Energy Crisis and Performance of Industry of Pakistan: An Empirical Study of KSE Listed Companies

Muzammil Khurshid (Corresponding author)
Dokuz Eylül University,Izmir,Turkey
muzammilkhurshid@yahoo.com
Waseem Anwar
Center for Excellence in Research, Department of Management Sciences
COMSATS Institute of Information Technology, Lahore, Pakistan.
wasyhcc@yahoo.com

Abstract
This study investigates the impact of Energy crisis on the financial performance of the different industries in Pakistan. In the study Performance has been measured by Return on Assets ratio (ROA).Performance of all the KSE listed companies from five major industries of Pakistan has been observed for the period of six years (2004 to 2009). For Descriptive and paired sample mean comparison, sample has divided into two, pre and post energy crisis. Results of the study suggested that performance of the companies have decreased significantly because of energy crisis in Pakistan. Industry wise analysis revealed that Textile, Cement and Engineering Industries badly affected by energy crisis. However impact of these crises on Sugar and Chemical industry is insignificant.
Keywords: Energy Crisis, Performance of Industry, Karachi Stock Exchange, Pakistan

Introduction

Energy is considered to be the lifeline for every economy around the globe, and it is considered the most important component in the course of development (Sahir and Qurashi, 2007)whether it is agriculture or industry, energy is an essential component to move forward. Socially it represents the class of life of citizens and community and economically it is important for every industry. Traditional theories of economics consider just capital and labor as the most important factors of production(Stern Cleveland, 2004). But it is no more the case in current scenario, recent studies have suggested that energy is the most important component in the production and consumption function of every economy in the world(IEA, 2005). Lot of work has done in the recent years and it has been proved that energy is the essential component in the growth of economy because of its complementary part in production (for example, Asafu-Adjaye, 2000;Stern,2000;ShiuandLam,2004;Altinayand Karagol, 2005;Lee,2005).

The relationship of energy consumption and economic growth has been investigating from last few decades. Various studies has conducted in this regard, findings of these studies are much contradictory in few of the cases. This difference in the findings may be because of the difference in the structure of the economies and dependency of the economy on energy (Sari *et al*., 2008). Akarca and Long (1980) found no relationship between energy consumption and economic development in US. Similar results were reported by (Asafu-Adjaye, 2000;Altinay and aragol, 2004 ;Wolde-Rufael, 2005; Lee, 2006). However some of the studies found the significant impact of energy on the economic development(Soytas and Sari, 2003;Wolde-Rufael, 2004 and Lee, 2005). In Pakistan this area has not adequately explores there are just few studies that attempted to find the relationship of energy consumption and economy development. Aqeel and Butt (2001) found a positive relationship between economic development and energy demand and consumption.

In Pakistan demand for different sources of energy is increasing rapidly. For example if we just look at the electricity, in Pakistan number of consumers increased to 15 million in 2005-06 which were just 8.2 million in 1992-93 (ESP 2005–2006). So it is 83% growth in consumer which is observed in these 15 years. And per capita usage of electricity is also increasing with a sharp rate which was 425 kWh in 2004-05 (IEA, 2006). The main reason of this sharp increase in per capita consumption is industrialization, growth and technological advancement in agriculture, urbanization and electrification of rural areas in the country (NBP, 2008). During the same period, world average per capita consumption of electricity was 2516 kWh which shows that still in Pakistan per capita consumption of electricity is not too much high (IEA, 2006). According to Economic survey of Pakistan in the year of 2007 electricity is available to 86.6% of the total population of Pakistan (ESP 2007–2008). It shows that still there is lot of room in the demand of electricity. If government takes some action to provide electricity to remaining population of Pakistan, there would be a significant increase in the demand of electricity. Same is the case in utilization of natural gas which is the second major source of energy. During 2007 natural gas was available to just 30% of the total population of Pakistan (ESP 2007–2008). This suggests that demand is expected to increase in this sector.

According to the different researches conducted all over the world, it has been proved that electricity is the most important and richest source of production and economic growth followed by gas(Erbaykal, 2008). Statistics has been proved that gas and electricity are main energy sources in Pakistan, for domestic usage and

commercial usage as well(ESP 2007–2008). Since 2006 Pakistan is facing a decline in the production and distribution of the gas and electricity(ESP 2006–2007). During the year of 2006 and 2007, production and distribution of electricity and gashas decreased approximately 40%(ESP 2007–2008).In Pakistan both of the two main energy recourses are not enough to meet the demand of domestic and commercial users. In this scenario growth of economy is not possible, even it is very difficult to maintain the GDP at current level. At the same time tariffs of electricity and gas is increasing rapidly, which is the major source of inflation in Pakistan(ESP 2008–2009). In this study we have investigated the impact of these energy crises on the performance of different industries in Pakistan.

Objectives

Main objective of the study is to find out the extent of energy crises affects the different industries in Pakistan. Other sub-objectives of the study are as follow:

- To find the affect of energy crises on textile industry.
- To find the affect of energy crises on cement industry.
- To find the affect of energy crises on engineering industry.
- To find the affect of energy crises on chemical industry.
- To find the affect of energy crises on sugar industry.

Research Methodology

According to (Economic Survey) Electricity, gas production and distribution has shapely decreased in the year of 2006 and 2007 and situation is going worse with the time. So we are expecting a decline in the performance of the industries from the year 2006. Our analysis is included pre and post performance of the different industries of Pakistan. For this study we used six year data (from 2004 to 2009). We have taken the post time period from 2007, which we have already mentioned we are expecting the decline in the performance from 2006 which is the part of financial report of 2007.

In consistent with previous studies Return on Assets (ROA) ratio has been used to measure the performance of the companies e.g. (Anwar and Tabassum 2011, Chen. et al., 2005. ROA is calculated by dividing the net income by total assets. ROA ratio has calculated for individual company for six years. For analysis purpose three year pre and post ROA ratios have been combined by taking the average. Descriptive analysis has been used to identify the extent to which the energy crisis.

Sample of the study included all companies from five major sectors (Textile, Cement, Sugar, Engineering and Chemical) that are listed on Karachi Stock Exchange. Any company that is listed during this period or delisted during this six year period excluded from the sample. Number of observed companies has been mentioned in table 1. Data have been collected from the "financial statement analysis", which is a publication of State Bank of Pakistan. This includes financial statements of all the companies listed in Karachi Stock Exchange.

Following are the descriptive analysis of the entire observed companies sector wise. Table 1 is representing the pre energy crisis performance of the companies. While table 2 is representing the descriptive analysis of post energy crisis. Mean value of ROA is representing that in the post energy crisis time period performance of all the sectors has decreased. ROA of textile and cement sector is in negative during the post crisis time period. There is also a sharp decline in the average ROA of engineering sector. On the other hand ROA ratio of chemical sector and sugar sector is comparatively stable.

Table 1: Descriptive Analysis (Pre Energy Crisis)

Industry	Obs	mean	skweness	min	max	Percentiles	
						10%	90%
Cement	19	9.94	0.3	-11.8	31.87	-6.97	30.73
Textile	140	1.27	-0.94	-45	39	-5	7
Sugar	35	2.6	-0.038	-20.33	26.17	-5.23	10.2
Chemical	30	12.47	0.13	-13.17	35.93	-2.57	31.54
Engineering	37	10.67	0.47	-20.63	46.17	0.7	21.43

Table 2:Descriptive Analysis (Post Energy Crisis)

Industry	Obs	Mean	skweness	min	max	Percentiles	
						10%	90%
Cement	19	-0.924	0.02	-20.63	20.2	-15.73	10.23
Textile	140	-1.52	2.44	-19	52	-9	4.5
Sugar	35	2.9	0.87	-8.7	25.1	-6.87	16.1
Chemical	30	10.78	0.744	-7.27	39.47	0.05	23.8
Engineering	37	5.12	-0.34	-28.03	30.57	-12.9	19.13

Results and Discussion

Mean comparison of the overall five sectors is shown in the table 1

Table 1: Overall Paired Sample mean comparison

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
pre	243	4.199465	.6815253	10.62393	2.856986	5.541944
post	243	.7268313	.5929324	9.242902	-.4411359	1.894799
diff	243	3.472634	.7723994	12.04051	1.95115	4.994118

```
    mean(diff) = mean(pre - post)                                 t =   4.4959
Ho: mean(diff) = 0                         degrees of freedom =      242

Ha: mean(diff) < 0           Ha: mean(diff) != 0           Ha: mean(diff) > 0
Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Table 1 is showing the overall analysis of all the industries include in the study. Mean comparison analysis of seven sectors has suggested that there is a huge difference between the pre and post performance of these five sectors. Mean values of these sectors have been decreased from 4.19 to 0.73. The major reason of this poor performance is decrease in the supply of major two sources of energy (electricity and gas) used in Pakistan.

To measure the impact of energy crisis on different industries, we analyze the pre and post performance of the different industries individually. Table 2 representing the performance analysis of textile sector.

Table 2: Textile Sector,Paired Sample mean comparison

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
pre	140	1.271429	.7253906	8.582937	-.1627975	2.705655
post	140	-1.521429	.6310294	7.466441	-2.769086	-.2737712
diff	140	2.792857	.9118663	10.78935	.9899354	4.595779

```
    mean(diff) = mean(pre - post)                                 t =   3.0628
Ho: mean(diff) = 0                         degrees of freedom =      139

Ha: mean(diff) < 0           Ha: mean(diff) != 0           Ha: mean(diff) > 0
Pr(T < t) = 0.9987         Pr(|T| > |t|) = 0.0026          Pr(T > t) = 0.0013
```

Analysis of textile sector has revealed that energy crisis hit the textile industry very badly. Average Return on Assets (ROA) is negative in post period, which means that on average textile industry is in losses during the period 2007 to 2009. In textile electricity and gas are two major sources. Reduction in the supply of these two affected textile industry.

Table 3: Sugar Sector, Paired Sample mean comparison

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
pre	35	2.595143	1.327881	7.855849	-.1034356	5.293721
post	35	2.896	1.541835	9.121616	-.2373847	6.029385
diff	35	-.3008572	1.937837	11.4644	-4.239015	3.637301

mean(diff) = mean(pre - post) t = -0.1553
Ho: mean(diff) = 0 degrees of freedom = 34

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.4388 Pr(|T| > |t|) = 0.8775 Pr(T > t) = 0.5612

On average performance of the sugar sector is better in the post period. ROA has increased in the post period. Mean comparison test also suggesting that there is no decrease in the performance of sugar sector on average. Reason for this stability may be the rise in the prices of sugar in these years. Another reason of this stability is that sugar industry is a seasonal industry.

Table 4: Cement Sector, Paired Sample means comparison

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
pre	19	9.937895	2.874931	12.53153	3.89789	15.9779
post	19	-.9242105	2.021303	8.810656	-5.170811	3.32239
diff	19	10.86211	2.508659	10.93499	5.591608	16.1326

mean(diff) = mean(pre - post) t = 4.3298
Ho: mean(diff) = 0 degrees of freedom = 18

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.9998 Pr(|T| > |t|) = 0.0004 Pr(T > t) = 0.0002

Table 4 is representing the paired sample mean comparison of pre and post period of Cement sector. Results are suggesting that cement sector has seriously affected by energy crisis. In the post period, ROA is in negative which were very handsome in the pre period. Mean comparison has also reported that on average there is a huge decline in the performance of the cement sector. The major reason of this decline is the dependency of cement sector on the major energy sources electricity and gas.

Table 5: Chemical Sector, paired sample mean comparison

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
pre	30	12.46667	2.331826	12.77194	7.697546	17.23579
post	30	10.77933	1.945932	10.65831	6.799456	14.75921
diff	30	1.687333	2.915614	15.96947	-4.275767	7.650433

mean(diff) = mean(pre - post) t = 0.5787
Ho: mean(diff) = 0 degrees of freedom = 29

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 0.7164 Pr(|T| > |t|) = 0.5672 Pr(T > t) = 0.2836

Analysis of the chemical sector is representing a decline in the performance at very minimal level. Mean values of ROA are not differing significantly in the pre and post period. The main reason of this stability is that unlike textile and cement, chemical sector is not too much dependent on electricity or gas. So, we can say that there is stability in the chemical sector. Mean comparison analysis is also confirming the statement above.

Table 6: Engineering Sector, Paired Sample mean comparison

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
pre	37	10.67378	1.74765	10.63054	7.129385	14.21818
post	37	5.124595	1.941775	11.81136	1.186492	9.062697
diff	37	5.549189	1.000233	6.084179	3.520623	7.577755

mean(diff) = mean(pre - post) t = 5.5479
Ho: mean(diff) = 0 degrees of freedom = 36

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0
Pr(T < t) = 1.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 0.0000

Table 6 is representing the paired sample mean comparison of engineering sector. Results are suggesting that there is a huge decline in the performance of engineering sector. ROA has decreased more than 50% during the 2007 to 2009. Mean comparison has also reported a significant decrease in the performance. The major reason of this decline in that engineering sector is totally dependent upon the electricity. And during this period electricity production and distribution has decreased significantly (ESP 2008-09).

Conclusion and Recommendation

This study empirically investigated the impact of energy crisis on five major industries of Pakistan. Return on Assets ratio (ROA) is used to measure the performance of the firm. Descriptive analysis and Paired sample Mean Analysis were used in the study to comparethe pre and post energy crisis performance of the industries. Overall analysis of five sectors revealed that there is a significant decline in the performance of these industries. Sector wise analysis showed mix results. Textile, Cement and Engineering industry reported a significant decline in performance during post energy crisis period (2007 to 2009). While performance of other two industries chemical and Sugar, remain consistent during the post energy crisis period.

We have observed a Sharpe decline in the performance of major three industries of Pakistan because of these energy crises. Textile and cement, two major industrieswhich are not only contributing towards GDP but also a major part of our exports (ESP 2008-09). Performance of these two industries has badly affected by these crises. Government should focus on the energy sector to save industries of Pakistan. It should be first priority of government because it is the issue of survival for industries in Pakistan.

References

1. Akarca, A. T., and T.V. Long (1980), “On the Relationship between Energy and GNP: A Reexamination”, Journal of Energy Development, Vol. 5, pp. 326-331.
2. Altinay, G. and E. Karagol (2004), “Structural Break, Unit Root, and the Causality between Energy Consumption and GNP in Turkey”, Energy Economics, Vol. 26, pp. 985-994.
3. Altinay, G., Karagol, E., 2005. Electricity consumption and economic growth: evidence from Turkey. Energy Economics 27, pp.849–856.
4. An IEA Fact Sheet, International Energy Agency Statistics; 2006.
5. Aqeel, A and M.S. Butt (2001), “The Relationship between Energy Consumption and Economic Growth in Pakistan”, Asia-Pacific Development Journal, Vol. 8, No. 2, pp. 101-109
6. Asafu-Adjaye, J. (2000), “The Relationship between Energy Consumption, Energy Prices and Economic Growth: Time Series Evidence from Asian Developing Countries”, Energy Economics, Vol. 22, pp. 615-625.
7. Asafu-Adjaye, J., 2000. The relationship between energy consumption, energy prices and economic growth: time series evidence from Asian developing countries. Energy Economics 22, pp.615–625.
8. Economic Survey of Pakistan 2005–2006, Finance Division, Government of Pakistan, Islamabad.
9. Economic Survey of Pakistan 2006-2007, Finance Division, Government of Pakistan, Islamabad.
10. Economic Survey of Pakistan 2007-2008, Finance Division, Government of Pakistan, Islamabad.
11. Economic Survey of Pakistan 2008-2009, Finance Division, Government of Pakistan, Islamabad.
12. Erbaykal, E. (2008), “Disaggregate Energy Consumption and Economic Growth: Evodence from Turkey”, International Research Journal of Finance and Economics, Issue, 20, pp. 172-179.
13. In the year of 2006-07 gas and electricity, which are the main sources of energy for industries in Pakistan, reported a negative growth of 15.2% [17]
14. January-February, 2008, pp. 4-15.
15. Lee, C. C. (2005), Energy Consumption and GDP in Developing Countries: A Cointegrated Panel Analysis”, Energy Economics, Vol. 27, pp. 415-427.
16. Lee, C. C. (2006), “The Causality Relationship between Energy Consumption and GDP in G-11 Countries Revisited”, Energy Policy, Vol. 34, pp. 1086-1093.
17. Lee, C., 2005. Energy consumption and GDP in developing countries: a co-integrated panel analysis. Energy Economics 27, pp.415–427.

18. National Bank of Pakistan (2008), "Pakistan's Energy Sector", Economic Bulletin,
19. Pakistan WAPDA, http://www.wapda.gov.pk/
20. Sahir, M. H. and A. H. Qureshi (2007), "Specific Concerns of Pakistan in the Context of Energy Security Issues and Geopolitics of the Region", Energy Policy, Vol. 35, pp. 2031-2037.
21. Sari, R., B. T. Ewing and U. Soytas (2008), "The Relationship Between Disaggregate Energy Consumption and Industrial Production in the United States: An ARDL Approach", Energy Economics, Vol. 30, pp. 2302-2313.
22. Shiu, A., Lam, P., 2004. Electricity consumption and economic growth in China. Energy Policy 32, pp.47–54.
23. Soytas, U. and R. Sari (2003), "Energy Consumption and GDP: Causality Relationship in G-7 Countries and Emerging Markets", Energy Economics, Vol. 25, pp. 33-37.
24. Stern, D. I. and J. C. Cleveland (2004), "Energy and Economic Growth", Rensselaer Working Papers in Economics, ss. 1-42
25. Stern, D.I., 2000. Multivariate cointegration analysis of the role of energy in the US Macroeconomy. Energy Economics 22, pp.267–283.
26. Wolde-Rufael, Y. (2004), "Disaggregate Energy Consumption and GDP, the Experience of Shangai 1952-1999", Energy Economics, Vol. 26, pp. 69-75.
27. Wolde-Rufael, Y. (2005), "Energy Demand and Economic Growth: The African Experience of 19 Countries", Journal of Policy Modeling, Vol. 27, pp. 891-903.
28. Zaleski, P. (2001), "Energy and Geopolitical Issues", In Rao, D. B., D. Harshyita (eds.), Energy Security, Discovery Publishing House, New Delhi.