Contribution of Financial Development in Electricity-Growth Nexus in Pakistan

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Abstract: The perseverance of the paper is to scrutinize the causal connection within economic uplift and electricity consumption in Pakistan. There is a need to incorporate a third variable as a financial development in traditional electricity-growth model by creating a tri-variate causality framework; so the problem of omitted variables bias in this nexus has been eradicated. The application of co-integration along with vector error correction model in our study validates a uni-variate an extensive rise in causality in succession from electricity consumption towards financial development and economic development. These results spring strength to argument according to that Pakistan is a state which depends on energy. Every set back in the power supply retards the development process and in consequence the economy moves towards evil of backwardness. In addition, results show that financial development as well as economic development in Pakistan raises the electricity consumption, and the outcomes are applicable to all regardless of the long run causality observed in Pakistan. Hence the study commends geared headed for the expansion of power sector through FDI influx and Credit plans in order to handle the rising electricity call utilized by rapid industrialization and growth in the economy.

Key Words: electricity consumption; foreign direct investment; gross domestic product; financial development

JEL Classification: C33; O52; Q43

1. Introduction

The ties between electricity consumption, financial development and economic development have recently enduring to be claimed in energy-growth literature. This literature can be alienated into three streaks. In this paper the primary line of exploration emphases on the nexus amid economic evolution and energy consumption. This nexus advocates that economic progression and energy consumption may be mutually resolute, because higher economic progression necessitates more energy consumption. Similarly, more competent use of energy needs a upper level of economic growth. Therefore, the trend of interconnection may not be determined prior. Meanwhile the innovator Kraft and Kraft (1978), the

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Granger causality test method has become a prevalent tool for reviewing the affiliation between economic growth and energy consumption in unalike countries (Ghosh, 2010; Ozturk & Acaravci, 2010) and this takes to four experiment able hypotheses; (1) a causal relationship from energy consumption towards economic evolution, (2) a causal relationship from economic evolution towards energy, (3) a feed-back correlation within energy and GDP, and (4) no causal association within energy and economic evolution (neutrality).

Second area of this research is to scan the interrelationship within financial development by considering FDI and Economic evolution. It was considered that the FDI through capital accumulation plays a dominant role in uplift of the economy. However it's has been widely argued in the literature and has been considered as one of the fundamental concepts of economics. A number of studies have also been observed in the literature discussing the role of FDI in the capital formation, later used as a tool for evaluation of economic growth (Omri and Kahouli, 2013). A number of studies like Bloomstrom et al. (1996); Aitken et al. (1997); Lee and Chang (2009) defines the direction of causality from FDI towards economic development. Furthermore, studies like Hsiao and Shen (2003) also stress upon the importance of FDI in economic uplift by validating the economy's dependence upon this factor. In contrast few studies like Nguyen and Nguyen (2007); Anwar and Nguyen (2010) define the two way associationship between FDI and economic evolution by considering different nations of the world. Apart from such discussion, studies in this strand of literature also lead towards different results and it has been concluded that such difference is due to the country specific conditions (Zhang, 2001).

The third dimension of this research has scrutinized the associationship between financial development (FDI) and electricity consumption. In this regard, tang (2009) opt a stance that the influx of FDI encourage the demand of electricity through expansion of transportation, industrialization and manufacturing sector development. However this area of researcher is not well crowded and still has a window of opportunity as open to accept the latest studies. In this regard, studies like Mielnik and Goldemberg (2000); Sadorsky (2010) claims the positive associationship between electricity consumption and FDI influx in the economy. They state that the involvement of FDI in the economy raises the competition as a consequence of which business became cheaper and also ensure the easy availability of capital, which can be casted to expand the production sector as a consequence of which demand for power resources will be improved and move towards new levels. A main limitation of different results has also been observed in this area of research as we find in the previous lines of research.

So, by keeping the results of such previous literature under consideration, it has been concluded that the higher level of development in the economy can be

attained through the addition of power resources to the economy, which not only raise the production sector of the economy, also raises the involvement of foreign interest towards the economy. In this situation, it is worthwhile to empirically investigate the associationship between economic development, electricity consumption and financial evolution. The present study is unique from the existing literature in the following manners. Compared to the previous literature, this study does not restrict itself towards traditional bi-variate model of relationship, but add financial development as a third variable in the traditional bi-variate model in order to eliminate the omitted variable problem from the relationship. This study further employs principal component analysis (PCA) approach for the measurement of financial development indicators, which helps us to find the suitable indicator without hurting the data. As far as we know, this study became first in itself, which applies the concept of PCA in energy growth nexus in Pakistan and hence represents our contribution towards the existing strand of knowledge.

In terms of objectivity and practical application, this study will help the government and other policy-making organizations to design suitable policies to grab the evil of power shortage, which has become one of the challenging tasks for the Government of Pakistan. The results will define the nature as well as direction of the relationship, which will enable the government and other policy-making organizations to take relevant steps regarding promotion of trade, liberalization of the electricity sector or financial sector. This will help the economy to come out from this state of the economic downturn and smoothen its way towards economic development.

The pattern of this study is as follows: Section 1 gives an introduction of the topic, section 2 define the review of the literature. Section 3 represents the theoretical model, data as well as a methodology of the study. However, interpretation of results and conclusion are defined in section 4 and 5 respectively.

2. Review of Literature

Enormous number of studies has been conducted with a view to relate financial sector development with economic evolution in different areas of the world (Schumpeter, 1911; Shaw, 1973; Mckinnon, 1973; Arestis & Demetriades, 1997; Shahbaz at el, 2013 and Ozturk & Acaravci, 2013). However, these studies contribute to the literature by providing different dimensions for measurement. Among these dimensions, two dimensions named as factor accumulation and factor productivity are defined by Sadorsky (2010). Both of these approaches raise the efficiency of financial systems by reducing the problems of information asymmetries, which increase the contribution of these studies in the economic development of the nations.

A number of studies (Claessens & Leaven, 2004; Karanfil, 2009; Sadorsky, 2010; Sadorsky, 2011) are of the view that energy-growth relationship is not justified through simple bivariate model; but there is another important element whose presence in relationship is not ignorable, and that is financial development. Similarly, Shahbaz and Lean (2012) conducted a study in Tunisia and found a positive bi-directional relationship of industrialization with financial development **(FD↔IND),** financial development with energy consumption **(FD↔EC)** and Industrialization with energy consumption **(IND↔EC)**. Sadorsky (2010) uses the GMM approach to measuring the financial development impression on economic progress of 22 developing nations. He uses stock market approach to measure the financial development and found significant results of the existence of the relationship between economic uplift and financial sector development in developing nations (Sadorsky, 2010). Similarly in another study he uses the same concept of identification of the association between electricity consumption and financial development in panel of 9 frontier nations of Central and Eastern Europe by employing same GMM technique (Sadorsky, 2011). In this paper, he used four banking and three stock market indicators for the measurement of financial development and concluded that each of the banking variables is statistically significant in this case. These results validate his previous findings of presence of a positive relationship between electricity consumption and financial sector development of the country (Sadorsky, 2010).

Apart from studies of Sadorsky, considerable work done by Yandan and Lijun (2009) in Guangdong for the purpose of primary electricity consumption relationship with the financial development of the state. Authors employ Granger causality and cointegration analysis to investigate the existence of causality in either short or long term in Guangdong. Results indicate the presence of stability in cointegration on a short term, while variations in long-term relationship. Furthermore, the study also states that financial development in Guangdong is a reason of rise in its primary electric consumption, which is an evidence of one-way causal relationship in this study **(FD→EC)** (Yandan & Lijun, 2009).

In energy growth nexus, significant work is done on the determination of energy consumption and economic development (Karanfil, 2009; Barleet and Gounder, 2010; Ozturk & Acravci, 2010; Narayan et al, 2010; Saatci & Dumrul, 2013). All these studies resulted with a stable form of relationship between these variables. Among these studies, Hou (2009) also address this traditional relationship between EC and EG in China with the help of ADF, Cointegration and Hsiao's ranger causality in China. The results of his study show an existence of a bidirectional relationship in which energy consumption along with economic growth Granger cause each other **(EC↔EG)** (Hou, 2009).

Islam et al. (2013) conducted a study on Malaysian economy and used a vector error correction technique and demonstrates the existence of bidirectional causality between financial development and electricity consumption **(FD↔EC)**. The study of a similar nature was conducted by Shahbaz et al. (2012) in Tunisian economy, and shows results in the form of relationship between energy consumption, financial industrialization, as well as financial development. Similarly Salman and Atya (2014) carried a study on North African nations covering period of 1980 to 2010 for validation of causality between financial development and economic growth, and check its impact on electricity consumption. They applied Granger causality as well as error correction model and demonstrate the existence of positive causality in energy finance relationship in Algeria as well as Tunisia, while negative correlation in Egypt due to very minimal amount of subsidies in power sector.

In case of Pakistan, Hye and Riaz (2008) conducted a study for governing the dimension of causality between ED (economic development) and EC (electricity consumption) through application of augmented form of Granger causality as well as bound testing approach of cointegration. Results of this study indicate the presence of short-term bidirectional causality between electricity consumption and economic development **(EC↔ED)**. On the other side of the picture, the existence of unidirectional causality indicates that the economic development is the main reason of rise in electricity consumption in the economy. This is because the involvement of big tickets in economy raises the consumption and to meet this consumption; demand of oil increases, which in turn increase the electricity prices.

Another study conducted by Shahbaz and Fetidun (2011) also supports the results of Hye and Riaz (2008) about the presence of long-run unidirectional causality from economic growth towards electricity consumption **(EG→EC)**. The results of the study also show the existence of the relationship between employment level of the country and electricity consumption, which in a broader sense supports the argument of Sadorsky (2010, 2011) about big tickets. On the other hand Aqeel and Butt (2001) contradict the views of energy growth nexus, and show that the causality exists, but in the opposite direction as defined by previous studies (Hye and Riaz, 2008 and Shahbaz and Feridun, 2011). Javid et al. (2013) identifies the presence of unidirectional long-term causality, in which electricity consumption causes the rise in the per capita GDP. The reason for this causlaity is the direct relationship between electricity consumption and production process, which will raise the employment as well as exports of the country resulting in a rise per capita GDP. They also showed the deviations in the short term by defining electricity consumption as a restraining factor of economic growth in Pakistan. A significant portion of economy's earning derives from production sector and any shock or shortfall in electricity results in a reduction in production level, which in turn

reduces the exports and cause adverse effects on economic growth. Kakar et al. (2011) aimed to identify the nature of the relationship between economic development, electricity consumption and financial development variables. Results of his study show compliance with other studies through the presence of long-run unidirectional causality from financial development to electricity consumption, while contradiction through inexistence of the short-term relationship. However, direction of causality is found from EG to EC and from FD to EC.

Apart from these studies, this study uses principal component analysis in accordance with Tang and Tan (2014) to measure the financial development. Along with PCA, cointegration and regression analysis is also adopted to define its impact of FD on FDI inflow as well as electricity consumption and economic growth either in short or long-term.

3. Theoretical Background

In this study, a framework based upon the theory of consumer behavior is employed. This theory like any other theory of finance is based on the concept of rationality. These theories say that despite different values and perceptions in the society, one thing became common among all the customers, and is the maximization of benefit within limited resources. However, there are different items that can affect the consumption pattern of a person and define the consumer consumption pattern. In this study, we use a portion of such factors to define a model to measure electricity consumption.

$$\ln EC_t = a_0 + a_1 \ln GDP_t + a_2 \ln FDI_t + a_3 \ln FD_t + \varepsilon_t$$

EC stands for electricity consumption measured in kilowatt-hour; FDI represents the inflow of FDI measured in local currency; GDP includes the real per capita GDP in resident currency and FD becomes an indicator of financial development.

3.1. Measurement of Financial Development

Karanfil (2009) consider financial development as one of those other variables that affect not only the electricity demand, but also the relationship between EC and ED. However, this concept of financial development cannot be measured through any single variable, as it contains a number of similar variables that are extensively used in existing literature for measurement of financial development. This study uses banking sector approach in accordance with Ang (2009); Ang and Mckibbon (2007); Sadorsky (2011); Tang and Tan (2014) and used Domestic credit provided by banking sector, financial system deposit, broad money (M2), Liquid Liabilities

(M3), Domestic Credit to Private Sector (PRI) to measure financial development in Pakistan. All these proxies of financial development are in percentage form of GDP. Banking sector approach is used because it helps in the determination of financial depth of the economy. On the other hand, depth defines size of the financial sector with respect to the economy indicators. The more the depth, higher will be the financial sector, and greater will be the industrialization in the economy. On the other hand, higher the industrialization, the greater will be electricity consumption, because of the rise in per capita income that stimulates not only the demand of big tickets, but also the economic growth of the economy.

Traditionally M2 and M3 are used for determination of financial development, but these variables are related to one another and show the flow of funds instead their channelization from depositors to investors in the economy (Ang & Mckibbin, 2007). In this regard, credit provided to a private channel is considered as suitable because it shows the efficiency of private sector to channelize funds in an efficient manner as compared to public sector. However, all of these variables of FD used in this study are closely related to each other, so their inclusion in a single equation raises a problem of multi-collinearity. In order to eliminate the risk of such problem, this study adopts a technique named as Principal Component analysis for measurement of financial development. PCA is a method used for the reduction of dimensional problem in the data (Coban & Topcu, 2013). PCA reduces the number of variables by including their information in a group of principle components. Among these groups, the first component shows the maximum variance, and if more than one component exists; then the amount of variance is distributed among components. Each principle shows the variance through its Eigenvalues that display the percentage of total data explained by the component.

3.2. Data and Methodology

This study focuses on the annual time series data of 1975-2011, collected from World Bank's published and unpublished resources (WDI). All the variables selected for this study represent time series data, so there is a possibility of the presence of trends in the data. In order to resolve this problem, we procured the log of all the variables used in this study. In order to further remove the problem of trends in data, we calculate the unit root via Augmented Dickey Filler test, so that all the variables became stationary at any single period.

3.3. Unit Root analysis

In any time series data, there is always a possibility of the presence of trends, and it is essential to integrate the data at any single level of integration for getting fruitful results. However with this view, we also apply ADF (augmented Dickey filler) test in this study to check the presence of integration or stationarity in the data at any certain level by using the following equation.

$$\Delta Y_t = \alpha + \delta Y_{t-1} + U_t$$

3.4. Cointegration analysis

In order to judge the presence of any level of cointegration between EC, FDI, GDP and FD variables, this study employs the Johansen method of cointegration in accordance with the study of Tang and Tan (2014). However, the Johansen cointegration approach can be calculated by adopting the vector autoregression (VAR) model with the following estimator.

$$\Delta Z_t = \emptyset D_t + \prod Z_{t-1} + \sum_{j=1}^{k-1} \Gamma \Delta Z_{t-j} + \upsilon_t$$

The Δ sign indicates the difference operator; *Z* represents the vector of all the endogenous variables that includes the log of EC, FDI, GDP and FD. $\prod$ defines the matrix containing long-term information of all the variables while Γ represents the matrix of all the unknown parameters. For taking any decision regarding the presence of cointegration or association among the stated variables, this study considered P values of Trace statistics and Maximum Eigenvalue tests. If the P-value is less than 5%, Null hypothesis of no cointegration among variables is rejected while alternative hypothesis of the presence of cointegration is accepted and vice versa.

3.5. Vector Error Correction Term

The direction of causality can easily calculated through the application of traditional causality approach defined by Engle and Granger (1987). Such application through standard VAR model is misleading because of the stationarity of all the variables at same first order I(1). In this particular situation, causality can be determined through the application of error correction model.

$$\Delta \ln EC_t = \alpha_1 + \sum_{i=1}^{p} \beta_i \Delta \ln EC_{t-i} + \sum_{i=1}^{p} \vartheta_i \Delta \ln GDP_{t-i} + \sum_{i=1}^{p} \kappa_i \Delta \ln FD_{t-i} + \sum_{i=1}^{p} \theta_i \Delta \ln \mathrm{FDI}_{t-i} + + \psi_1 ECT_{t-1} + \upsilon_{1t} + \varsigma 1t$$

$$\Delta \ln GDP_t = \alpha_2 + \sum_{i=1}^{p} \vartheta_i \Delta \ln GDP_{t-i} + \sum_{i=1}^{p} \beta_i \Delta \ln EC_{t-i} + \sum_{i=1}^{p} \kappa_i \Delta \ln FD_{t-i} + \sum_{i=1}^{p} \theta_i \Delta \ln FDI_{t-i} + \psi_2 ECT_{t-1} + \upsilon_{2t} + \varsigma 2t$$

$$\Delta \ln FD_t = \alpha_3 + \sum_{i=1}^{p} \kappa_i \Delta \ln FD_{t-i} + \sum_{i=1}^{p} \beta_i \Delta \ln EC_{t-i} + \sum_{i=1}^{p} \vartheta_i \Delta \ln GDP_{t-i} + \sum_{i=1}^{p} \theta_i \Delta \ln FDI_{t-i} + \psi_3 ECT_{t-1} + \upsilon_{3t} + \varsigma 3t$$

$$\Delta \ln FDI_t = \alpha_4 + \sum_{i=1}^{p} \theta_i \Delta \ln FDI_{t-i} + \sum_{i=1}^{p} \beta_i \Delta \ln EC_{t-i} + \sum_{i=1}^{p} \vartheta_i \Delta \ln GDP_{t-i} + \sum_{i=1}^{p} \kappa_i \Delta \ln FD_{t-i} + \psi_4 ECT_{t-1} + \upsilon_{4t} + \varsigma 4t$$

In these above mentioned equations elements of both long and short term are involved. Δ denotes the first difference while *ln* denotes the natural logarithm of a variable, while ςit represents the value of white noise and normally distributed residuals. On the other hand, residuals are denoted by υ_{it} and they are considered as normally distributed. As we mentioned earlier ECT_{t-1} represents lagged error term, which we obtained through the application of cointegration. In contrast, short-term direction causality is determined through application of Wald test on the both lagged error term and lagged value of exogenous variable.

4. Empirical Findings

4.1. Results of Principal Component Analysis

Principal component analysis is labeled as a tool applied to reduce the dimensionality of the variables by addressing the variance in form of principal components. The study employed principle component analysis for identification of the suitable measure of financial development. In this regard, four parameters of the banking sector are used to measure the depth of the financial sector in Pakistan. The results of PCA are shown in Table 1.

Table 2. Principal Component Analysis

Principal Component	Eigenvalues	% of Variance	Cumulative %
1	3.462113	0.6924	0.6924
2	1.064093	0.2128	0.9052
3	0.339304	0.0679	0.9731
4	0.107042	0.0214	0.9945
5	0.027448	0.0055	1.0000

Variable	Principal Component 1	Principal Component 2	Principal Component 3	Principal Component 4	Principal Component 5
LOGM3GDP	0.521747	0.179519	0.107059	0.085796	-0.822636
LOGM2GDP	0.512555	-0.095172	0.203637	-0.0775772	0.291443
LOGPRI	0.435372	0.318186	-0.832580	0.069745	0.105614
LOGFSDGDP	0.475170	-0.386652	0.210865	0.595284	0.475275
LOGDCBC	0.223007	0.841411	0.457620	0.177733	0.035915

Note: all variables in this matrix are in their logged form

Results show that among the above mentioned five principal components, 1st principal component describes 69.24% and 2nd principal component define 21.28% of the total variation. In contrast, the remaining three principal components (3rd, 4th and 5th) explain less than 10% of the total variation. This statistics of the variables express that the first principal component is the best measure of financial development in the case of Pakistan. The individual contribution of each of the variables of financial development to first principal component includes DCBC 22.30%, PRI 43.53%, M2 51.25%, FSD 47.52% and M3 52.17%, which will be used in the creation of general index used to measure the concept of financial development. In terms of descriptive statistics, results of this study show that all the variables; gross domestic product, foreign direct investment (inflows), electricity consumption and financial development (PCA) are usually distributed in accordance with findings of Shahbaz (2011) and Tang and Tan (2014). The corresponding Jarque-Bera statistics in our case also show the rejection of the null hypothesis of familiarity of the data. So we can conclude that the data is normal, and there is no problem of non-stability in it. However, the results of Descriptive statistics are mentioned in Table II as below:

Table 3. Descriptive Statistics

	LogEC	LogFDI	LogGDP	FD_Index
Mean	5.578277	-0.561833	10.53663	-1.22E-14
Median	5.783609	-0.491035	10.59052	-0.025332
Maximum	6.162068	1.299735	10.88559	3.155371
Minimum	4.660688	-2.786604	10.09989	-5.220132
Std. Dev.	0.484036	0.955344	0.235637	1.886341
Skewness	-0.595944	-0.173993	-0.279412	-0.421783
Kurtosis	2.001385	2.831337	2.119822	2.959841
Jarque-Bera	3.727487	0.230542	1.675790	1.099542
Sum	206.3962	-20.78780	389.8554	-4.55E-13
Sum Sq.Dev.	8.434484	32.85655	1.998900	128.0982

4.2. Results of Unit Root Test

The stability of data is further analyzed through implementation of augmented Dickey-Fuller (ADF). This test has been extensively used in existing literature like; Tang and Tan, (2014) and Shahbaz, (2012) for identification of trends in data of electricity consumption, financial development and economic growth. Results show that all the variables in their log form are stationary at first order and became stationary at 1% significance level. Table 3 displays the results of Unit root test of the study.

Table 4. Unit Root results

	Null Hypothesis: variable has a Unit Root Exogenous: Constant Lag Length: 0 (Automatic - based on AIC, LR, FPE, max lag= 2)			
	t-Statistics (Test Critical Values)			
Variable Name	**ADF value**	**1% level**	**5% level**	**10% level**
LogEC	-4.617903***	-3.632900	-2.948404	-2.612874
LogGDP	-4.394965***	-3.632900	-2.948404	-2.612874
LogFDI	-6.075929***	-3.632900	-2.948404	-2.612874
PCA_Index	-4.674176***	-3.632900	-2.948404	-2.612874

Note: All the variables are in Log form, instead of PCA_index because of having negative values in the index.

(***, **,* represents 1%, 5% and 10% significance Level.)

4.3. Results of Cointegration

The results of ADF test about integration shows that variables are stationary at *I* (1). This level of stationarity provides us a base for further examination of long-term relationship between the variables under study. For such purpose, this study applies the Johanson-Juselius cointegration approach among others, because of the fulfillment of the primary requirement about same level of integration of variables. In this cointegration test, the number of appropriate lags is selected on the basis of AIC, FPE, and LR test. Results show that the hypothesis of no cointegrating relationship is rejected at 5% level of significance, which means that there is a presence of long-term relationship between variables. With this view to find a long term relationship, this research further finds the failure of rejection of at most one cointegrating vector on the basis of both max Eigenvalues and Trace statistics. Hence we conclude that there is a significant long-term association ship between all the variables in the model, but the direction of such long-term causality is not acknowledged at this point. The results of this approach are mentioned in Table IV as following:

Table 5. Results of Cointegration

Hypothesis	Trace Statistics	Max Eigen Values
R = 0	51.42927 [0.0222]	33.73220 [0.0071]
R ≤ 1	17.69707 * [0.5885]	9.233686 * [0.8131]
R ≤ 2	8.463383 [0.4173]	8.404322 [0.3391]
R ≤ 3	0.059061 [0.8080]	0.059061 [0.8080]

Note: * represents the decision about number of cointegration relationship.
[ ] denotes probability distribution.

Statistics of the above-mentioned table shows that all the variables have some long-term interaction with each other. These statistics allow us to proceed towards the estimation of cointegration equation, which we found from the normalized cointegration coefficient matrix are as following:

$$LogEC = -0.82logFDI + 0.6358logGDP - 0.1639FD$$

Results of the cointegration are according to our expectation about the long run relationship. so, we can conclude that our results comprehend the possessions of both Shahbaz and Feridun (2012) and Alam (2013), who reports the occurrence of long-term cointegration relationship between economic growth and electricity consumption. Our results also support the findings of Sadorsky (2011), who state that the financial sector developments raise the demands of big tickets in the economy, which raise the demand for electricity.

4.4. Vector error correction model

The direction of causality can be determined through application of vector error correction model. ECT approach is adopted in this research because exclusion of ECT from model gives unrealistic results (Adjaye, 2000). Another reason for this application is the segregation of both long and short term causality in this model. Table V provides an overview of the VECM results.

Table 6.VECM Results

	Short term relationships (Wald Test Statistics)				**Long term relationship**
Variables	**LogEC**	**LogGDP**	**LogFDI**	**FD (PCA_index)**	**ECT_{t-1}**
LogEC	---------	0.430138 [0.8065]	2.944502 [0.2294]	1.802147 [0.4061]	0.084167 {0.02111}
LogGDP	6.541744** [0.0380]	----------	0.405112 [0.8116]	8.928322** [0.0115]	0.635782 {0.79426}
LogFDI	5.026477* [0.0810]	1.086044 [0.5810]	----------	1.370376 [0.4050]	-0.814808 {-3.45348}
FD (PCA_index)	9.965790*** [0.0069]	5.772555* [0.0558]	8.706936** [0.0129]	----------	-0.163883 {-2.83130}
Diagnostic Tests					
R^2	0.6031				
Adjusted R^2	0.4541				
F-Statistics	4.0506	[0.0029]			
JB (χ^2 Normality)	0.8207	[0.6634]			
BG (χ^2 Hetero)	0.1156	[0.9438]			
BG (χ^2 Serial)	3.5211	[0.9906]			

Note: (***,**,* represents the significance level of 1%,5%,10%)
[] shows the probability value, {} shows the value of standard error

Results demonstrates that the error correction term is positive and significant, which means that in short-term, there is a positive relationship between financial development, electricity consumption and economic development. These results are in accordance with the trends observed in Pakistan. For example, we see that whenever the politicians receive aid for Saudi-Arabian government in holy month of Ramadan, the government ensures the uninterrupted power supply for the month. As the reserves of aid finishes, the system again comes back to its previous stage of Power shortage. In contrast, the speed of adjustment is also negligible and rank up to 8.47%, which further comprehend the results of error correction term. This means that in short run the system will not overcome its main problem of power shortage. So we can conclude that there is a need of long term planning to

grab this evil, which shows that in the long-term causality moves from electricity consumption towards financial development, FDI inflows and per capita GDP. This direction is in accordance with the basic argument that if the country ensures the adequate availability of power resources to the industrial sector along with handsome environment, investor attracts towards this nation and prefers to invest their capital in the economy.

In contrast, the chi-square values obtained from Wald statistics demonstrate the presence of short-term causality running from financial development towards electricity consumption, FDI inflow towards electricity consumption and from GDP towards electricity consumption. 1% rise in electricity consumption can be observed if there will be a rise of 5% in FDI in the country. Similarly, if GDP per capita raise by 6.54% then the electricity consumption will increase by 1%. Furthermore, the rise of 9.5% in the financial sector development would cause a 1% rise in the value of electricity consumption. On the other hand, both financial development and GDP cause each other at the same time, which shows the existence of bidirectional causality running between GDP and FD.

All of these results give strength to the argument that Pakistan is an energy dependent country and needs electricity for its long term growth. So, any energy policy which is aimed to conserve the energy will have not much significance on the economy, become conservation of system where raise the power supply to industrial sector, also reduce the supply to domestic sector. This situation leads towards unrest in the economy, which directly hurt the business in the economy. When no electricity is provided to the domestic users their demand of big tickets is entirely changed, also badly hurt the business in the domestic industry. This reduction where reduce the turnover of the investors in the market, also reduce the per capita income by raising unemployment in the economy.

On the other hand, our results regarding bidirectional causality are in accordance with Iqbal, Shaikh and Shar (2010), which states that this causality is the evidence of different growth theories. These theories state that the attraction of FDI in this economy gives fruitful results for the economy. In contrast, previous trend FDI further supports the hypothesis that FDI inclusion raises the level of development in the economy.

5. Conclusion and Policy Implications

The intent of this study is to find the role of financial development in traditional electricity-growth nexus. Johanson Cointegration, Principal component analysis and vector error correction methods were adopted in this study to define the existence as well as direction of both long and short term causality between the variable of this study. Analysis of the study determines the existence of long-term causality from electricity consumption towards financial development and economic growth. On the other hand, short term causality is observed from FDI, FD and GDP towards electricity consumption in the economy. Further a bidirectional relationship is also observed between FDI and GDP, which supports the findings of Iqbal et al. (2010).

Pakistan is well known for its agricultural land and its viable geographic as well as market situations. These markets have enough potential to provide sufficient revenue to investors. A number of different factors have been observed in previous decade that reduce the potential of these markets. One of such limiting factors is the power shortage in the economy, which retards the uplift of the economy. This shortage has been further observed as a reason of capital flight from Pakistan towards other nations, which results in raising unemployment as well as reducing interest of foreign investor in the economy. In order to overcome this problem, different governments take various short term steps in their tenure with a view to raise their popularity. Unfortunately, all of these efforts became vague and imposed further debt burden instead of dwindling of this problem. So in present, where Pakistani faces lots of challenges, one main challenge for the government is to overcome the power shortage problem, so that the economy regains its old position in the race of developing nations. In this crucial movement, there is a need of proper efficient long term planning, which helps in the eradication of this problem. The Government of Pakistan have to leave the traditional point scoring strategy and collect all the school of thoughts at any single point of reference, so the appropriate enactment will be conceivable.

On the basis of the results of the study, I hereby suggest that the government should decentralize the power sector and initiate the credit expansion program in the power sector. Apart from the expansion there is a need of provision of incentives to attract the level of investment in the economy. The attempts of the current government are impressive, but the involvement of credit expansion program as well foreign investment raise the numbers of competitor in the power sector. The result of such competition will be technological advancements with a number of substitute ways, which will help the economy to nib this devil of load shedding in the bud. Furthermore, governments instead of the provision of short term yellow cap scheme and youth employment loan schemes initiate technical education programs, which will provide us an educated and well trained class of

labor. So that the investor moves towards economy and enjoys the benefits of the abundant supply of power as well as huge profits, which in turn raise the movement of the nation towards economic uplift.

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