables, a non-stationary series I (1) have a co-integration relationship i.e. one or more linear combinations are in stochastic process, if individually not. The said relationship is called long run equilibrium relationship among variables.

4.2.1 Maddala and Wu Co-integration Test

Maddala and Wu (1999) developed panel co-integration test by using Fisher's approach. This test is also known as combined Johansen test for panel co-integration. Like Panel unit root tests, this technique also gives the advantage of both time series (T) and cross sectional dimensions (N). It uses Fisher results to propose an alternative approach for co-integration to obtain test statistic for complete set of panel observations after combining the panel data from individual cross sections. It is based on the rank of matrix that determines the existence of number of co-integrating vectors. The specific equation form of Maddala and Wu test is as

$$\Delta Y_{i,t} = \Pi_i y_{i,t-1} + Tk \, \Delta Yi_{,t-k} + u_{i,t}$$

Maddala and Wu (1999) Johansen's co-integration test results are based on *p-values*. Johansen (1988) proposed two types of approaches in non-stationary time series to find co-integration relationship i.e. Fisher Likelihood Ratio trace statistic and Fisher maximum eigenvalue statistics. The specific form of equation for trace statistic is given below

$$\lambda_{trace}(r) = -T\sum_{r+1}^{n}\ln(1-\hat{\lambda}_i)$$

In the above trace statistics T represents sample size and $\hat{\lambda}_i$ estimates characteristic root. The equation for maximum eigenvalue is given as under.

$$\lambda_{\max}(r, r+1) = -T\ln(1-\hat{\lambda}_{r+1})$$

In Maddala and Wu type Johansen Fisher test, the Null and alternative hypothesis in trace statics are as under

$$H_0 : rank(\pi) \le r(\text{at most r integrated vector}) \text{ and } H_1 : rank(\pi) > r(\text{at least r+1 integrated vector})$$

If test rejects Null hypothesis i.e. H_0 it means that there exists at least r+1 long term integrated relationship among the variables.

Whereas the specific form of Null and alternative hypothesis in maximum eigenvalue is as

$$H_0 : rank(\pi) \le r(\text{at most r integrated vector}) \text{ and } H_1 : rank(\pi) > r(\text{at least r+1 integrated vector})$$

In above maximum eigenvalue statistics, if test statistic accepts H_0 it means there exists *r* co-integrating vectors among variables. The hypothesis of said test statistic is that it do not have any co-integrated relationship that is *r* = 0. If accepted, then test has added the number of co-integrating variables till can't reject H_0 that means variables have *r* cointegrated vector. In the panel data set Fisher type Johansen test has following specific form, which measures existence of long run relationship between the economic growth and financial development variables .The said test uses the chi-square statistic to access the co-integrating vectors in the panel data. The test statistic uses *p-values*

$$CT = -2\sum_{i=1}^{N}\log_{\pi i} \quad H_0 = \text{No Co-integration}$$

4.3 Kao Co-Integration Test

Kao (1999) used both DF and ADF test for co-integration in panel. This test is similar to the standard approach adopted in the Engle Granger two step procedures. Test start with panel regression model as set out in following equation

$$Y_{it} = \alpha_i + \beta X_{it} + u_{it}$$

Where Y and X is presumed to be non-stationary and i=1,….., N and t=1,…., T

$$u_{it} = e\hat{u}_{it-1} + v_{it}$$

Where u_{it} = (Y_{it} - $X_{it}\hat{\beta}_{it}$ - $Z_{it}\hat{\gamma}$) are the residuals from estimating equation. The hypotheses in Kao test are as $H_{0:}\ \rho = 1$ null hypothesis of no co-integration between X and Y

And $H_{1:}\ \rho < 1$ Y and X are co-integrated.

Both Dickey Fuller -Type test statistics (DF) and Augmented Dickey Fuller (ADF) test statistics are used in Kao test to investigate co-integration in panel. Kao propose four specific Dickey Fuller (DF) type test statistic and one Augmented Dickey Fuller (ADF) type test statistic.

4.4 Granger Causality Tests

Co-integration tests of Maddala and Wu and Kao are able to indicate the existence of long run relationship among the variables only. The results of Co-integration establishes that a long run relationship exists but do not tell about the direction of causality. Direction of causality has specific importance in economic literature; therefore, it is necessary to find the direction of causality for finance growth nexus in selected countries of SAARC region.

Granger (1988) states that if two variables say X_{1t} and X_{2t} are co-integrated and each is stationary at first difference i.e. I (1) individually, then either X_{1t} Granger Causes X_{2t} or X_{2t} Granger causes X_{1t}.To find the direction of Causality for a panel based data Vector Error Correction Model (VECM) was employed using the Wald test. The VECM regresses the changes in both endogenous variables and exogenous variables on lagged deviations. VECM approach serves two basic purposes besides indicating direction of causality i.e. Short run causality and long run causality. If Granger causality exists then it tells about interdependence of variables of economic growth on financial development and vice versa. The Granger causality represents three types of relationships i.e.bi-directional or two way causality, uni -directional or one way causality and no causality. The specific form of the model is given as

$$\Delta GDP_{it} = \pi_{1j} + \sum_{p=1}^{m} \pi_{11ip} \Delta GDP_{it-p} + \sum_{p=1}^{m} \pi_{12ip} \Delta LL_{it-p} + \sum_{p=1}^{m} \pi_{13ip} \Delta PRVCR_{it-p} + \sum_{p=1}^{m} \Delta_{14} BD_{it-p} + \sum_{p=1}^{m} \Delta_{15} DMBCBA_{it-p} + u_{1i} ECT_{it-i} + e_{1it} \qquad (1)$$

$$\Delta LL_{it} = \pi_{2j} + \sum_{p=1}^{m} \pi_{21ip} \Delta LL_{it-p} + \sum_{p=1}^{m} \pi_{22ip} \Delta GDP_{it-p} + \sum_{p=1}^{m} \pi_{23ip} \Delta PRVCR_{it-p} + \sum_{p=1}^{m} \Delta_{24} BD_{it-p} + \sum_{p=1}^{m} \Delta_{25} DMBCBA_{it-p} + u_{2i} ECT_{it-i} + e_{2it} \qquad (2)$$

$$\Delta PRVCR_{it} = \pi_{3j} + \sum_{p=1}^{m} \pi_{31ip} \Delta PRVCR_{it-p} + \sum_{p=1}^{m} \pi_{32ip} \Delta LL_{it-p} + \sum_{p=1}^{m} \pi_{33ip} \Delta GDP_{it-p} + \sum_{p=1}^{m} \Delta_{34} BD_{it-p} + \sum_{p=1}^{m} \Delta_{35} DMBCBA_{it-p} + u_{3i} ECT_{it-i} + e_{3it} \qquad (3)$$

$$\Delta BD_{it} = \pi_{4j} + \sum_{p=1}^{m} \pi_{41ip} \Delta BD_{it-p} + \sum_{p=1}^{m} \pi_{42ip} \Delta LL_{it-p} + \sum_{p=1}^{m} \pi_{43ip} \Delta PRVCR_{it-p} + \sum_{p=1}^{m} \Delta_{44} GDP_{it-p} + \sum_{p=1}^{m} \Delta_{45} DMBCBA_{it-p} + u_{4i} ECT_{it-i} + e_{4it} \qquad (4)$$

$$\Delta DMBCBA_{it} = \pi_{5j} + \sum_{p=1}^{m} \pi_{51ip} \Delta DMBCBA_{it-p} + \sum_{p=1}^{m} \pi_{52ip} \Delta LL_{it-p} + \sum_{p=1}^{m} \pi_{53ip} \Delta PRVCR_{it-p} + \sum_{p=1}^{m} \Delta_{54} BD_{it-p} + \sum_{p=1}^{m} \Delta_{55} GDP_{it-p} + u_{5i} ECT_{it-i} + e_{5it} \qquad (5)$$

Where, Δ represents lag operator and P stands for lag length in the above VECM frame work. The above frame work allows for causality direction. ECT shows error correction term. The Error Correction Term (ECT) co-efficient i.e. $u_{1i} .. u_{6i}$, quantify tendency of each variable to return towards equilibrium position.

V-Empirical Results and Discussions

In this section the results obtained on finance growth nexus are discussed. At first step, in order to check stationary or non stationary of variables this study employed three panel Integration tests under the Null Hypothesis that series contain a unit root. Therefore, a rejection of Null hypothesis means that series does not have a unit root and is interpreted as evidence of stationary data. In unit root tests, lag order for determining the unit root process was based on automatic lag selection criteria i.e. Schawz Information Criteria (SIC) whereas Kernel method was based on Bartlett and Bandwidth selection was based to Newey-west method.

5.1 Results of Panel Unit Root Tests

This paper employed panel unit root tests of Im, Pesaran and Shin (2003), Maddala & Wu (1999) for both Fisher type using ADF and PP test .The results are given hereunder

Table 3 Panel Unit Root Tests

Variable	IPS		Fischer-ADF		Fischer-PP	
	Intercept Only	Intercept +Trend	Intercept Only	Intercept +Trend	Intercept Only	Intercept +Trend
LGDP	3.81055 (0.9999)	0.66801 (0.7479)	1.02575 (0.9981)	5.82907 (0.6664)	1.67029 (0.9895)	6.40848 (0.6016)
D(LGDP)	-9.44145*** (0.0000)	-8.88527*** (0.0000)	82.0179*** (0.0000)	71.1632*** (0.0000)	82.3167*** (0.0000)	71.6208*** (0.0000)
LL	5.85656 (1.0000)	4.41582 (1.0000)	8.34791 (0.4002)	16.4224** (0.0367)	3.62057 (0.8896)	3.25982 (0.9170)
D(LL)	-3.31762*** (0.0005)	-1.49697* (0.0672)	50.2467*** (0.0000)	28.5663*** (0.0004)	63.7977*** (0.0000)	127.941*** (0.0000)
PRVCR	3.08422 (0.9990)	1.67236 (0.9528)	5.94553 (0.6533)	8.64040 (0.3735)	2.12690 (0.9769)	2.66768 (0.9535)
D(PRVCR)	-1.43896* (0.0757)	-0.41527 (0.3390)	29.2178*** (0.0003)	21.3379*** (0.0063)	25.7203*** (0.0012)	18.2272** (0.0196)
DMBCBA	1.98763 (0.9766)	-0.76648 (0.2217)	1.72943 (0.9982)	11.9394 (0.1539)	1.85307 (0.9852)	7.89184 (0.4441)
D(DMBCBA)	-8.57410*** (0.000)	-7.97239*** (0.000)	73.3226*** (0.0000)	62.6574*** (0.0000)	78.4666*** (0.0000)	88.5860*** (0.0000)
BD	4.16866 (1.0000)	6.11223 (1.0000)	3.32625 (0.9122)	11.3906 (0.1805)	2.38337 (0.9669)	2.09608 (0.9779)
D(BD)	-2.61896** (0.0044)	-3.45664*** (0.0003)	41.8616*** (0.0000)	34.1647*** (0.0000)	52.7951*** (0.0000)	47.0435*** (0.0000)
Order of Integration	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)

***, ** and * denote significance at 1%, 5% and 10% significance level, respectively. *P-values* are reported in squared brackets. GDP is ratio of GDP to per captia income, LL is ratio of Liquid Liabilities to GDP per captia, PRVCR is ratio of Private credit by deposit money bank and other financial institutions to GDP per captia, BD is ratio of Bank Deposits to GDP per captia, and DMBCBA is the ratio of Deposit Money Bank Assets to Deposit Money Bank Assets plus Central Bank Assets

Table 3 depicts the results of IPS panel unit tests of Im *et al* (2003), Maddala and Wu type test of ADF Fisher and PP-Fischer (1999). The results show that variables employed are non-stationary at level except LL in ADF – Fischer test at intercept & trend. Therefore, study repeated the panel unit root tests on first difference in accordance with the guidelines of Granger (1974).The results of unit root employed on first difference unfolds that all variables are in non-stochastic trend at first difference. Therefore, study concluded that data series is in I (1) process.

Thus results of Panel unit root tests confirms that variables are non stationary at Level and stationary at First difference, therefore, the next step is to find the Panel co-integration tests. The first step is to find the appropriate lag length as Co-integration test of Maddala and Wu is sensitive to it. Lag order by various criteria are given below in Table 4.

Table 4 VAR Lag Order Selection Criteria

Lag	Log L	LR	FPE	AIC	SC	HQ
0	744.3129	NA	1.78e-11	-10.56161	-10.45655	-10.51892
1	1700.938	1831.254	2.96e-17	-23.87055	-23.24019	-23.61439
2	1773.905	134.4666	1.49e-17	-24.55578	-23.40013*	-24.08616*
3	1805.078	55.22155*	1.37e-17*	-24.64397*	-22.96303	-23.96089
4	1826.772	36.88056	1.45e-17	-24.59675	-22.39052	-23.70020
5	1846.433	32.01925	1.58e-17	-24.52048	-21.78895	-23.41047
6	1862.892	25.62826	1.81e-17	-24.39846	-21.14164	-23.07498
7	1884.632	32.29998	1.94e-17	-24.35189	-20.56978	-22.81495
8	1893.265	12.20974	2.52e-17	-24.11808	-19.81067	-22.36768

* indicates lag order selected by the criterion and LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

After finding the lag order the next step is to employee Maddala and Wu technique of Fisher type Johansen methodology and Kao test to find the co-integration in the Panel structure, detail of which are given hereunder.

5.2 Results of Co-integration

Granger (1988) suggested that if there exists a stationary linear combination between the variables, a non-stationary series I (1) have a co-integration relationship i.e. one or more linear combinations are in stochastic process, if individually not. Therefore, study performed panel co-integration test on variables of interest are in I (1) process. The results of panel co-integration are discussed in detail in the following table.

Table 5 Co-Integration Results

Hypothesis	Fischer Trace Statistics	Probability	Fischer Max Eigen Value Statistics	Probability
None	102.1***	(0.0000)	53.03***	(0.0000)
At Most 1	57.99***	(0.0000)	42.67***	(0.0000)
At Most 2	23.56**	(0.0027)	21.89**	(0.0051)
At Most 3	9.488	(0.3028)	8.915	(0.3495)
At Most 4	10.09	(0.2584)	10.09	(0.2584)
Kao Co-Integration Test				
Kao Test		t-Statistics	-3.058006**	(0.0011)

Notes: probabilities are computed using the asymptotic Chi-square distribution (Maddala and Wu) and t-Statistic (Kao test); p-values are shown immediately to the right of the relevant test statistic; ***, **, * indicate that the null hypothesis is rejected at 1, 5, and 10 percent, respectively.

The results highlighted in Table 5 are obtained from Maddala & Wu panel co-integration test (1999) and Kao test (1999). The study employed five variables that capture financial development and real sector growth. Therefore, there are chances of existence of at most four co-integrating relationships among the variables. Results of both Likelihood ratio trace statistics and maximum eigenvalue statistics are given against hypothesis of none, at most one, at most two, at most three, and at most four co-integration relationships. Both these statistics determines the co-integrating vectors in the non-stationary panels. The null hypothesis is of No co-integration in the panel dataset against the alternative that there exists a co-integration in the series. Lag order has been found by various criteria, the majority of which gives a lag order of 3.But this study has taken the lag order as 2 from Schwarz information criterion to save the loss of degree of freedom. The Likelihood ratio trace statistic is 102.1 at $r = 0$ i.e. for none co-integrating relationship, 57.99 at $r = 1$ i.e. for at most one, 23.56 at $r = 2$ for at most two, 9.488 at $r = 3$ for at most three, and 10.09 at $r = 4$ for at most four in the Likelihood trace statistic. The results of at most none, at most one and at most two co-integration trace statistics are significant at 1% level of significance. These results of trace statistic suggest that there exist at least two co-integrating vectors that establish a long run relationship among the variables of financial development and real sector growth in selected countries of SAARC region.

The results of maximum eigenvalue shows that test statistic is 53.03 at $r = 0$ for none co-integrating relationship, 42.67 at $r = 1$ for at most one, 21.89 at $r = 2$ for at most two, 8.915 at $r = 3$ for at most three,10.09 and at $r = 4$ for at most four in the maximum eigenvalue statistics. The results at none, at most one and at most two are significant at 1% level of significance. This test also suggests that there exists a long run relationship among variables and found two co-integrating vectors.

Both the results of Maddala and Wu test of co-integration i.e. likelihood trace statistic and eigenvalue statistic are statistically significant. This shows that there exists a co-integration relationship among the variables of financial intermediaries and economic sector growth. Thus, it is concluded that GDP per capita, liquid liabilities to GDP per capita, Private credit by deposit money bank and other financial institutions to GDP per capita, Bank deposits to GDP per capita and central bank assets as ratio of central bank assets plus domestic money bank assets have a co-integrating relationship. Therefore, financial development and real sector growth can led the economic growth in the long run, which is a positive and encouraging sign for the SAARC region.

Kao test statistics (1999) is employed as an alternative test to confirm the robustness of results. The results based on Kao ADF tests statistic also suggests that there exists a long run relationship as the "t" statistic value rejects the Null hypothesis of No co-integration at 1% level of significance. Both the panel co-integration tests of Maddala and Wu (1999) and Kao (1999) confirms that there exists a long run relationship between the variables of financial intermediaries and economic growth These variables can jointly pave the long run growth in the real sector of India, Nepal, Pakistan and Sri Lankan. These results are consistent with the findings of Christopoulos and Tsionas (2004) Cavenaile *et al* (2011) Levine and Zervos (1998) Iyare and Moore (2011) Akinlo and Egelunde (2010) Rahamn (2004) Arestis *et al* (2004) Acharya *et al* (2009).Rehman and Cheema (2013).

5.3 Results of Granger Causality

The section 5.2 empirically proved that a long run relationship exists among the variables .Granger concluded

that if there is a co-integration relationship then there must be causality, therefore, it is necessary to find the direction of causation among the finance growth indicators. The table no. 6 shows results of Vector Error Correction (VEC) Granger Causality /Block Wald test.

Table 6 Granger Causality-Wald Test

	LGDP	LL	PRVCR	DMBCBA	BD
LGDP		2.014446 (0.3652)	0.019158 (0.9905)	3.334568 (0.1888)	1.774359 (0.4118)
LL	6.408479** (0.0406)		0.004355 (0.9978)	2.754358 (0.2523)	3.029743 (0.2198)
PRVCR	5.269098* (0.0718)	0.593018 (0.7434)		3.925268 (0.1405)	1.750531 (0.4168)
DMBCBA	13.16978** (0.0014)	1.164253 (0.5587)	7.575196** (0.0227)		1.173810 (0.5560)
BD	6.490143** (0.0390)	1.758121 (0.4152)	0.031735 (0.9843)	2.608585 (0.2714)	

Notes:-Reported estimates are asymptotic Wald statistics. P-values is in parentheses ( ) showing level of significance at 10%, 5% and 01% by *, ** and *** respectively.

The result shows the causality among the variables of economic growth and financial development in the selected countries of SAARC region. The Granger causality result shows a uni -directional relationship from real sector development to liquid liabilities. The result demonstrates that GDP Granger cause to Liquid liabilities at 5% level of significance .It means that growth in GDP per capita play a significant role in the real sector of selected countries of SAARC region as it augment liquid liabilities which is a symbol of financial deepening. These results are consistent with the findings of Handa and Khan (2008) for Sri Lanka and Abu- Bader and Abu-Qarn (2008) for Israel who found that causality runs from GDP per capita to liquid liabilities in these countries. Results are inconsistent with Jamil (2010) for developed countries, Abu- Bader and Abu- Qarn (2008) for Algeria, Egypt, Morcco and Syria and Perera and Paudel (2009) for Sri Lanka. Furthermore, these results are also inconsistent with Jamil (2010) as well as with Handa and Khan (2008) for Pakistan that liquid liabilities do not have casual relationship with real sector growth.

The results of Granger causality showed that uni-directional causality exists between PRVCR and GDP in the Panel of SAARC countries. This causality runs from GDP to PRVCR at 10% level of significance .Results are consistent with the findings of Handa and Khan (2008) who found unidirectional causality from GDP to PRVCR in Sri Lanka , Shan and Morris (2002) found One way from economic growth to credit in Canada, China, Italy & Korea, Hassan et al (2011) , who found causality from growth to credit in Sub Sahara Africa and Algeria, Egypt and Morocco and with Rehman and Cheema (2013) who found one- way causality from growth to credit in Pakistan. Whereas these results are inconsistent with the findings of Handa and Khan (2008) for Pakistan, Shan and Morris (2002) for France, Greece, Ireland, Netherland, New Zeeland, Norway, Spain, Sweden, Switzerland and United Kingdom as no causality found. These results are also not consistent with the findings of Jamil (2010) who found bi-directional relationship between PRVCR and GDP in the panel of 76 countries. The same results also hold for developed countries where uni directional causality found in the sample of developing countries. Handa and Khan (2008) found bi-directional causality from GDP to PRVCR in India. Shan and Morris (2002) found two ways Causality in Australia, Denmark, Japan and USA, and One way from credit to economic Growth in Finland and Portugal. Hassan et al (2011), found uni-directional causality from PRVCR to growth in Sub Sahara Africa and Latin Asia, South Asia and Pacific regions Abu Badar and Abu Qarn (2008) found one way casualty from PRVCR to growth in Algeria, Egypt and Morocco. Atindehou et al (2005) found uni-directional causality from PRVCR to growth in Mauritania and Sierra Leone

Findings of Granger causality result shows that uni-directional causality exists between real sector growth and DMBCBA. The results are consistent with Ang and Mekibbin (2007), Zang and Kim(2007). These results are inconsistent with Bailliu (2000) who found yuni-directional from Assets to real sector growth, Jamil (2010) who found bi-directional causality with complete panel and uni-directional from assets to growth with the developed countries

The results of Granger causality through Vector Error Correction (VEC) Granger Causality /Block Wald tests runs from real sector to financial development through the variables of liquid Liabilities, DMBCBA and Banking sector deposits. It means that uni-directional causality runs from growth to finance in the SAARC region. With the increase in the GDP per capita in these countries the financial deepening and banking sector deposits shall increase. The role of commercial sector shall also enhance with real sector growth in the region.

5.4 Conclusion and policy Implications.

This study probed the possible long run as well as Granger casual relationship between financial development and economic growth in the selected countries of SAARC region. It examined finance growth linkage in India,

Nepal, Pakistan and Sri Lanka covering 35 yearly observations from 1975 to 2009. Empirical results based on Co-integration tests of Maddala & Wu and Kao *t*-statistics confirmed that long run finance-growth relationship exists in the SAARC region. One way causality was found that run from economic growth to financial development. The study concluded that the financial reforms that were started in late 1980's and early 1990's in SAARC countries were successful in achieving the targets. The policy implication is that these countries should devise the policies that promote economic growth in the region.

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